Data quality issues for accounting information systems' implementation: Systems, stakeholders, and organizational factors

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ABSTRACT

Quality information is one of the competitive advantages for an organization. In an accounting information system, the quality of the information provided is imperative to the success of the systems. This paper reviews the current literature, and uses a case study to address the important systems, stakeholders, and organizational factors that influence the data quality in accounting information systems' implementation.

KEYWORDS: information quality, data quality, accounting information systems, systems factors, stakeholders factors, organizational factors

INTRODUCTION

The management of organizations in the contemporary world has much more focus on systematical issues than was previously required. Accounting Information System (AIS) as one of the most critical systems in the organization has also changed its way of capturing, processing, storing and distributing information. Nowadays, more and more digital and on-line information is utilized in the accounting information systems. Organizations need to take an approach which put such systems at the forefront, and consider both the system and the human related factors while managing their accounting information systems. They must focus on critical factors if they are to attain high-quality accounting information. Failure to do so has negative impacts on the organizations' financial process. Poor information quality may have adverse effects on decision-making (Huang, Lee and Wang 1999, Clikeman 1999). This paper first reviews the literature in relevant areas and then uses a case study to discuss the data quality issues for accounting information systems' implementation, by analyzing systems, stakeholders' and organizational factors influencing accounting information quality. Finally, it draws some conclusions from the analysis of the case study.

BACKGROUND

The factors impacting on data quality (DQ) for accounting information systems are similar to those of the factors for information systems in general. There have been many studies focusing on critical success factors in quality management such as Total Quality Management and Just-In-Time (Saraph et al. 1989; Porter and Parker 1993; Black and Porter 1996; Badri, Davis and Davis 1995; Yusof and Aspinwall 1999). Some of the data quality literature has addressed the critical points and steps for DQ (Firth 1996; Segev 1996; Huang et al. 1999; English 1999).

Table 1 indicates the related research efforts and reflects whether these research efforts addressed certain issues or elements of critical success factors of quality or data quality management.

Factors	Saraph (1989)	English (1999)	Firth (1996)	Wang (1998) Huang et al (1999)	Segev (1996)	Zhu (1995)	Birkett (1986)	Yu (1973) Cushing (1974) Fields (1986) Nichols (1987)	Johnson (1981) Groomer (1989)	Bowen (1993)
Role of top management	✔	✔	✔	✔	✔	✔				
(Data) quality polices and standards			✔	✔	✔					
Role of (data) quality and (data) quality manager	✔	✔	✔	✔	✔	✔				
Training	✔	✔		✔		✔				
Organizational structure		✔				✔				
Nature of the system Product/service design	✔				✔					
Approaches (control and improvement) Process management	✔	✔		✔	✔					
Employee/ personnel relations	✔		✔			✔				
Supplier quality management	✔			✔		✔				
Performance evaluation and rewards (responsibility for DQ)		✔		✔			✔			
Manage change		✔								
External factors							✔			
Evaluate cost/benefit tradeoffs					✔	✔				
Audits									✔	
Internal control (systems, process)								✔		
Input control										✔
Customer focus				✔						
Continuous improvement		✔								

Table 1: Summary of literature review identifying factors influencing data quality

In data quality studies, four types of stakeholders have been identified; they are data producers, data custodians, data consumers, and data managers (Strong et al. 1997, Wang 1998). In AIS, these stakeholders were identified as follows:
(1) Data producers are those who create or collect data for the AIS;
(2) Data custodians are those who design, develop and operate the AIS;
(3) Data consumers are those who use the accounting information in their work activities;
(4) Data managers are those responsible for managing the entire data quality in AIS.

METHODOLOGY

Case study research is used to study the contemporary phenomenon in its real-life context (Yin 1994). Data for the case studies in this research was collected from multiple sources. It is generally accepted that multiple data sources allow an investigator to address a broader range of historical, attitudinal, and behavioral issues (Eisenhardt 1989). Furthermore, the use of multiple sources of evidence is considered to facilitate the development of a 'converging line of inquiry,' by which the process of *triangulation* is ensured (Yin 1994). With this triangulation it is considered that *construct validity* can be achieved because the multiple sources of evidence essentially provide multiple measures of the same phenomena (Yin 1994).

In-depth interviews with major AIS stakeholders were selected as the main source of the data collection because it is suggested that most case studies are about human affairs and well-informed respondents can provide important insights into the situation (Yin 1994). Furthermore, it is recommended that an interview is a better method of obtaining quality data efficiently (Marshall & Rossman 1995).

Data collection sources also include relevant documents, such as position descriptions, policy manuals, organizational structure charts and training documents as well as some published information about organizations, such as financial statements and annual reports. It is considered that documents can be used to corroborate and augment evidence from other sources, and they play an explicit role in the data collection process in doing case studies (Yin 1994). Position descriptions can provide the researcher explicit responsibilities of certain positions in AIS. Furthermore, organizational structure charts can be used to understand the interrelationship among different divisions, such as IT and Finance, within an organization. Training documents provide evidence of training that has been undertaken by an organization. Annual reports and financial statements provide the general background information about an organization and its financial position.

Analysis techniques

All case study interviews together with the additional documents obtained from the case study organization were transcribed and entered into a software package for qualitative data analysis. A content analysis of those documents and interview transcripts was conducted. All transcript material was coded (Neuman 1997) and an *index tree* was also developed to aid in categorizing and grouping of the qualitative materials.

Use of quotations

Direct quotations from the case study interview transcripts (Patton 1990) were used to illustrate the factors or sub-factors which could assist in explanation building (Miles & Huberman 1994). Quotations from case study interviewees represented their own opinions, perceptions, and experiences regarding particular factors or situations. They also provide the respondents' true feelings and beliefs on certain issues. Therefore, these quotes have the potential to assist readers to obtain insights into the respondents' understanding of the phenomena. Quotes are presented in italics identified by the case name and the respondent's position title.

CASE STUDY

This section briefly describes the case study organization, includes an overview of the company, its information systems, and the data analysis of the case study follows.

In this case study, there is no data manager position; therefore, three other stakeholders are interviewed:

- Data producers: CFO and accounting officer
- Data custodian: IT manager
- Data consumer: General user

Case study organization E is an education and training infrastructure company that partners with universities and professional education providers to market and deliver their courses over the Internet to students and organizations. It's a medium size organization with approximately one hundred staff. They use an offthe shelf commercial software package which basically performs the group's accounting information. The program is also used to report against budgets. The organization's business units throughout the world have different entities with their own local budgets and they run a separate analysis in the software package for each of those divisions.

DATA ANALYSIS

Summary of cross stakeholders analysis

At the conclusion of the interviews with the stakeholders, each of them was asked to rate a list of factors, generated from the literature review, on a ten point scale for the importance of those factors, where ten represented extremely important, and one was not important at all. Table 2 summarizes the scores given by different stakeholders in Case E.

Table 2 Stakeholders rating of the importance of the factors

Category	Factors	Stakeholders				Mean
		Info producer		Info custodian	Info user	
		CFO	Acc Officer			
AIS Characteristics	Nature of the IS	8	7	5	8	**7**

DQ characteristics	**DQ policies & standards**	10	10	8	10	**9.5**
	DQ controls & approaches	8	6	9	7	**7.5**
	DQ vision	8	5	10	8	**7.75**
	Internal control	10	6	5	10	**7.75**
	Input control	7	7	10	9	**8.25**
	Understanding of the systems and DQ	7	8	10	7	**8**
	Continuous improvement	9	7	8	10	**8.5**
Stakeholders' related factors	**Top management's commitment**	8	10	7	5	**7.5**
	DQ manager	5	5	6	8	**6**
	User focus	10	5	8	10	**8.25**
	Employee relations	7	6	6	5	**6**
	Information supplier quality management	8	7	10	10	**8.75**
	Audit and reviews	8	7	7	9	**7.75**
Organizational factors	**Training**	7	8	10	7	**8**
	Org structure			7		**7**
	Org culture	10	5	7	10	**8**
	Performance evaluation & rewards	7	5	6	7	**6.25**
	Manage change	9	5	9	10	**8.25**
	Evaluate cost/benefit tradeoffs	7	7	2	8	**6**
	Teamwork (communication)	8	6	7	6	**6.75**
External factors	**External factors**	9	5	4	7	**6.25**
Overall		**8.10**	**6.52**	**7.32**	**8.14**	**7.50**

Source: analysis of field data

Legend: 1, 2, 3 …= Rating of the importance {1 as not important at all, 10 as extremely important}

Findings of Case E

The importance of data quality issues in accounting information systems were addressed by the case participants. This resulted that data quality was regarded as a priority in the organization. As the CFO stated:

> *We have to monitor our cash balances fairly closely and it [data quality] is definitely one of the highest priorities. We have forecasts that need to be met, so*

we need to give ourselves early warning signals if a part of the business looks like it is not performing. The numbers will tell us that hopefully, so we can address the issue.

Case E transferred a substantial portion of its funds electronically, and that seemed easier to control than the traditional method. Typically, any transfer required two approvals from two senior employees. Therefore, Input controls had been addressed as the most important control.

I prefer to get it right on the way in. I have to review it. You have to trust your information at the end of the day and if you don't you are going to spend a lot of time worrying about it.

IT Manager (Case E)

There was no formal performance evaluation or rewards for employees' data quality control activities in Case E. Instead, they tried to employ well-trained and experienced personnel to prevent the possible DQ problems. What they did was to put the DQ requirement as part of the job description for the appropriate position; this method worked as a negative incentive: 'You do it right or you get sacked.' At the same time, Case E's managers also made efforts on keeping good *personnel relations*:

The person who is working there - they need to keep happy as much as possible. Part of that is getting paid at market rates. Also the personal relationship and the teamwork is quite important. They have to know you are responding to their questions quickly, so they don't feel lost.

CFO (Case E)

On the other hand, because it is a young company and expanding very rapidly, employees rated as performing in an above-average manner were given opportunities for promotion. If they were doing a good job and conducting high quality controls, they would be recognized by senior management.

In relation to responsibility for data quality, top management commitment to data quality was seen as most important:

It is management commitment to it and management review of how things are going. At the end of the day they should be the ones who have to ensure it works properly. The pressure and the resources, the sorts of hard answers and decisions have to come from there [top].

General User (Case E)

Because it was a medium sized organization, Case E did not have a middle layer of management. Therefore, the ongoing implementation responsibility from day to day rested with the people at the front end.

There was usually a timing pressure from each of the information customers, both internal and external customers. For example, a board meeting normally had a deadline as to when everything needed to be presented, which might be every quarter or bimonthly. There was also some monthly reporting that needed to be done by a certain day every month, as well as statutory annual reporting. Because timing was the major influence for this type of information and reports, sometimes the deadline might suffer inaccuracy of information. The realistic timing of deadlines was still the major concerns in Case E.

To set up a data quality manager position was seen as unnecessary for the company at the moment, as although some stakeholders believed that to have such an individual or a team, as quality manager would help, they could not afford it as a growing medium sized company. Therefore, duties to ensure the quality of accounting information were assigned to the individuals who were doing the relevant work.

> *I think each person has to actually be their own data quality manager for that part of their job that requires high quality data. At the end of the day the information is going to come from a source somewhere and they have to be responsible for that quality themselves.*
>
> IT Manager (Case E)

Furthermore, in Case E, it was believed that having a DQ manager position would not make a significant difference.

> *The people at the front end who are responsible whether they are answering to someone called data quality manager or someone doing the data quality manager function, I don't think it makes any difference.*
>
> CFO (Case E)

Opposed to traditional data entry, Case E captured most of their information online. In most circumstances, the *raw data supplier* was the data entry person as they inputted raw data into the system. In order to manage the quality of data from suppliers, Case E established a position called 'account relationship manager,' who had all the details needed and did all the communication back and forth between the technical staff and clients.

> *What they do is normally they make sure the clients are inputting the correct information into the system to make the system work correctly. So they are doing quality control of all the data the clients are entering. So they know the system.*
>
> IT Manager (Case E)

Therefore, *input controls* were divided into two main parts, the systems controls and the human controls:

> *When we set the system up it was as easy to use as possible for our clients to use to input their data. Now it of course has all the edit checks and balances for the data that they actually enter. But you can't always put in 100% controls. That is just impossible … the account relationship managers' job is to oversee the*

information to make sure that what they are doing is what they are meant to be doing. So it is a manual look over the quality.

IT Manager (Case E)

CONCLUSION

This study focused on the investigation of systems', stakeholders' and organizational factors' impacts on data quality of accounting information systems' implementation. After the initial literature reviews of the important factors that could influence data quality in general, the case study methodology was utilized to further exploring the issues especially related to accounting information systems' implementation.

There are some important points that could be drawn from the analysis of the case study data. These are summarized below:

- *Competent personnel* is as important as the *suitable system;*
- *Input control* is the most important control, and in the online transaction environment, it should be incorporated with *data suppliers' quality management;*
- It is hard to have *DQ manger* positions in small and medium organizations. However, organizations should incorporate DQ manager functions into those relevant stakeholders' job functions that should be responsible for DQ in AIS.

This study showed that in order to have a successful accounting information systems' implementation, organizations should pay attentions to both systems and organizational factors. Different stakeholders of the systems and data quality controls need to work together to ensure the data quality in AIS. Future studies could look into the relationship between the systems', stakeholders', and organizational factors' with the data quality outcomes in organization's AIS. Cross cultures and cross-countries research in this topic may also help better understanding the related issues.

REFERENCES

Badri, M. A., Davis, Donald and Davis, Donna (1995). A study of measuring the critical factors of quality management. *International Journal of Quality and Reliability Management*, 12(2), pp. 36-53.

Birkett, W.P. (1986). Professional specialization in accounting IV: management accounting. *Australian Accountant*, September, p.78.

Bowen, P. (1993). *Managing data quality accounting information systems: A stochastic clearing system approach.* Unpublished PhD dissertation, Univ. of Tennessee.

Clikeman, P. M. (1999). Improving information quality. *Internal Auditor*, 56(3), pp. 32-33.

Cushing, B. E. (1974). A mathematical approach to the analysis and design of internal control systems. *The Accounting Review*, 49(1), pp. 24-41.

Eisenhardt, K. M. (1989). Building Theories From Case Studies, *Academy of Management Review,* 14(4), pp. 532-50.

English, L. P. (1999). *Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits*, John Wiley and Sons, Inc.

Fields, K. T., Sami, H. and Sumners, G. E. (1986). Quantification of the auditor's evaluation of internal control in data base systems. *The Journal of Information Systems*, 1(1), pp. 24-77.

Firth, C. (1996). Data quality in practice: experience from the frontline, Paper presented to the Conference of Information Quality, 25-26 Oct.

Groomer, S. M., Murthy, U.S. (1989). Continuous auditing of database applications: An embedded audit module approach. *The Journal of Information Systems*, 3(2), pp. 53-69.

Huang, Huan-Tsae, Lee, Y. W. and Wang, R. Y. (1999). *Quality information and knowledge*, Prentice Hall PTR.

Johnson, J. R., Leitch, R. A. and Neter, J. (1981). Characteristics of errors in accounts receivable and inventory audits. *The Accounting Review*, 56(2), pp. 270-293.

Marshall, C. & Rossman, G. (1995). *Designing Qualitative Research,* Sage Publications, Thousand Oaks.

Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis - A Source Book of New Methods,* Sage Publications, Thousand Oaks.

Neuman, W. L. (1994). *Social Research Methods: Qualitative and Quantitative Approaches,* Allyn & Bacon, Boston.

Nichols, D. R. (1987). A model of auditor's preliminary evaluations of internal control from audit data. *The accounting review*, 62, pp. 183-190.

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods,* Sage Publications, Newbury Park.

Saraph, J.V., Benson, P. G. and Schroeder, R. G. (1989). An instrument for measuring the critical factors of quality management. *Decision Sciences*, 20(4), pp. 810-829.

Segev, A. (1996). On information quality and the WWW impact a position paper. Conference of Information Quality, Oct 25-26.

Strong, D. M., Lee, Y.W. and Wang, R. Y. (1997). Data quality in context. *Communications of the ACM*, 40(5), pp. 103-110.

Wang, R. Y. (1998). A product perspective on total data quality management. *Communications of the ACM*, 41(2), pp.58-65.

Wang, R. Y., Storey, V. C. and Firth, C. P. (1995). A framework for analysis of data quality research. *IEEE Transactions on Knowledge and Data Engineering*, 7(4), pp. 623-640.

Wang, Y. and Strong, D.M. (1996). Beyond Accuracy: What data quality means to data consumers. *Journal of Management Information Systems*, 12, pp. 5-34.

Yin, P. K. (1994). *Case Study Research-Design and Methods,* Sage Publications, Newbury Park.

Yu, S. and Neter, J. (1973). A stochastic model of the internal control system. *Journal of Accounting Research*, 11(3), pp. 273-295.

Yusof, S. M. and Aspinwall, E. (1999). Critical success factors for total quality management implementation in small and medium enterprises. *Total Quality Management*, July pp. 803.

Zhu, Z. and Meredith, P. H. (1995). Defining critical elements in JIT implementation: a survey. *Industrial Management and Data Systems*, 95(8), pp. 21-29.