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Preparing strategic information management plans for hospitals: a practical guideline
SIM plans for hospitals: a guideline

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Summary
Objectives: Systematic information management in hospitals demands for a strategic information management plan (SIM plan). As preparing a SIM plan is a considerable challenge we provide a practical guideline that is directly applicable when a SIM plan is going to be prepared.
Methods: The guideline recommends a detailed structure of a SIM plan and gives advices about its content and the preparation process. It may be used as template, which can be adapted to the individual demands of any hospital.
Results: The guideline was used in several hospitals preparing a SIM plan. Experiences showed that the SIM plans could be prepared very efficiently and timely using the guideline, that the proposed SIM plan structure suited well, that the guideline offers enough flexibility to meet the requirements of the individual hospitals and that the specific recommendations of the guideline were very helpful.
Conclusions: Nevertheless, we must strive for a more comprehensive theory of strategic information management planning which — in the sense of enterprise architecture planning — represents the intrinsic correlations of the different parts of a SIM plan to a greater extent.

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1. Why do we need a strategic information management plan in a hospital

As already argued in [1] systematic information management in hospitals demands for a strategic information management plan (in the following: SIM plan). A SIM plan gives general guidelines for building and further development of the hospital information system (HIS). We consider as a HIS the socio-technical subsystem of a hospital, which comprises all information processing actions as well as the associated human or technical actors in their respective information processing role. It supports the information management in future strategic planning activities by

- defining the aims of strategic information management aligned with hospital aims,
- presenting the complete current state of hospital information processing including paper-based, and computer-based information processing tools,
- assessing the current state and recognizing deficits,
- identifying the necessary call for action, and defining the target state,
- defining a migration strategy which determines the tactical projects to be carried out.

So, a SIM plan is the result of enterprise architecture planning (EAP; see e.g. [2—4]). As the SIM plan documents the strategic alignment of business goals and information management goals, it is one of the most important references for every stakeholder interested not only in the further development of the HIS but also in the hospital's general development.

Preparing a SIM plan is a considerable challenge (e.g. [5]) — especially for small — and medium-sized hospitals. In [1], we already recommended a shallow structure for SIM plans. The guideline suggested now expands this structure and gives advices about the content of a SIM plan and hints about things to pay attention to. We hope to motivate information managers to systematically and completely plan their HIS.

2. What other approaches are there for the preparation of a SIM plan

The demand for systematic information management planning is not new for the health care community. Already in 1991, Lederer and Sethi presented principles for SIM planning [6], Spitzer suggests a rough structure for a SIM plan in 1993 [7]. Business management oriented approaches adapted for health care and theoretically motivated can be found in [8,9]. The latter one e.g. presents a procedure to align business strategy and information management strategy, the so-called 'Component Alignment Model'. Tan in [10] strives for the same goal, using another approach. In his 'Critical Success Factor Approach to Strategic Alignment' he proposes to identify factors critical for the success or unsuccessfulness of an organization, and to derive a SIM plan starting from these critical success factors.

Other approaches for SIM planning result from the accreditation procedure of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). To get accredited, health care organizations have to comply with a set of information management standards, and they have to prove this by SIM plans. There are a lot of papers that deal with the question of how to design SIM plans to get the best chance to become accredited [11—14]. In this context there are also commercial software tools available (e.g. http://www.abbeyassociates.com/IMTools.html).

Strategic information management is essential for enterprises of other industries as well as for public organizations. Several approaches for SIM planning have been proposed. These approaches are based in information management, information systems and even business management. Zachman [3] proposes in his enterprise architecture framework a kind of classification of what has to be modeled but does not go into detail about how to get the information needed. Boar [4] concentrates on the description of the enterprise architecture and provides several ready-to-use blueprints and adaptable templates. In [15] the Chief Information Officer Council in the USA as government-wide body addressing SIM planning issues of the federal agencies developed a practical guide of how to plan federal enterprise architectures. Comprehensive guidelines for SIM planning are provided by [2,5]. These books provide advanced knowledge and could complement the guideline proposed in this paper.

We decided to develop a practical guideline for strategic information management planning in hospitals for the following reasons:

- The guideline should be complete, dealing with all aspects of SIM planning not just focus on special topics, like e.g. strategic alignment as in [8,9].
- The guideline should be compendious, and not as comprehensive as e.g. [2,5], and thus be di-

rectly applicable when a SIM plan is going to be prepared for a specific health care institution.
- The guideline should be concrete, and not just give general hints like in [6,7,18] or just provide a framework like in [3].
- The guideline should be uncommitted, and not produce SIM plans answering just one purpose as e.g. [11,14].
- The guideline should be practical, i.e. readers should not be enforced to deal primarily with theoretical background.
- The guideline, and especially the illustrative examples, should consider specifics of health care information systems.
- The guideline should especially support people inexperienced in SIM planning.
- The guideline should reflect the authors' experiences with strategic information management planning.

Nevertheless, the core conclusions of the approaches mentioned above should be integrated if suitable.

3. How can we prepare and use a SIM plan

In our lifecycle model a SIM plan passes through four phases: the preparation, the adoption, the implementation/usage and the revision. The revision phase initiates the rerun of the first three phases considering that the SIM plan does not have to be prepared from scratch. In the following we draw attention to some points most important within these phases.

3.1. Who is responsible for the preparation of a SIM plan

Ideally, the chief information officer (CIO) [16,17] as head of the IT department is responsible for the *preparation* of the SIM plan. If there is no CIO the hospital management should choose one responsible person who gathers and arranges all information from the different stakeholders and draws up a first version of the SIM plan. This first version should be the basis for further discussions, which successively leads to a final draft version. The final draft goes through the adoption process. It is important that the final draft version of the SIM plan is already aligned with the hospital management and with the expectations of the various departments and different professional groups to avoid discordance and resulting delay during the adoption process.

3.2. Why is it necessary to adopt the SIM plan

During the phase of *adopting* the SIM plan, there is opportunity to check the content of the final draft version and to enforce modifications. To that effect, we need strategies to reach consensus. In large hospitals there should exist an information management board, where the different professional groups are represented. This board will approve the SIM plan, and propose it to the hospital management. If necessary, the consensus finding may be moderated by an external consultant. The hospital management finally deliberates on the SIM plan and adopts it. After adoption, it becomes effective and should not be changed up to the scheduled revision. It is obligatory for all stakeholders. This adoption process ensures that the main decision-makers are committed to the SIM plan. It gives planning reliability to all concerned stakeholders, especially the IT department, and is therefore a good starting-point for a goal-oriented and successful further development of the HIS.

3.3. How can we implement the SIM plan

Ideally, the SIM plan is valid for 3—5 years. During this time, it is implemented step by step. The hospital management has to provide financing and staff necessary for the implementation. The persons responsible for strategic information management have to monitor the project portfolio and to ensure that the target state of the HIS will be reached as planned. Tactical information management is responsible for planning and carrying out the projects given by the migration concept. Each of the stakeholders has to act in accordance to the SIM plan. If new major requirements appear the SIM plan may only be adjusted in full and explicit accordance with those having adopted it, i.e. the hospital's management.

3.4. When must a SIM plan be revised

The validity of a SIM plan depends on the changing impact factors on the HIS. These may be new legal requirements (e.g. introduction of new financing rules), new user requirements (e.g. introduction of a PACS) or new technical advances (e.g. introduction of mobile computing). Normally, a SIM plan is valid for 3—5 years. A revision should be initiated in sufficient time, i.e. there should be no period of time without a valid SIM plan. Nevertheless, there may be some major unexpected changes of the

HIS necessary (e.g. an unplanned but necessary displacement of a central application system). If it becomes clear, that the target state cannot be reached anymore, a revision of the SIM plan may be necessary ahead of schedule.

4. What is the content of a SIM plan

In this chapter we will especially focus on the preparation of a SIM plan. It describes the content of a SIM plan and gives advices and best practices of what to consider most and from where to get the information needed. We propose to structure a SIM plan as shown in Table 1. This structure can easily be modified to fit the requirements of an individual hospital.

In the following, we will go into detail for each section of this structure.

4.1. Summary

A summary is necessary for those stakeholders who want to get a quick overview about the most essential statements of the SIM plan. Aim of the summary is to precisely point out these essentials as basis for the stakeholders' decisions. It may be necessary to make different summaries available for different stakeholders. The style of the summary should motivate the reader to support the implementation of the SIM plan. For this, past omissions and future risks should not be overemphasized; existing advances and expected benefits should be presented appropriately.

Table 1 Structure of a SIM plan

1. Summary
2. Introduction
3. The hospital
3.1. Vision, mission and goals of the hospital
3.2. Hospital characteristics
3.3. Organizational structure
3.4. Spatial structure
4. Information management
4.1. Organization of information management
4.2. Goals, principles and standards for information processing
5. The current state of the hospital information system
5.1. Hospital functions and information needs
5.2. Information processing tools
5.3. Communication infrastructure
6. Assessment
6.1. Progresses made
6.2. Weak points and call for action
7. The target state of the hospital information system
8. Migration concept
8.1. Overview
8.2. Task, time and cost planning

4.2. Introduction

Aim of the introduction is to point out, why a strategic plan is necessary, which facts are described and which goals are pursued by the strategic plan. Because the preparation of a SIM plan causes great efforts and the plan must be accepted by all management levels, the expected benefit must be stressed primarily.

4.3. The hospital

The HIS must support all hospital functions and fulfill the information needs of all organizational units and professional groups, to contribute to the success of the hospital. Therefore, a short description of the hospital itself is a must for every SIM plan. Without considering the vision, the mission and the goals of the hospital, some relevant hospital characteristics and the organizational and spatial structure of the hospital, efficient SIM planning is not possible. The alignment of the hospital strategy and IT strategy is one of the major goals of strategic information management (see e.g. [8,9,18]).

The *hospital vision*, *mission* and *goals* briefly and impressively fix the principal orientation of the hospital. The main hospital goals result from the vision. It includes ethical demands as well as quality requirements of the hospital to fulfill its mission. Examples are given in Table 2. It is recommended to discuss the vision and the mission of the hospital with the hospital management in a personal dialogue, even if an appropriate document already exists. The personal dialogue does not only serve for acquiring the information needed, but is a good opportunity to illustrate the importance of strategic information management planning as well.

The *hospital characteristics* necessary for the SIM plan should give information about the size and the complexity of the hospital and, with it, about the extent of information processing. Each hospital has to decide for itself which characteristics are important for the SIM plan. Typical hospital characteristics are given in Fig. 1. The characteristics of the hospital may lead to technical requirements, e.g. for computer networks and computers as well as requirements concerning the number of clinical workstations, which will effect the middle- and long-term planning of financial resources and

Table 2 Visions, missions, and goals of a hospital (examples)

Vision
''We strive for an international top position on clinical research and realize patient care accordant to the latest medical knowledge.''
''We see other hospitals, general practitioners and care services as our partners in an integrated healthcare delivery system and aim for a close cooperation.''
''Our hospital focuses on a patient and process optimized medical care, which requires the interdisciplinary collaboration of all medical disciplines.''
Mission
''Our mission is to provide the highest quality care, to advance care through excellence in biomedical research, and to educate future academic and practice leaders of the health care professions.''
''Our mission is to deliver compassionate, high quality, and patient-focused clinical care and health plan services.''
Goals
''We want to improve the quality of health care at our hospital without increasing the expenditures.''
''We will reduce our costs of about 15% within the next 2 years.''
''In the year 2004 we will have paperless hospital.''

of personal responsible for support, maintenance, and staff training.

The *organizational structure* should make clear, which business areas (including the medical departments) have to be taken into account, and which business functions they have to fulfill. The analysis of the current state will lead to current information needs of the different professional groups of the hospitals and to enterprise functions and processes more or less supported by the HIS. The organizational structure of the hospital is usually represented as an organizational chart. The description of the current and the target state of the HIS should refer to the organizational units represented there.

The *spatial structure* shows which buildings have to be taken into account when planning the HIS as a kind of site plan. This is important for the physical architecture of the HIS, especially if the organizational units are distributed over a broader area or over several buildings.

4.4. Information management of the hospital

4.4.1. Organization of information management

Information management deals with strategic, tactical and operational tasks. This section of the SIM plan describes which units or persons of the hospital undertake which information management tasks and how these units are integrated in the hospital's organization. The organization of information management described here should not just reflect the actual state. Necessary changes should be discussed in the run-up to the SIM plan, as well as during the SIM planning process to be sure to get a well-fitting organizational structure of information management for the implementation of the SIM plan. It is recommended to bundle the overall responsibility for information management in one person, the chief information officer (CIO) [16,17]

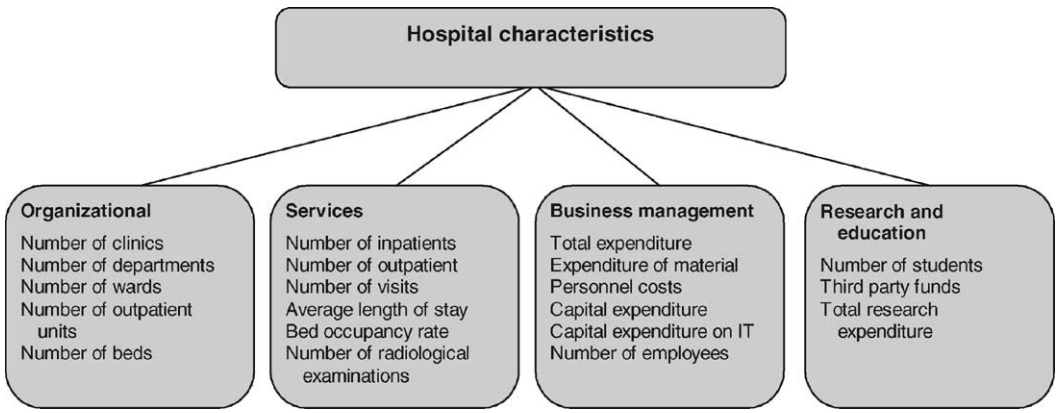

Fig. 1. Typical hospital characteristics.

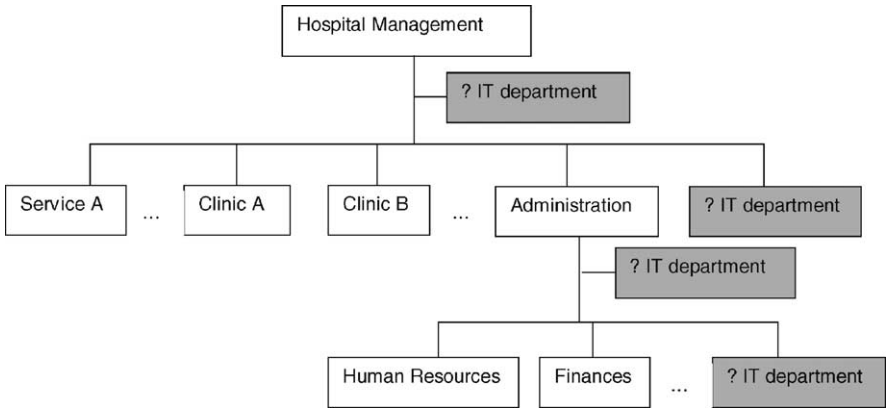

Fig. 2. Organizational positioning of the IT department.

who leads an IT department as that organizational unit responsible for the management and operation of the HIS. Depending on the size of the hospital it may be structured in several units. There are several possibilities to position the IT department within the hospital's organizational structure (see Fig. 2), and it is the individual decision of each hospital where to really position it. In our opinion, the CIO should directly be responsible to the hospital top management. In general it is advantageous if there are clear and simple information management structures. Complicated structures are a sign for unclear allocation of responsibilities and competencies and could endanger the implementation of the SIM plan because conflict resolution is postponed to the implementation phase.

4.4.2. Information management principles, goals, and standards

This section will define the basic conditions for information management. These are general information processing principles, defaults about how information management tasks have to be accomplished (e.g. the establishment of project teams or legal regulations) as well as standards concerning the technical or organizational infrastructure of information processing.

Information management principles must be formulated in consensus with the hospital's top management. Possibly, they can be derived from the hospital's vision and mission, but in general finding information management goals and principles is the most creative part of SIM planning. We recommend to initiate a meeting with hospital top management representatives, the CIO, and some other decision-makers, to corporately develop an information management vision and the associated goals and principles. These goals and principles will determine the target state most.

Standards (e.g. preferred hardware producers, operating systems, network protocols, communication standards) are needed due to organizational or economic constraints. For example, the restriction on one operating system will lead to advances concerning maintenance and training.

There must be a reasonable middle course between a strong regimentation — which would unnecessarily narrow the scope of information management — and a ''laissez-faire'', where the goals of information management get lost of sight. Examples of principles, goals and standard are given in Table 3.

4.5. The current state of the hospital information system

This section describes the current state of the HIS to facilitate the assessment of the progress made. But it equally serves as a frame of reference for the identification of the weak points in relation to the information management goals, and for deriving suggestions for improvement (target state) and a call for action.

The current state of a HIS (see e.g. Fig. 3) can most suitably be described by an architectural model [2,15,19]. It is reasonable to regard the structure of the computer-supported part of the HIS as well as the structure of the paper-based part. This section should give answers to the following questions:

- Which hospital functions have to be performed and which information needs are there?
- For the computer-supported part of the HIS: Which computer-based information processing tools support these hospital functions? Which hardware and software is installed in which organizational units?

Table 3 Information management principles, goals, and standards (examples)

Principles
''Data should be entered once at the place where they appear first and should be at the disposal of all authorized staff members of the hospital in the context of their activities.''
''Information must be timely and comprehensive for the medical care as well as for administrative purposes and quality management.''
''The usage of computer-supported tools must improve hospital processes and reduce unnecessary activities.''
Goals
''All digital documents in the context of patient care will be integrated to the electronic patient record and be accessible were they are needed.''
''The working places of the outpatient units will be provided with computer-supported application systems.''
Standards
''For the communication between application systems the communication standard HL7 is used.

- For the paper-based part of the HIS: In which manner are the hospital functions supported and which (paper-based) tools are used?
- Which organizational units communicate, what information is communicated, and how is the communication realized by information processing tools?

For the description of the hospital functions, we recommend to use reference catalogues, e.g. the requirements index for information processing in hospitals (see [20]), which just have to be adapted to individual demands.

According to our experiences, existing SIM plans mainly consider the computer-based part of the HIS. We want to stress, that the description of paper-based information processing tools is just as important. For example, the decision of a hospital to keep paper-based patient records has far-reaching consequences for the SIM planning. If solely the computer-supported functions of a hospital are considered, important information needs in different organizational units may be overlooked, and in consequence, the analysis of the current state will become incomplete (Fig. 3).

4.6. Assessment of the current state

The assessment of the current state should take into consideration the progress made as well as the weak points of the HIS. The assessment has to be based on criteria derived from the hospital and information management goals and — if there already exists a preceding SIM plan — the call for action presented there. For example, degree of availability of healthcare professional workstations at the wards, the proportion of all medical reports stored in the digital patient record, or the quality of data relevant for accounting may be assessed.

4.6.1. Progress made

This section will present the progresses made since the last revision of the SIM plan. If it is the initial SIM plan, the quality of the current HIS must be judged critically.

The information management goals of the actually valid SIM plan and the measures derived from those goals are examined regarding their achievement respectively implementation. For goals not achieved or measures not implemented, the reasons must be stated. These may be personnel or financial bottlenecks as well as changing legal requirements or new technological advances, which made some measures obsolete. It should also be documented if these measures are still current. This section informs the hospital management about the progresses made and motivates to engage in the further development of the HIS. Nevertheless, the presentation of the progresses made should be brief because, in fact, it reflects the success of the HIS but says nothing about its future development.

4.6.2. Weak points and call for action

This section presents the weak points of the HIS, i.e. those components which are not consistent with the information management principles and goals, and describes the call for action to improve the HIS. For each weak point it must be clearly described which principles, goals, or standards are violated.

Furthermore, we must consider that there may be call for actions, which do not directly affect the architecture of the HIS, but in particular operational information management questions. For example, the goal to introduce clinical workstations all over the hospital may demand the establishment of a staff training center. In this case it may be mandatory to uncover deficits concerning the organization of information management and

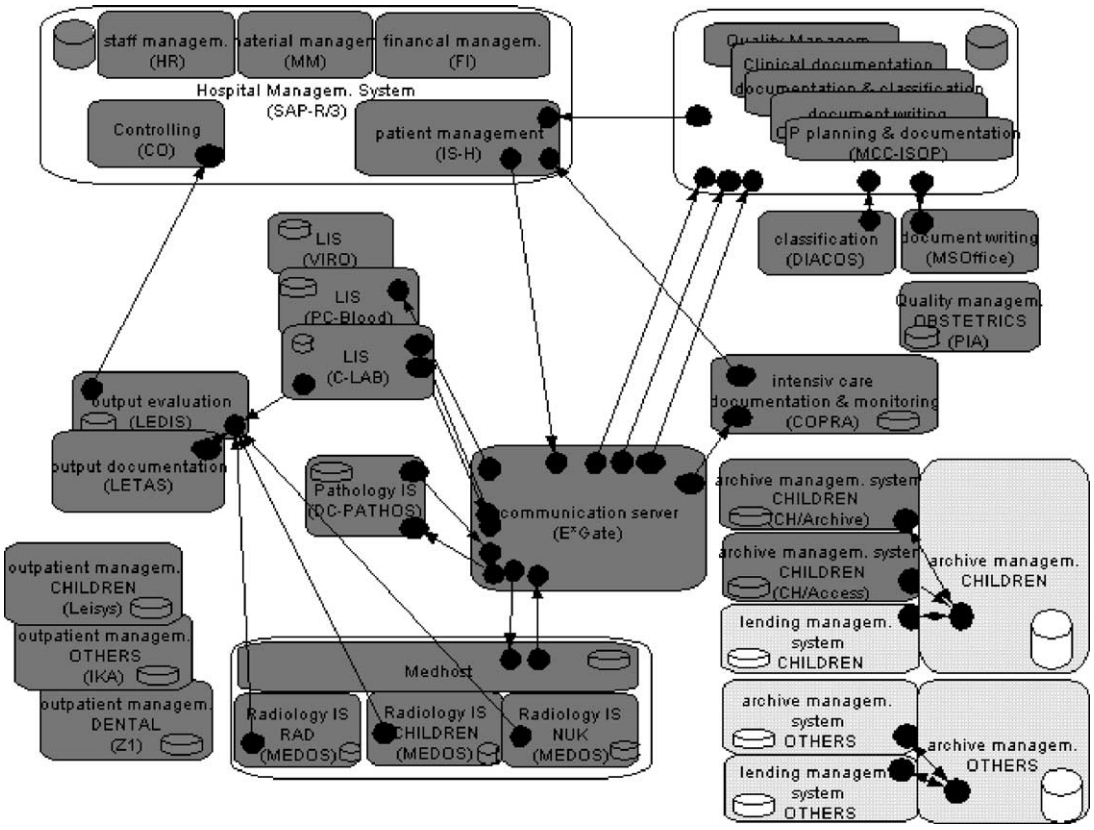

Fig. 3. Part of a HIS architecture showing the computer-based application systems, their communication interfaces and communication links between them using the 3LGM^2 meta model [19].

derive solutions. Necessary modification proposals concerning the information management organization have to be prematurely arranged with the hospital management.

The formulation of the call for action should allow to derive or to prove the target state. This is not a pure formal process, where the weak points can automatically be derived from the current state. Rather, it is necessary to use the experiences of the whole information management staff, who mostly know the weak points but do not trace them to the HIS architecture. Examples for weak points are given in Table 4.

4.7. The target state of the hospital information system

This section describes the future architecture of the HIS and is basis for the development of a migration concept, i.e. the way from the current state to the target state of the HIS.

The description of the target state of the HIS can be similar to the description of the current state of the HIS. The target architecture should then show which changes are essential in comparison to the current architecture. In this case the differences between the current state and the target state have

Table 4 Weak points and call for action (examples)

Weak points and call for action
''The heterogeneity of information processing tools is too high. Mainframes, departmental server, local networks using different operating systems coexist in parallel. Equal hospital functions are supported by different application systems. This fact contradicts to the principle usage of standards, controlled heterogeneity.''
''The hospital-wide introduction of a healthcare professional workstation (HCPW) entails increased training opportunities, because the number of staff members working with HCPW increases and the employee turnover causes more problems. An adequate staff training can only be guaranteed through the establishment of a training center and the realization of a systematic training concept.''
''The access to medical knowledge at the HCPW is insufficient. Partly, the knowledge sources are provided by a knowledge server, partly by the hospital's intranet, and the user interfaces are not standardized.''

Table 5 Problem-oriented description of the target state (examples)

Target state
''The healthcare professional workstation shall offer an integrated functionality for physicians and nurses at all clinical working places, and thus support the cooperation of these healthcare groups. For the long-term, one software product should be used hospital-wide.''
''The laboratory and radiological results will be presented as HTML documents using a web interface. The call of a result takes place at the healthcare professional workstation by passing patient und case identifying characteristics, user identification and associated authorizations."

to be discussed in detail. We recommend a more problem-oriented approach, where the target state of the HIS is described along the weak points (examples see Table 5). The migration concept can then be derived directly from the target state.

At this planning point, central concepts determining the future development of the HIS are cooperatively developed, aligned and announced. The development of these concepts is very labor-intensive and time-consuming. To get general accepted solutions, it is recommended to discuss those concepts right before the actual phase of strategic planning activities.

4.8. Migration plan

The migration plan should concretely point out what has to be done to attain the target state. Result of that planning step is a project portfolio containing planned measures, priorities, the time involved and the costs.

At first, the most important modifications have to be formulated. Subsequently, you can derive concrete measures to come from the current state to the target state. The timeframe should consider the dependencies between the projects and the project priorities. Particularly, the available personal resources for the realization of the projects and the qualification of the staff members must be taken into account.

Second, the costs arising from those projects must be estimated to allow the hospital management to prepare for the expenses. These are costs for performing the projects (staff, costs for consultants) as well as the costs for implementation of the measures. Be aware to consider not only direct costs for hardware and software but also follow-up costs for operation, maintenance, support and staff training and even (re)construction of buildings or rooms.

In a last step it must be made clear with which priorities and within which timeframe the measures will be implemented.

This section of the SIM plan will be the one read most attentively by the various stakeholders and, therefore, needs special diligence and realism, to sustain credibility.

It may occur that there are measures demanded which can not directly be derived from the information management goals, the current state of the HIS, the assessment if the HIS or the target state of the HIS. In this case the associated goal must be formulated and — provided the goal is accepted by all decision-makers — integrated in the SIM plan. An example migration plan is given in Table 6.

Table 7 reflects the most essential issues of chapter 4. For each section of the SIM plan we summarize the aim that should be achieved by that section, the content itself, the sources of that content and/or the methods to elicit it, and the points that have to considered most.

Table 6 Migration plan — rough planning (example)

Measures in 2002
Introduction OP planning and documentation system (closing)
Healthcare Professional Workstation, Phase 1
Introduction radiological image server
Replacement and extension of active net technology
Facility management, Phase 1
...
Measures in 2003
Introduction RIS/PACS
Healthcare Professional Workstation (Introduction of IS-H*Med), Phase 2
Introduction Electronic healthcare record, Phase 1
Facility management, Phase 2
...
Measures in 2004
Healthcare Professional Workstation (Introduction of IS-H*Med), Phase 3
Facility management, Phase 3
Introduction Electronic healthcare record, Phase 2
...

Table 7 Developing a SIM plan

Section	Aim (why)	Content (what)	Source (S)/ methods (M)	To consider
Summary	Motivates the stakeholder to support the implementation of the strategic plan	Essentials of the SIM plan	SIM plan (S)	Different summaries for different stakeholders. Stress existing advances and expected benefits
Introduction	Motivation for the preparation of the SIM plan (why, what)	Content of the SIM plan and motivates the reader	—	Stress the expected benefits
The hospital		Vision, mission and goals of the hospital	Hospital management (S)	Discuss the hospital's vision, mission and goals with the hospital top management
		Hospital characteristics, organizational and spatial structure	Hospital administration (S)	
Information management	Describes the IM resources and responsibilities	IM organization	Organizational charts (M)	Don't just describe the actual state but rather find a IM organizational structure which is particularly suited for the implementation of the strategic plan
	Defines where to go	Goals, principles of IM	Desired state analysis (M), strategic alignment (M), brainstorming (M)	Align strategic information goals and principles with the hospital's vision, mission, and goals
	Defines criteria for the assessment of the current state of the HIS	Standards of IM		Find a reasonable middle course between a strong regimentation — and a ''laissez-faire.''
Current State	Provides a survey of the HIS architecture; Is basis for the assessment of the current state of the HIS	Hospital functions and information needs; Information processing tools; Communication infrastructure	IT department (S); Requirements analysis (M); Enterprise architecture planning (M), systems analysis (M)	The current state should give a complete survey of information processing. Don't forget paper-based information processing aspects
Assessment	Assesses in which points the current state deviates from the IM principles and goals	Weak points; Progresses made	Application portfolio management (M); Weak point analysis (M)	
Target State	Describes the architecture of the HIS when the SIM plan will be implemented	Changes concerning information processing tools and communication infrastructure	Enterprise architecture planning (M)	Consider the expectations and reservations of the various hospital departments and professional groups. Consider already known advanced technologies or changing legal requirements in advance to assure that the SIM plan is valid as expected

Table 7 (*Continued*)

Section	Aim (why)	Content (what)	Source (S)/ methods (M)	To consider
Migration concept	Describes how to get from the current state of the HIS to the target state of the HIS	Project, time, and cost planning	Project planning (M); Project portfolio management	Set up a realistic project, time and cost plan; don't underestimate time exposure and costs. Define clear priorities for each project and a clear project sequence

5. What happens after the SIM plan is adopted?

After the SIM plan is adopted by the hospital management the plan is obligatory for all stakeholders in the hospital. Obviously, all strategic planning principles have to be observed and all planned projects stated in the SIM plan have to be implemented. If necessary, minor adaptations of the SIM plan may be possible, but only in full and explicit accordance with all people who adopted it (see also Section 3.3). Major adaptations should lead to a complete revision of the SIM plan (see Section 3.4). Furthermore, all changes concerning the architecture or the infrastructure of the hospital information system or the organization of the information management must be compatible with the SIM plan. This holds for hospital-wide projects as well as for departmental projects.

A prerequisite for the acceptance and the implementation of the SIM plan is to inform all concerned professional groups about how they are involved with the implementation of the SIM plan. Informing all concerned stakeholders broadly is decisive for a successful implementation of the SIM plan. Only if the SIM plan becomes a really used tool for planning and implementation of projects, it fulfils its aims — not if it disappears unread in the tray.

6. Experiences

6.1. University Hospital Leipzig

The University Hospital of Leipzig, Germany, is a hospital with more than 1400 beds, 3830 employees are caring for 44,400 inpatients and about 230,000 outpatients a year. The 'Information Management' department is supported by a committee for strategic information management (information management board). Since the University Hospital and the Medical Faculty of Leipzig University are closely working together, the faculty's Medical Informatics department acts as the hospital's consultant in the field of strategic information management. Thus, it organizes the information management board and prepares the SIM plans.

The first SIM plan had been established in 1996 and intended to be valid to the year 2000. Based on this plan important steps were taken to come to an information system with more efficient support especially for functions in the clinical context.

In the late 2001 and the beginning of 2002 a new SIM plan has been prepared using the presented guideline [21]. The plan resulted from an 8-months-project comprising a lot of meetings with the hospital's top management and innumerable meetings with persons responsible for information management. Finally, the plan had been adopted by the hospital's board of directors.

The following observations can be made regarding the usability of the guidelines:

- The proposed structure of the strategic plan proved to be well suited. The only change in structure of the SIM was to place the hospital's goals as top level chapter following the ''The hospital'' chapter. This was helpful in getting attention from top management.
- There had been no vision, mission or goals in a codified form in the hospital before the project started. It turned out, that strategic information management is an excellent catalyst for strategic business planning. In various discussions with top management important goals could be identified. They became basis for the strategy of the university hospital. One of the most important goals was that of striving for process oriented patient care instead of department oriented care. This goal had a major impact in defining the needed changes of the HIS. So the importance of having goals defined before strategically planning the hospital's information system proved true.
- When discussing the organizational structure and the responsibilities for information management,

the structure of information management as proposed in [1] was very helpful to define beneficial division of labor without forgetting important tasks and duties.
- Although the guideline recommends, that ''at first, the most important modifications have to be formulated'', that passage in our ''Migration'' chapter was omitted. This turned out to be a severe mistake, because for executives and top management it is now difficult to understand the variety of different projects and to find out their major aims.
- Due to shortage of time and considerable pressure to complete the strategic plan, the most serious mistake was made. This was to calculate only investment costs concerning hard- and software for the measures to be taken. Now also costs for investing in server and training rooms, for tactical information management (e.g. costs for consultant services during implementation projects), and for operational information management (e.g. costs for operational and administrative personnel) have to be recalculated.

6.2. Tyrolean Federal Hospitals

The Tyrolean Federal Hospitals (TILAK) is a hospital association, which comprises the University Medical Center Innsbruck (with 1500 beds) and four smaller hospitals in Tyrol (with altogether 600 beds). The TILAK also holds shares on other Tyrolean hospitals as well as on several healthcare companies. TILAK was founded in 1991 to ensure the proper supply of healthcare services to the Tyrolean population. About 7600 staff members are working for the TILAK, the annual budget is around 350 M€, about 4% of this being spend on IT.

To advise the TILAK management in questions of information management, a committee for strategic information management exists. This committee comprises a professor for medical informatics with strong experiences in strategic information management (head of the committee), the TILAK CIO, and an IT representative from the Medical Faculty of the University of Innsbruck. Further advising members are the head of administration of one of the TILAK hospitals, the TILAK vice-CIO and a second professor for medical informatics. In 2002, TILAK decided to develop a 5-year IT strategy and gave the committee this task. There had been experiences in preparing both annual and long-term IT strategies.

The motivation for preparing an updated IT strategy was to rise the already high quality of information processing, to create a framework for the annual IT plans, to derive concrete projects together with the IT budget for the next years, to align the IT strategy with the TILAK business goals, and finally, to inform all user groups on the way information processing will develop in the next years.

The development of the IT strategy started in April 2002. The draft was ready in October 2002, and after intensive and broader discussions, the 80-page IT strategy was accepted by the TILAK management in December 2002 (see also [22]). During the 9 months of development, two formal meetings and seven working meeting of the committee took place, prepared by additional 14 meeting of the editorial team.

During the development of the IT strategy, the following experiences were made:

- We found the proposed structure of the IT strategy as given by the guideline well suited and helpful. Only minor modifications were made. For example, we started the IT strategy with a chapter on the future development in healthcare which form the background for the TILAK strategy and therefore also for the TILAK IT strategy. Then, we invested some time not only to describe the present IT architecture and infrastructure, but also to find quantitative indices for the amount and quality of information processing such as the proportion of reports transmitted in electronic form, or the proportion of radiological images stored in electronic form. We also added a subchapter on ongoing IT projects, as they have to be coordinated with the planned IT projects.
- The development of the IT strategy was started with a 1-day vision workshop by the committee members to derive the major aims of information management. We found this very useful to get a clearer picture where TILAK IT should be in 5 years. The visions discussed here were structured and later integrated into the IT strategy in the chapter describing the future state.
- We structured the organizational levels of information management into strategic, tactical and operational and found this very useful.
- Usually, stakeholders are more interested in the future state (and the needed budget to go there) than in the recent state of information processing. However, the complete and structured description of the recent state is important in our opinion, as it is both the basis for the description of the future steps as well as the reference to describe the development of the IT in the years to come. In our case, as TILAK already had a well-organized information management for many years, the often time-consuming description of the state of information process-

ing could be done rather quickly. It occupies, however, together with the description of TILAK, about the half of the pages of the IT strategy. In order to reduce the dominance of those parts of the IT strategy, we included the description of the organization of information management and the assessment of the recent state in the chapter on description of the current state, thus now having four main chapters within the IT strategy: description of TILAK; description of current IT; description of future IT; description of future IT projects.
- We only shortly described the future IT architecture, but rather thoroughly described the planned IT projects (about 70 in our case) and indicated the expected time frame. We did not add budgetary information for the individual projects, but for blocks of projects, and were thus able to derive the necessary budget for information management for the next 5 years.
- The IT strategy had to take into account that TILAK is an association of various hospitals, all with their own characteristics (e.g. partly different software in use). It is important to see that the IT strategy must be valid for all TILAK hospitals (e.g. uniform IT infrastructure), without overlooking the individual qualities of each thus. Thus, we stuck to the general structure as given in the guideline, and only described differences in the hospitals where necessary (e.g. with regard to individual software projects).
- In order to ensure that the strategic IT plan is really accepted in all TILAK hospitals and by all user groups, we invested some time in presenting and discussing the draft of the IT strategy, as also indicated by the guideline. For example, the draft was discussed with the management of all TILAK hospitals, with IT representatives from the Medical Faculty of the University of Innsbruck, and with representatives from the TILAK IT department. Second, the IT strategy is distributed widely both in a printed form as well as in the Internet.
- The committee which developed the IT strategy did not comprise representatives from clinical professionals (in particular nurses and physicians). While the limited numbers of committee members certainly supported an efficient work, it was discussed whether this organization may not sufficiently integrate the clinician's point of view with regard to IT. We feel that by the long-year experience of all committee members with clinical information processing, this was not a real problem. However, it is now planned to extend the committee with clinical professionals.

Overall, the guideline seems to be a good support for the structured and efficient development of an IT strategy. However, it cannot, in our opinion, replace years-long experience with strategic IT management. Thus, hospitals facing this topic for the first time are nevertheless advised to recruit external consulting, even when using this guideline.

6.3. Minden Regional Hospital

In the year 2002, Minden Regional Hospital, a 1000 bed hospital, authorized a healthcare consultant to develop a SIM plan comprising an IT strategy and a corresponding action planning in view of the forthcoming move of the hospital to a new complex of buildings.

The development of that SIM plan required the analysis and description of the status quo of information processing, especially the hospital functions and their support by logical and physical information processing tools. In this regard, the organizational, functional and technical weak points of the HIS where considered most. After that, the strategic goals for the further development of the Minden HIS where acquired:

- Implementation of the IT strategy.
- Setup of an electronic patient record.
- Mapping of workflows concerning individual hospital units.
- Measures to completely reproduce performed medical services and procedures.
- Measures to improve the organization.
- Measures to improve the IT infrastructure and
- Measures to support logistics.

Starting from those goals, a precise catalogue of measures was developed, which describes all necessary steps to reach the strategic goals. A subsequently submitted plan of stages established a chronological connection among these measures. Additionally, the plan of stages pointed out the expected costs.

For the preparation of the SIM plan, the presented guideline was extensively consulted, and therefore, could be realized within less than 3 months. The content of the SIM plan is now basis for all HIS planning activities of Minden Regional Hospital.

The guideline used for the preparation of the SIM plan provided broad support, especially for the rough planning of the strategic procedure and for the structuring and the check for completeness of the SIM plan. Nevertheless, the authors of a SIM plan are responsible for sufficiently adapting the content

as well as the degree of detail to the hospitals' individual specific concerns.

7. Discussion

In this paper we presented a guideline for the preparation of SIM plans as an important instrument for the management of HISs. The guideline gives recommendations about the structure and content of a SIM plan and details about what to consider most.

The guideline was used for the preparation of several SIM plans in German and Austrian hospitals. These practical experiences showed that

- the SIM plans could be prepared very efficiently and timely using the guideline;
- the proposed SIM plan structure suited well, only minor modifications were necessary to accommodate local priorities;
- the guideline offers enough flexibility to meet the requirements of the individual hospitals;
- the specific recommendations of the guideline were very helpful.

Nevertheless, the usage of the guideline holds some risks:

- SIM plans tend to become rather general and vacuous if the guideline is used as template or formula that just has to be filled out. Users must be aware that the guideline reflects general hints and best practices whereas a SIM plan must reflect the specific situation of the health care institution.
- The guideline primarily gives hints about the content of a SIM plan. It is up to the user to design a SIM plan which is concise, coherent, balanced and understandable for the different groups of readers, and as mentioned above specific for the health care institution.
- Persons totally inexperienced in SIM planning are recommended to read advanced literature and may need the help of external consulting even if they use the guideline.

The approaches cited in Section 2 of this paper are especially suited for more experienced IT managers who want to go into detail.

The guideline and the resulting SIM plans is a first step striving for enterprise architecture planning in hospitals. Nevertheless, we must come up to a more comprehensive theory of strategic information management planning which represents the intrinsic correlations of the different parts of a SIM plan to a greater extent. Furthermore, the structure recommended by the guideline suggests the development of a software product supporting the preparation of SIM plans. Though there are some professional tools available, these tools are very targeted to answer a certain purpose, e.g. tools for needs assessment and development of strategic information management plans in the scope of accreditation programs like the JCAHO accreditation, but are not sufficient for general strategic purposes.

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