# Monitoring and Controlling of Healthcare Information Systems (HIS)



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## BACKGROUND

*Information management* (IM) at a health care institution encompasses the management of information, the management of application systems, and the management of information and communication technology whether computer supported or not, that is, IM provides function, performance, and quality of HIS. Management means, as well, the responsible persons and organizational units as the tasks of planning, directing, and monitoring HIS. IM has to be done systematically to enable an orderly processing of information coherent with the goals of the health care institution.

While planning and directing are supported comprehensively by basic methods of strategic planning and project management (Brigl, Ammenwerth, Dujat et al., 2005; Haux, Winter, Ammenwerth, & Brigl, 2004; Winter, Ammenwerth, Bott et al., 2001), the monitoring is neglected sometimes and thus insufficiently supported (Ammenwerth, Ehlers, Hirsch, & Gratl, 2007). As nevertheless a continuous and careful monitoring is a very important task in interaction with all other management tasks, we will define the relevant terms and describe the most significant concepts and methods.

### Monitoring

Generally, *monitoring* of HIS means the continuous observation of whether the directives and objectives defined in the strategic information management plan will be reached, and whether the HIS is able to fulfill the required tasks. Therefore, the IM must be able at any time to assess the state of the HIS using quality criteria which can be derived from the objectives. Its results affect directing and planning again by feedback mechanisms.

The tasks of monitoring may be linked to the strategic level (auditing HIS quality as defined by means of strategic information management plan's directives and goals as well as quality of the strategic management process itself), the tactical level (check whether the initiated projects are running as planned and whether they will produce the expected results), and the operational level (verifying the proper working and effectiveness of all HIS components) (Haux et al., 2004, p. 182-184).

Nowadays the management tasks providing an excellent service for all users of HIS are embraced by the term *IT service management* (ITSM). There are several frameworks describing an architecture for installing and maintaining ITSM. The most known framework is the *IT infrastructure library* (ITIL) (www.itil.org). It is a set of best practices enabling organizations to deliver their services more efficiently and thus at last to reach for a maximum of customer (patient) satisfaction. ITIL may be regarded as a guideline for monitoring of HIS.

### IT Controlling

Management decisions require information or data. In this context, the part of IM delivering information needed as basis for management decisions is called *IT controlling*. For this purpose, IT controlling applies different approaches and methods, for example, the continuous measuring and interpretation of indicators and characteristic values explaining the current state of HIS, or the realization of evaluation studies. Thus, among other IT controlling, comprises following tasks (the terms reference model, indicator, and evaluation project are outlined below):

- Defining and operationalizing objectives (in cooperation with partners of IM)

- Defining models, selection and application of reference models
- Defining indicators and appropriate values
- Planning, initiating, and continuous measurement of indicators
- Planning and performance of evaluation projects
- Reporting results
- Analyzing results (which may influence all preceding steps by feedback-mechanism) (in cooperation with partners of IM)
- Preparing decisions (in cooperation with partners of IM)

Depending on tasks and questions, different methods of information acquisition are applied. Sometimes one performs ad-hoc-studies (field studies) to find hypotheses, to get some insight in the features of performance measuring, or to detect problems and deficiencies (screening). An example of screening is a survey performed to discover the problems with a new nursing documentation system two weeks after installation. More important are the continuous data collection via indicators and occasional deeper investigations (evaluation).

## Indicators and Characteristic Values

*Indicators* are variables whose values (characteristics values) represent an aspect of HIS. To discern good and bad quality of information processing and to assess the achievement of goals, one has to compare the current value of indicator with one or more predefined reference values. With standardized indicators comparisons between different HIS become possible. Relevant aspects may be all components of HIS, for example, strategy, projects, quality, processes, functionality, or parts of IT infrastructure. The indicators can be qualitative (e.g., user satisfaction), quantitative non-monetary (e.g., failure time), or quantitative monetary (e.g., cost). They should be specified as follows:

- Comprehensive description, including its purpose and correlation with the objectives
- Data source, measurement procedure, and algorithms (when indicators are derived from others)
- Characteristic values and reference values (limits), for example, corresponding to quality goals
- Time interval for measurement (e.g., daily, weekly)
- Time of availability
- Responsible organizational unit and person(s)
- Procedure to check adequateness, completeness, and correctness of results afterwards (evaluation of indicators)

To describe complex aspects of HIS, several indicators have to be considered. The combination of logically associated indicators is called an *indicator system*. The Balanced Scorecard (see next paragraph) is an example for an indicator system.

## Balanced Scorecard

A suitable tool for management and controlling is the *Balanced Scorecard* (BSC) (Kaplan & Norton, 1992, 2000). At first developed for strategic management of an organization, the BSC can be applied for purposes of monitoring too. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning into the "nerve center" of an enterprise. Using BSC the manager may establish a "balanced" situation between the traditional financial measures and other success factors of an organization. The BSC combines the continuous measurement of performance with a reviewing and refinement strategy as well an ongoing evaluation process.

The basic terms are so-called *perspectives*, for example, potentials (learning and growth), internal processes, customers, and financial perspective. Depending on the view, the term customer can vary: customers from the view of health care organization are mostly patients, customers from the view of IM are users of IT applications. For each perspective, strategic objectives, indicators, and measures to achieve these objectives must be defined.

## Models and Reference Models

A *model* is a simplified representation of a section of the real world (subject area). Models are developed for understanding, analysis, or improvement of subject area. Depending on purposes of modeling the relevant aspects of subject area are selected and built in only. Models become an important tool for the IM, because they help overwhelm the complexity of HIS.