INTERNATIONAL JOURNAL OF SUSTAINABLE DEVELOPMENT IN COMPUTING SCIENCE
OPEN ACCESS, PEER REVIEWED, REFEREED JOURNAL
ISSN: 3246-544X

Review & Analysis of Master Data Management in Agtech & Manufacturing industry

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JOURNAL INFO

Double Peer Reviewed
Impact Factor: 5.6 (SJR)
Open Access
Refereed Journal

ABSTRACT

The role of data science in Agricultural Technology (Agtech) and manufacturing industries remains a top emerging intervention that has revolutionized sustainability and productivity. The measure of this interaction is based on the need for accuracy, precision, consistency, accountability, and uniformity. Such practices would be cited in activities such as crop planning and management, precision farming, market intelligence, value chain integration, climate resilience, and risk management in Agtech. The metrics around these practices are based on the active engagement of the farmers to make observations, collect data, analyze, and create historical data historical data that improves predictive interventions. This would include using data repositories, managing inconsistent data repository standards, sustaining data repositories, and dataset appraisal. Assigning values to the dataset gathered would help the farmers make objective conclusions supported by evidence and research interventions. Transparency in data management is another major component that helps farmers improve the relevance and significance of the information obtained. The same interventions have been realized in the exercise of Master Data Management in the Manufacturing industry, with the activities being enforced to realize a balanced local and global economy, integrating direct and indirect customers and mixing different implementation styles. The concept of master data management has received increased appraisal within the manufacturing industries through the intervention of producing products that are objective to meet customer needs.

KEYWORDS: Manufacturing, Agtech, Data Management, Decision, Information, & Analysis

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INTRODUCTION

The architecture of smart farming and the integration of technology in agriculture have increased data management opportunities. The aim is to have a transparent view of production, commerce, and research about improving productivity. The use of data has presented a diverse environment within the agricultural sector, as elaborated within Agricultural Technology (Agtech) and the manufacturing process. In production, the farmers seek to understand the cost associated with the input to prepare the output for the market. Also, in the commerce sector, the farmers and the buyers seek to understand the value of the

ISSN: 3246-544X

money associated with agricultural practice. Further, using data in manufacturing seeks to understand how value addition improves the utility of agricultural products [6]. The need for data-intensive agricultural research and production is evolving to act as a cushion to the ever-changing customer demands, tastes and preferences, food security, disease, and commerce, among other operations that relate to farming. Therefore, Data science is the most influential technology and processes adopted to improve the Agtech and manufacturing industries. The purpose is to promote increased productivity by appreciating the role of data in understanding the trends within production, manufacturing, and commerce. Improving agricultural practices is best supported by a clear understanding of the input and output interaction to understand the marginal value and utility realized after engaging in agricultural investment. Further, the integration of Master data management proves that business and IT are integrated to achieve accuracy, uniformity, stewardship, accountability, and consistency [10]. Such interventions are crucial in creating a seamless exercise to enhance higher productivity. This paper aims to review and perform an analysis of master data management in the Agtech & manufacturing industry following the complex nature of the processes involved.

APPROACH FOR AGTECH

The evolution of data science in agriculture has proved to be an important development through which farmers, among other shareholders, can hold meaningful conversations supported by data-driven insights. This new trend has resulted in several factors promoting increased revolution as supported by empowering the farmers to approach agriculture through challenges, benefits, opportunities, and innovative solutions [6]. The benefits are best explained in support of the farmers making informed decisions supported by data. Further, data has played an important role in driving sustainable agricultural practices that have been of great importance in countering the current global challenges such as food security, climate change, and poverty. Regarding food security, the world's population is growing exponentially, a major setback that would lead to a greater shock if the right data does not support agricultural production [9]. Feeding this type of population is strenuous and would always lead to a gap in supply amidst higher demand. A report by the World Bank indicates that small-scale farmers account for 80% of the food consumed in developing countries [4]. This is quite an important approach that translates to the transformative role of data-driven agriculture in changing the metrics associated with increased productivity. The benefits are associated with the farmers receiving appropriate knowledge that supports the decision-making process within the context of improving sustainability and productivity. Such actions are based on the farmer's understanding of crop health, soil characteristics, weather patterns, and type of crops. The information is crucial since it also provides an expansive advantage through the farmers making the right choices on fertilization, irrigation, pest management, and market trends.

Relevant weather data includes understanding elements such as humidity, rainfall, temperature, and light, among other meteorological characteristics [6]. On this note, different crops require optimal weather conditions to thrive and increase productivity. This requires the use of data to have a clear direction and deliberation of whether the prevailing conditions support farming activities. For instance, high temperatures are necessary during harvesting, and thus, the farmers must invest in planting during the seasons that will allow harvesting to

be done during the hot periods to reduce loss. Soil data relevant to the farmers includes pH, nutrient levels, soil texture, and organic matter content. These factors are important in choosing soil amendments, fertilization, and conservation [6]. Understanding the variations in the soil properties helps the farmers to make informed decisions about the best combination that would lead to increased productivity. For instance, measuring soil fertility will ensure that the crops have the right nutrients, which is the best choice in fertilization, and pH levels must balance [10]. Therefore, collecting data through soil sampling is important, with the result guiding the farmer on the purchases to make in terms of the inputs. The utilization of market data has also been effective in Agtech, especially in understanding when to harvest the farm products supported by the right information on demand trends, prices, and consumer preferences [4]. This is an important factor that leads to the farmers being intentional about their activities while embracing the best practices.

Several best practices that support data management in agtech have been appraised to lead to improved outcomes and sustainability. This includes peer review interventions, which act as an important practice allowing effective farming activity monitoring. Further, the practice enhances quality control whereby increased consultation is an intervention that supports screening the best available alternatives. The aim is to ensure appropriate frameworks and protocols related to metadata, methodology, and data processing are implemented. This includes having the right data repositories that allow the farmers to learn from historical data to reference in predicting outcomes [4]. Another practice that has been appraised in data management within agricultural activities entails the use of the Minimal dataset development principle. This entails the practice of the farmers only engaging data that is useful and objective to their practice. The aim is to reduce inventory costs while saving time to act on information relevant to the farming techniques utilized [12]. As a result, the farmers will be inspired to quantify variations, which helps maximize the value of the data obtained. For instance, collecting water resource data or nutrient data would help the farmers understand the variation between crop requirements and resource availability [3]. The information can subsequently be subjected to large-scale aggregation, which helps the farmers make informed decisions. The practice helps realize the optimal responses to crop growth by having the right resources available. As a result, realizing finer resolution is made possible by allowing the farmers to make informed decisions that support sustainability and increased productivity [10].

Furthermore, data management in agtech requires improved interventions that support the effective seizure of the data repositories. This would include using data repositories, managing inconsistent data repository standards, sustaining data repositories, and dataset appraisal [11]. Such interventions are cited to include intentional observations of the farming activities to support effective research. Assigning values to the dataset gathered would help the farmers make objective conclusions supported by evidence and research interventions [3]. This is an appropriate intervention through which data modification helps refine the decision-making practices. Transparency in data management is another major component that helps farmers improve the relevance and significance of the information obtained. This is based on the rationale that a problem is easily quantified while allowing the farmers to use the available data to quantify the problem and solutions [10].

Data management practices in agricultural technology have been contextualized in crop planning and management, precision farming, market intelligence, value chain

integration, climate resilience, and risk management [9]. Precision farming is emerging as a top trend that utilizes data obtained through satellite photography and sensors to obtain real information about weather, crop health, and soil moisture. The information aims to aid farmers in improving production, crop health, and resource efficiency [6]. The practice results are low-wastage agriculture followed by the integration of sustainable practices and increased resource awareness. The execution of crop planning and management is best done using historical data to predict the outcomes. The farmers can choose the best practices supporting increased yields and profitability. Such interventions are best realized through the active engagement of the farmers relevant to collecting information about plant growth, pest and disease interactions, and resource inputs such as fertilizers. Through effective data analysis, farmers can apply timely interventions that support decreased loss, optimize pest and disease control, reduce cost, and maintain healthy crops. Further, market intelligence and value chain integration interventions have been important in tech, especially in making decisions based on price and market dynamics through access to real-time data [12]. The farmers aim to improve their competence, competitiveness, and profitability by adjusting pricing, quantities, product timing, and choice of market channels [3]. This has been an intervention that has revolutionized the marketing of agricultural products through increased optimization of practices related to increased market transparency, fair pricing, and supply chain management.

APPROACH FOR MANUFACTURING

The blueprint for Master Data Management in the Manufacturing industry is believed to take its course based on the support of the Internet of Things and technological development. The activities are enforced to realize a balanced local and global economy, integrating direct and indirect customers and mixing different implementation styles [7]. The concept of master data management has received increased appraisal within the manufacturing industries through the intervention of producing products that are objective to meet customer needs. This has been defined through the concept of the industrial Internet of Things, which has refined production to embrace sustainability. The involvement of data has been cited as the common defining factor in which precision and accuracy have been realized [5]. Further, such practices have had the greatest benefits of centralizing data management practices to produce a decentralized effort in balancing local and global production, for instance, through data analysis on elements such as geography, culture, product characteristics, and job specialization. Manufacturing practices are designed to meet diverse customers [8]. On this note, data is the overlying governance framework that helps establish a superior data management architecture. Integrating different data management application styles helps improve the complexity and value of the production process. This is embedded in the need to use data as a framework for harnessing effective implementation in the manufacturing industry [2]. As a result, the improved outcome in serving direct and indirect customers is supported by establishing a functional supply chain that allows that player to collect data relevant to supporting efficiency in manufacturing. Precision in data is considered the key defining factor that results in increased competency in meeting the customers' demands and preferences.

Today's economy at the local and global scale has been heavily linked with increased volatility supported by the high level of competition. As a result, manufacturing companies

ISSN: 3246-544X

have contested to adopt digitalized interventions and systems utilizing data as the governance and operations framework. Vending of data is considered the most important interaction to attain precision in defining the demand and supply, which are crucial in creating a seamless process embedded around effective manufacturing processes [2]. Consolidating data for easy accessibility helps nurture improved productivity by acquiring data supporting value addition. Customers are evolving, and thus, their needs are changing over time. The need for strategic decision-making interventions in the manufacturing industry is an important intervention that helps refine product information to produce a satisfying outcome [8]. This is supported by the unanimous interaction that calls for increased data engagement in the age of information to improve overall productivity, sustainability, and effectiveness. The aim is to create a satisfying experience that allows improved interaction among all the stakeholders by organizing the inputs to produce a finished product that effectively matches the customers' needs [2]. However, achieving such precision is only supported by integrating data to support increased interaction between systems and processes. The process involved in effective master data management in the manufacturing industry includes seeking out new customers by aligning the products with their needs [8]. Also, the practice allows monitoring and audit of company data, which acts as a reference point for establishing systems and processes that improve scalability, management, profitability, and sustainability [5]. Effective data management in the manufacturing industry makes it easy to eliminate incorrect, irrelevant, duplicates, and incomplete processes and systems. This is considered an important step that leads to increased efficiency by only focusing on the value and utility of the input and output, respectively. Further, the use of data has been associated with increased and faster decision-making processes that allow manufacturing activities to be managed in the context of analyzing the trends within the market and using the findings to predict production and sales [13]. Another intervention relates to the manufacturing businesses extracting, sorting, organizing, and standardizing data to act as a database and foundation of improved decision-making [8]. Using multiple data streams, as a result, helps in increasing accuracy and precision by improving the competency associated with improved processes.

The benefits of master data management in the manufacturing industries are, therefore, categorical through providing a single source of information [13]. This is supported by increased data standardization to improve quality and accuracy while integrating various stakeholders, including customers, employees, business partners, and the market [2]. Centralization of the system helps the manufacturers obtain relevant information that helps in improving collaboration, reducing complexity, and saving time. Also, using master data management has improved traceability and transparency by empowering businesses to collect details critical to tracking and improving processes [13]. This has been crucial, especially in providing a platform through which customer experience has improved. The use of data has also led to increased business efficiency and agility supported by simplifying product development initiatives across the different stages within the value chain [1]. Further, it has become easy for manufacturers to mitigate risk with expansive interventions for controlling damage. This has been realized by addressing unforeseen challenges, including supply chain disruptions, workforce disputes, and product recalls. As a result, collecting on such problems, the manufacturer can engage in corrective measures that promote value addition [13]. The result is increased and improved business streamlining through effective inventory management with higher opportunities for business acceleration

ISSN: 3246-544X

into digital transformation.

METHODOLOGY

Research is an important concept that has revolutionized access to information based on applying the best methods and approaches to utilize data. This report has been prepared through the use of a systematic review through analysis of the previous research on the topic. The choice of this method is supported by the need to acquire more data that supports the accumulation of insights to understand how the topic in context is involved. The search strategy used databases such as Google Scholar, school libraries, and government-related government-related websites providing information about agricultural activities. Such databases are chosen based on the need for reliable information.

A clear topic was crucial to narrowing the search strategy by being precise and accurate in looking for the right information. This was guided by the key terms already developed in support of inclusion and exclusion interventions. The articles selected for the review were five years older, which allows the synthesis of current information. Agtech and manufacturing practices are evolving; thus, one must intentionally search strategies to obtain relevant information. Many sources are available, so making the choices through screening the information in the resources is important. This is crucial to ensure maximum data utility in support of the best practices that promote improved agtech and manufacturing activities. Patterns and themes within the articles were synthesized to provide a framework for analysis. This exercise was important to acquire more information to understand how master data management has been used in the tech and manufacturing industries.

CONCLUSION

Data science has emerged as the cutting edge of improved productivity and sustainability. This is a crucial factor that has resulted in increased use of research to empower the farmers in making the best choices. The need to incorporate knowledge and understanding of the current and relevant practice is the most crucial factor that has revolutionized Agtech and manufacturing industries. This new trend has resulted in several factors promoting increased revolution, as supported by empowering the farmers to approach agriculture through challenges, benefits, opportunities, and innovative solutions. In agricultural technology, data management practices have been contextualized in terms of soil data, market data, and weather data to understand how variation in input would influence the realization of optimal productivity. For instance, soil data relevant to the farmers includes pH, nutrient levels, soil texture, and organic matter content. Further, the use of data has been industrialized in Master Data Management in the Manufacturing sector to improve production. The activities are enforced to realize a balanced local and global economy, integrating direct and indirect customers and mixing different implementation styles. The concept of master data management has received increased appraisal within the manufacturing industries through the intervention of producing products that are objective to meet customer needs. On this note, data is used as the overlying governance framework that helps establish a superior data management architecture. As a result, the improved outcome in serving direct and indirect customers is supported by establishing a functional

supply chain that allows that player to collect data relevant to supporting efficiency in manufacturing. Precision in data is considered the key defining factor that results in increased competency in meeting the customers' demands and preferences.

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