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Measurement of analytical knowledge-based corporate memory and its application

Chun-Che Huang [a], Yu-Neng Fan [b,*], Ching-Chin Chern [b], Pei-Hua Yen [a]

[a] Department of Information Management, National Chi Nan University, Taiwan, No. 1, University Road, Puli, Nantou 545, Taiwan, ROC
[b] Department of Information Management, National Taiwan University, Taiwan, No.1, Sec. 4, Roosevelt Rd., Taipei City 106, Taiwan, ROC

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ABSTRACT

In the current knowledge-driven economy, businesses are increasingly required to function as knowledge-based organizations. In these organizations, knowledge usually serves as the means for attainment of competitive advantage. It is clear that organizational knowledge has to be carefully managed, and knowledge management measurement is important to businesses. In this paper, corporate memory (CM) is viewed as an organization memory for managing knowledge. Generically and concretely, CM is constructed using analytical knowledge (AK), which is defined as the knowledge formatted with 5W1H (who, when, where, what, why, and how). AK is extracted from data storage systems and domain experts by aggregating information, where data analysts, knowledge workers, and knowledge users are involved in a knowledge discovery process. The research objective of this study is to propose a measurement approach, which provides a generic and applicable methodology for measuring the performance and quality of CM. To represent the uncertainty and fuzzy terms in the evaluation environments, and to explicate the invisible impact induced by information technology (IT), the fuzzy set theory is applied. An effective procedure is also proposed to apply the measurement approach in practice.

1. Introduction

In current organizations, knowledge usually serves as the means for attainment of competitive advantage. Knowledge resources in an organization are often complex and multifaceted, ranging from tacit components to knowledge that is explicitly represented [21], and including descriptive knowledge, procedural knowledge, and reasoning knowledge [31]. Knowledge quality is important since high-quality knowledge yields high value and returns for the business. It is clear that organizational knowledge has to be carefully managed rather than being left to serendipity [12].

In order to support organizational learning and manage organizational knowledge, CM is viewed as an organization memory for knowledge management. The construction of CM affects effectiveness and efficiency of KM directly. However, various definitions of CM from various perspectives; for example, organizational behavior [29], management science [3], and organizational learning [13,27] result in constructing CM not in general, but partial manner. To present a precise and concrete definition of CM, this paper focuses on analytical knowledge (AK)-based CM [12,13], where AK denotes knowledge extracted from data storage systems and domain experts by aggregating information, where data analysts, knowledge workers (knowledge analysts, knowledge editors, knowledge managers), and knowledge users are involved in a knowledge discovery process. AK is also structured by 5W1H (who, when where, what, why, and how) and is the integration of general information, technical information, captured information, refined knowledge, and feedback knowledge (called five *basic elements*). The AK-based CM provides a fundamental and standard procedure to develop CM.

The quality of organizational knowledge and information determines the value of organizational knowledge assets [6]. The evaluation of knowledge quality has become an increasingly important issue in measurement researches [1,26]. Measuring the knowledge, e.g., AK, in CM is crucial to CM measurement. In addition, it is obvious that the quality of CM affects the core competence of a business [25], and enhances a business's competitiveness in the marketplace [16].

To date, studies on measurement of knowledge quality have been scarce, and there is not much literature on measurement of CM. The research objective in this paper is to propose a measurement approach to the performance and quality of CM. We expect that our research results can contribute to several aspects. First, this research fits to the nature of the AK generation processes, which provide a fundamental and standard procedure to develop CM. Second, this research integrates the evaluation and assessment mechanisms based on a solid and complete foundation. Third, this research is able to represent the uncertainty and fuzzy terms in the evaluation environment, and to explicate the invisible impact induced by information technology (IT). Fourth, this research provides an effective procedure to support the measurement approach in practice. The value of the proposed measurement approach in managing information/knowledge and developing strategies in businesses is shown using illustrated examples. With the strategies, business is expected to enhance competitiveness.

* Corresponding author.
E-mail addresses: cchuang@ncnu.edu.tw (C.-C. Huang), d96725003@ntu.edu.tw (Y.-N. Fan), cchern@ntu.edu.tw (C.-C. Chern), fta936@ms15.hinet.net (P.-H. Yen).

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The rest of the paper is organized as follows. AK-based CM is introduced and measurement approaches are surveyed in Section 2. The foundation of CM measurement including a measurement framework and related measurement concepts is presented in Section 3. The methodology that includes the evaluation and assessment methods is proposed in Section 4. Examples of the measurement approach applied in practice are illustrated finally in Section 5.

2. Literature review — CM studies

In this section, the AK-based CM is introduced first. Measurement approaches are surveyed and their weaknesses are summarized next.

2.1. AK-based CM

The definitions of CM in previous literature are developed from various perspectives and implemented in different applications. A precise and concrete description about the intrinsic properties [7] of CM, for example, descriptions of inputs, outputs, controls, and mechanisms, is required for CM measurement. It is useful to construct a measurement framework so that the scope of measurement could be clarified, the complexity of the measurement could be reduced, and the measure target could be focused, which results in precision of the measurement [7]. In this paper, from the decision-making perspective [24], the relativity of decision/activity perspective [25], and the benefits to the organization [27], CM is viewed as "the contents of organizational memory" that the various types of knowledge in the repository are accumulated over time. CM is also viewed as "the impact induced by organizational memory" that implies by which knowledge from the past is brought into to bear on present activities or decisions and leading in higher levels of organizational effectiveness to increase competitiveness of a business.

Huang et al. [13] and Huang and Kuo [12] present an explicit structure of CM named "AK-based CM" which provides a generic way to construct CM for businesses. Since AK can flexibly externalize most knowledge and is helpful for decision support and problem-solving to improve businesses' competitiveness [12], a CM is constructed using AK in this paper.

AK in the CM is generated at different stages, with each stage involving contemporary technology and management tools. The process of generating AK with the child activities is introduced in Fig. 1 [12,13], where IDEF3 (*DEFinition for Process Description Capture Method*) is used. In IDEF3 modeling, each activity includes an input, output, controls, and mechanisms [14]. Events and data (inputs) are transformed into AK (outputs). Necessary controls (top arrows) and mechanisms (bottom arrows) support AK generation. A four-activity process of generating AK can construct CM step by step. Each activity has specific controls and mechanisms to support operations of the activity and produce outputs as the inputs of the next activity. In essence, AK is the integration of five *basic elements*: general information, technical information, captured information, refined knowledge, and feedback knowledge and serves as a capstone in CM.

2.1.1. Activity 1: event classification and event subject analysis

Activity 1 includes two procedures: Event classification and Event subject analysis. First, event classification procedure is responsible for determining the relationship between an event occurring during business operations and a business organization. In this procedure,

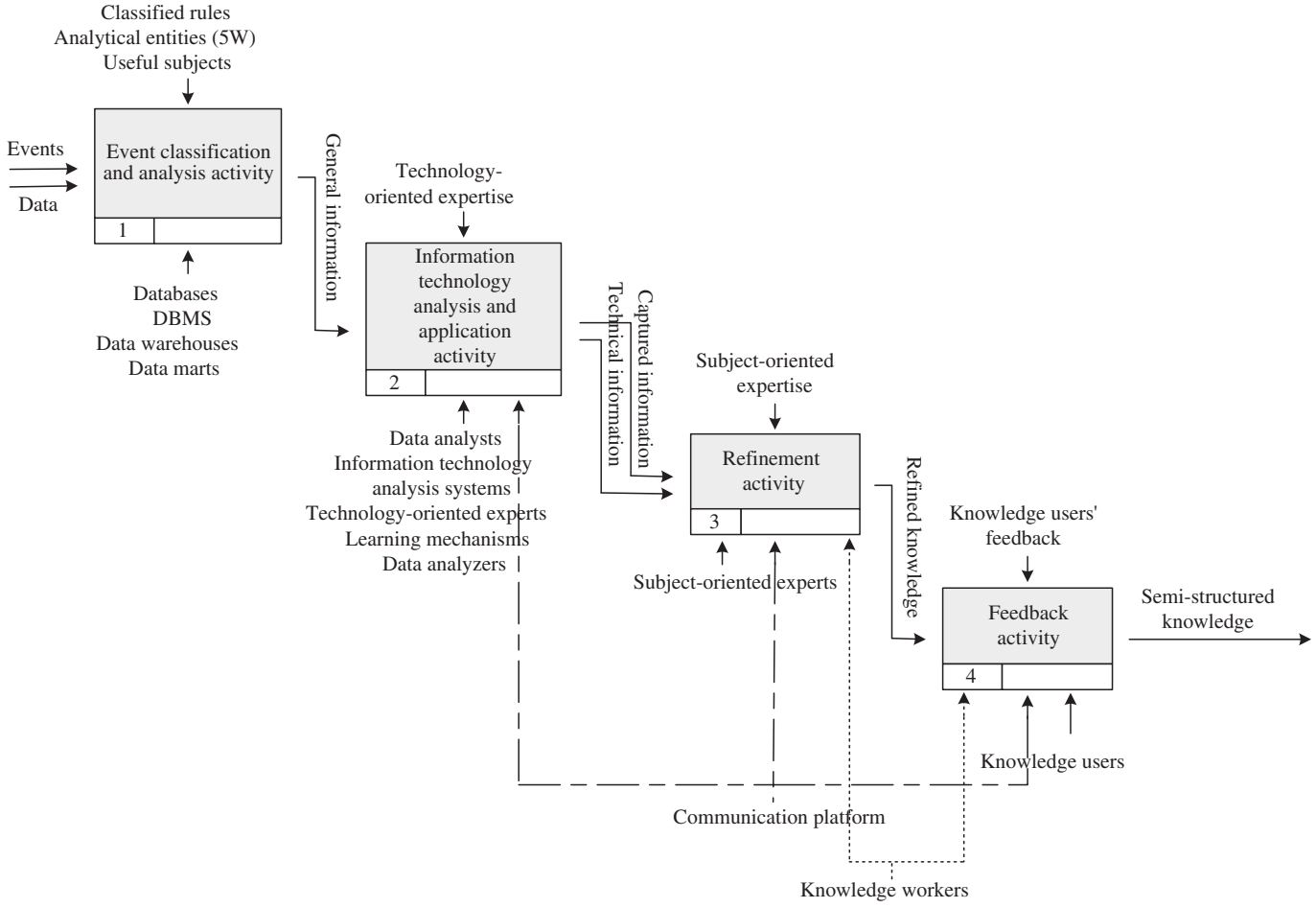

Fig. 1. The IDEF3 model of AK generation.