Essays on Managing Cooperation in Hospitals
Construction of a Maturity Model for Measuring and Improving Inter-Departmental Cooperation

DISSERTATION
of the University of St. Gallen,
School of Management,
Economics, Law, Social Sciences
and International Affairs
to obtain the title of
Doctor of Philosophy in Management

submitted by

André Blondiau
from
Germany

Approved on the application of

Prof. Dr. Robert Winter
and
Prof. Dr. Peter Rohner

Dissertation no. 4511

Difo-Druck GmbH, Bamberg 2017
The University of St. Gallen, School of Management, Economics, Law, Social Sciences and International Affairs hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.


The President:

Prof. Dr. Thomas Bieger
Acknowledgements

This dissertation was written as part of my work as a research assistant and doctoral student at the Institute of Information Management at the University of St. Gallen (IWI-HSG). The development of this dissertation was made possible with the support and active assistance of a multitude of people, whom I would like to thank warmly at this point.

First and foremost, I would like to thank my professor, Robert Winter. His personal and professional supervision, as well as the creation of a research-friendly environment, contributed significantly to the content and success of this work. Furthermore, I would like to thank Peter Rohner and Tobias Mettler for their dedicated co-supervision during this dissertation process and their mentoring during various challenging projects. I owe special thanks to you, Tobias, for your thoughtful comments and constructive critique as well as your calm, stabilizing words during difficult periods. Beyond this, I would like to thank all my colleagues from the institute and beyond for their mutual support and our unforgettable time together. We will see each other again.

During my time at the Institute of Information Management, I had the pleasure of being involved in several national and international projects with leading hospitals. Thus, my thanks go to all our project partners for sharing their world, providing valuable insights, and supporting our work. It was an exciting and inspiring time cooperating with the company partners on workshops, seminars, and onsite visits. This would have not been possible without the funding of the European Regional Development Fund (INTERREG). Therefore, special thanks go to Gregor Cornelsen, who represented the coordinating office, for supporting our ideas.

Last but not least, I thank my family and especially you, Yuliya. Your loving care and support made this exciting, and sometimes challenging, period of my life a true pleasure.

Bern, July 2016

André Blondiau
Dissertation Papers


**Paper C:** Blondiau, André. Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis. *Journal of Health Policy and Technology* (2015), Nr. 1, S. 4-13.
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<th>Description</th>
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<tbody>
<tr>
<td>ADR</td>
<td>Action Design Research</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CIO</td>
<td>Chief Information Officer</td>
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<tr>
<td>CMM</td>
<td>Capability Maturity Model</td>
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<tr>
<td>DSR</td>
<td>Design Science Research</td>
</tr>
<tr>
<td>H-BIT</td>
<td>Hospital Business-IT Alignment Method</td>
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<tr>
<td>HCMM</td>
<td>Hospital Cooperation Maturity Model</td>
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<tr>
<td>HCMM</td>
<td>Healthcare Cooperation Maturity Model</td>
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<tr>
<td>HR</td>
<td>Human Resources</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>INTERREG</td>
<td>Innovation and Environment Regions of Europe Sharing Solutions</td>
</tr>
<tr>
<td>IS</td>
<td>Information System(s)</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>KTI</td>
<td>Kommission für Technologie und Innovation</td>
</tr>
<tr>
<td>MM</td>
<td>Maturity Model</td>
</tr>
<tr>
<td>US</td>
<td>United States (of America)</td>
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Abstract

Flawless cooperation within hospitals is a crucial factor for high-quality medical service provision and efficient processes. This is particularly relevant for large hospitals, such as university hospitals, whose clinics differ strongly in specialization and function but still must be able to guarantee integrated care services. Flawless cooperation among these clinics secures high medical service quality while at same time saves resources and helps to reduce costs. In times of increasing competition among hospitals smooth inter-clinical cooperation can provide competitive advantages.

Thus, for the general management of full service hospitals, such as University hospitals, it is important to identify and address bottlenecks in the cooperation process and avoid them in the future to achieve quality and cost advantages. For this purpose an instrument supporting hospital management to identify and address challenges for inter-clinical cooperation on a regular base is necessary. However, as University hospitals are characterized by a high degree of interprofessionalism and a strong functional orientation, large-scale change efforts are most likely to fail. For this reason a supporting instrument should allow change in small steps. At the same time, the instrument should be easy understandable for various professional groups to meet the pluralistic reality of a university hospital. Approaches for a maturity-based improvement management meet these requirements. They comprise of several stages, so called maturity levels, integrate a diverse set of capability areas in a coherent way, allow a multiperspective view on improvement potentials and provide guidance for a meaningful change sequence. As such they allow communication between different professional groups by providing a unifying concept of maturity. Thus, these models are suitable for managing stepwise improvement initiatives in the interprofessional hospital context. However, literature research neither revealed a specific model addressing inter-clinical cooperation, nor these works provided guidance on how to construct new models for the pluralistic hospital context.

Therefore, in this dissertation, a maturity model prototype is presented based on qualitative methods, such as interviews, focus group discussions, and workshops with key hospital employees. The process of developing the model was documented in order to guide researchers in developing similar models for decision-making support in this specific field. Finally, the constructed prototype was field-tested during two case studies in different sized hospitals, to evaluate usefulness and feasibility of the model.
In this way, first results could be generated and the need for further research could be identified. While the specific model itself might not yet address all relevant issues relating to cooperation within hospitals yet, it offers a solid base for further research in this field. Moreover, the guidelines for developing such models inform further research aimed at constructing and implementing models in the field of healthcare. Therefore, this dissertation contributes to both practical and scientific fields by offering a basis for the development of a maturity based assessment models for the healthcare context.
Kurzfassung


Mit dem entwickelten Prototyp leistet die Arbeit einen praktischen Beitrag zu reifegradbasierten Verbesserungsansätzen im Krankenhaus. Gleichzeitig wird durch die präsentierten Leitlinien auch ein allgemeiner, theoretischer Beitrag geleistet.
Part A – Summary of the Dissertation

1 Introduction

1.1 Motivation

With around 500,000 employees and a turnover of more than 60 billion Swiss francs, healthcare costs account for nearly 12% of the gross domestic product (GDP) in Switzerland (Lindner 2014). It is thus one of the largest sectors of the Swiss economy. While total expenditures in 1995 amounted to CHF 36 billion, they further rose to CHF 65 billion by the year of 2011. This corresponds to an average nominal growth rate of 3.8% per year. The ratio of health expenditures to the gross domestic product (GDP) has risen from 9.5% in 1995 of Swiss GDP to 11.8% in 2015 (Lindner 2014, BFS 2016). Thereby, the rate of increase of health care costs has been exceeding the rate of GDP growth in recent years. The Federal Financial Administration assumes that the share of health care expenditures in gross domestic product will increase to 16% by 2060 (BFS 2016). Compared with 1995, this means almost a doubling of health expenditures. Thus, alongside with Sweden and France, Switzerland’s health care is one of the most expensive in Europe, becoming a relevant burden for national economy (Herzlinger 2007, Lindner 2014, BFS 2016).

The main reasons for this cost development are such factors as the aging population, the costly progress in medical technology and the growing demands of patients (Gemmel, Vandaele et al. 2008, Kohlbacher and Gruenwald 2011). Apart from these mainly unalterable factors the formerly applied payment scheme for inpatient care in hospitals played a decisive role in the cost development. According to the old remuneration scheme, the costs of inpatient treatments in hospitals were covered almost unlimitedly by insurers through payments of the fixed daily rates for the period of treatment. Emerging shortcomings in the remuneration were covered by the cantons due to their legal obligation to cover deficits in public hospitals. Therefore, hardly any incentive existed for hospitals to compete in price and quality by improving their service provision. Over time, the lack of such incentives caused many hospitals to evolve into loosely coupled sets of highly specialized functional units with disparate
local goals, limited communication capabilities and coordination difficulties in the
treatment process (Vera and Kuntz 2007). As a consequence, prices in inpatient care in
Switzerland rose over the last years.

In order to counteract this development, in 2012 the legislative authority introduced a
new remuneration scheme, based on flat rates per case (SwissDRG) to stimulate
efficiency and effectiveness in healthcare (Fässler, Wild et al. 2015, Hoelzer 2015). In
contrast to the remuneration based on daily rates, the new system is based on case-
based billing. Case-based billing means that the remuneration is provided based on a
flat rate rather than the price, calculated based on related costs. The flat rate for one
diagnosis-related group (DRG) consists of the individual base rate at the hospital, the
average length of stay, and the relative cost weight for the DRG, calculated based on a
sample of reference hospitals (Hoelzer 2015). In this way, the costs of medical
procedures should become comparable among different hospitals.

Introduction of the DRG system created the pressure for hospitals not only to be highly
resource-efficient but also to comply with numerous security standards, to improve the
quality of patient care, and to better meet the need of patients. In other words, the
introduction of the DRG compensation scheme has led to more competition among
hospitals as it improved transparency and, in particular, comparability of both costs
and quality in inpatient care (Dormont, Milcent et al. 2006, Cleven, Winter et al. 2014).
In this light, hospitals can no longer afford uncontrolled spending and inefficiencies. Rather, they need to be concerned to manage the costs and quality of
their treatments by monitoring and improving the efficiency of the service provision
(Cleven, Winter et al. 2014).

Similar paradigm shift was experienced by other industries earlier. In manufacturing or
logistics for example, the answer to increased competition and a rise of quality
requirements has been the adoption of process orientation approach (Garrido,
Organization et al. 2008, Kohlbacher 2010, Kohlbacher and Gruenwald 2011). This
concept is commonly understood as a cross-functional, customer-oriented paradigm of

---

The Swiss Diagnosis Related Groups system was introduced in 2012 after the German G-DRG model to improve transparency of medical service provision. Therefore, Switzerland has changed from a time-based system to a case-based remuneration system.
organizational thinking and working (McCormack and Johnson 2001, Kohlbacher 2010). Experiences from the medical technology industry, for example, suggest that process orientation supports cost reductions and an improvement of customer satisfaction, by offering higher quality of care, and an improved productivity (Bocionek and Ricevuto 2010, Kohlbacher 2010). Therefore, process orientation is currently seen as the appropriate method to address the aforementioned challenges in hospitals (Vera and Kuntz 2007, Kohlbacher 2010).

Specialized hospitals with a focused treatment portfolio can benefit easily from process orientation as they can streamline their few core treatments and profit from scale-effects. For large hospitals, such as university hospitals with a high number of largely independent clinics that are traditionally organized along medical specializations (Vera and Kuntz 2007, Gemmel, Vandaele et al. 2008) the implementation of process orientation is more challenging (Lega and DePietro 2005, Vos, Chalmers et al. 2011).

In order to improve the outcome of treatment and save resources at the same time, the treatment process must be coordinated throughout the hospital's supply chain. Furthermore, with the increase of multimorbidities in an aging population, the need for interdisciplinary cooperation in hospitals is further rising. The quality and efficiency of the treatment is therefore directly dependent on how well different medical departments cooperate with each other (Gemmel, Vandaele et al. 2008, Nicolini, Mengis et al. 2012, Lin, Wang et al. 2015).

1.2 Problem Statement

As mentioned in the previous subchapter, hospitals have been traditionally organized in a function-focused manner rather than in a process-focused way (Haraden and Resar 2004). This means that departments concentrate on their treatment portfolios and that they did not align them with those of other departments. Increasing specialization of different medical fields, such as the dividing of classical surgery into various sub-areas, has reinforced this tendency. It is assumed that this professionalization creates scale effects in increasing income and reducing medical risk (Haraden and Resar 2004). However, one downside of specialization is the isolation of different departments (Vos, Chalmers et al. 2011). In light of increasing hospital sizes and
complexities of illnesses, such isolation has led to additional costs, which have put the quality of medical services at risk (Vos, Chalmers et al. 2011, Lin, Wang et al. 2015). With the governmentally introduced shift from an unlimited payment of medical services to limited treatment remuneration through SwissDRGs disproportionate spending will no longer be paid. Thus, hospitals are forced now to streamline their operations to use the dwindling resources meaningful and sustain the quality of the medical services (Bragato and Jacobs 2003, Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011, Cleven, Winter et al. 2014). This applies in particular to large university hospitals which are characterized by highly distinctive functional units (clinics). Traditionally these clinics grew and specialized along similar medical treatments rather than focusing on interclinical treatment procedures (Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011).

Thus, the ability for smooth cooperation between different medical departments has become a crucial factor for the quality and efficiency of care provision. Furthermore, given the complex inter-professional contexts of larger hospitals, not only different departments, but also different professional groups should be able to smoothly cooperate with one another (Ferlie and Pettigrew 1996). In sum, it can be stated that improving inter-departmental cooperation by identifying and reducing barriers is crucial for allowing integrated care (Mettler and Blondiau 2012).

Overall, the ability to improve inter-clinical cooperation is of outmost importance. For this purpose, it is important to identify bottlenecks in the cooperation process in a timely manner so that they can be effectively removed and avoided in the future. A maturity model-based approach could fulfill these requirements by evaluating factors that affect cooperation. These models allow the measurement of the as-is state of an artifact under development against desired to-be state. However, these studies did not develop a specific model for evaluating and improving cooperation within hospitals, neither they provided guidelines for the design of such models. This dissertation addresses this gap.

1.3 Research Objective and Research Questions

As inter-departmental cooperation is of major interest, the main objective of this dissertation is to determine a way to measure the prerequisites for effective cooperation. This process requires developing and testing a measurement model as well as deriving guidelines for designing and improving such a model.
To reach this objective, the concept of cooperation within hospitals must be clarified and the prerequisites for flawless cooperation processes identified. For this purpose, not only should a single stage-based model be created, but also guidelines for developing and implementing such models in the healthcare field. Finally, the model should be tested in the field to identify actual challenges to inter-departmental cooperation as well as to evaluate the relevance of the model.

In this context, the research questions in this dissertation are as follows.

Table 1: Research questions

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
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<tbody>
<tr>
<td>RQ 1</td>
<td>What constitutes the problem of inter-departmental cooperation within hospitals?</td>
</tr>
<tr>
<td>RQ1a</td>
<td>How can inter-departmental cooperation be defined and conceptualized?</td>
</tr>
<tr>
<td>RQ 1b</td>
<td>What is a suitable approach for evaluating the prerequisites for inter-departmental cooperation?</td>
</tr>
<tr>
<td>RQ 2</td>
<td>What are the success factors for developing and using maturity based measurement approaches in hospitals?</td>
</tr>
<tr>
<td>RQ 2a</td>
<td>What are the dos and don’ts when developing a measurement instrument for the specific domain of healthcare?</td>
</tr>
<tr>
<td>RQ2b</td>
<td>What are the crucial success factors for implementing maturity model approaches in the hospital context?</td>
</tr>
<tr>
<td>RQ 3</td>
<td>What are the challenges for inter-departmental cooperation in hospitals and how can they be successfully addressed?</td>
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1.4 Research Approach

This dissertation is anchored in the information systems discipline. Information Systems Research has a wide focus on the “confluence of people, organizations, and technology” (Hevner, March et al. 2004). It can therefore be described as a bridging science between business and computer science comprising organizational (human) as well as technical (software) components (Winter 2008). Basically, two main research paradigms or groups are distinguished (Peffers, Tuunanen et al. 2007, Winter 2008). On the one hand, there is the more behavioral-oriented research stream (IS behavioral research), which focuses on explaining “the truth” by identifying and describing phenomena. On the other hand, there is the design-oriented IS research, aimed mainly at explaining “the usefulness” through the development and evaluation of artifacts.
(models, methods, constructs, instances, etc.) in order to solve practical, real-world problems (Winter 2008).

Although this dissertation includes elements of both paradigms, the development process of the model was mainly oriented on the design-research process described by Offermann. He distinguishes several phases of solution generation, such as “problem identification,” “model construction,” and “evaluation” in circular repetition (Offermann, Levina et al. 2009). The “model” is thereby both a tool for understanding and describing phenomena, with the clear aim of allowing targeted improvements of these phenomena. However, to answer the research questions of this dissertation, several methods had to be applied.

To answer the RQs 1a and 1b, knowledge base was screened for valuable conceptualizations of inter-departmental cooperation (refer to Chapter 2). A step-wise improvement model to measure success factors for inter-departmental cooperation was developed, based on dimensions borrowed from contingency theory, and iteratively enriched and evaluated in numerous focus-group discussions and interviews with hospital personnel. In this context, it was challenging to reach a common understanding of the questions and concepts of the model among different professional groups in hospitals (for further explanation, refer to Part B.3.1). This led to an understanding of additional inter-departmental challenges that were not only related to departments’ isolation, but also the isolated work styles of different professional groups.

The answers to the RQs 2a and 2b were based on the experiences of developing three different maturity assessments in health information management between 2008 and 2012 (refer to Section 3.2.2). These models were analyzed to determine crucial success factors (as well as the pitfalls) in the development of staged maturity models in the specific field of healthcare.

Finally, to test the model, which was developed to measure inter-departmental cooperation in a real-life context and to answer RQ 3, a comparative case study approach has been used (Eisenhardt 1989, Orlikowski and Baroudi 1991, Yin 2003, Ferlie and Fitzgerald 2005). To determine the “real-situation” regarding the challenges in hospitals, representatives of different professional groups were interviewed using open-ended and closed-ended questions, as advocated by Rouch et al. (Rouch, Thomson et al. 2010). In addition, to increase generalizability and determine the
individual and external validity of the cases, the findings were compared in a cross-case analysis.

### 1.5 Structure of the Dissertation

This cumulative dissertation is composed of two parts. Part A provides a synopsis of the entire dissertation and establishes the relationships between the different articles, while Part B includes the three scientific papers.

In Chapter 1, the research project is introduced and motivated (1.1), the research problem is described (1.2), the research questions are derived (1.3), and the research approach is presented (1.4). In Chapter 2, the underlying concepts are explained, the process-centered hospital is described in the context of the changing Swiss healthcare system (2.1), and the importance of inter-departmental cooperation for hospital performance is discussed (2.2). In addition, Section 2.3 outlines the concept of maturity-based assessments by discussing the history of these measurement instruments, followed by an overview of their broad field of application. Chapter 2.4 provides an overview of existing maturity-based improvement approaches in the healthcare context. Chapter 3 provides an overview of the papers from Part B (3.1) and briefly presents each paper (3.2). Finally, Chapter 4 summarizes the contributions made (4.1), critically appraises the work by discussing its limitations and assumptions and concludes by identifying opportunities for future research (4.2).

Part B covers the individual papers contributing to the realization of the dissertation objective. In this case, the papers are marked from A to C. All three papers have been published in peer-reviewed outlets and Papers B and C, in particular, have been published in papers listed in PubMed, the largest knowledge database in medicine. The papers herein are presented in their original format, except for minor adaptations, such as the unification of font size and font type, to enhance the reading experience of this dissertation. Furthermore, the citation format is unified and all of citations are included in the joint references section at the end of the dissertation. The figures and tables are continuously numbered and uniformly formatted throughout the dissertation. Moreover, all abbreviations, figures, and tables are included in the respective overarching list at the beginning of the dissertation. Finally, a table comprised of bibliographic information precedes each paper in Part B.
Research (quantitative and qualitative) is, by nature, the process of satisfying curiosity (Grünberg 2008) and gaining new knowledge. New knowledge can only be created on the basis of pre-existing knowledge. In other words, new knowledge must be built on previous findings or concepts (Keuth 2013).

The basics and concepts important for a thorough understanding of this dissertation are explained in this chapter. A description of the founding concepts is also included in each of the full-length articles presented in Part B. However, due to strict page limitations, the articles mostly focus on presenting the methods used and the results, rather than the details of the conceptual background. This chapter bridges this gap by complementing and deepening the explanations provided in the articles.

Maturity-based assessment of inter-departmental cooperation in hospitals and the identification of factors hampering this cooperation are the core research phenomena of this dissertation. In Section 2.1, the actual challenges of the Swiss healthcare system are briefly outlined and the concept of process-centered hospitals is introduced. In the following chapter 2.2, the role of effective inter-clinical cooperation in hospitals is explained and delimited against other forms of cooperation. In Section 2.3, the concept of maturity-based assessments is introduced, beginning with a historical overview and followed by a discussion of their wide range of applications. Finally in subchapter 2.4 an overview of existing maturity-based approaches for change management in hospitals is provided and explained why maturity model-based approaches are specifically suitable for the hospital context. Finally, the work at hand is differentiated against the existing approaches and it is defined and explained which goals are pursued.

2.1 The process-centred hospital

With rising competition and increasing demands of customers, many companies have been facing eroding margins since the early 1990s. In order to survive, these companies had to find faster ways to respond to customers’ needs, while reducing overall production costs (Davenport 2013). Thus, the change in market conditions demanded a new and more adaptable organizational design. While companies, up to that time, were primarily perceived as the sum of their functions and business units, the new concept focused more on processes and process designs (Reijers 2006, Suter
As a result, the process-centric view of the firm was born (Osterloh and Frost 2006, Gaitanides 2007). Besides higher customer satisfaction, these process-centric approaches promised more effective use of resources (Schwarzer 2013).

For several years, healthcare in Switzerland and many other first-world countries faced similar challenges (European Policy Centre 2012, Cleven, Winter et al. 2014). On the one side, increasing numbers of age-related multi-morbidities, growing quality expectations, and an increased use of expensive medical technologies resulted in continuously rising healthcare costs. On the other side, non-existent incentives for sustainable resource use and the close intertwining of local politics and health care contributed to a further increase in health expenditure (Fourie, Biller-Andorno et al. 2014, Fässler, Wild et al. 2015, Hoelzer 2015).

With the introduction of the new flat rate based remuneration via SwissDRG system in 2012 (also refer to 1.1) disproportionate expenditure was no longer paid. Instead, the new remuneration system allowed comparisons of quality and efficiency of medical services through increased transparency. This pushed hospitals into competition for price and quality of their offered treatments and in the meantime created financial challenges for hospitals (Hall and Jones 2004, Centre 2012). As a consequence, hospitals and their management are increasingly forced to search for solutions to streamline their operations in order to reduce cost while maintaining a high quality of care (Bragato and Jacobs 2003, Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011). This applies in particular to large full service hospitals, such as university hospitals, which are characterized by highly distinctive functional units (clinics). Traditionally these clinics grew and specialized along similar medical treatments rather than focusing on interclinical treatment procedures (Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011).

Owing to their broad portfolio and their legally fixed supply contracts, the key to maintain treatment quality while reducing the costs of inpatient care of these hospitals, is a the better alignment of their various treatment processes (Gemmel, Vandaele et al. 2008, Kohlbacher 2010). According to Kohlbacher (Kohlbacher 2010) such goal can be achieved through a stronger cross-functional and customer-oriented way of thinking and working, such as the introduction of clinical pathways and multidisciplinary care plans or through the use of interdisciplinary staff (Helfert 2009, Rotter, Kinsman et al. 2010). Studies from various fields indicate that “process-oriented” approaches have a positive impact on the quality of outcome, the operational effectiveness, the related
costs and the customer satisfaction (Schmelzer and Sesselmann 2006, Setti, Stückl et al. 2006, Hirzel 2008), to name just a few.

In hospitals process orientation therefore means the alignment of medical functions of different clinics along the care process to offer a high medical service quality. In other words, effective cooperation between different clinics has a direct impact on the internal hospital performances (Cleven, Mettler et al. 2016) and therefore also on the quality of the care (Boughzala and de Vreede 2015). In the light of an aging population and the associated increase in complex multimorbidities, the effective cooperation between various medical specialties - like in the case of oncology or pediatrics - play an important role for both quality assurance and for the sustainable use of resources in university hospitals (Pinto and Pinto 1990, Berenson, Ginsburg et al. 2007, Vera and Kuntz 2007, Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011). Therefore, improving the ability to cooperate among various clinics must be a crucial goal for university hospitals and other full-service hospitals.

2.2 Cooperation within hospitals as means to improve effectiveness and efficiency of care

The notion “cooperation” originates from the Latin word “cooperatio” and describes the process of people working together. From a classical management perspective, “cooperation” describes the process of working together by two or more legally independent entities with the aim of either increasing efficiency or creating new products or services (Gabler 2010). Among the various concepts used to describe individuals working together to accomplish a specific task, coordination, collaboration, cooperation, or integration can be found in the management literature (Mettler and Rohner 2010, Moharana, Murty et al. 2012). In some instances, these concepts are used as substitutes, synonyms, or mutually explaining terms. The original notion of cooperation is understood as the “coordination” of behaviors among individuals to achieve mutual goals (Johnson 1975). Coordination has been described as the process of integrating or linking together different parts of an organization to accomplish a collective set of tasks (Van de Ven and Walker 1984). Integration is described as the state of “collaboration” that exists between different departments in order to accomplish an organization’s tasks (Lawrence, Lorsch et al. 1967). The notion of collaboration has been presented as the willingness to align one’s own purposes with those of diverse others to reach mutually accepted compromises (Gray and Wood 1991, Gajda 2004). The commonality among the four concepts is the aim to achieve
Part A: Underlying Conceptual Foundations

the same goal of shared interest through joint behavior (Pinto and Pinto 1990, Pinto, Pinto et al. 1993, Lin, Wang et al. 2015). In this understanding, at least the meaning of the concepts of collaboration and cooperation is very similar, if not interchangeable. Thus, for the purpose of consistency throughout this dissertation, cooperation in hospitals is defined as the cooperation between different clinics to accomplish common medical and or organizational goals.

As mentioned before, today’s reality of full-service hospitals, such as university hospitals, has become more competitive and economically unstable than ever before (Gemmel, Vandaele et al. 2008, Kohlbacher 2010). Today’s increase in complex diseases requires more effective cooperation of different specialized medical fields and their representing clinics. Complex treatment situations emerge where the care of the patient, their records, and the resources necessary for care need to be transferred between different clinics and across departmental boundaries (van Merode, Molema et al. 2004) as for the case of treatment of tumor diseases. The number of such diseases is continuously increasing with the aging population and their cure is often very expensive. Depending on the type of cancer, a successful therapy requires the aligned cooperation between different clinics such as e.g. oncology, surgery, dermatology, clinical chemistry, physiotherapy and psychiatry. Another example, where cooperation among differently specialized clinics is crucial for the quality of outcome efficiency of therapy, is pediatrics. Similar to oncology, therapy scenarios in pediatrics are often highly complex and therefore require expertise from different medical specialties. Effective cooperation therefore ensures a high level of treatment quality (Hindley, Ramchandani et al. 2006).

However, effective cooperation between different clinics requires various prerequisites. On the one hand, a comprehensive concept defining the intention and the expected results of the cooperation must exist. In other words, a clear cooperation strategy should be explicitly formulated. On the other hand, the process of cooperation itself should be defined, so that it is clear who does what, when and in what form. A clear sequence model and defined roles make collaboration more effective and safer, especially in the complex medical context (Baker, Day et al. 2005, Gemmel, Vandaele et al. 2008, Vos, Chalmers et al. 2011). Last but not least, the information systems used in different clinics must be compatible with each other in order to allow information to be smoothly exchanged between the cooperating clinics or other partners along the treatment chain. Under these conditions, high medical performance can be ensured and resources can be saved (Jordan, Feild et al. 2002, Antoneli, Ribeiro

Beyond this, the need for effective and efficient cooperation within hospitals will increase even further, as different fields continuously differentiate into sub-specialties. This “professionalization” is assumed to create scale effects, resulting in more efficient use of resources, improved quality of care and reduced medical risks (Haraden and Resar 2004). However, the side effect of this increasing isolation or separation is again an increased need for effective interdisciplinary cooperation (Vos, Chalmers et al. 2011, Kutash, Acri et al. 2014).

In summary, effective interdisciplinary cooperation is crucial for university hospitals or other full service hospitals to improve service quality and optimize the use of their resources at the same time. Thus, improving the prerequisites for interdisciplinary cooperation within hospitals by identifying and reducing barriers for cooperation is important to improve the competitiveness of these hospitals (Mettler and Blondiau 2012). In this light, hospitals are faced with the question what enables or hinders successful interdisciplinary cooperation between different clinics. However, challenges for flawless cooperation might occur on different organizational levels, relating to different factors, which could include strategic (e.g. general strategy for cooperation within a hospital), process (e.g. pathways or reference processes on how to cooperate), technological (e.g. compatible software tools within cooperating clinics to allow flawless workflows) and other aspects, to name just a few (Österle, Fleisch et al. 2001, Mettlter, Fitterer et al. 2014). Thus, to facilitate flawless interdisciplinary cooperation, hospital management needs to identify and address challenges on all these areas. Furthermore, regarding the pluralistic reality of hospitals that has been mentioned earlier (strongly function-oriented clinics with their own individual goals) and their transformation inertia (Tuckermann and Rüegg-Stürm 2007) multifaceted organizational development should be managed step by step as there is a high chance for large initiatives to fail (Cleven, Winter et al. 2014).

An instrument for assessing the challenges for cooperation within hospitals should therefore integrate a diverse set of measurement areas (such as the ones mentioned before) and be comprised of several levels to make the overall change process more comprehensible and manageable. Maturity-based assessments meet most of the aforementioned requirements (for a more detailed description of maturity assessments please refer to chapter 2.3). First, they comprise several stages, so called maturity levels, decomposing an evolutionary path of change into coherent, comprehensible and
manageable steps (Mettler and Rohner 2009). Second, based on assessed gaps between as-is maturity and to-be maturity, these models allow prioritizing challenges in various areas. Finally, a multitude of otherwise incompatible ideas is covered by the unifying concept of maturity. Especially because of this last characteristic, maturity-based approaches are particularly suitable for the multifaceted hospital context, as they allow a shared understanding between the different clinics (Bititci 2015).

### 2.3 Maturity Based Assessments

> “Every morning in Africa, a gazelle wakes up, it knows it must outrun the fastest lion or it will be killed. Every morning in Africa, a lion wakes up. It knows it must run faster than the slowest gazelle, or it will starve. It doesn’t matter whether you’re the lion or the gazelle – when the sun comes up, you’d better be running.” (Friedman 2005)

Survival of the fittest or even more precise, the best fitting, not only applies to lions and gazelles. Organizations also compete with one another for customers and resources; they thrive to stand out from their competitors. In this light, the development and improvement of organizational skills, which could represent a competitive advantage, is of particular interest. Therefore, it is unsurprising that numerous theories and approaches focusing on how to design organizations in order to gain such advantages exist in social science (Van de Ven and Poole 1995, Swayne, Duncan et al. 2013, Daft 2015).

Among these, maturity models (MMs) are widely accepted and used in organizations, both as an approach for organizational assessment or as means for development (Ahern, Clouse et al. 2003) by identifying strengths and weaknesses of certain domains (Mettler and Rohner 2009, Lahrmann and Marx 2010). MMs are conceptual multi-stage models that describe typical patterns in the development of organizational capabilities (De Bruin, Freeze et al. 2005, Solli-Sæther and Gottschalk 2010). Rooted in early multi-stage models, such as Kuznets’s theory of economic growth (Kuznets 1966) or Nolan’s stage model on the progression of information technology (IT) in organizations (Nolan 1973, Nolan 1979), MMs gained particular popularity with the emergence of the Capability Maturity Model (CMM) or the commonly referred to Standardized Process Improvement for Construction Enterprises (SPICE) Model in the late 1980s (Paulk, Curtis et al. 1993, Paulk 1995, De Bruin, Freeze et al. 2005). These maturity models inspired many subsequent models (Becker, Knackstedt et al. 2009).
Formerly limited to the use in specific and limited contexts, the fields of application for MMs have expanded (Paulk, Curtis et al. 1993, De Bruin, Freeze et al. 2005, Blondiau, Mettler et al. 2016). Besides generic areas, there are also increasingly more MMs developed for examining domain-specific processes or technologies (Poeppelbuss, Niehaves et al. 2011, Blondiau, Mettler et al. 2016). Among these are various healthcare-specific models covering improvement areas such as software quality (Shroff, Reid et al. 2011), software security (Williams 2008), risk management (Mc Caffery, Burton et al. 2010), health supply management (Mettler and Rohner 2009), and collaborations in hospitals (Mettler and Blondiau 2012).

Common to practically all these instruments is their characteristic to assess the as-is state of an organizational artifact under development in contrast to a potential to-be design. From comparing to-be and as-is maturity, a staged development plan can be derived prescribing which capabilities need to be acquired to reach a certain goal (Paulk, Curtis et al. 1993, Blondiau, Mettler et al. 2016). In other words, MMs aim to “analyze how an organization really works” by identifying the gap(s) between an as-is and a to-be state (maturity), and demonstrating potential paths for improvement (Bush and Dunaway 2005). Accordingly, the notion of “maturity” refers to an evolutionary progress in the demonstration of a specific ability (De Bruin, Freeze et al. 2005, Mettler 2010). Thus, by incorporating formality into possible improvement activities, the model helps illustrate favorable developments. According to Kwak et al. (Kwak, Sadatsafavi et al. 2015), this makes MMs an effective and comprehensive tool for informing and improving decision processes in complex organizational settings, such as hospitals. As such, these models represent a suitable foundation for measuring and improving cooperation in hospitals. For these reasons, the maturity approach has been chosen to examine the challenges for cooperation.

However, “where there is a light, there is also a shadow.” For defining which state or set of characteristics is considered as mature, most MMs favor a top-down approach\(^2\) over a bottom-up\(^3\) approach. The latter is achieved by first fixing a number of maturity stages or levels, and further corroborating them with certain characteristics (De Bruin, Freeze et al. 2005, Rosemann and de Bruin 2005). This, in turn, has led to criticisms since these MMs appeared arbitrary and/or self-fulfilling (Poeppelbuss, Niehaves et al. 2011). Another criticism concerns the linearity and dependence of the individual

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\(^2\) In the top-down approach, maturity is defined beforehand and corroborated with characteristics.

\(^3\) In the bottom-up approach, maturity is defined based on measurements made with the model.
improvement steps on one another (Rönkkö, Järvi et al. 2008, Lahrmann, Marx et al. 2011). While current research is occupied with the specification of ever-more rigorous approaches for developing MMs, there has been a general disregard of implementing domain-specific MMs in complex organizational environments, such as hospitals (Mettler 2010). In the following chapter existing maturity model-based approaches are presented and discussed if they fulfill the requirements to assess prerequisites for effective cooperation between different medical departments within hospitals.

2.4 Maturity Model-based Approaches for Managing Improvements in Hospitals

Literature search via Web of Science identified 1,200 articles related to the subjects of cooperation and hospitals in a broader sense. Some of these publications addressed topics such as patient well-being from a psychological or medical perspective (McKinlay and Stoeckle 1988, Mechanic 1996), while others focused on the challenges associated with hospital mergers (Lynk 1995, Kessler and McClellan 1999), management issues from an economical perspective (Melnick, Zwanziger et al. 1992, Singh 1997), or technological innovation diffusion in hospitals (Ferlie and Pettigrew 1996, Goes 1997). Finally, several researchers suggested models for improving single aspects of process orientation (Gemmel, Vandaele et al. 2008), elaborated on the role of leaders (Laschinger, Wong et al. 1999), and provided an overview of the literature on organization-wide process orientation of care (Vos, Chalmers et al. 2011). Thus, the range of literature on cooperation in hospitals is wide.

However, this changes when the focus is narrowed down to maturity model-based improvement management in hospitals. Depending on the type of cooperation, or the cooperating units, “cooperation” can be found in different designated areas. Interesting and valuable approaches to manage organizational development in hospitals are found among the terms process orientation, process management, networking, key supplier cooperation, supply collaboration, or interoperability, to name just a few (Gericke, Rohner et al. 2006, Gemmel, Vandaele et al. 2008, Fitterer and Rohner 2010, Mettler 2010, Kohlbacher and Gruenwald 2011, Vos, Chalmers et al. 2011, Mettler and Blondiau 2012, Cleven, Winter et al. 2014, Blondiau, Mettler et al. 2016). Common to most approaches is the aim to facilitate or improve cooperation among various independent entities, such as organizations, organizational units, or individuals. However, these approaches differ with regard to the scope of cooperation or, in other words, the level, at which the cooperation takes place.
For example, the term "networking" is understood as the ability to enter interorganizational business relationships, particularly through the use of IT (Gericke, Rohner et al. 2006, Mettler and Rohner 2009). For instance, the Networkability Maturity Model is an approach to assess a healthcare organization’s capacity to engage in business relations with partner organizations (Fitterer and Rohner 2010). The used concept is consistent and supported by the work in the field of interoperability research (Chen 2006). However, the proposed measurement framework is not applied to interoperability on a software application level within a system, but rather interoperability with other systems, thereby covering corporate interoperability from a strategic, organizational and system point of view according to the layers of the Business Engineering Framework as described by (Österle and Winter 2003).

Other approaches, such as the work of Boughzala and de Vreede (Boughzala and de Vreede 2015) also follow maturity based approaches to assess the phenomenon of cooperation. Founding on research in the field of applied science and engineering (AS / E) Boughzala and de Vreede thrive to assess the effectiveness of collaboration across organizational boundaries (Col-MM) in order to better meet the effects of globalization and increased product and service complexity in the automotive industry. Like Mettler and Fitterer, they propose a model incorporating different areas of cooperation, e.g. people, information, process, management, and technology. Although these approaches provide valuable insights and fulfill the requirements for a multilevel assessment, both approaches focus mainly on interorganizational cooperation rather than on inner-organizational cooperation.

Furthermore, the work of Boughzala deals with the manufacturing industry. The concepts from manufacturing industry, however, cannot simply be transferred to healthcare, since there are several characteristics that differentiate these sectors. While management is mostly unified in industry, hospitals are characterized by having a medical and an administrative management (Gemmel, Vandaele et al. 2008, Brooks, El-Gayar et al. 2013). The division between the two is aggravated even further as directors of bigger clinics within university hospitals often have strong individual influence (Helfert 2009). As a result, hospitals, compared to the manufacturing industry, often lag common organizational goals and are rather dominated by a functional focus (Vera and Kuntz 2007, Vos, Chalmers et al. 2011, Cleven, Winter et al. 2014). Another difference is the wide range of medical services in university hospitals, involving a multiplicity of routines and actors (Brooks, El-Gayar et al. 2013). Last but not least, most industrial systems are characterized by hard metrics. In
the healthcare context, however, people’s feelings and choices also play an important role in decision-making (Avison and Young 2007). Thus, all these strategic, procedural, cultural, and informational peculiarities have to be taken into account in order to assess cooperation in university hospitals.

This is partly achieved by different maturity model based approaches to assess and improve process management and orientation in hospitals. In contrast to the broad interorganizational focus of the approaches mentioned before, these works are more concerned with the streamlining of mainly inner-organizational workflows, processes and care pathways (Gemmell, Vandaele et al. 2008, Mettler and Rohner 2010, Cleven, Winter et al. 2014, Cleven, Mettler et al. 2016). Gemmell et al. used a maturity model-based approach for assessing the effects of implementing care programs and clinical pathways to strengthen process orientation in a large European university hospital. For this, an existing model was adapted to the specific hospital context using the following three dimensions: “process view” – measuring the degree of documentation, “process jobs” – measuring to what extend jobs are process oriented, as well as “process management and measurement” indicating if hard variables existed to measure process orientation. This approach is one of the few focusing solely on the aspect of process orientation in hospitals. However, this approach neither includes technical aspects for streamlining processes, nor does it provide the possibility for multi-perspective assessment, as the approaches of Mettler, Fitterer and Rohner do (Fitterer and Rohner 2010, Mettler and Rohner 2010, Mettler 2011).

The technical aspects for streamlining processes as well as multi-perspective assessments are covered in the approaches of Cleven et. al. (Cleven, Winter et al. 2014, Cleven, Mettler et al. 2016). In their work, the researchers present a theoretically grounded model for measuring capabilities crucial for process orientation within hospitals based on a design science approach. They reveal that most of the existent models are not applicable in the healthcare context as they are too complex for the given task and as they focus too much on technical aspects, such as IT integration and automation. Therefore, Cleven et al. recommend that models for the assessment of process orientation in hospitals should, in addition to technical aspects, also include structural and cultural aspects. Since process orientation and the ability to cooperate are related closely, the approaches of Cleven et al. are of high value for the approach developed in this work. However, in this work – in contrast to Cleven at al. – top down approach is used to make the model easy understandable for practitioners. Especially considering the high organizational complexity in hospitals, top-down approaches are
likely to have an advantage here, since they restrict freedom of choice and provide easy understandable options. As such they allow communication between different professional groups by providing a unifying concept of maturity (Cleven, Winter et al. 2014, Blondiau, Mettler et al. 2016). Furthermore, in this work the guidelines on how the assessments should be carried out are developed as required in various studies (Mettler 2010, Poeppelbuss, Niehaves et al. 2011). The present work therefore ties up the top-down maturity model-based approaches for improvement in hospitals by focusing on the aspect of cooperation within hospitals and providing a manual-like approach how to construct and use such model using some elements of bottom-up approaches.
3 Summary of Dissertation Papers

3.1 Overview

This cumulative dissertation consists of three distinct scientific articles, referred to as Papers A, B, and C. Each paper represents a self-contained work that answers specific and overreaching research questions within the overall research objective. Table 2 illustrates the relationship between the distinct papers and their contributions within the overall research project. The Harvey Balls thereby indicate the degree a paper covers and helps answer a research question (Table 1 presents the research questions)

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The levels of the Harvey Balls, as illustrated below, indicates the degree a paper covers or answers one or more research questions.

- ♦ Basic, foundational, or summarizing coverage (minor contributions).
- ♦ Partial coverage, building foundations, or making additions (medium contributions).
- ♦ Major coverage, covers certain aspects in great detail (major contributions).
- ● Full coverage, core focus of the paper (major contributions).

Owing to the fact that each paper has to be a self-contained study that simultaneously serves a higher research goal, the papers not only focus on a single question. In this context, Paper A sets the scene by explaining the context and presenting a
measurement approach for assessing the ability for inter-departmental cooperation within hospitals. In Paper B, suggestions for development and implementing a measurement model in the hospital context are made, based on five years of research experience. Finally, challenges for inter-departmental cooperation in hospitals experienced while developing and using the maturity approach are presented and discussed in Paper C. Overall, the most comprehensive papers can be regarded as Papers B and C. Considering page limitations, the underlying fundamentals are not just presented in Paper A, but are complemented in Part A of this dissertation. In the following section, each paper will be briefly presented.

3.2 Papers

3.2.1 Paper A: HCMM - A Maturity Model for Measuring and Assessing the Quality of Cooperation between and within Hospitals.

Purpose:
In regard to the aim to develop an approach to assess and reduce challenges for cooperation within hospitals, it is important to understand some underlying basics. First, the problems of inter-departmental cooperation and its facets must be delimited and defined in a comprehensive manner. Second, it is important to understand the notion of MMs and how such models could be used to estimate the ability to cooperate. Third, the appropriate set of variables must be identified for measuring the ability to cooperate, as defined beforehand.

The purpose of Paper A is to provide answers to these three questions. By illuminating the problem and suggesting a measurement approach, Paper A (together with the introductory chapter of this dissertation) sets the scene for subsequent research steps.

Research Method and Content:
Being the initial work, Paper A clarifies the practical as well as scientific relevance of the problem. This paper conceptualizes MMs as step-wise improvement models. It also deepens the understanding of the “maturity model” notion by discussing the history of step-wise improvement models. Furthermore, it describes their anatomy based on well-known model types such as the CMM or the bootstrap model. Based on existing literature and various experiences, it shows that rigorous development based on adequate dimensions and elements is as important as implementation. Following
Part A: Summary of Dissertation Papers

this screening of the problem’s “playing field,” this paper argues why a maturity model is a suitable approach for measuring the ability to cooperate within hospitals. Finally, based on a literature review, interviews and focus-group discussions, the paper documents the prototype development of a model for assessing the challenges for cooperation within hospitals.

Results:

This paper presents the prototype of the model for measuring the ability to cooperate within hospitals based on three measurement dimensions (strategy, process, and technology) and 12 measurement criteria. In addition, different options for visualizing the measurement results are developed. First, evaluations of the ability to cooperate, based on the developed model prototype in different hospitals, are presented and critically discussed. This paper argues that the ability to cooperate is a crucial topic within hospitals and that a systematic approach to rate it is necessary. Based on experience with the prototype and insights gained from the literature, it concludes that further research should focus on the development and implementation of such models for measuring the ability to cooperate within hospitals.

3.2.2 Paper B: Designing and implementing maturity models in hospitals: An experience report from 5 years of research.

Purpose:

Paper A concluded with a statement that, above all, further research is required in the area related to the development and implementation of domain-specific maturity models. Indeed, focused literature searches reveal that criticism emerged regarding increasingly arbitrary development (Mettler 2010, Röglinger, Pöppelbuß et al. 2012) and lagging guidelines for implementing maturity models (Caldwell and Atwal 2003, Rönkkö, Järvi et al. 2008, Röglinger, Pöppelbuß et al. 2012). These guidelines should specify if and when the use of a maturity model seems reasonable. Furthermore, the roles need to be clarified specifying who is using the model and who is responsible for its further development. While current research is mainly occupied with providing ever-more rigorous approaches for developing MMs, a general disregard of effectively implementing MMs in complex organizational environments (such as hospitals) is observed (Rönkkö, Järvi et al. 2008, Röglinger, Pöppelbuß et al. 2012, Blondiau, Mettler et al. 2016). In order to provide guidelines that allow more appropriate
improvement, a better understanding of the challenges arising and the mistakes being made during development and implementation is necessary. Thus, Paper B answers the question regarding what the common challenges and mistakes are when implementing MMs in hospitals as well as provides guidelines for successful implementation.

Research Method and Content:
The “answers” for the above-mentioned problems were derived from three projects (conducted from 2008 to 2012) related to distinct areas of health informatics and health information management. The first project developed an MM for measuring the IT capability of hospitals. For this purpose, a method was designed and a corresponding tool was developed (named H-BIT) to support hospitals in assessing any mismatches between the capabilities of their IT facilities and their future strategic needs (Mettler, Fitterer et al. 2014). In the second project, a MM (named HSRM) (Shroff, Reid et al. 2011, Shroff, Reid et al. 2011) was used as a reference for measuring the effectiveness and reliability of a hospital’s supply management procedures (Mettler 2010). Finally, the third project focused on the assessment of intra- and inter-organizational collaboration of hospitals, as referred to (Mettler and Rohner 2009, Mettler and Blondiau 2012).

In all three projects, action design research (ADR) was used as the research approach. This approach is suitable for “generating prescriptive design knowledge through building and evaluating ensemble IT artifacts in an organizational setting” (Sein, Henfridsson et al. 2011). The Action Design Research approach is a merger of Action Research (AR) and Design Research (DR) and combines the “action planning” and “action taking” from the AR with the “building” from DR (Sein, Henfridsson et al. 2011). By following this approach, researchers face two kinds of assignments: First, addressing a problem situation encountered in a specific organizational setting by intervening and evaluating. Second, constructing and evaluating an IT artifact that addresses the class of problems. By periodically addressing an encountered problem in a specific organizational setting through intervening and evaluating on the one hand, as well as model construction and evaluation (solution generation) on the other, this approach focuses on building, intervening and evaluating of an artifact (Sein, Henfridsson et al. 2011, Blondiau, Mettler et al. 2016). Like with other design-oriented approaches, the initial problem investigation is a crucial step for building adequate problem solutions (Offermann, Levina et al. 2009, Kuechler and Vaishnavi 2012, Goldkuhl 2013). As such the ADR approach does not strongly differ from a classical
design research (DR) approach (Goldkuhl 2013). However, according to Sein et al. the ADR approach does not suggest that an evaluation-phase necessarily follows always a building phase. Rather the different phases (problem formulation, BIE, reflection & learning) can occur in different sequences. In this described characteristic ADR reflects quite well the research method, which has been followed in the various projects as the insights regarding the challenges presented herein were made while periodically refining the models in focus groups with practitioners (Blondiau, Mettler et al. 2016).

Results:

This paper presents the challenges that might occur during the different phases of design/development and implementation. The common challenges during the design phase concerned, for example, the question of when the use of a MM could be suitable. Other challenges were related to the uniqueness of the questions (scope definition) and how these questions should be answered within a given scale (model design). Both are important, especially since correct understanding and reproducible answers directly affect appropriate and correct measures. Finally, continuous adaption of the measurement models according to contextual changes was another identified challenge.

On the implementation side, the clarification of the actual demand for a model has been identified as an important factor. Moreover the decision of “when” and “what for” a MM should be used is crucial for thorough use and later acceptance. The latter was also noticeably influenced by a comprehensible and documented choice for a specific model. Finally, using a two-step approach, as suggested by De Bruin et al. (De Bruin, Freeze et al. 2005), and localizing the responsibility for future model refinement on a top management level can help firmly anchor the model in the organization.

3.2.3 Paper C: Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis

Purpose:

Building on the measurement model prototype presented in Paper A and the guidelines for the model development and use suggestion from Paper B, the purpose of Paper C is twofold. First, it identifies the challenges for inter-departmental cooperation through a
Part A: Summary of Dissertation Papers

larger field test and discusses potential practices for overcoming them. Second, it tests the measurement approach itself (the items) and the generated results for reproducibility. Thus, the results are generated and compared with each in a cross-case analysis.

Research Method and Content:

To study the model in a real-life context, a case study approach was used (Orlikowski and Baroudi 1991, Cavaye 1996, Yin 2003). For comparative in-depth analysis of the potential challenges, two hospitals that differed significantly in their efforts to improve inter-departmental cooperation were chosen. By choosing two key- or maximum-variation cases, an information-oriented strategy was utilized (Eisenhardt 1989) in order to generate distinguishable findings.

As suggested by various researchers (Ferlie and Fitzgerald 2005, Davis, Davis et al. 2012), practitioners of several professional groups (i.e., management, medicine, and nursing) were interviewed to establish a representative picture. Open- and closed-ended questions regarding the challenges concerning all three dimensions (i.e., strategy, process, and technology) were combined (Kaplan and Duchon 1988) to obtain a more complete picture of real situations, as advocated by Bouchard (Bouchard 1976). According to Rouch et al. this limited freedom during the interviews still allows “the unexpected to be explored” (Rouch, Thomson et al. 2010). Finally, to assure generalizability and to avoid problems of individual external validity, the findings were compared in a cross-case analysis (Ferlie and Fitzgerald 2005).

Results:

In regard to the prior goal of identifying the challenges hindering inter-departmental cooperation, the analyses revealed several generalizable findings on different organizational levels. These challenges were not necessarily interconnected, although some certainly influenced or reinforced one another. Thus, the model can be considered appropriate and functional. In addition, the obstacles could clearly be identified and rated based on the results of the scaled questions.

In this regard, several challenges, such as the application of data standards on a technological level, were simply rated as high in one hospital. Meanwhile, other challenges, such as non-reliable medical service quality or ineffective quality assurance, were rated as relevant obstacles for cooperation in both hospitals and, thus, were reproducible. Moreover, the skill levels of employees in regard to the core process of collaborative care were perceived as main obstacles in both hospitals. In
this case, the often-mentioned criticism that social research in general and case study research in particular could never claim full representativeness is not supported. Instead, it is assumed that reality is socially constructed (Orlikowski and Baroudi 1991, Cavaye 1996, Yin 2003) and based on multiple perceptions. Consequently, the findings of the assessment cannot be understood as “truth,” but as guiding statements valid for the given context.
4 Discussion and Outlook

4.1 Contribution

Flawless cooperation between different medical departments improves medical service quality and saves resources (refer to Sections 2.1 and 2.2). Thus, the capability of identifying and improving factors that affect (or even hinder) the ability to cooperate between medical departments can be perceived as an important competitive advantage in light of rising costs and quality competition. In addition, a maturity-model based approach that can help identify and specifically improve challenges for inter-departmental cooperation is of great value to managers in hospitals.

In order to contribute to the development of such maturity-based improvement models, this dissertation pursued several objectives. On the one hand, it intended to create a better understanding of the concept of inter-departmental cooperation in general. On the other, following the design science path, it intended to identify appropriate variables for institutionalizing the concept of inter-departmental cooperation as such and for validating the concepts constructing it in practice. Additionally, important success factors for designing and implementing maturity model-based approaches for the context of hospitals and healthcare are suggested, according to the experiences of developing a model in several projects with hospitals.

Therefore, the main contribution of this dissertation is two-fold. First, it develops a specific model for measuring the factors affecting inter-departmental cooperation. Second, it identifies the most relevant factors affecting inter-departmental cooperation, based on the developed model. Overall, this dissertation contributes to the literature on model development and implementation as well as to the literature on cooperation in the field of healthcare. For a detailed overview of contributions to science and practice, refer to Table 3 and to the papers in Part B.
### Table 3: Research results in relation to research questions and dissertation papers

<table>
<thead>
<tr>
<th>RQ No.</th>
<th>Research Question/Results</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1</td>
<td>What constitutes the problem of inter-departmental cooperation within hospitals?</td>
<td>1.2; 2.2; 3.1; 3.2.1; 3.2.3</td>
</tr>
<tr>
<td></td>
<td>The problem of inter-departmental cooperation is constituted by high organizational complexities of hospitals, strong departmental focus, and function-focused history of hospital departments.</td>
<td></td>
</tr>
<tr>
<td>RQ1a</td>
<td>How can inter-departmental cooperation be defined and conceptualized?</td>
<td>2.2; A.4; C.2</td>
</tr>
<tr>
<td></td>
<td>Inter-departmental cooperation can be defined as the joint behavior of different departments to reduce costs and improve medical quality. Research has shown that it is appropriate to study inter-departmental cooperation from the following perspectives: strategic, process, and technological. This allows depicting the multi-dimensional nature of inter-departmental cooperation.</td>
<td></td>
</tr>
<tr>
<td>RQ1b</td>
<td>What is a suitable approach for evaluating the prerequisites for inter-departmental cooperation?</td>
<td>A.4; A.5; 2.3; B.3; C.1</td>
</tr>
<tr>
<td></td>
<td>Based on the interviews and focus-group discussions, 12 constructs for measuring cooperation from strategic, process, and technological perspectives were identified. These concepts include: documentation, availability, quality, redundancy, completeness, ease of integration, standardization, liability, support, personal capabilities, responsibilities, and involvement. A maturity model was developed based on the design decision scheme, as proposed by Mettler (2010). This model illustrated the characteristics of identified concepts in different stages versus the desired stage of inter-departmental cooperation. For example, the different characteristics of documentation represented different degrees of its formalization. The staged-based approach proved helpful in achieving the common understanding of the concepts by hospital employees. This, in turn, was useful not only for research purposes, but also for improved usability of the model by hospital management. Thus, a maturity model-based approach was identified as the suitable approach for evaluating the prerequisites for inter-departmental cooperation.</td>
<td></td>
</tr>
<tr>
<td>RQ2</td>
<td>What are the success factors for developing and using staged-based measurement approaches in hospitals?</td>
<td></td>
</tr>
</tbody>
</table>
Research has shown that the successful development and implementation of staged-based measuring approaches in hospitals relies on the following factors: a clear understanding of the specific goal that must be achieved by using a staged-based measuring approach; an appropriate design of the approach itself; and the integration of practitioners, both in its development and implementation.

<table>
<thead>
<tr>
<th>RQ2a</th>
<th>What are dos and don’ts when developing a measurement instrument for the specific domain of healthcare?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For developing a measurement instrument for the specific context of healthcare, research has demonstrated that it is appropriate to follow a defined path. First, it must be clarified whether there is a real need for the model or it is only an opportunity. In this regard, when there is a real need for improvement of inter-departmental cooperation, the process of developing a corresponding model will be more likely supported and the characteristics of a model will have a greater level of validity. Second, the purpose and the scope of the model should be clarified within/between the affected professional groups. In this sense, a clear “don’t” in developing a measurement instrument is to use a top-down approach without consulting relevant stakeholders. Furthermore, in developing a maturity model as a measurement instrument, it is important to clarify what is the desirable stage of maturity and what are the other stages as well as their characteristics. In order to do so, again, it is important to consult hospital practitioners. The following step to a successful model develop is to perform iterative evaluations of the model through interviews with healthcare practitioners. Finally, in order to keep the model up-to-date, one should validate its characteristics on a periodic basis.</td>
</tr>
<tr>
<td>RQ2b</td>
<td>What are the crucial success factors for implementing maturity-based models for improvement in the hospital context?</td>
</tr>
</tbody>
</table>
First, one crucial success factor for the implementation of staged-based models in the hospital context is the actual organizational need for these models. Thus, the decision for (or against) the use of the model should be based on the character of the situation that should be improved. This means that it must be decided whether a staged-based model is appropriate for the situation at hand.

Second, another important implementation success factor is the selection of a model and how quickly it can be adapted to the given context. Research has indicated that complex adaptation requirements can reduce the chances of acceptance of the model by hospital practitioners.

For the deployment of the model through the general management a step-wise approach should also be used. By testing a prototype with practitioners first, the chances of rejection can be significantly reduced. Another important aspect is to clarify which groups of practitioners will be interviewed during the assessment. While the responsibility for use of the maturity model can just be located on the top-management level, the decision which practitioners or professional groups are the right ones for assessments depends on what should be assessed and needs to be decided depending on the situation. Also the decision about the periodicity of use depends mostly on the object under investigation. Following these guidelines can facilitate long-term organizational learning.

<table>
<thead>
<tr>
<th>RQ 3</th>
<th>What are the challenges for inter-departmental cooperation in hospitals and how can they be successfully addressed?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During the test of the developed maturity model of inter-departmental cooperation, the following three challenges were considered to be the most important: trust in the reliability of medical services between different departments; insufficient experience and education of some of the hospital staff (professional level of hospital employees); and insufficient data integration during the process of care.</td>
</tr>
<tr>
<td></td>
<td>In order to address the challenge of trust between clinics, certain quality standards need to be fulfilled. In other words, departments may trust one another more if there an official shared quality assurance system has been implemented.</td>
</tr>
<tr>
<td></td>
<td>To improve the professional level of hospital employees, executive education programs need to be identified.</td>
</tr>
<tr>
<td></td>
<td>Finally, to allow for better data integration during the process of care, IT systems used by different professionals must be compatible. Moreover, the IT system must be managed on a central, rather than departmental level, so that it matches the central strategy.</td>
</tr>
</tbody>
</table>
4.2 Critical Appraisal and Prospects for Future Research

As with any research addressing maturity-based assessments, this dissertation includes several limitations. First, it is impossible to evaluate the definite effects of the model on the results of inter-departmental cooperation within hospitals. This may be due to the limited time frame of the study. In order to increase the level of validity and improve generalizability, future studies could conduct case studies with selected hospitals at different points of time. This could show whether there is a longitudinal effect of maturity model implementation for improving inter-departmental cooperation. For example, a longitudinal field study could be conducted to measure the impact of the CMM and to obtain sufficient data for studying long-term “real” effects. However, for this purpose, a broad adoption of the model as well as sufficient time for implementing particular improvement activities from one scale to another is required.

Second, although the model proved functional for these specific cases, it could be improved in several ways. Since it was noted that some health practitioners had difficulties understanding the full-text descriptions and concepts of the model in the questionnaires, more research is necessary to provide users with superior explanatory materials as well as with additional graphic aids. Additionally, since the concepts building up the model were defined in cooperation with professionals from specific hospitals, the developed maturity model might be more suitable for these particular hospitals. This suggests that future research should not only copy the developed concepts, but also appropriately adapt them to the context of study.

Third, the results of the challenges might have been affected by individual perceptions of interviewed hospital employees, which are not necessarily affected by the fact of effective inter-departmental cooperation. Instead, individual perceptions of the concepts related to inter-departmental cooperation might have been affected by external factors, such as personal success in an organization.

Since the model prototype was developed in response to the specific needs of the hospitals involved, it did help identify the most important cooperation challenges in the selected cases. However, one cannot guarantee that the same challenges would be identified in other cases, especially if there is no specific need for such a model. In order to increase the generalizability of the results, future research should conduct more case studies with other hospitals in Switzerland and in other countries. Hospitals operating within other structures may be facing other constraints, which may identify
the need for inter-departmental cooperation and its evolutionary development differently. Therefore, widening the scope might allow additional insights.

In sum, the maturity model developed in this dissertation did help identify and measure challenges in inter-departmental cooperation. It also showed that inter-departmental cooperation is a success factor for ensuring smooth processes within hospitals. Future research should examine the longitudinal effects of this model on the same cases, test the model on different cases in terms of size and geography, test the effect of employees’ perceptions, and evaluate the effect of other external factors on the results. Again, it is important that researchers working with the same model should adapt it to their specific study.
Part B – Papers of the Dissertation

Paper A: HCMM - A Maturity Model for Measuring and Assessing the Quality of Cooperation between and within Hospitals.

Table 4: Bibliographic information for paper A

<table>
<thead>
<tr>
<th>Title</th>
<th>HCMM - A Maturity Model for Measuring and Assessing the Quality of Cooperation between and within Hospitals.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>Mettler, Tobias; Blondiau, André</td>
</tr>
<tr>
<td></td>
<td>University of St. Gallen, Institute of Information Management, Mueller-Friedberg-Strasse 8, 9000 St. Gallen, Switzerland tobias.mettler</td>
</tr>
<tr>
<td>Publication Outlet</td>
<td>Proceedings of the 25th International Symposium on Computer-Based Medical Systems (CBMS), Rome, Italy Institute of Electrical and Electronics Engineers (IEEE), New York</td>
</tr>
<tr>
<td>Year</td>
<td>2012</td>
</tr>
</tbody>
</table>

A.1 Abstract

Increased competition and market dynamics in healthcare force hospitals to intensify their efforts toward specialization and cooperation with others. In this paper, a maturity model is discussed that assists hospitals in evolving the required strategic, organizational, and technical capabilities in a systematic way so that the formation of collaborative structures and processes is efficient and effective. The so-called Hospital Cooperation Maturity Model (HCMM), queries a total of 36 reference points reflecting 3 distinct organizational dimensions relevant for the ability to cooperate. On the one hand it can be used as basis for benchmarking the quality of cooperation between a particular hospital and its business partners; on the other hand, it can also be applied as common ground for shared learning and improvement initiatives. In order to demonstrate its usability and applicability, an instantiation in form of a software prototype is presented. The paper ends with recommendations for healthcare practice and future research.
A.2 Introduction

Health systems all over the world are facing considerable pressure to reduce costs while having to sustain or even improve the quality of health service delivery. Side-effects, such as the demographic change, the lack of qualified health workers, and higher expectations and demands of patients, local administrators or health insurers, additionally complicate the fulfilment of this mission (European Policy Centre 2012). Expectations are high that the broader adoption of information systems (IS) and information technology (IT) in healthcare will contribute to cost reduction and sustainable or improved quality (Goldschmidt 2005, Khoumbati, Themistocleous et al. 2006, LeRouge, Hevner et al. 2007).

However, evidence exists that implementing IS/IT without adapting the underlying strategic and organizational structures and processes, will not necessarily generate the expected benefits (Mettler 2011). Experiences from other industries, such as from the automotive or electronics sector, showed that fundamental challenges like drastic margin erosions and increased competition could only be tackled by substantially extending the division of labour and by improving the value for the customer (Van Alstyne 1997). In doing so, market leaders typically followed the core competency approach and constricted their range of self-developed products and services accordingly. Instead, these companies formed networks with complimentary providers and key suppliers to provide their customers with the full spectrum of services and products. Basic prerequisites for this were a clear strategic positioning of each actor, an explicit definition of offered products and services (and their service/quality levels), as well as formulated rules and standards for joining, operating, and further developing the network (Österle, Fleisch et al. 2001).

In healthcare, indications for a similar development exist (Mettler and Rohner 2009). Driven by the implementation of new economic principles and remuneration schemes, such as diagnosis related groups (DRG), more and more hospitals begin to extend specialization (e.g. specialty hospitals) and cooperation (e.g. integrated care networks) (Porter and Olmsted Teisberg 2004). However, efficiency and effectiveness can only be attained if the collaborating organizations succeed to optimize their services and integrate them along the whole value creation process (Glouberman and Mintzberg 2001). This means that they are forced to reduce redundancies and optimize processes with respect to their value creation and along the whole process of patient care. Therefore healthcare organizations are expected to change from function-oriented
to a process-oriented firms (Haraden and Resar 2004). In this sense, especially hospitals are under an increasing pressure to accomplish three goals: (i) developing efficient cooperation structures, (ii) maintaining or rather improving their competitiveness, and (iii) ensuring a high quality of treatment.

In this paper, we present a maturity model that primarily – but not exclusively – helps to address the first of the mentioned goals. With the aim of motivating hospital representatives toward positive change by helping them with decision support with best (or common) cooperation practices, we hope to provide them with an effective tool for the development and maintenance of upstream (e.g. to referral doctors and key suppliers) and downstream relationships (e.g. to other hospitals and homecare institutions). The design of this maturity model and software tool is described in the following.

First, a brief delineation of the theoretical foundations is presented in the next section. Then, we describe the rationale of how the proposed model was built and evaluated. After this, the actual design of the maturity model and software instantiation is illustrated. We conclude with a discussion of the major findings and future research suggestions.

**A.3 Background**

The term “maturity model” typically refers to a conceptual model that describes the evolution of organizational or individual capabilities (Paulk, Curtis et al. 1993). By incorporating formality into possible improvement activities, the model helps to illustrate a favourable development path towards “maturity”. Accordingly, “maturity” refers to an evolutionary progress in the demonstration of a specific ability (Mettler 2010).

In line with (Fraser, Moultrie et al. 2002), all maturity models share the common property of defining a number of dimensions at several stages of maturity, with a description of characteristic performance at various levels of granularity. Common elements of maturity models thus are a number of levels (typically three to six), a descriptor for each level, a generic description or summary of the characteristics of each level as a whole, a number of dimensions, a number of activities for each dimension, and a description of each activity as it might be performed at each level of maturity (Fraser, Moultrie et al. 2002).
Most well-known examples following the stated design principles are the capability maturity model (CMM) (Paulk, Curtis et al. 1993), ISO/IEC 15504 also known as SPICE (software process improvement and capability determination) and BOOTSTRAP (Haase, Messnarz et al. 1994). However, perceiving “maturity” from an activity-perspective only and hence overemphasizing processes and disregarding cultural and technical aspects, has been criticized by several authors (e.g. (Bach 1994)). More and more evidence exists, that a good fundament for assessing socio-technical systems should consist of both processes/structures, people/culture, and objects/technology as a strong and mutual dependency is often detected (Weinberg 1992). Nevertheless, only a handful maturity models were identified that assessed “maturity” using a multi-dimensional and multi-facetted approach.

**A.4 Method**

Up to now, no standardized approach was found that describes how to rigorously build new maturity models. However, some researchers argue that such models should be conceptualized and built like conventional IT artefacts (Donellan and Helfert 2010). Typically, this implies to differentiate two iterative steps: (i) **build**: describing the actual construction of the maturity model in a transparent and traceable way, and (ii) **evaluate**: proving the utility and ability to solve the addressed problem (March and Smith 1995).

**A.4.1 Building the HCMM**

An extensive search within the relevant literature demonstrated that the great part of the analysed maturity models does not disclose its design process and/or underlying design decisions. Following the design patterns described in (Mettler 2010), the subsequent decisions were made when building the proposed maturity model (cf. Table 5).

*Table 5: HCMM design decisions*

<table>
<thead>
<tr>
<th>Design activity</th>
<th>Decision parameter</th>
<th>HCMM design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify need or new opportunity</td>
<td>Novelty</td>
<td>HCMM addresses an <em>emerging</em> phenomenon, i.e. intensified networking and cooperation in healthcare.</td>
</tr>
<tr>
<td>Design activity</td>
<td>Decision parameter</td>
<td>HCMM design</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Innovation</td>
<td></td>
<td>HCMM is a completely <em>new</em> maturity model. But the structure is similar to a CMM-like model.</td>
</tr>
<tr>
<td>Define scope</td>
<td>Breadth</td>
<td>HCMM covers a very <em>specific</em> area of interest.</td>
</tr>
<tr>
<td></td>
<td>Depth</td>
<td>HCMM focuses on <em>intra-organizational</em> as well as <em>inter-organizational</em> aspects relevant to optimizing cooperative structures and processes in hospitals.</td>
</tr>
<tr>
<td>Audience</td>
<td></td>
<td>HCMM is intended to primarily support decision-making of hospital <em>managers</em>.</td>
</tr>
<tr>
<td>Design model</td>
<td>Maturity concept</td>
<td>HCMM uses a <em>multi-dimensional</em> approach to measure maturity, including items for strategic, organizational, and technical capabilities as well as “as-is” and the targeted “to-be” maturity.</td>
</tr>
<tr>
<td></td>
<td>Goal function</td>
<td>HCMM tries to identify challenges for cooperation and supports optimization of cooperation in a holistic manner, thus underlies <em>multi-dimensional</em> goals.</td>
</tr>
<tr>
<td></td>
<td>Design process</td>
<td>HCMM measurement items are a <em>combination</em> of theory-driven and practitioner-based inputs.</td>
</tr>
<tr>
<td></td>
<td>Design product</td>
<td>HCMM is available as instantiated <em>software</em>.</td>
</tr>
<tr>
<td></td>
<td>Application method</td>
<td>HCMM uses <em>third-party assisted</em> assessments.</td>
</tr>
<tr>
<td></td>
<td>Respondents</td>
<td>HCMM requires answers from both <em>management</em> and <em>workforce</em>.</td>
</tr>
<tr>
<td>Evaluate design</td>
<td>Subject of evaluation</td>
<td>HCMM was evaluated in terms of form</td>
</tr>
<tr>
<td>Design activity</td>
<td>Decision parameter</td>
<td>HCMM design</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and content (<em>design product</em>)</td>
</tr>
<tr>
<td></td>
<td>Point of time</td>
<td>HCMM was evaluated <em>ex-ante</em> (questionnaire)</td>
</tr>
<tr>
<td></td>
<td>Evaluation method</td>
<td>HCMM was evaluated in a <em>naturalistic</em> setting by means of the experiences of real users</td>
</tr>
<tr>
<td>Reflect evolution</td>
<td>Subject of change</td>
<td>HCMM so far does <em>not</em> comprise any formal mechanisms for changing the model basis</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>HCMM is <em>continuously</em> revised based on users’ input</td>
</tr>
<tr>
<td></td>
<td>Structure of change</td>
<td>HCMM change requests can <em>exclusively</em> be placed by registered users</td>
</tr>
<tr>
<td></td>
<td>Dissemination</td>
<td>HCMM is <em>freely</em> available upon request by the authors. But assessments need to be third-party assisted in order to obtain comparable results</td>
</tr>
</tbody>
</table>

### A.4.2 Evaluating the HCMM

As stated above, the proposed maturity model was tested in a real environment with real users. The evaluation procedure included to fulfil a third-party assisted assessment as well as to respond a questionnaire that included questions as to the utility of the model and usability of the software tool. A total of 30 practitioners working for five distinct hospitals located in Switzerland and Germany successfully followed the above-mentioned procedure. The sample included 9 members of management (30%), 10 doctors (33%), and 11 nurses (37%).

Overall, the evaluation showed that both measurement items of the maturity model (model base), and the software tool (instantiation) were largely understandable for the practitioners. In addition, the structure along the different layers was fully
comprehensible for non-specialized personnel and was perceived as being a good help for navigation within the model, respectively software.

However, the answers from the questionnaire also showed that some respondents had difficulties to differentiate between the actual (as-is) and the targeted state (to-be) based on full-text maturity descriptions regarding a specific measurement item. Furthermore two respondents of the evaluation group of nurses had difficulties to comprehend the questions formulated on the strategic layer of the HCMM. Conversely, this statement never applied to persons in leading positions.

**A.5 Results**

The obtained feedback from the evaluation procedure was used to further improve the model base and instantiation in an additional iterative step. The resulting final maturity model is presented in the subsequent sections.

**A.5.1 HCMM Model Base**

The HCMM model base consists of three main components: (i) measurement dimensions that help to shape the structure of the phenomenon of interest, (ii) measurement items building the reference points for the assessment, and (iii) measurement scales that indicate how a specific item can be progressed.

**A.5.1.1 Measurement Dimensions**

Building upon evidence from literature, which conceive “cooperation” as multi-faceted phenomenon not only established by actions but also by technical and cultural means, we defined three dimensions or layers for structuring the model. The first dimension, referred to as *strategic layer*, was defined to measure the ability of a hospital to cooperate with external partners. The second dimension, referred to as *organizational layer*, was defined to measure the ability to cooperate within the hospital (i.e. between distinct departments, wards, etc.). Finally the third dimension, referred to as *information layer*, was used to measure the technical capabilities of a hospital to provide the required IT-infrastructure for an efficient and effective internal and external cooperation.
A.5.1.2 Measurement Items

The reference points for the assessment, which reflect an adequate and manageable evolutionary improvement path, were derived from both theoretic and practical evidence (cf. Table 1). For the former, the relevant literature was searched and analysed in the fields of healthcare management, business, and information systems. For the latter, focus group workshops (Tremblay, Hevner et al. 2010) with designated high-quality hospitals were conducted in order to obtain practical knowledge as to successful cooperation practices. The evaluated and improved list of measurement items is illustrated in the following table.

Table 6: HCMM measurement items

<table>
<thead>
<tr>
<th>Reference Point / Item</th>
<th>Strategic Layer</th>
<th>Organisational Layer</th>
<th>Information Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Documentation</strong></td>
<td>Degree of formalization of external services</td>
<td>Degree of formalization of internal services</td>
<td>Existence of document management system</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>Availability of external services</td>
<td>Availability of internal services</td>
<td>Availability of information</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>Quality of external services</td>
<td>Quality of internal services</td>
<td>Quality of information</td>
</tr>
<tr>
<td><strong>Redundancy</strong></td>
<td>Redundancy of services provided by the network</td>
<td>Redundancy of services provided by internal departments</td>
<td>Undesired redundancies in data bases</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>Completeness of services provided by the network</td>
<td>Completeness of services provided by internal departments</td>
<td>Total coverage of information needs</td>
</tr>
<tr>
<td><strong>Ease of integration</strong></td>
<td>Ability to integrate externally received services into own value chain</td>
<td>Ability integrate own services to form a consistent value chain for patients</td>
<td>Data integration along value creation</td>
</tr>
<tr>
<td><strong>Standardisation</strong></td>
<td>Degree of standardisation of</td>
<td>Degree of standardisation of</td>
<td>Application of data standards along</td>
</tr>
</tbody>
</table>
### A.5.1.3 Measurement Scale

As described above, a common property of maturity models is to depict maturity as a number of levels or stages where higher stages build on the requirements of lower stages. In principle, models such as CMM usually use five maturity stages, with five representing mature and one immature assessment items. However, the number of stages may vary depending on the subject under study (Fraser, Moultrie et al. 2002). For the HCMM we applied a four-staged approach, ranging from "Initial/Ad-hoc", "Committed", "Established/Focused", to "Optimized". This was done to deliberately force a clear statement and thus avoid the often-preferred middle range answers.

### A.5.2 HCMM Instantiation

Following an iterative and rapid development approach, first versions of the instantiation of the HCMM were based on Microsoft Excel with macros. An online
platform is in the course of development in order to allow several parallel assessments and provide multiple language support. The design of the software is straightforward, primarily based on forms (cf. Figure 1); yet additional reports are provided for the simplified comparison within and between different hospitals.

*Figure 1: HCMM software – Assessment form*

Different visual elements such as color-coded dashboards (cf. Figure 2) or cobweb diagrams (cf. Figure 3) were used to illustrate the assessment results also in graphical form. This was repeatedly postulated by practitioners, hence was a key requirement for the software.
Figure 2: HCMM software – Dashboard

<table>
<thead>
<tr>
<th>No.</th>
<th>Reference point / item</th>
<th>Strategy Diff. t0/t1</th>
<th>Organization Diff. t0/t1</th>
<th>Information Diff. t0/t1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Documentation</td>
<td>1.25</td>
<td>0.75</td>
<td>0.75</td>
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Figure 3: HCMM software – Cobweb diagram
A.6 Discussion and Conclusion

The objective of this study was to build and evaluate a maturity model – referred to as HCMM –conceptualizing an evolutionary improvement path for cooperation within and between hospitals. The need for such a model was motivated by the actual observable change that hospitals are undergoing in order to cope with increased competition and market dynamics due to the implementation of new economic principles and remuneration schemes and the constant lack of qualified personnel.

A.6.1 Implications for Healthcare Practice

First impressions from the assessment at five Swiss and German hospitals indicate that cooperation is an important topic for hospital managers and that is worth of a systematic development and validation approach. Since an assessment takes between 1-2 hours to complete, it seems that a relevant practical management issue was addressed.

The interviews and focus group workshops with a closed group healthcare practitioners disclosed that the model provides effectual support for identifying deficiencies in their actual strategic, organizational, and technical cooperation capabilities. The multi-dimensional approach was highly appreciated in that context. Also the resulting reports were accepted since they provided a clear allusion to the areas, which needed further consideration. However, it was also argued that the maturity model does not describe how to effectively perform any improvement actions. Hence, it can be stated that the proposed model is a suitable tool for discovering major gaps in collaborative structures and processes of a hospital; but it is not yet expedient for closing these gaps. Nevertheless, all participating practitioners affirmed that the HCMM is a good fundament for shared learning and improvement initiatives within and across the borders of a hospital and particular health system.

A.6.2 Implications for research

From a theoretic perspective it can be stated that the design patterns described in (Mettler 2010) proved to be useful during the development of the model base. But still, a more detailed description of a common development method or design theory for maturity models is needed.
From the evaluation of the software (prototype) it can be concluded that visual elements considerably affected comprehensibility and usability. Hence, it is recommendable to not only specify the different levels in form of text (so-called maturity grids (Fraser, Moultrie et al. 2002), but also provide graphical analyses. Particularly color-coded dashboards and cobweb diagrams were perceived as being valuable amendments.

### A.6.3 Limitations and Future Work

As with any research article addressing maturity models as a central theme, this work has limitations. First, it is not possible to evaluate the definitive effects of the model on the quality of cooperation between hospitals; at least not with a cross-sectional research design as applied in this paper. A longitudinal field study – as for instance conducted for measuring the impact of CMM (Herbsleb and Goldenson 1996) – is needed to obtain enough data for studying the long-term “real” effects of the model. However, for this a broad adoption of the HCMM as well as sufficient time for implementing particular improvement activities (to move from one scale to another) is required. As for now there is no consensus on “one true way” to assure a positive outcome.

Second, the model is based on theoretical and practical knowledge contrasting the general conditions of a specific health system, namely from the German-speaking area. Hospitals operating within other structures as well as facing other constraints may recognize cooperation and its evolutionary progress differently. Therefore future work may also emphasize peculiarities of distinct health systems. This may lead to a situational maturity model design as described in (Mettler and Rohner 2009).

Third, during the evaluation of the software it was noted that maturity assessments based on full-text description are difficult for some health workers. More research is needed to provide the user with superior supporting material as well as additional graphical aids that contribute to a better understanding of the specific measurement items and the phenomenon of interest as a whole. The online platform for instantiating the final version of HCMM is still under development, yet further essential requirements and useful ideas from research and practice are welcome.
Paper B: Designing and implementing maturity models in hospitals: An experience report from 5 years of research.

Table 7: Bibliographic information for paper B

<table>
<thead>
<tr>
<th>Title</th>
<th>Designing and implementing maturity models in hospitals: An experience report from 5 years of research.</th>
</tr>
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| Authors | Blondiau, André; Mettler, Tobias; Winter, Robert  
University of St. Gallen, Institute of Information Management,  
Mueller-Friedberg-Strasse 8, 9000 St. Gallen, Switzerland  
andre.blondiau | tobias.mettler | robert.winter@unisg.ch |
| Publication Outlet | Health Informatics Journal (PubMed listed) |
| Year | 2015 |

Abstract:

In recent years, a wide range of generic and domain-specific maturity models have been developed in order to improve organizational design and learning of healthcare organizations. While many of these studies describe methods on how to measure dedicated aspects of a healthcare organization’s “maturity,” little evidence exists on how to effectively implement and deploy them into practice. This article therefore delineates the encountered challenges during the design and implementation of three maturity models for distinct improvement areas in hospitals. On the one hand, this study’s findings may serve as basis for refining existing maturity model design approaches. On the other hand, it may facilitate further research in domain-specific organizational design with maturity models.

Keywords:

Action design research, maturity model, organizational change, organizational learning
B.1 Introduction

Maturity models (MMs) are recognized tools for the stepwise and systematic development and/or improvement of skills, processes, structures or general conditions of an organization. It has its roots in software engineering where it was found helpful in guiding and monitoring the maturity of software development practices. The Capability Maturity Model (CMM), BOOTSTRAP and the international standard ISO/IEC 15504 commonly referred to as SPICE (Software Process Improvement and Capability determination) are but a few examples for largely successful MMs (Kuvaja 1999).

Besides generic areas of application, there are also more and more MMs designed for examining domain-specific processes or technologies. A brief review of the literature showed that a variety of healthcare-specific models covering a wide range of improvement areas, such as software quality (Paulk, Curtis et al. 1993, Shroff, Reid et al. 2011), software security (Williams 2008), risk management (McCaffery, Burton et al. 2010), health supply management (Mettler and Rohner 2009) or hospital collaboration (Mettler and Blondiau 2012), exist. Common to practically all these MMs is the notion of having a staged representation of an actual state in relation to a potentially achievable goal state and a description of steps required to achieve this objective. The major aim is to identify gaps between actual and desired states as well as to demonstrate an evolutionary path to achieve the improvement from a desired to an actual state. In specifying this imaginary improvement trial, most MMs apply a top-down approach by fixing a number of maturity stages or levels first and further corroborating it with characteristics (typically in the form of specific assessment items) that support the initial assumptions about the maturity distribution. This has led to a strong criticism since many MMs seemed to be quite arbitrary. This problem has been dealt with in the recent literature by proposing sophisticated data-driven (bottom-up) techniques and algorithms (Rönkkö, Järvi et al. 2008, Mettler 2010, Lahrmann, Marx et al. 2011).

While current research is occupied with the specification of ever-more rigorous approaches for developing MM, there has been a general disregard of effectively implementing MM in complex organizational environments, such as hospitals (Mettler 2010). The aim of this article is therefore to identify and designate major challenges and risks when it comes to the implementation of MMs in the daily practice of healthcare organizations. We thus strive to answer the following research question:
What are major challenges and mistakes when implementing MM as means for the improvement of healthcare practice?

Since MM implementation and development are mutually influenced by each other, we will not only reflect on how to effectively integrate MM in healthcare organizations but also bring forward some considerations to positively adept design of MM in order to foster a broader proliferation. The remainder of the article is organized as follows: in the next section, the research approach of this study is discussed. This is followed by a report on findings drawn from three projects aimed at developing healthcare-specific MM. We conclude with a description of recommendations for future research.

B.2 Research Approach

Our research follows the assumption that “value-free data cannot be obtained, since the enquirer uses his or her preconceptions in order to guide the process of enquiry, and furthermore the researcher interacts with the human subjects of the enquiry, changing the perceptions of both parties.” (Walsham 1995) Being aware of the subjectivity as part of our research, we base the findings reported in this article on three projects, which we conducted from 2008 to 2012 relating to distinct areas of health informatics and health information management. The first project aimed at developing an MM for measuring the information technology (IT) capability of hospitals. For this, we designed a method and developed a corresponding tool named H-BIT that supports hospitals in assessing mismatches between the capabilities of their IT facilities and their imminent and future strategic needs (Shroff, Reid et al. 2011, Mettler, Fitterer et al. 2014). In a second project, we developed an MM named HSRM that can be used as reference for measuring the effectiveness and reliability of a hospital’s supply management procedures (Mettler and Rohner 2009). The third project emphasized the inspection of intra- and inter-organizational collaboration of hospitals. For this, we designed an MM that measured different aspects of collaborative behaviour in hospitals (HCMM) (Mettler and Blondiau 2012).

In all three projects, we followed the notion of action design research (ADR). ADR is used for “generating prescriptive design knowledge through building and evaluating ensemble IT artefacts in an organizational setting.” (Sein, Henfridsson et al. 2011). In doing so, a research team faces two kinds of assignments: (1) addressing a problem situation encountered in a specific organizational setting by intervening and evaluating
and (2) constructing and evaluating an IT artefact that addresses the class of problems typified by the encountered situation. Research applying ADR follows a generic schema or interaction pattern, as illustrated in Figure 4 (Luftman, Zadeh et al. 2012).

**Figure 4: Adapted action design research.**

![Diagram](image)

After a first phase of requirements elicitation (mainly desk research), we used focus group discussions to pre-test a first version of our new MM. This commonly served as the basis for refining the MM and getting more specific feedback for the software design. The initial (physical) prototype allowed us to conduct organizational assessments in several hospitals. This in turn helped us to identify the key challenges and mistakes on which we will report in the next section. With each MM, we conducted 20–50 assessments with distinct health professionals in Austrian, Swiss and German hospitals during the reported time period.
B.3 Findings from 5 years of research on MMs in hospital settings

In this section, we present the findings that we gained from 5 years of research on the subject of MMs and the translation of MMs to the healthcare context. Since the design and implementation of MMs are interconnected (refer to Figure 5), we present and discuss our findings based on the intervening cycles as discussed by Mettler (Mettler 2010).

B.3.1 Design challenges

The implementation success of MM is directly interlinked with how the model has been developed and tested (De Bruin, Freeze et al. 2005). Therefore, we first take a closer look at the necessary steps and challenges that might occur during the development of the model (refer to Figure 5 by Mettler 2010).

Figure 5: Duality of maturity model design and implementation.

Need- or opportunity-driven approach. Each measurement process starts with the questions “what” and “why” something should be measured. Therefore, one of the first challenges is how to decide when it is fruitful to use a measurement tool such as an MM. Researchers such as Mettler (Mettler 2010), therefore, propose to start the process by answering questions regarding the “novelty” of phenomenon and the “innovation” that could be created by a new measurement model. Organizations therefore should clarify whether the phenomenon under investigation is a new
(emerging) one or whether it is an already known (mature) problem. In the latter case, it is very probable that model-based solutions already exist. This in turn enables thinking about the “innovation” of the model to decide whether a new model has to be developed or whether it is suitable to modify or directly apply an existing model to the phenomenon under investigation.

This decision certainly is important in any organizational context. In hospitals, however, such a decision is usually more difficult than in other types of organization. The latter are mostly centrally managed on the basis of an overall strategy. In hospitals, a common strategy is missing, the aims of the different clinics can diverge strongly and there is not just one key decision-maker, but - in the worst case - as many as there are clinics. Taking this and the tense resource situation into account, it becomes even more important to integrate leaders from both administration and clinical management from the very beginning in the decision and development processes. This reduces later rejection of a prospective measurement solution and avoids the waste of resources for false developments.

**Purpose and scope definition.** Once the question of the need has been answered, the “focus” and the “purpose” of the model have to be defined. As already mentioned, it is fundamental for success to clarify which stakeholder(s) should be addressed by the model. Therefore, it is necessary to think about the targeted audience and its particularities before designing a model (De Bruin, Freeze et al. 2005). In the context of hospitals, this could be management personnel, physicians, nursing staff, or members of the sup- port staff such as IT personnel to name just a few. However, it could also be possible that the viewpoint is higher and that the model should be developed for practitioners of different professional groups. As all these different groups do have their own individual language, it is a major challenge to find the right language, so to say the “Esperanto” of MM.

We have encountered the challenge that health professionals sometimes do not understand questions correctly without further explanation or that it was hard to find a shared language when crossing professional borders. Nurses, for example, had a different concept of medical service quality than doctors or members of the management. This had a non-negligible influence on, for example, answers to the question whether the quality of medical services influences the willingness to cooperate between departments. In general, the approaches to dealing with maturity-related questions and the angle of vision of different professional groups differed
strongly. Therefore, it is of utmost importance to substantiate questions or measuring items with concrete examples from practice. We therefore believe that for actionable results regarding the assessment of maturity or the definition of maturity itself, a shared understanding is fundamental. The used language for questionnaires or interviews has to be as unequivocal as possible and be supported by anecdotal examples from daily practice. The higher the heterogeneity of the audience, the more difficult and time consuming it is to find a common language in a number of evaluation cycles with practitioners.

Besides the challenge of “language,” developers of MMs also have to define the observation “depth” and “breadth” of their model. To improve understandability and conserve resources, it is therefore helpful to decide whether the model is designed to represent phenomena on people (e.g. work routines, educational background), group (e.g. professions, age groups), departmental (e.g. clinics, specialties), organizational (e.g. locations), or even inter-organizational level. Furthermore, it should be determined whether the model should be used rather generalist or specific to improve feasibility and reduce understanding difficulties. The decision in regard to these two aspects, of course, depends on the actual purpose of the measurement model on the one hand and influences the “language” of the model on the other hand. Again, it is therefore crucial to have a clear idea of the overall purpose of the model and to incorporate the correct stakeholders in the development process in order to ensure a subsequent acceptance.

**Model design.** After the need has been elicited and both audience and scope have been set, the model itself has to be designed. One of the first and, at the same time, biggest challenges in this context, therefore, is to develop a suitable concept of maturity. Three different concepts, notably the process-focused, the object- or technology-focused, and the people-focused concepts of maturity, do exist (Mettler 2010). In the process-focused concept, it is measured to what extent a specific process is defined, managed, measured, controlled and effective (Paulk, Curtis et al. 1993). In other words, it is measured how the efficiency or effectiveness of the current process relates to a possible ideal process (target process) (Fraser, Moultrie et al. 2002). This could be, for example, the stepwise implementation and/or refinement of integrated care processes, the adaptation surgical procedures or paving the way for a new health information system. In the object-focused concept, it is assessed to what extent a product, a machine or anything alike reaches a defined level of satisfaction. This could be, for
example, the evaluation to what extent the newly integrated health information system improves the process of patient enrolment or discharge as crucial bottlenecks for effective and efficient care pathways. Finally, in the people-centric concept, abilities are at the centre of interest, and it is measured to what extent the individual skills are suitable to achieve or support certain organizational goals (Curtis, Hefley et al. 2002). Staying with the same example, what skill level of the medical personnel is needed to use the new health information system effectively would be measured.

The different concepts also show that the aim of improvement is multi-faceted and may vary, for example, between cost, quality, efficiency or other objectives. In addition to the specification of the objective, or “optimization function,” developers also have to decide how one or several objectives are influenced by changes in the maturity path. This is very challenging, as cause-and-effect relationships have to be understood first.

Another question arises with respect to the model base: On what do we find the improvement path? On theoretical knowledge practical–empirical experience or a combination of both? How do we present our model base? Is it a text document (e.g. a questionnaire), a software product or again combination of these?

**Model evaluation.** Another challenging task is to provide proof of whether the MM measures the “right things” in the “right manner.” With respect to the evaluation of an MM, this means that both the theoretic validity and reliability, and the usefulness and practical relevance of an MM need to be evaluated somehow. According to Kuechler and Vaishnavi (Kuechler and Vaishnavi 2008), the evaluation process itself thereby involves frequent iterations between development (with health professionals) and evaluation (by health professionals), rather than a procedural approach. It is hence hard to identify a clear start of the evaluation in the development process. Nevertheless, the process of evaluation should follow some rules to guarantee rigor. Developers thus should think about the “object” (what should be evaluated), the “time” (when should it be evaluated) and the “way” (how should it be evaluated) to validate the model in a plausible and comprehensible way. In terms of “what,” developers have to decide whether only the model itself, its development path or both should be evaluated. In regard to regular criticism on the validity of MM, it was suggested to evaluate the path and the product, thus opening both to scientific evaluation and discussion (Mettler 2010). Considering the duality and iterative character of the evaluation process, it is clear that this process can take its time.
Continuous improvement. The MM has to be maintained, and further development will be needed given that some model elements will get obsolete, new constructs will emerge and assumptions on the different levels of maturity will be affirmed or refuted (Becker, Knackstedt et al. 2009). Therefore, even in an early stage, it is important to also reflect on how to handle alterations in model design and deployment.

In order to ensure a certain degree of sustainability, the model should be developed over time. A challenge therefore is to decide whether only the structure of the model as such, its function or both should be further developed. Also, it is important to decide whether the model should be reviewed further on the basis of regular intervals and, even more important, who is responsible for deciding that the model does no longer fit certain requirements. In addition, it can help to increase the acceptance of the model as such by stipulating which stakeholders, such as health managers, clinicians, nurses or IT specialists, will be integrated into the process of renewal.

B.3.2 Implementation challenges

Although numerous challenges during the building phase can be identified, several process models and approaches already exist that guide the development process in order to guarantee or at least facilitate rigor. However, in regard to the implementation and use of MM, this looks different. The knowledge base on how to use and implement MM in practice is small. We will therefore identify possible challenges and necessary decisions in terms of the implementation of MM and relate them again to the steps of designing such a model.

Organizational needs. As in the design phase, the first decision that has to be made during implementation concerns the question of when the use of an MM seems reasonable in an organization. MMs are primarily characterized by their property to assess an object under observation (instances, processes crossing paths or skills) in terms of their current and a possible target state. An MM thereby includes several maturity levels and describes an anticipated, desired or typical development path. These maturity levels are defined by characteristics and characteristic values (Becker, Knackstedt et al. 2009). Therefore, these models have a dynamic character and thus are well suited for the gradual and evolutionary improvement of situations and conditions.

The decision for or against the use of MMs should therefore be based on the character of the situation that should be improved. If a gradual improvement in the targeted
context seems useful, adequate access to evaluating partners (knowledge base) does exist and sufficient financial resources are available, the implementation and use of an MM appear promising. For a useful application of an MM, however, it is crucial that the state of maturity can be conceptualized clearly enough in order to ultimately rate it. The final question is, ‘Do we really need a model that guides our improvement activities?’

Most of the hospitals performing assessments with one of our MMs were driven by the urge of improving organizational learning. On the one hand, MMs were seen as excellent instruments to critically reflect capabilities of the own organization. On the other hand, it allowed health professionals to compare dedicated aspects with a peer group outside the own hospital. While we expected that economic drivers will have a major influence on the decision whether to do an assessment or not, the possibility for inside-out and outside-in learning was actually the main reason for adopting MMs in hospitals.

Model selection. As mentioned earlier, hospitals are characterized by a high degree of organizational complexity and specific linguistic features (Caldwell and Atwal 2003). This means that models, either newly developed or reused from other domains, need to be strongly tailored to the context of hospitals. Since adapting is usually less time- and resource consuming, it should be the preferred approach in the context at hand. In addition, it is very likely that an already established model has been tested several times and thus meets the criteria of rigor in terms of its development and functionality.

However, in order to decide whether to develop a new model or adapt an existing one, implementers need to have an overview of the existing model that might be appropriate for adaptation in order to save resources and avoid deficiencies in rigor (Paulk, Curtis et al. 1993, Curtis, Hefley et al. 2002). However, the search for an adaptable model is very time-consuming and only promising if context and the aim of use of the MMs are sufficiently known. Since there is no common model base or classification system for MMs to date, it is challenging to find the right model for the given task (Mettler 2010). Therefore, a transparent and comprehensible search process underpins the later credibility of the used MMs.

In addition to a rigorous search process, the implementation success also heavily depends on the requirement rationales for the MMs itself. It usually makes little sense to use an MM for unique assessments or doubtful certificates. Rather, in view of the effort and the costs associated with the implementation of MMs, hospitals should think
of using these models for long- or medium-term change processes (e.g. integrating continuous improvement processes). This, however, requires again a clear picture of the changes that need to be measured and controlled on the bases of MMs.

**Model deployment.** Managers are often confronted with workforce resistance. This especially applies to healthcare organisations, as these organisations are often not used for performance measurement, yet. In order to gain acceptance and improve standardization of the model (De Bruin, Freeze et al. 2005), we suggest a two-phase deployment approach.

In a first step, the model should be tested with people who are dependent, for example, the group of people who are directly confronted with collecting the necessary data for the assessments. This initial development group has, therefore, great influence on the appropriateness of the model as such and the awareness the model might reach in the organization during development or adaptation. Important decisions that have to be taken in this phase are which practitioners should serve as information suppliers in order to build a suitable tool. These collaborators should be actively selected according to their knowledge regarding the phenomenon that should be measured and improved. A survey on voluntary basis, instead, can cause key informant bias because usually these practitioners do cooperate which supports the integration of a model and could therefore distort the appropriateness of the model. In political science, this phenomenon is well known and describes a systematic measurement error caused by the differences between the subjective perception and the present value of the objective or phenomenon under investigation.

As key causes of informant bias, information- and valuation differences apply depending on functional areas, roles and hierarchy levels (Campbell 1955). This, however, can lead to significant differences in the assessment of facts by different interviewees and therefore directly affects the results of a maturity assessment.

In a next step, the model should be tested with practitioners who are independent of the developing and testing process in order to improve the model (De Bruin, Freeze et al. 2005). Besides these initiatives to increase generalizability, another important decision concerns the question “who should perform the assessment?”

Depending on the situation, self-assessments, third-party assisted interviews or interviews by external professionals and/or consultants can be the options (Mettler 2010). During our field research with MMs in hospitals, we noted several times that
self-assessments were often prone to errors due to misunderstandings and that interviews by external consultants were refused. As best practice, therefore, often the third-party interviews are helpful.

**Model use.** MMs represent tools for evolutionary improvement of objects, skills or conditions. Assessments with these models on regular basis, therefore, are a critical requirement in order to guide changes over time. Unfortunately, most of the works regarding MMs do neither address the question how to routinize maturity assessments over time nor do they address the challenge how to adapt and develop the model over time (in the assessment process). Therefore, maturity assessments are often seen as single, unrelated events. However, as MMs guide evolutionary development activities, one of the most important aspects is to address time and change in an appropriate way. Hence, another challenge concerns the question how MM assessment and further developments can be anchored in the organizational and personal routines, processes and culture. In addition, it is necessary to appoint responsibility to one or more representatives of the organization in order to guarantee a periodic and regular use.

In hospitals, responsibility for MM use and development should therefore be located at the top management level of the organization in order to ensure a sustainable use across professional borders. Furthermore, as the development and use of MMs are resource intensive, organizations should strive to develop models that can be used for more than just one opportunity or at least adapted to new domains easily. This reduces the costs of such models and can therefore help to improve acceptance and foster sustainability (De Bruin, Freeze et al. 2005).

**Facilitating long-lasting organizational learning.** Organizations only benefit from the findings of maturity assessments if the results are collected centrally and if structured improvement initiatives are derived periodically on the basis of these findings. With regard to the organizational structure of hospitals, it is therefore most promising to collect data on management level. This matters especially when cross-sectional assessments are carried out that could reveal detailed improvement potential. Another reason for the localization of responsibility on top management level is the high resource intensity of maturity assessments. Since the budget responsibility for organizational improvements in hospitals is always localized at the top of the organization, management is the only department to release resources for assessments, improvements or changes. Furthermore, high staff turnover on departmental level aggravates a sustainable development of the tool if located on departmental level.
However, depending on the way an assessment is performed and the model instantiated, close cooperation between the IT department and hospital management is of utmost importance.

### B.4 Conclusion

Not least the increasing need for process orientation in hospitals, the development and use of MMs for path-oriented improvements have become more and more common in the recent years. MMs have become an established and major instrument for guiding organizational change and learning initiatives.

The fast-growing number of models cannot obscure that there are only few studies on the efficacy of initiated change efforts. The need for implementation support in general and for hospitals in particular is therefore very high (Conwell, Enright et al. 2000, Caldwell and Atwal 2003). We found that the extant literature has a strong emphasis on the development of MM and the perspective of the developers of such models. However, in practice these developers are frequently not or only indirectly involved in the actual deployment of an MM in a hospital setting.

Besides the challenges from a design perspective, we also wanted to describe challenges, which are faced by implementers of MMs, such as hospital manager or health policy makers. We have also tried to move the discussion beyond design methodologies.
Paper C: Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis

Table 8: Bibliographic information for paper C

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<thead>
<tr>
<th>Title</th>
<th>Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis</th>
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</table>
| Authors | Blondiau, André  
University of St. Gallen, Institute of Information Management,  
Mueller-Friedberg-Strasse 8, 9000 St. Gallen, Switzerland  
andre.blondiau@unisg.ch |
| Publication Outlet | Journal of Health Policy and Technology |
| Year | 2015 |
| Rating (VHB 2011) | - |

Abstract:

Background: Increased economic pressure and rising quality expectations force hospitals to use their resources more efficient than ever. Therefore, hospitals specialize to generate quality advantages and link up with other hospitals to generate economies of scale. In this light of increasing organizational complexity of growing hospitals, successful inter-departmental cooperation is discussed as important lever for mitigation of these growing challenges.

Purpose: A core requirement for successful inter-departmental cooperation is the sufficient knowledge about potential barriers and challenges in such complex organizations. Unfortunately, existing literature does not address this question in a structured way. Therefore, the aim of this study is to provide a list of challenges that can occur in a hospital environment and to suggest initiatives to overcome or reduce these challenges.

Method: The author follows a case study approach based on the data from scaled- and open interviews with members of different professional groups in two hospitals. To generate a holistic picture, the phenomenon is studied from a strategic-, process- and
Part B: Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis

Technological perspective. Furthermore cases are compared in a cross-case analysis to improve generalizability.

Results: Challenges identified from the three different perspectives are presented and compared in the cross-case comparison. Furthermore, potential initiatives to overcome the identified challenges are presented.

Conclusion: The study reveals that several challenges on organizational and technological level hinder inter-departmental cooperation. Among these are distrust in the medical service quality, lack of skills of employees as well insufficient data integration and media breaks.

Keywords:
Inter-Departmental Cooperation, Cross-case analysis, Case Study, Hospital Management, Cooperation within Hospitals

C.1 Introduction

In recent years health systems all over the world are facing considerable pressure to reduce costs while having to sustain and improve the quality of health service delivery. There are several side effects, which complicate the fulfilment of this mission. Among these are an increased number of chronic diseases and multi-morbidities associated with demographic change, the lack of qualified health workers, and higher demands of patients, local administrators and health insurers (Gemmel, Vandaele et al. 2008, Kohlbacher and Gruenwald 2011). Therefore, such initiatives as change from a time-based to a fixed price remunerations system should increase competition among healthcare institutions and help to sustain the quality and costs of care (Centre 2012). In this light, hospitals – the biggest cost drivers (OECD 2012, FMH 2013) – are forced to improve the efficiency of care processes by intensifying their efforts toward specialization, and cooperation (e.g. within integrated care networks) (Porter and Olmsted Teisberg 2004). Similar to movements in the manufacturing industry in the mid-80s (Van Alstyne 1997), hospitals aim to change from a historically grown function-oriented to a process-oriented and more patient-focused organization of their main treatment processes (Garrido, Organization et al. 2008, Kohlbacher 2010, Pinto and Baracsi 2012). Critical requirement for such a paradigm shift is the smooth cooperation between different functional units and/or departments within hospitals (Garrido, Organization et al. 2008, Vos, Chalmers et al. 2011, Corwin, Corbin et al.
2012). Therefore, profound knowledge about potential barriers and critical process interfaces for flawless cooperation is important to avoid redundancies and to design and guide efficient care processes. Furthermore, it is expected that a broader adoption of information technology (IT) can improve interoperability, reduce the risk of redundancies at departmental interfaces and facilitate cooperation between different stakeholders participating in the care process (Goldschmidt 2005, Khoumbati, Themistocleous et al. 2006, LeRouge, Hevner et al. 2007, Mettler and Eurich 2012). This applies to the cooperation between various medical departments as well as between different professional groups, such as physicians, nurses and hospital managers (Ferlie and Fitzgerald 2005). However, evidence exists that implementing IT for medical use without further knowledge of the underlying challenges of cooperation from a holistic perspective will not necessarily generate the expected benefits (Mettler 2011). This is also reflected in the current debate on “meaningful use” of supporting technologies in healthcare (Adams, Mann et al. 2003, Furukawa, Raghu et al. 2010, Xiao, Sharman et al. 2012). For a successful transformation of hospitals to more efficient organisations, it is crucial to know the critical pitfalls for intra-departmental cooperation on a strategic, organizational and technological level (Ferlie and Fitzgerald 2005). Therefore, it is important to identify challenges that prevent smooth inter-departmental cooperation and to derive clear guidelines that help practitioners avoiding them. The interest of this paper can be summarized in the following two research questions:

- What are the current challenges for inter-departmental cooperation within hospitals from a holistic organisational perspective?
- What are the potential organisational and technological levers to address these challenges?

These questions are answered illustrating the challenges identified during an empirical comparative study of an urban and a rural hospital. First, a brief delineation of the important underlying concepts is presented in the next section. Then, in the method section we describe why and how we used the case study methodology, including aspects such as cases selection, interview participants’ recruitment and data analysis. Finally, in the result section we describe the findings. We conclude with a discussion of the major findings and suggest questions for future research.
C.2 Background

Before analysing and discussing the data generated in two hospital cases, we introduce and explain several concepts and conceptual foundations relevant for the discourse on cooperation.

C.2.1 Cooperation in healthcare

From a classical management perspective the notion of "cooperation" describes the collaboration between two or more legally independent companies or entities with the aim to either increase efficiency or to create new products or services (Gabler 2010). With increasing economic pressure different concepts of cooperation also find their way into health care. Among these are integrated care networks (to increase medical service portfolio), cooperation to jointly buy medical materials (to increase bargaining power) or cooperation between hospitals to increase the number of patients and to benefit from treatment synergies (Salfeld 2009, Mettler and Rohner 2010). As a consequence of such consolidating initiatives, hospitals grow significantly (Vos, Chalmers et al. 2011). This creates certain challenges for inter-departmental cooperation between and within different hospitals. Due to these changes, hospitals are forced to improve certain processes: for example, by optimizing and unifying certain treatment procedures to guarantee high quality and also reduce costs. As a consequence, different medical departments (e.g. surgery, orthopaedics, etc.) specialise their treatment portfolio and procedures. This, in turn, is expected to increase operation times and reduce medical risk (Haraden and Resar 2004). However, the downside of specialisation can be an increased isolation of different departments, and, thus, an increased need for process reintegration (Vos, Chalmers et al. 2011). Therefore, to take advantage of specialisation and to provide holistic care at the same time, individual functional units (departments) have to be linked up smoothly with other departments (Gemmel, Vandaele et al. 2008). Furthermore, given the complex inter-professional context of bigger hospitals, not only different departments, but also different professional groups should be able to cooperate smoothly (Ferlie and Pettigrew 1996). To facilitate integrated care, cooperation between different departments must be improved and redundancies should be limited (Mettler and Blondiau 2012). Therefore, the basis for gaining competitive advantage is the ability to identify challenges for inter-departmental cooperation.
There are numerous publications on the subject of cooperation in the hospital environment. A literature search via Web of Science identified 1200 articles related to the subjects of cooperation and hospital in a broader sense. Some publications address topics such as patient well-being from a psychological or medical perspective (McKinlay and Stoeckle 1988, Mechanic 1996). Others focus on challenges associated with hospital mergers (Lynk 1995, Kessler and McClellan 1999), management challenges from an economical perspective (Melnick, Zwanziger et al. 1992, Singh 1997) or technological innovation diffusion in hospitals (Ferlie and Pettigrew 1996, Goes 1997). Finally, several researchers suggest models for improvement of single aspects for process orientation (Gemmel, Vandaele et al. 2008), elaborate on the role of leaders (Laschinger, Wong et al. 1999) and provide an overview about organisation-wide process orientation of care (Vos, Chalmers et al. 2011). However, although each of these contributions is very valuable in itself, they cannot answer the questions of our study. To identify challenges in such a multi-level and multi-professional environment, we need to develop a conceptual model that allows examining the phenomenon of cooperation from several perspectives.

C.2.2 A contingency based view on cooperation

Building upon our discussion and the evidence from literature, «cooperation» can be understood as a multifaceted phenomenon, which consists of strategic, process and technological aspects (Österle, Fleisch et al. 2001). This phenomenon can be seen as a consequence of different changing conditions and structures. This understanding of cooperation is closely related to the concept used in contingency theory: for example, based on this theory Mintzberg and Morgan suggest that there is no optimal course of management (Mintzberg 1979, Morgan 1986). To sustain success of the organisation, management initiatives need to satisfy and carefully balance different changing structures and entities, including technology, people, culture, management etc. (Morgan 1986). Taking into account pluralistic (multi-departmental and multi-professional) structure of hospitals and building upon contingency theory, we developed a conceptual model for analysing cooperation challenges (Mettler and Blondiau 2012). This model suggests studying challenges of cooperation from a (1) strategic, (2) process, and (3) technological perspectives. This study implements this model to identify inter-departmental cooperation challenges on multiple levels in a structures way.
C.3 Method

To identify important challenges for intra-hospital cooperation we choose a case-study design, studying two hospital cases and following an interpretative epistemology (Orlikowski and Baroudi 1991). Case studies can be understood as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin 2003). As such, case studies are suitable to provide rich descriptions and deep understanding of one or more predefined phenomena within their specific context without manipulating variables of interest (Cavaye 1996). By in-depth analysis of the two cases, this study aims to analyse factors that affect flawless cooperation between and within hospitals from strategic, process and technological perspectives.

We recognise that, like other studies that use qualitative case-study approach, this study might be affected by the researcher’s bias. According to the literature focusing on this issue, reality is constructed through the eyes of the observer and is based on his perceptions affected by specific historical and cultural background (Orlikowski and Baroudi 1991). Therefore, value-free data cannot be obtained (Walsham 1995). Despite these potential biases, we suggest that our study may contribute to the literature on cooperation within hospitals (1) by using structured approach to analyse cooperation challenges on multiple levels and (2) by providing insights into the local context of the cooperation challenges in two hospitals in German-speaking countries.

C.3.1 Case Selection and Boundaries

One of the most important questions in case study research is what is recognized as the “case”. Following Stake (2006) it is of utmost importance to make a clear definition of the scope and boundaries: “Certain components lie within the system, within the boundaries of the case, while certain other features lie outside”. During 2009-2011 an international project on challenges for intra-hospital cooperation in 8 different hospitals around Lake Constance was conducted by the Institute of Information Management at the University of St. Gallen (Winter, Mettler et al. 2009).

For the in-depth analysis of cooperation challenges, we selected two of these hospitals based on preliminary results from focus group workshops that had been conducted during the project (Winter, Mettler et al. 2009). Besides the differences in hospitals’ size and location, these two cases differed strongly in regard to the degree to which they standardized processes simplifying cooperation. Therefore, by choosing these two
specific cases we aimed to identify different patterns of challenges. Furthermore, these hospitals agreed to provide a number of additional interviews for the purpose of this study.

**Table 9: Case characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case 1: Collaboration in a small regional hospital</th>
<th>Case 2: Collaboration in a large metropolitan hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary mission</td>
<td>Acute care provider in a hospital network</td>
<td>center hospital</td>
</tr>
<tr>
<td>Geographic localization</td>
<td>rural</td>
<td>urban</td>
</tr>
<tr>
<td>Ownership</td>
<td>private (limited)</td>
<td>publicly owned</td>
</tr>
<tr>
<td># Employees</td>
<td>250</td>
<td>1000</td>
</tr>
<tr>
<td># Beds</td>
<td>115</td>
<td>300</td>
</tr>
<tr>
<td># Cases (inpatient)</td>
<td>5663</td>
<td>12719</td>
</tr>
<tr>
<td># Functional Departm.</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>

With the selection of two very different key- or maximum variation cases (Flyvbjerg 2006), we follow an information-oriented strategy (Eisenhardt 1989). According to this strategy, cases should differ strongly to enable clear identification of differences. In order to generate clear and stable insights we focused on the deep investigation of the two cases (Creswell 1998) rather than on multiple cases as proposed by Eisenhardt (Eisenhardt 1991). To assure for the possibility of generalisation and to avoid the problems of the individual cases’ external validity, we compared the findings of the two cases in a cross-case analysis (Bennett and Elman 2006).

**C.3.2 Data Collection**

Data were mainly gathered during the semi-structured interviews to address the need for nuance and to allow the unexpected to be explored (Rouch, Thomson et al. 2010). The interviews were conducted between 2009 and 2011.

As suggested by Ferlie and Davis (Ferlie and Fitzgerald 2005, Davis, Davis et al. 2012), practitioners of several professional groups, i.e. management, medicine and nursing were interviewed to create a representative picture of these multi-professional contexts. In total, 18 health professionals (9 per hospital) were interviewed (see Table 10). The interviews lasted between 1 and 2 hours and were tape-recorded. Additionally, notes were taken by one of the participating researchers to simplify the meaningful transcription (Darke, Shanks et al. 1998). In the interviews a combination of focused scaled-response (based on a four point scale to avoid centre-weighted selections) and open-ended questions were used (Kaplan and Duchon 1988). The latter was applied in order to ensure that a more complete picture of real-life situation was
attained. Thus, we implemented the approach advocated by Bouchard (1976) who explicitly envisages re-focussing during the interview, which provides a greater flexibility than completely structured interviews.

In the beginning of each interview, we gave a short standardised description of the context, the research interest and the overall questions. Then, general questions about the organisation, the interviewed person and their biographical background were asked to generate an atmosphere of comfort (Darke, Shanks et al. 1998). Next, more specific questions regarding factors hindering cooperation were asked from the strategic planning perspective and the process perspective focusing on challenges hindering daily procedures. Furthermore, practitioners were asked about challenges that they see on the system level with the focus on information technology implemented to support cooperation between departments. For later triangulation of the data, a multitude of annual reports, project documents, announcements, and press releases were included in the study (Darke, Shanks et al. 1998).

Table 10: Data gathering (note: \(m = \text{minutes}\))

<table>
<thead>
<tr>
<th>Case A</th>
<th>Interviewee role</th>
<th>Dur in m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case A</td>
<td>CEO</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Head of Controlling</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>CIO</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Chief Anesthesiologist</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Senior physician</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Assistant physician</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Nursing Director</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Nurse manager</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Head of QM (Nurse)</td>
<td>90</td>
</tr>
<tr>
<td>Case B</td>
<td>Assistant to the CEO</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Head of Finance</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>CIO</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Head of internal medicine</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Chief physician (IM)</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Senior physician oncology</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Nursing Director</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Nurse manager</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Nurse</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Total interview time in min.</td>
<td>1675</td>
</tr>
</tbody>
</table>

C.3.3 Data Analysis

To analyse and generate deep insights from the obtained data, interviews were transcribed and read by at least two of the participating researchers in the project (Dyer and Wilkins 1991). Then the data were coded and examined for notions related to challenges of cooperation such as, for example, “redundancy in treatment portfolio”, “quality of medical services” or skills of staff”. The primary codes were later refined
as further themes or more specific understandings from focus groups workshops with health professionals emerged (Rouch, Thomson et al. 2010). Then, quotations were examined for similar statements regarding the main challenges of cooperation from strategic, process, and technological perspective. These statements were later clustered by concise themes. The themes were discussed again among researchers and in focus group with professionals.

Later cross-case comparisons were done to identify potential differences between hospitals and / or professional groups and to assure higher generalizability e of the findings (Ferlie and Fitzgerald 2005).

C.4 Results

C.4.1 Findings from in-depth case analysis: Large Metropolitan Hospital

For several years an important aim of the metropolitan hospital was and still is to improve the quality of care through several medical and structural initiatives. This includes initiatives to explicitly improve holistic care pathways and, along with that, efforts to improve intra-departmental cooperation, such as the cooperation between several medical units as well as cooperation between administrative and medical staff.

Challenges from a strategic perspective

Insufficiently coordinated treatment services of various departments and the competition between hospitals offering similar therapy were perceived as biggest challenges for interdepartmental cooperation in the scaled-response questions. This image was also confirmed in the open interview questions. For example, a chief physician mentioned the following:

“...a big problem is that different departments offer similar services, and therefore compete directly with each other, rather than complement each other along the care pathway. In times of increasing competition between hospitals this self-cannibalization is certainly the wrong strategy.”
A reliable quality of medical procedures has also been identified in scaled-response questions as an important challenge for cooperation between departments across hospital boundaries. For example, one medical doctor mentioned:

“...Smaller hospitals often start treating patients in a wrong way [...] if they don’t know any more how to continue they transfer them to us [to the hospital]. We then have to play fire fighters and save what can be saved, instead of following our normal procedures. This for sure does not strengthen trust in cooperation activities.”

In this regard clear definitions of quality standards and regular control of the medical service quality provided by external partners were mentioned as factors increasing trust in cooperation.

However, besides the medical services quality and the formalization of inter-departmental routines, the lack of information about availability of medical services was also identified as an obstacle for efficient cooperation. Particular members of the medical staff named easy accessible, reliable and actual information about the availability of medical services and/or beds as an important requirement for cross-hospital cooperation.

**Challenges from a process perspective**

At the process (operational) level, again, professionals perceived quality of medical services as the most important challenge. Members of the management team and the care unit reported that large quality caveats occur between the different departments. They suggested that this complicates the mutual trust and efficient cooperation. They highlighted the importance of continuous improvement of quality controls for medical services. A member of the management noted:

"What we see again and again is that the quality of medical services between the departments is very different. But to be honest, we cannot really prevent this, because different people work in these different departments. However, what we can do is to check the quality regularly, so that we reduce these disparities.”

In other words, according to medical professionals, high medical service quality can be understood as a crucial factor for cross-departmental cooperation. However, unlike
nurses, medical doctors never mentioned any quality deficits on their own side while frequently criticising quality of the services that were not under their direct responsibility. We observed these differences of perceptions between different professional groups several times during interviews. Furthermore, we often observed fundamental scepticism of the medical doctors toward the management team, which was reflected in several statements, such as the following:

"We have enough work to do with taking care of our patients. The permanent quality claim of the management just disturbs our work. We do our job well, what can’t be said about the management."

In addition to this, scaled-responses revealed the importance of such challenges as the lack of management support and inadequate qualification of employees.

**Challenges from a technological perspective**

Contemporary, compatible and integrated technical systems were mentioned as being nearly as important as the strategic planning activities. Therefore, a low degree of data integration and standardization along the care pathways was identified as most important challenge from a systems perspective. According to members of the management and the care unit, an important reason for this, is the high autonomy of various departments. Most departments chose software components based on their functional requirements without considering the overall information supply concept. Therefore, an organisation-wide IT strategy can be seen as important success factor. Additionally, information systems compatibility was identified as important condition for IT-integration. In the interviews, medical doctors reported about regular time losses due to systems incompatibility between different departments. For example, such time losses resulted from double- and inconsistent entries as well as from media breaks in communication between medical and administration departments. Finally, IT-literacy was mentioned as crucial factor in implementing IT for successful inter-departmental cooperation.

Besides challenges in data-integration, compatibility and IT-literacy, medical professionals also highlighted the importance of having up-to-date technical equipment. They mentioned that decisions for new technical acquisitions were often opportunity-driven, rather than demand-oriented and aligned with the overall needs of the hospital. A director of the patient care mentioned:
“...who comes first eats first. Therefore, departments that submit their requests first get the new technical equipment faster than departments where it is mostly needed or where the treatment process could be improved overall.”

As the main reason for opportunity-driven purchases health professionals often identified the absence or immaturity of an organisation-wide IT strategy. Thus, a centralised procurement of IT under the lead representatives of all relevant professional groups could address this challenge.

C.4.2 Findings from in-depth case analysis: The case of a small regional hospital

Challenges from a strategic perspective

Analysis of the responses to scaled and open questions revealed that professionals of the rural hospital in average see less challenges at the planning level. However, certain potential for improvement was mentioned in regard to the quality of externally-based services. Physicians mentioned that insufficient attention is paid to the service quality of externally acquired medical services. For this reason, quality regularly did not meet their expectations.

Furthermore, analysis of responses revealed that certain groups of medical professionals (i.e. nurses) lack motivation for improving cooperation because they do not feel supported at organizational level. For example, one of the nurses mentioned:

“...Unfortunately, the knowledge of us [the nurses] is often not appreciated and we are hardly involved in decision-making. I mean we like our work, but sometimes a little more esteem, as equal partners would do quite well. Unfortunately, doctors do not see us like equal partners, but rather as subordinates.”

Interestingly, members of the management also recognised the support of the employees as a critical success factor. In contrast, medical doctors saw little need for improvements in this area. They perceived the lack of quality control as the most important challenge for inter-departmental cooperation across hospital borders. Doctors emphasised that fluctuating quality negatively affects the trust of potential external partners. As one example they mentioned the importance of quality standards
for gaining trust of referring general practitioners. High service quality and regular quality checks were seen as important success factors for cooperation, since they would strengthen the willingness to cooperate among partners.

**Challenges from a process perspective**

Professionals of the rural hospital also identified the medical service quality as the biggest challenge and success factor for cooperation. Representatives of all professional groups also mentioned that improving the quality control mechanisms could enhance trust and the willingness to cooperate.

“How are we supposed to cooperate well if we can never really count on the quality of other departments? We regularly have to do extra work in medical operations and lose time because the other departments did not provide for the sufficient quality. Nevertheless, in the end we have to bear the responsibility for time and quality losses. As you can imagine, this is not improving trust in cooperation with other departments.”

Additionally, medical professionals identified unclear distribution of responsibilities and low liability as barriers for inter-departmental cooperation. This is reflected in the following statement by the head of internal medicine.

“How cooperation works only if there are clear leaders that take care of it. In our house assistant physicians are responsible for this. However, these assistants are learning doctors who never raise their word against seniors. This responsibility for criticising and improving the process must be located on management level if we honestly want to improve the situation.”

**Challenges from a technological perspective**

With regard to the technical challenges for cooperation, practitioners of the rural hospital did not identify severe challenges. Nevertheless, they identified redundancies in databases, lack of governance mechanisms and incompatibility of the systems as challenges for inter-departmental cooperation. Additionally, data integration in IT along the care processes was identified as the key success factor for cooperation.
Several statements by physicians, which reflect the overall opinion on this issue, are presented below:

"We already have very good systems here, but sometimes it happens that the systems of the different departments are not 100% compatible, or patient data is stored in different forms. Of course, this blocks the treatment process."

"For us, the systems are just partly harmonised. If we aim to reach an integrated treatment, it cannot be true that X-ray images need to be carried from one department to another by the patient himself just because systems are not compatible with each other."

As in case of the metropolitan hospital, the professionals of this regional hospital mentioned opportunity-driven purchases of IT-systems as factor hindering cooperation. One of the nurses commented on this as follows:

"Although we are centrally organized, some departments behave like little kingdoms. They largely value their autonomy and do not arrange themselves with other departments or the management in regard to the systems they want to use or buy."

This observation was also confirmed by physicians who perceived compatibility as crucial challenge for inter-departmental cooperation from a technological perspective. However, although professionals saw the potential for improvement from the technological perspective, they perceived potential improvements on the strategic and process levels as more relevant.

C.4.3 Findings from cross-case analysis

Strategic perspective

Following the process described in the Method section, we listed the identified challenges in the order of their perceived importance, which was measured by responses to scaled questions (Table 11).
Part B: Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis

Table 11: Comparison of the challenges identified from a strategic perspective (in order of their relevance)

<table>
<thead>
<tr>
<th>Challenges from a strategic perspective</th>
<th>Large metropolitan hospital</th>
<th>Small regional hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Redundancy of services provided by the network</td>
<td>1 Quality of external services</td>
<td></td>
</tr>
<tr>
<td>2 Quality of external services</td>
<td>2 Degree of formalization of external services</td>
<td></td>
</tr>
<tr>
<td>3 Degree of formalization of external services</td>
<td>3 Quality of support for external services</td>
<td></td>
</tr>
<tr>
<td>4 Availability of external services</td>
<td>4 Completeness of services provided by the network</td>
<td></td>
</tr>
<tr>
<td>5 Clear defined responsibilities in care process</td>
<td>5 Availability of external services</td>
<td></td>
</tr>
<tr>
<td>6 Ability to integrate externally received services into own value chain</td>
<td>6 Clear defined responsibilities in care process</td>
<td></td>
</tr>
<tr>
<td>7 Degree of formalization of external liabilities</td>
<td>7 Degree of formalization of external liabilities</td>
<td></td>
</tr>
<tr>
<td>8 Quality of support for external services</td>
<td>8 Skills of external personnel</td>
<td></td>
</tr>
<tr>
<td>9 Involvement of employees for improving cooperation</td>
<td>9 Involvement of employees for improving cooperation</td>
<td></td>
</tr>
<tr>
<td>10 Completeness of services provided by the network</td>
<td>10 Ability to integrate externally received services into own value chain</td>
<td></td>
</tr>
<tr>
<td>11 Skills of external personnel</td>
<td>11 Redundancy of services provided by the network</td>
<td></td>
</tr>
</tbody>
</table>

Professionals of both hospitals perceive the medical service quality, support in quality assurance and information about the availability of services as biggest challenges for inter-departmental cooperation between hospitals. Furthermore, professionals of both hospitals mentioned the importance of formalization of cooperating activities as an important enabler for smooth cooperation. Other identified challenges sometimes differ strongly between the two hospitals and could therefore not be replicated. However, comparison of the open interview questions revealed, that medical doctors often had a sceptical attitude toward the skills of the management which could be recognized in several interviews.

Process perspective

From a process-oriented perspective, professionals of both hospitals agreed across all professional groups, that a reliable medical quality and strong interdepartmental support are important challenges. They mentioned that the quality should be controlled and improved in order to facilitate cooperation between the different departments. Besides the quality aspect practitioners also agreed that also the skills of the employees do have a clear influence on the success of cooperation. We also identified other aspects which unfortunately could not be replicated in the cross-case analysis and which suggests the presumption, that these are individual challenges (Table 12).
Part B: Challenges for inter-departmental cooperation in hospitals: Results from cross-case analysis

Table 12: Comparison of the challenges identified from a process perspective (in order of their relevance)

<table>
<thead>
<tr>
<th>Challenges from a process perspective</th>
<th>Large metropolitan hospital</th>
<th>Small regional hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Quality of internal services</td>
<td>1 Quality of internal services</td>
<td></td>
</tr>
<tr>
<td>2 Quality of support for internal services</td>
<td>2 Quality of support for internal services</td>
<td></td>
</tr>
<tr>
<td>3 Skills of internal personnel</td>
<td>3 Skills of internal personnel</td>
<td></td>
</tr>
<tr>
<td>4 Redundancy of services provided by internal departments</td>
<td>4 Involvement of employees for improving internal cooperation</td>
<td></td>
</tr>
<tr>
<td>5 Degree of standardization of internal services</td>
<td>5 Degree of standardization of internal services</td>
<td></td>
</tr>
<tr>
<td>6 Degree of formalization of internal liabilities</td>
<td>6 Degree of formalization of internal liabilities</td>
<td></td>
</tr>
<tr>
<td>7 Availability of internal services</td>
<td>7 Availability of internal services</td>
<td></td>
</tr>
<tr>
<td>8 Involvement of employees for improving internal cooperation</td>
<td>8 Involvement of employees for improving internal cooperation</td>
<td></td>
</tr>
<tr>
<td>9 Availability of internal services</td>
<td>9 Availability of internal services</td>
<td></td>
</tr>
<tr>
<td>10 Completeness of services provided by internal departments</td>
<td>10 Completeness of services provided by internal departments</td>
<td></td>
</tr>
<tr>
<td>11 Involvement of employees for improving internal cooperation</td>
<td>11 Involvement of employees for improving internal cooperation</td>
<td></td>
</tr>
</tbody>
</table>

Technological perspective

From a technology-oriented view, almost all of the interviewed practitioners identified seamless data integration along the treatment processes and the avoidance of redundancies in the databases as important factors for cooperation. Moreover, practitioners of both hospitals agreed that user-centric information coverage is an important success factor for inter-departmental cooperation. Again, other interesting findings were made (Table 13). However, these challenges could not be replicated in the cross-case analysis.

Table 13: Comparison of the challenges identified from a technological perspective (in order of their relevance)

<table>
<thead>
<tr>
<th>Challenges from a technological perspective</th>
<th>Centre Hospital</th>
<th>Rural Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Data integration along value creation</td>
<td>1 Undesired redundancies in data bases</td>
<td></td>
</tr>
<tr>
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The cross-case analysis revealed several reproducible challenges from all three perspectives. From a strategic perspective, medical service quality, information about the availability of services and the degree to which cooperating activities are formulized among cooperating partners could be replicated as most important challenges in both hospitals.
From a process perspective quality (and quality standards), inter-departmental support and the skills of employees could be replicated as challenges, which were mentioned by professionals in both hospitals.

Last but not least, practitioners identified an integrated information concept supporting the important process-flows and the avoidance of redundancies as important success factors to enable and foster flawless inter-departmental cooperation from a technological perspective.

Besides the above mentioned challenges, it was interesting that differences between different professional groups were sometimes higher than between different hospitals. For the management of such inter-professional organisations this even complicates the task, as not only different departments and functions have to be considered but also the varying worldviews have to be addressed.

**C.5 Conclusion and Implications**

In regard to the question which challenges hinder inter-departmental cooperation, the analyses of the two cases revealed several generalizable challenges on different organisational levels. These challenges are not necessarily interconnected, although some certainly do influence or reinforce each other. The importance of medical service quality and effective quality assurance, for example, is considered a crucial confidence-building factor for inter-departmental cooperation on both strategic and process level. Furthermore, insufficient work experience and qualifications of the hospital staff were also identified as some of the major challenges.

These findings are easily understandable if one considers that quality is the key performance indicator in health care. The focus on quality is further reinforced by other challenges for cooperation, identified in our study: the insufficiency of cooperation support by the hospital management and the lack of up-to-date information about services availability in other hospitals. Both factors directly affect the ability to provide high medical quality and, thus, are in line with the omnipresent demand for stable quality. However, it remains unclear, whether the abovementioned differences in quality do actually exist or they only exist in the perceptions of professionals. Assuming that reality is socially-constructed (Orlikowski and Baroudi 1991, Walsham 1995), these perceptions, however, can be accepted as reality. Thus, quality and quality assurance are some of the main challenges and success factors for inter-departmental cooperation.
Another important success factor, directly associated with the first, is the demand for reliable information provided by an adequate IT-infrastructure. The main challenges for such infrastructure were identified in seamless data integration along care-pathways, coverage of the stakeholder information needs and compulsory IT standards. For hospitals, these findings mean that information supply should still be addressed more professionally.

For the management of hospitals several possibilities exist to address these challenges. First, on a strategic level an organisation-wide IT-strategy and an IT-department could improve impact and efficiency of IT. Furthermore, decisions about system purchases should be elaborated by inter-professional competence groups (Ferlie and Fitzgerald 2005). This ensures systems compatibility and prevents lack of information coverage. Furthermore, it ensures that requirements are imposed more precisely, IT better address the need of the users and better aligned between the departments. In this way, information systems can be integrated even stronger in the daily business of hospitals and used for regular quality measurements and controls. In addition, better IT integration also helps to increase understanding between different professional groups and, thereby, improve quality of care.

As other qualitative research approaches based on case studies, this work has limitations. The results presented at hand are based on qualitative interviews with professionals of two German hospitals. The strong focus on one country and one system could limit the generalizability of the findings. However, by interviewing different representatives of different professional groups we aim to provide as representative insights as possible.

In conclusion, the results of our study contribute to the literature on inter-departmental cooperation in hospitals by demonstrating what challenges for cooperation emerge on different organisational levels and how they can be addressed in a structured way. The different challenges exist on different levels because the perspectives of the various professional groups and departments often differ strongly. Unlike companies that often do have an overall vision that is shared among the departments, hospitals often struggle with the fact that they have several visions or goals of the different departments. Thus, flawless interdepartmental cooperation through adequate IT support can be realized only if the requirements are addressed successfully at the all relevant levels.
Further research may address the questions of managing such complex inter-professional organisations as hospitals and addressing the demands for adequate information. Therefore, it should be interesting to further explore the issue of cooperation in such complex surroundings and the role of information technology in this context.
Bibliography


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# Curriculum Vitae

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<tr>
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<tr>
<td>2010 – 2017</td>
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<tr>
<td>University of St. Gallen (HSG), Switzerland</td>
</tr>
<tr>
<td>Ph.D. Programme in Management (PMA), Business Innovation</td>
</tr>
<tr>
<td>2008 – 2010</td>
</tr>
<tr>
<td>University of St. Gallen (HSG), Switzerland</td>
</tr>
<tr>
<td>Ph.D. Programme in Organization Studies and Cultural Theory (DOK)</td>
</tr>
<tr>
<td>2007 – 2008</td>
</tr>
<tr>
<td>University of St. Gallen (HSG), Switzerland</td>
</tr>
<tr>
<td>Executive course in management, graduated with distinction</td>
</tr>
<tr>
<td>2006</td>
</tr>
<tr>
<td>Stuttgart Institute of Management and Technology, Germany</td>
</tr>
<tr>
<td>Executive Training in Innovation Management</td>
</tr>
<tr>
<td>2005 – 2006</td>
</tr>
<tr>
<td>Natural &amp; Medical Science Institute (NMI), Tübingen, Germany</td>
</tr>
<tr>
<td>Diploma thesis</td>
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<tr>
<td>1999 – 2006</td>
</tr>
<tr>
<td>University of Bonn (RFWU), Bonn, Germany</td>
</tr>
<tr>
<td>Study of Biology and Medicine, Biology, graduated with distinction</td>
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<tr>
<td>1997</td>
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<tr>
<td>Beethoven Gymnasium, Bonn, Germany</td>
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<tbody>
<tr>
<td>2014 – 2017</td>
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<tr>
<td>Bern University Hospital, Switzerland</td>
</tr>
<tr>
<td>Strategic Medical Controller &amp; Innovation Manager</td>
</tr>
<tr>
<td>2010 – 2013</td>
</tr>
<tr>
<td>University of St. Gallen (HSG), Institute of Information Management, Chair of Prof. Dr. Robert Winter, Switzerland</td>
</tr>
<tr>
<td>Research Assistant &amp; Project Coordinator in the Health Group</td>
</tr>
<tr>
<td>2008 – 2010</td>
</tr>
<tr>
<td>University of St. Gallen (HSG), Institute of Management, Chair of Prof. Dr. Johannes Rüegg-Stürm, Switzerland</td>
</tr>
<tr>
<td>Research Assistant</td>
</tr>
<tr>
<td>2006 – 2008</td>
</tr>
<tr>
<td>Natural &amp; Medical Science Institute (NMI), Tübingen, Germany</td>
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<td>Management Associate, Strategy Implementation</td>
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