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# Information Quality of a Nursing Information System depends on the nurses: A combined quantitative and qualitative evaluation

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## ABSTRACT

**Purpose:** Providing access to patient information is the key factor in nurses' adoption of a Nursing Information System (NIS). In this study the requirements for information quality and the perceived quality of information are investigated. A teaching hospital in the Netherlands has developed a NIS as a module of the Hospital Information System. After the NIS was implemented in six wards in March 2009, the NIS was evaluated.

**Methods:** A paper questionnaire was distributed among all 195 nurses, who used the system. Included in the research were 93 (48%) respondents. Also twelve NIS-users were interviewed, using the USE IT-model.

**Results:** Nurses express a broad need for information of each patient. Although the history is essential, the information needs are not very specified. They expect complete, correct, up-to-date and accessible information of each patient. The information quality of the NIS is satisfactory, but needs improvement. Since the achieved quality of information depends largely on the data-entry by the nurses themselves, a controversy exists between the required information quality and the effort needed to accomplish this.

**Conclusions:** The aspect of data-entry by the user of the information is not included in Information Quality-literature. To further increase the quality of information, a redesign of both process and system seems necessary, which reduces the information needs of nurses and rewards the nurse for accurate data-entry.

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## 1. Introduction

### 1.1. Rationale for the study

The use of the Nursing Information System (NIS) is mandatory for the nurses in a Dutch teaching hospital, so one could say that the adoption of the innovation is 100%. But adoption is not a dichotomous phenomenon: using the innovation, does not

automatically mean optimal use and correct use, nor user satisfaction. Evaluation of the NIS reveals what aspects are used and appreciated by the nurses and contributes to knowledge on aspects which enhance adoption. The evaluation is based on the USE IT-model, which theorizes that user characteristics determine adoption. User characteristics are described by four determinants: relevance, requirements, resources and resistance [1].

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The four determinants are located on two axes: the innovation axe, and the domain axe to demonstrate that adoption is always affected by the innovation process and the innovation product, and on the same time always affects both the user domain and the IT domain. The determinants help to identify what characteristics of the user and aspects of the innovation are dominant in a specific case.

Previous research on the relevance of the NIS learned, that the NIS is micro-relevant, because it solves the information problem of the nurse; the NIS can be regarded as an improved version of the paper record. Information quality seems more micro-relevant than relieving time pressure [2]. The NIS in the present study does not solve the problem of time-pressure, on the contrary: using the NIS is perceived as taking more time. But users expect that experience will reduce time spent on the NIS [2]. This implicates a challenge for the implementation of the NIS, because reducing time spent on documentation was one of the objectives the hospital management wanted to achieve by introducing the NIS. The predictions of shortage of nursing and medical staff in the near future are the incentives to make care processes more efficient. In order to understand why information quality is more micro-relevant than reducing time pressure, information quality is further explored in this article. The expectation that a NIS improves the quality of information and documentation is met in several studies [3–6], but not always [7]. To be able to improve the quality of information in the nursing documentation, it is necessary to know what factors determine this quality, and to know what information quality is required by the users of the information.

### 1.2. Scientific background

In their review of research dealing with IS-success DeLone and McLean define Information Quality as a the category of IS Success factors on the semantic or product level [8]. Since information is the product or output of an Information System (IS), the concept of output quality in the Technology Acceptance Model applies to the quality of information produced by an IS. Venkatesh and Davis define output quality as the degree to which an individual believes that the system performs its tasks well [9]. Output quality defined this way is part of the requirements determinant of the USE IT-model, see Fig. 1 [1]. The main quality criteria of the innovation are: timeliness (accessibility), accuracy (informativeness) and ability to integrate [1]. Also English defines information quality as the fulfillment of a requirement: information quality is “Consistently meeting knowledge worker and end-customer expectations” [10].

To accomplish the required information quality, information must be: the information the user needs, complete, accurate (reliable), understandable, accessible when and where the user needs it, in the format the user can use it easily, and fit the purpose [11]. According to Delen and Rijsenbrij the Information dimension of quality of Information Systems has five attributes: (1) correctness, (2) completeness, (3) up-to-dateness, (4) accuracy (degree of detail), and (5) verifiability [12]. In the above cited definitions the term accuracy is used in three meanings: (1) informative, (2) reliable, and (3) degree of detail. The common element in those three meanings is whether the information is usable and useful for a specific

	User Domain	Information Technology Domain
Product	Relevance  Macro-relevance Definition: The degree to which the user expects that the IT-system will solve his problems or help to realize his actually relevant goals.  Micro-relevance: Definition: The degree to which IT-use helps to solve the here-and-now problem of the user in his working process	Requirements  Definition: the degree to which the user needs are satisfied with the product quality of the innovation.  Macro-requirements Strategic general requirements and tactical approach is the degree in which the users agree with the objectives and methods used.  Micro-requirements Functional and performance requirements specify what the content of the innovation should be.
	Resistance  Macro-resistance Definition: The degree to which the surroundings an locality negatively influence the users of IT  Micro-resistance Definition: The degree to which IT-users themselves are opposing or postponing the IT-change	Resources  Material resources Definition: The degree to which material goods are available to design, operate and maintain the system.  Immaterial resources Definition: The degree to which immaterial goods are available to design, operate and maintain the system.

Fig. 1 – The USE IT-model.

task the user wants to accomplish. Accuracy is therefore interpreted as ‘fit for purpose’ in this study. Since patient information includes objective information (e.g. lab results), as well as subjective information (e.g. reporting), objective verification of data is not always possible. This means that reliability or trustworthiness is an important feature. Analysis of the definitions and attributes described above leads to the concept of Information Quality used in this study: Information Quality is defined as meeting the user’s information needs and being complete, correct, up-to-date, accurate, reliable and accessible anywhere and anytime the user needs the information.

### 1.3. Objectives of the study

To evaluate the quality of information in the NIS, the opinion and needs of the users on the quality of information are investigated by performing a further analysis of the study results. The central research question is:

*Does the Nursing Information System meet the information quality requirements of the users and what aspects determine this?*

To better understand the perception of information quality by the users, it is worthwhile to know their information needs. That is why the research question is further detailed in:

- (1) What are the information needs of the users?
- (2) To what extent are the information needs met?
- (3) What are the information quality requirements of users?
- (4) To what extent are the information quality requirements met?
- (5) What aspects of the NIS determine information quality?

The answers to these questions will result in the answering of the main research question.

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