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Assessing the quality of company's maintenance data reporting: a case study

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Problem in context

Business are increasingly using their enterprise data for strategic decision-making activities. In fact, information, derived from data, has become one of the most important tools for businesses to gain competitive edge. Data quality assessment is now a hot topic in numerous sectors and considerable research has been carried out in this respect. Nonetheless, existing frameworks often need to be adapted with respect to the use case needs and features. Given this, the present work develops a methodology for assessing the quality of enterprises' daily maintenance reporting, relying both on an existing data quality framework and on a Multi-Criteria Decision Making (MCDM) technique. This work is applied in cooperation with a Finnish multinational company in order to evaluate and rank different company sites/office branches (carrying out maintenance activities) according to the quality of their data reporting. Based on this evaluation, the industrial partner wants to establish new action plans for enhanced reporting practices.

Objectives

The paper's contribution is to develop a methodology combining an existing data quality framework (Krogstie's framework [1]) and an efficient MCDM technique (Analytic Hierarchy Process – AHP [2]) in order to assess the quality of enterprises' daily maintenance reporting. The overall methodology is depicted in Figure 1.

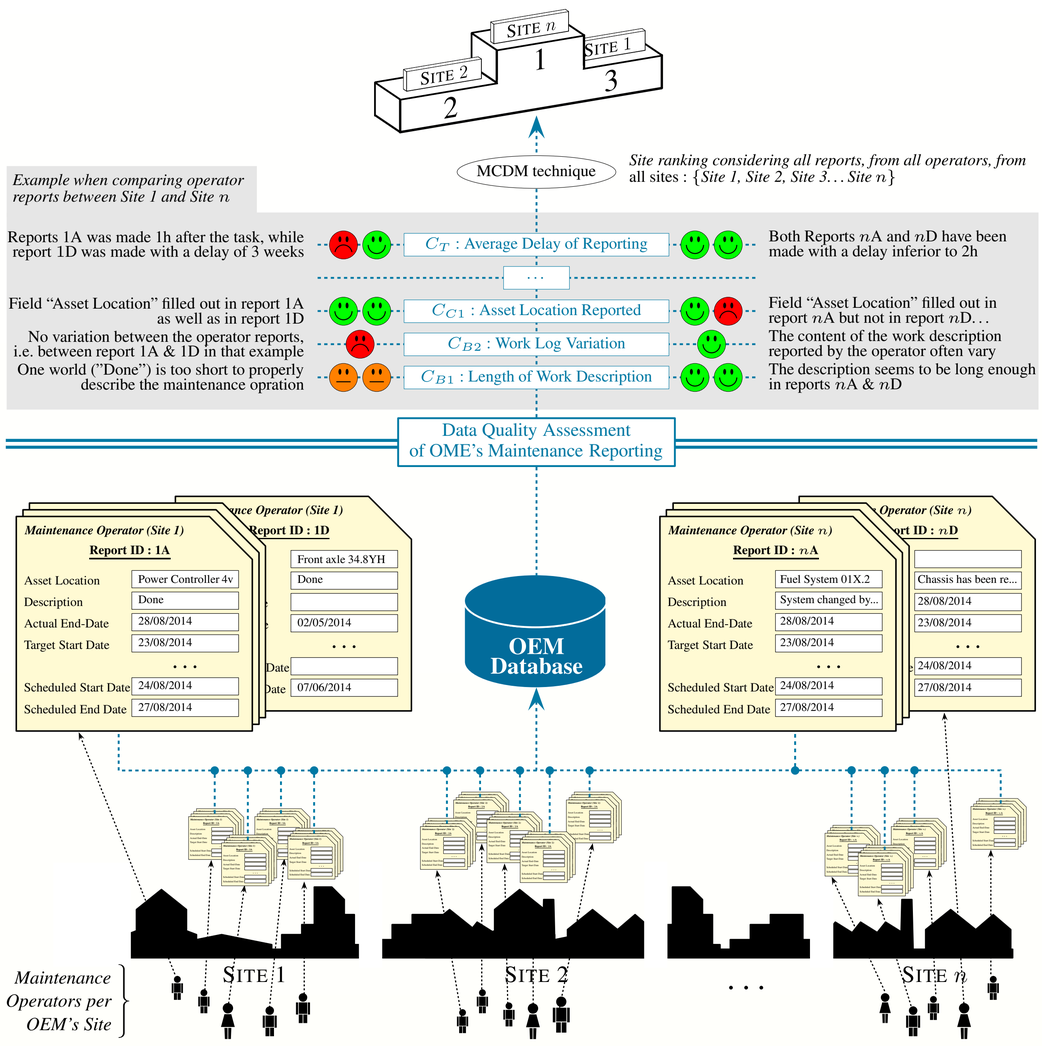

Figure 1: *Stages composing the maintenance reporting quality assessment framework*

Figure 2 shows how our MCDM ranking problem has been broken down into a hierarchical structure consisting of four levels :

➪ *Level 1 :* overall goal of the study is to rank the different OEM company sites in terms of maintenance reporting quality ;

➪ *Levels 2 and 3 :* set of data quality criteria/sub-criteria, used to assess the maintenance reporting quality (derived from Krogstie's framework and listed in Table 1) ;

➪ *Level 4 :* alternatives that are the OEM company sites ;

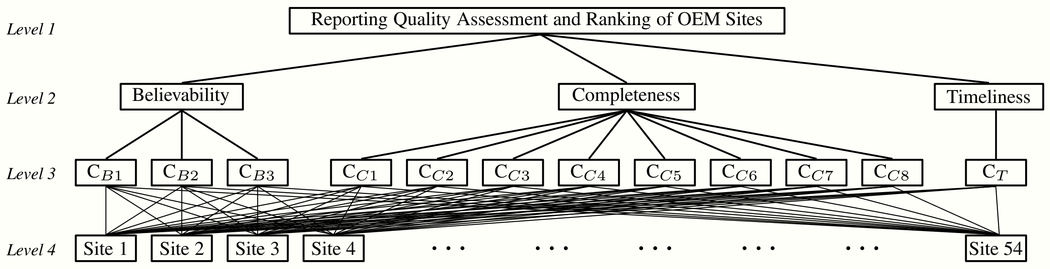

Figure 2: *AHP structure of the maintenance reporting quality assessment problem*

Table 1: *Criteria and its sub-criteria description related to the data quality dimensions*

.2 Criteria	Sub-Criteria	Description
Believability (C_B)	Length of Work Description (C_{B1})	Length of the work description related to a work order
	Work Log Variation (C_{B2})	Work Description variation among the different operator reports
	Technician Log Variation (C_{B3})	Technical log variation among the different operator reports
Completeness (C_C)	Asset Location reported (C_{C1})	Location of asset within product where maintenance has been done
	Description reported (C_{C2})	Description of work to be done in particular maintenance work
	Actual Finish Date reported (C_{C3})	Actual Finish date and time of work completed
	Target Start Date reported (C_{C4})	Targeted start date of the maintenance work
	Target Finish Date reported (C_{C5})	Targeted finish date of the maintenance work
	DLC Code reported (C_{C6})	Actual location of the defect within product
	Schedule Start Date reported (C_{C7})	Scheduled start date of the maintenance work
	Schedule Finish Date reported (C_{C8})	Scheduled Finish date of the maintenance work
Timeliness (C_T)		This is average delay of reporting on individual site

Case study & Results

The analysis on the maintenance reporting data has been carried out considering 54 maintenance sites of the Finnish company, and datasets collected during two years. The different sites have been assessed with respect to each criteria, and the resulting scores have been aggregated in order to get an overall score of the maintenance reporting quality. Figure 3 gives insight into the comparison of sites 11, 32, 37 and 47 when aggregating the scores at level 2 of the AHP structure (i.e., with respect to the three criteria : Believability, Completeness and Timeliness ; *cf.* Figure 2).

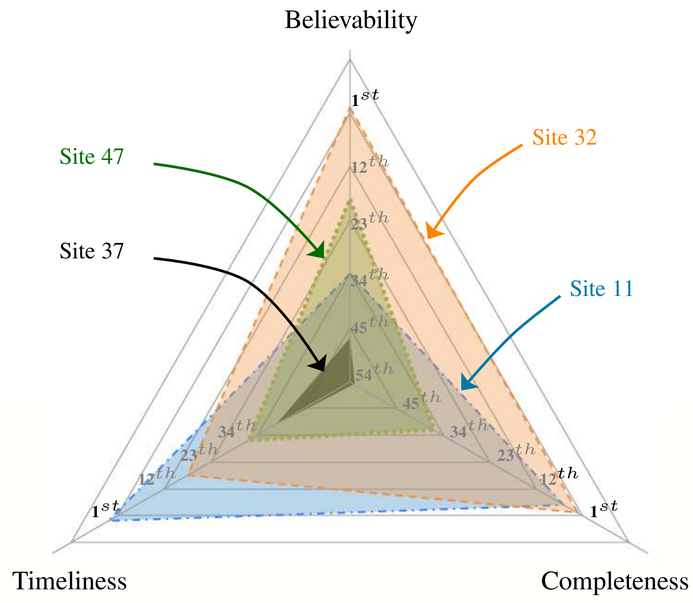

Figure 3: *Comparison of sites 11, 32, 37 and 47*

The overall ranking of the maintenance sites (i.e., when aggregating the scores at level 1 of the AHP structure) is presented in Figure 4. The histogram shows that some quality scores dropped below "0" ; the reason being that a penalty score has been introduced when a report field was left empty.

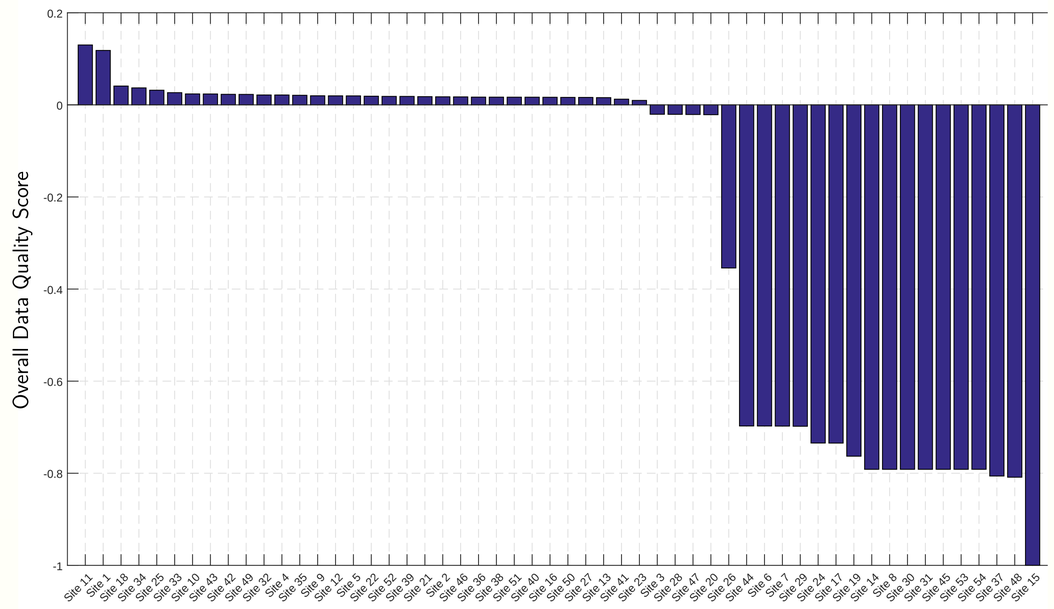

Figure 4: *Site ranking based on the maintenance reporting quality assessment*

References

[1] Krogstie, J., Lindland, O. I., and Sindre, G.(1995) Defining quality aspects for conceptual models, *Proceedings of the IFIP8.1 Working Conference on Information Systems Concepts : Towards a Consolidation of Views,* 1995 :216-231.

[2 Saaty, T. L. (1980) The analytic hierarchy process : planning, priority setting, resources allocation, *New York : McGraw.*