Local and Global Measures for Measuring the Performance of Big Data Analytics (BDA) Process

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Abstract:

Performance measurement is defined as the process of quantifying the efficiency and effectiveness of an action or a process. BDA system, viewed a process, has both front-end and back-end performance properties[1]. The BDA process phases, data acquisition, data preparation, and data analysis, determine how the systems performs according to a given time and resources. In visualization and interpretation phases, users see the analytics results and interpret them into their context[2]. The performance measurement of the BDA process uses two categories of measures: Local measures and global measures (refer to Figure 1).

The local measures consist of efficiency measures to assess the BDA system's functions, and effectiveness measures to assess user satisfaction towards the system. The efficiency measures include time, capacity, response time, throughput, processing time, accuracy, resource utilization, flexibility, and provenance, those scrutinize the speed and the capability of BDA system to meet user and business needs. The effectiveness measures, on the other hand, includes measures like user satisfaction, information representation, timeliness, reliability, understandability, and customizability.

The global measures are used to advance the performance of the BDA process. They include the measures of technology, competency, and working conditions. Figure 1 shows the two categories and the metrics for each. The technological tools to perform big data analytics range from database and storage technology from one end, to processing, analytics, and visualization technology to the other end. Both hardware and software aspects are considered. These tools and techniques should be examined using the following metrics: availability, suitability, volatility, and maturity[3][4]. The competency factor includes skills and know-how to perform the analytics, which could be summarized as technical skills, relational knowledge, business knowledge, and process knowledge (thinking of BDA as a process)[5][6]. The motivation of the big data analytics' participants and the condition of the work environment have also a key role in promoting performance of the BDA system and achieving its goals and objectives[6][7]. The local and the global measures are summarized in Table 1.

Table 1 The Summary ofLocal and Global Measures

Measurable Concept	Measures
Efficiency	Time, capacity, response time, throughput, processing time, accuracy, resource utilization, timeliness, flexibility, provenance

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Effectiveness	User satisfaction, information representation, timeliness, perceived usefulness, reliability, understandability, customizability
Technology	Availability, suitability, volatility, maturity
Competency	Qualification, technical skills, communication skills, process knowledge, business knowledge
Working Conditions	Motivation, workload per staff's capacity, comfortability of work environment
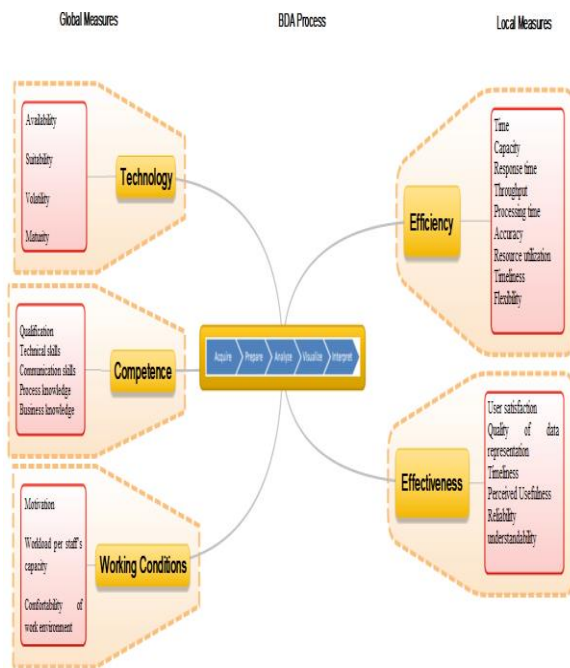
Figure 1 The Categories of the Measures

The application of the local and the global measures can be represented in the following sequence. First, put the required competency to perform BDA process tasks and activities in place. Then, equip the staff, given their competency, with the required tools to perform the job. Make sure that the staffs are happy and motivated. Then, come down to assess performance using efficiency measures which focuses on the capability of big data systems. Afterwards, evaluate the big data system's effectiveness which measures the performance in user settings. Invest the performance measurement insights in the performance improvement initiatives.

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