

# A monitoring infrastructure for supporting strategic information management in hospitals based on key performance indicators

Ulrike MÜLLER<sup>1</sup> and Alfred Winter

*Institute for Medical Informatics, Statistics and Epidemiology, University of Leipzig,  
Germany*

**Abstract.** To successfully run a hospital, its IT has to be planned, directed and monitored professionally. Although planning and directing of information systems are discussed frequently in literature, monitoring is neglected. But only systematic monitoring enables corrective action and strategic decisions. To provide information management with the information needed to manage and enhance the information system, we decided to use key performance indicators showing, how the information system is used and to which extent the information management's goals are reached and where weak points exist. This contribution shows our first experiences in building a monitoring system for strategic information management. It describes how the key performance indicators were defined, what the target group is and which problems came up.

Keywords: Information Management, Hospital Information Systems, Key performance indicators, Monitoring, Strategic planning

## 1. Introduction

Due to the increasing cost pressure and competition in health care, information technology (IT) is not only a convenient support for the daily work but also a productivity, cost and quality factor with strategic impact for health care providers [1]. Their dependency on IT and the related efforts require the management's attention at all levels [2]. Thus, to successfully run a company, its IT has to be planned, directed and monitored professionally. This is the task of information management. Due to the fact that the IT should support the company to reach its goals, the information management's goals have to be in line with the company's goals [3].

To verify that the company's goals are reached, the hospital's management needs information about the hospital. The acquisition and analysis of this information is task of the controlling department. Equivalently an IT-controlling should exist that provides information concerning information processing to the information manager and

---

<sup>1</sup> Ulrike Mueller, Institute for Medical Informatics, Statistics and Epidemiology, University of Leipzig, Härtelstr. 16-18, 04107 Leipzig, Germany, Email: [ulrike.mueller@imise.uni-leipzig.de](mailto:ulrike.mueller@imise.uni-leipzig.de), <http://www.imise.uni-leipzig.de/>

supports the information management in planning and directing. Thus a monitoring infrastructure is needed.

Although planning and directing of information systems are discussed frequently in literature ([4], [5], [6], [7]), monitoring is neglected both in literature and in practice [8]. As a reason often a lack of time and resources is mentioned [9]. But only systematic monitoring enables corrective action and strategic decisions [10].

Thus this work deals with the following questions:

1. What key performance indicators are suitable to provide information management with appropriate information concerning the hospital's information system?
2. How can a monitoring infrastructure be implemented?

Therefore we will show first experiences in building a monitoring system for strategic information management in the Leipzig academic medical centre.

## 2. Methods

A literature analysis showed that key performance indicators are a good possibility to describe and compare actual and target situation. This method is established within controlling and becomes accepted in IT controlling, too [11]. The problem is, that even in sectors where IT-controlling is established a long time universalised key performance indicators presently hardly exist [11]. Hence the situation in the health care sector is even worse. Therefore it was not possible to fall back on existing key performance indicator systems.

To support information management in making decisions and reaching its goals the key performance indicators should tell the information management if or to which extent the goals mentioned in the strategic information management plan [7] are reached. Therefore we started analysing the goals described in the strategic information management plan of the Leipzig academic medical centre and defined key performance indicators for each of them. We examined, how the data for each key performance indicator can be selected and if the effort will justify the benefit.

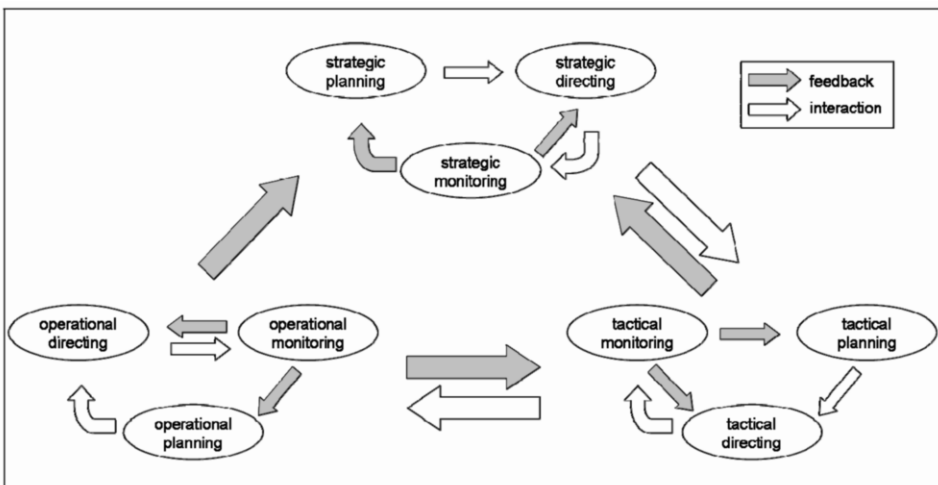


Figure 1: Information management cycle

The second step was to define which persons or boards are the target group. Kütz [2] differentiates between two groups in a company. On one side there is the business area that provides IT products and services – the computer centre of a hospital. On the other side there are the IT users, e.g. in a hospital: health care professionals, patients and the administrative personal. Each group has to be considered by IT controlling. Since the aims of these two groups are essentially not equal, IT controlling additionally has to consider the whole organization. Thus it finds a balance for the goals and interests of each group and the company as a whole. This trichotomy correlates with the three management levels: strategic, tactical and operational [12]. Tactical information management corresponds to the business area that provides IT, the operational information management refers to the IT usage and the strategic information management is superordinated. This dependency shows that decision making on the strategic information management level needs information from the other levels, like visualized in Figure 1.

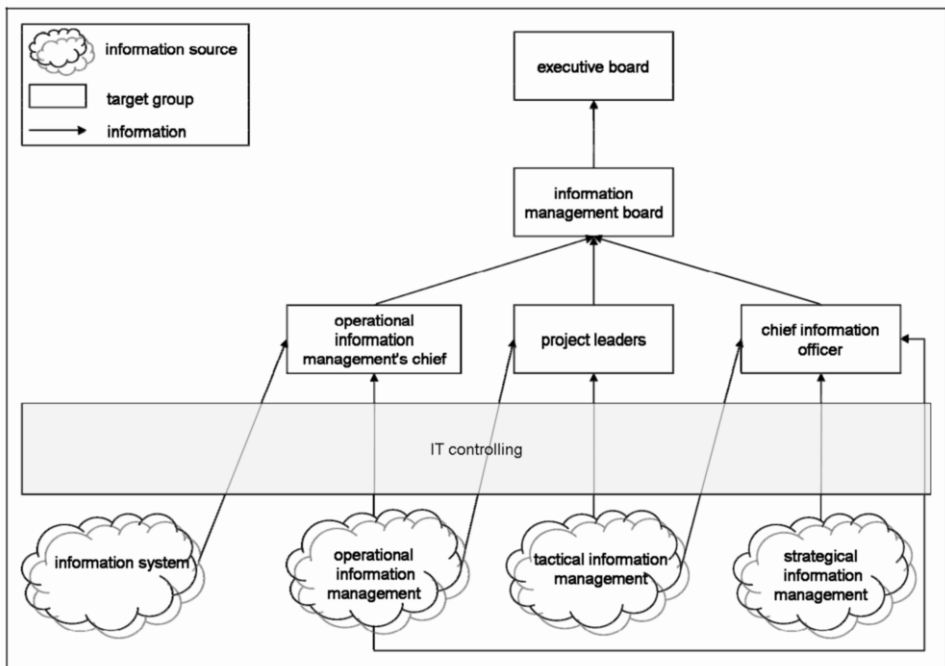


Figure 2: Information demand

In the academic medical centre of Leipzig the so-called “IT and organization consultation” is concerned with strategic IT decisions (in Figure 2: information management board). This board consists of the chief information officer (CIO), the head of the academic information management group, the chief executive officer (CEO), directors of clinical and administrative departments, and project leaders from the information management department. It meets periodically especially to align the IT projects with the strategic plan. Therefore it has to be informed about

- the status quo of the different IT projects;
- the status of the effective usage of the information system components;

- to what extent the goals mentioned in the strategic information management plan are reached.

The final decisions are often made by the executive board as a result of the information management board's advice. These interrelationships are shown in Figure 2.

### 3. Results

We installed an "HIS-Monitor" for the Leipzig academic medical centre as a combination of quarterly bulletin distributed by email and an online version at the centre's intranet. At this time key performance indicators are presented which predominantly reflect the information system's usage. There are key performance indicators which show how many documents, medical reports and nursery documents are created on each ward using the clinical documentation and management system (Figure 3). To compare the wards the data is normalized by using the average case number of the particular ward. Furthermore there are trouble ticket statistics demonstrating with which problems the users are calling and from which ward they do. The diagrams are represented via the web browser. They are generated by request from a relational database. So the user has the possibility to see those key performance indicators he or she is interested in by selecting a desired period and ward. Besides there exist quarterly reports which are enriched by textual justifications for uncommon data. For example in one month the analysis showed that on one ward more than six medical reports per case has been written which was significantly higher than normal. Reason was that the ward's clerk had imported older reports which have been created with MS Word. This case did not call for interventions. But other cases did. For example we noticed that at one ward not even one medical report was created in the clinical documentation and management system. Investigations showed that at this ward medical reports are written using MS Word and stored on local hard disks where it could not be accessed via the clinical documentation and management system and is not backed up. In this case the information management board decided to provide additional training courses for the ward's staff.

A problem was and is the acquisition of the data. Many key performance indicators base on data stored in the information system components like the clinical documentation and management system or the trouble ticket system. Since no automatic reports exist, most of this data presently has to be collected by hand. Help we await from the data warehouse system, that has been established last year. At present it only allocates administrative data, but in the future it should help supply

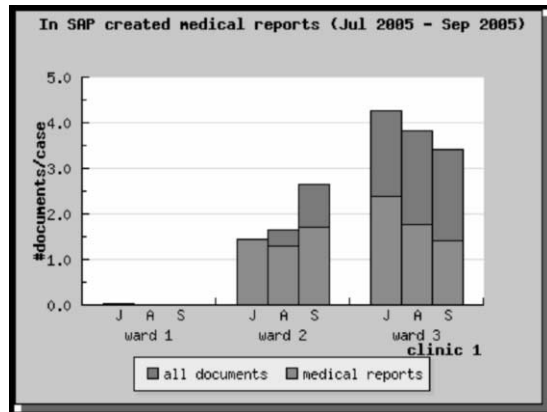


Figure 3: Created medical reports in Clinic 1

clinical data, too. Of course the data warehouse system will not supply finished key performance indicators, but it will provide a data base to calculate them.

#### 4. Conclusion and Outlook

Our approach to install a monitoring infrastructure for supporting strategic information management in Leipzig has been the HIS-Monitor as a combination of bulletin and interactive intranet application. It has been published first at the end of 2004 as a bulletin version. Since the middle of 2005 it is available online. The target group comprises the members of the information management board and the directors of administrative and clinical departments of the Leipzig academic medical center. Nevertheless the current acceptance is debatable, feedback or recommendations for other key performance indicators are rare. Therefore the most important task for the future is increasing the acceptance. Thereto the HIS-Monitor repectively the key performance indicators have to be actively integrated in daily work. The data has to be presented and discussed in the meetings of the information management board.

Furthermore more key performance indicators should be established. In this context the data warehouse system plays an important role. In the first place reports, which help collecting the data needed to calculate the key performance indicators, have to be implemented. In addition we have to evaluate how the key performance indicators will be presented in future. The current solution has to be revised and enhanced, interfaces that include data from other application systems like the trouble ticket system have to be created and different views for the different users have to be offered.

#### References

- [1] Haux R, Winter A, Ammenwerth A, Brigl B. *Strategic Information Management in Hospitals*. New York: Springer; 2004.
- [2] Kütz M. *IT-Controlling für die Praxis*. Heidelberg: dpunkt.verlag; 2005.
- [3] Gunasekaran S, Garets D.E. Business value of IT: the strategic planning process. *J Health Inf Manag*, 2003; 17(1). 31-36.
- [4] Cassidy A. *Information Systems Strategic Planning*. Boca Raton: St. Lucie Press; 1998.
- [5] Spewak S. *Enterprise Architecture Planning*. New York: John Wiley & Sons, Inc; 1992.
- [6] Haux R. *Management von Informationssystemen*. Stuttgart: B. G. Teubner; 1998.
- [7] Brigl B, Dujat C, Gräber S, Große A, Häber A, Jostes C, Winter A. Preparing strategic information management plans for hospitals: a practical guideline. *International Journal of Medical Informatics* 2005; 74. 51-56.
- [8] Ehlers F, Ammenwerth E., Hirsch B. Design and development of a monitoring system to assess the quality of hospital information systems: concept and structure. *Stud Health Technol Inform* 2005; 116. 575-580.
- [9] Tähkäpää J. Increasing Role of Information Systems in Public Health Care – Challenge to the Management. *Proceedings of the 37th Hawaii International Conference on System Sciences – 2004*.
- [10] Ammenwerth E. *Die Bewertung von Informationssystemen des Gesundheitswesens*. Postdoctoral thesis - Private Universität für Medizinische Informatik und Technik Tirol; 2003.
- [11] Kütz M. *Kennzahlen in der IT*. Heidelberg: dpunkt.verlag; 2003.
- [12] Winter AF, Ammenwerth E, Bott OJ, Brigl B, Buchauer A, Gräber S, Grant A, Häber A, Hasselbring W, Haux R, Heinrich A, Janssen H, Kock I, Penger O-S, Prokosch H-U, Terstappen A, Winter A. *Strategic Information Management Plans: The Basis for systematic Information Management in Hospitals*. *International Journal of Medical Informatics* 2002; 64(2-3). 99-109.