Managing Data Quality in Dynamic Decision Environments:
An Information Product Approach

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Abstract

Large data volumes, widely distributed data sources and multiple stakeholders (data providers and data consumers) characterize a typical e-business setting. Mobile and wireless technologies has further increased the volume, further distributed the data sources while permitting access to data anywhere, anytime. Such environments empower and necessitate decision-makers to act/react quicker to all decision-tasks including mission-critical ones. Decision-support in such environments demands efficient data quality management. This paper presents a framework for managing data quality in such environments using the information product approach. It includes a modeling technique to explicitly represent the manufacture of an information product, quality dimensions and methods to compute data quality of the product at any stage in the manufacture, and a set of capabilities to comprehensively manage data quality and implement total data quality management. The paper also posits the notion of a virtual business environment to support dynamic decision-making and describes the role of the data quality framework in this environment.
in such environments the framework permits decision-makers to gauge quality using their own assessment of data sources and processes. It enhances their ability to better assess quality implications by allowing them to understand the meta-details about the data being used. In the framework, we first define a representation scheme, the IPMAP, to systematically represent the manufacture of an information product. We then define a set of quality dimensions and describe methods to evaluate data quality using these. When used with the IPMAP, data quality can be evaluated at each stage of the manufacture.

We further define a set of capabilities on the IPMAP for total data quality management. These capabilities are defined by adapting proven techniques (CPM/PERT) from operations management and by using graph-based operations. The graph-operations are shown to be correct. The framework consisting of the representation technique, metadata including data quality dimensions, and the capabilities for managing data quality, guarantees total data quality management for IPs in organizations. We have further described the architecture for a data quality management system that incorporates this framework. Finally, we have posited the notion of virtual business environments as a way of supporting dynamic decision-making and illustrated the role of data quality management in these. We believe this approach to data quality management is necessary in dynamic decision environments. Coupled with virtual business environments it provides comprehensive support for managing data and its quality.

References

APPENDIX A-1

Lemma 1: Every IPMAP generates a unique IP-graph and each IP-graph converts back to one and only one IPMAP. Stated differently, no IP-graph can represent two different IPMAPs and no IPMAP can generate two different IP-graphs.

Proof: The set P consists of ordered pairs that associate each node in an IPMAP with its corresponding IP-graph. This set is unique for each ordered triple defining the mapping associated with an IPMAP and its IP-graph. Hence by construction, every IPMAP will generate a unique IP-graph and using the reverse –mapping, the IPMAP can be obtained from the IP-graph.
References

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