Predictive Analytics of Hyper-Connected Collaborative Network

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ABSTRACT

The foundation of the infrastructure of a collaborative network for ubiquitous connectivity will employ hyper-connected technologies in smart and sustainable cities. Typically, there are millions of items for processing and analytics on the massive generated data. The predictive analytics are indispensable for such volumes of which there are many drifts in data structures and contents. In order to make better decisions and future planning of ubiquity, a model, and correspondence implementation are designed and developed. It brings decision-making to the expected boundary of collaboration for different performance indexes. The selected method finds cause-and-effect between data to predict the optimum responses to incoming events. The core of approach focuses on Event-Condition-Action rules to build decision trees, which helps further planning. The method can summarize complexity via effective recommended decisions to local experts and analysts.

KEYWORDS

Decision-Making, Hyper-connected Collaborative Network, Predictive Analytic, Smart City

1. INTRODUCTION

The Hyper-Connected Collaborative Networks (HCNs) involve hundreds of people and millions of items for processing and analyzing the massive generated data through Collaborative Network (CN). Moreover, potential management functions will emerge quickly. Connecting up, analyzing and integrating the information produced by the various forms of every ware-devices, provides a more consistent and smart understanding of the ubiquitous city that enhances efficiency and sustainability (Hancke & Hancke, 2013). The HCN in ubiquitous city needs intelligent business processes that run across multiple organization and individuals. The intelligence in business processes has three levels of self-awareness, the performance monitoring, and interactions understanding. The intelligence of business processes in HCN also needs cognitive learning that implies an understanding of behavior, context, interaction and the ability to react to the internal and environmental changes. For the situation of changes, decisions are the products of complex interactions (Patterson, Weil & Patel, 2010) in performance monitoring.

The Big data of monitoring has potential to leverage intelligence via efficient decision making, which should bring new forms of data analytics to cope with data abundance (Kitchin, 2014). Today, the decision making attained by using traditional business intelligence tools (Williams & Williams, 2004), which such tools may not be responsive in the HCN. The HCN data analytics is the application of advanced analytic techniques to Big data sets. In an HCN, scenarios are dynamic, complex and

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uncertain, so that the old analytical method may not be appropriate. A variety of shared data (e.g., Smart Health, e-Government, Market Intelligence) made it challenging problem in the planning of HCN processes. The increasing number of cross-functional events of HCN is beyond one organization boundaries. Such events promoted an incredible expansion in data of business process performance monitoring. The real-time analytics (RADEN, 2003) include the capability to use all available assets in an organization to improve the tasks and quality of services provided by processes. Practical evaluation of data will provide new insights into the existence of operational aspects and expose optimization occasions. Additionally, informed decision making will be possible by considering these data on an unprecedented scale to future planning.

The challenges of such decision making are not easy to address, such as correlation of data across organizational boundaries, measuring and improving the overall performance of processes, and collaborative analysis for managing geographically separated individuals. The problem of this paper is predictive analytics and planning of data from different levels and complexities of HCN processes. Data may come from structured or unstructured processes activities of processing unit operation (e.g., smart phones), location-aware applications, organizational systems, and context-relevant analysis, in which there are different aspects to be analyzed. The situations like these make it hard to make a correct decision via predictive analytics. Also, advanced analytic of HCN is computationally intensive and creates performance problems for illustrative analytics such as dashboards when contesting of computing resources. The research questions of the present paper are:

- What is the approach to predictive analytics of HCN business processes performance indicators?
- How will the performance metrics be employed in planning and decision making?

The contribution of this paper is threefold. First, authors obtain an optimum point of a solution for various inconsistent parameters and Key Performance Indicators (KPI). The solution uses multi valued regression approach for KPIs of vision, goals, strategy, and processes on the metrics values. It will help to build a dashboard in three layers of strategic, analytical and operational. Second, it employs active databases approach to build decision tree on metrics structure. The decision trees are built upon ECA rules that extracted from KPIs. Third, an algorithm developed to ECA rule drift detection which helps decision tree predict the optimum responses. The approach has a model and correspondence implementation that developed to deal with different functional indexes to achieve expected boundary of collaboration. Finally, the approach tested on real data with the implemented application. The results will be used for planning of business processes via performance monitoring.

In the following parts, these items are covered. First, the background studies are provided. Then, our recommended solution to solve the problem above is presented. Third, the experiment analysis, evaluation, and discussion of the method are presented. Finally, the concluding point and future works are provided.

2. BACKGROUND

One of HCN analytic types for Big data is descriptive analytics. It provides insight into what has occurred previously and trends to dig into in additional detail (Assunção, Calheiros, Bianchi, Netto & Buyya, 2015) of predictive analytics. This analytic is essential for cognitive business processes, operational dashboards, and support of business strategy. In HCNs, current business plans are based on traditional multi-party strategies to deliver a direction between predictive analytics and business strategy. The authors’ current information indicates the area of HCN cross-organizational processes and their performance metrics strictly lack prior research in the issue of predictive analytics. So, the previous works have been addressed that have relations to our research.
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