Supporting Proactive Process Recovery Decisions in Agribusiness Using Business Intelligence Tools and Machine Learning - Abstract

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Summary

Agricultural operations are continuously exposed to hazardous situations which can cause their unexpected disruptions. The experiences from the COVID-19 globally in the agrarian industry revealed the need for proactively defining policies to prevent the dramatic consequences of such unexpected business interruptions. A recent study from the Organization for Economic Co-operation and Development (OECD) (OECD, 2020) analyzes the necessity to rely on resilience – oriented policies to minimize the negative consequences of disruptive events in agriculture such as the pandemics or the natural hazards. Nevertheless, the ideal source for charting recovery policies are the continuity and process recovery data provided directly from the agribusiness practitioners. Nowadays, multiple companies which operate in the agrarian sector have started to chart continuity plans which can be activated in the event of a disruption. However, there is no evidence from the literature that these data are organized in sophisticated database management solutions. Due to the fact that big data is undoubtedly one of the assets that dominantly foster decisions nowadays, it can be realized that big data solutions for hosting, analyzing and manipulating continuity data in agribusiness is an issue of major importance. Business intelligence tools may support simultaneously decisions based on descriptive On-line Analytical Processing (OLAP) Reports as well as predictive rules induced via machine learning tools for more sophisticated data manipulation of the aforementioned data reports. To build such solutions, it is crucial to define data dimensions, namely Function, Agrarian Business Unit, Recovery Team, and Resumption Timeframe Required, as well as measurable facts such as estimated resumption timeframe, number of critical/non critical operations. A star, snowflake, star flake or constellation data warehouse schema can be utilized for the conceptual and the logical design. Moreover the SQL Server database management system may be utilized for the physical database solution. SQL Server may support subject-oriented and time-variant business intelligence solutions as well as OLAP reporting services. Machine learning predictive decisions can then be supported by classification or regression tools constructed using the exported data in combination with specialized software packages such as the R-Package for the induction of classifiers such as the decision trees, k-NN, k-Folds, SVM and naive bayes, as well as regression analysis patterns for the exported business continuity data. Additionally, specific data mining tasks, such as the association rule induction, can assist in exploring precise relationships among business continuity variables that affect the recovery procedure. The results which can stem from thorough business continuity big data processing and analysis can be used as feedback regarding risk management policy charting and process availability estimation in the agricultural industry.

Keywords

Agribusiness, business functions, business intelligence, continuity, data, decisions, machine learning, SQL, R-Package, recovery

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