

Research Application Summary

How Enterprise Resource Planning (ERP) systems can facilitate Agribusiness improvement and value creation

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Abstract

Enterprise Resource Planning (ERP) is one of the major IT innovations in the world today. Indeed ERP systems over the years have become a crucial element in every facet of business, spanning from multi-million dollar businesses to “table-top” businesses. Generally, ERP systems are basically designed on the various information systems: Transaction processing systems (TPS), Management information systems (MIS) and Executive information systems (EIS) to synchronize and integrate data capturing, processing, reports and resource planning to improve on efficiency and effectiveness in organizations. This study seeks to clone the business processes of commerce business and orient it into the operations of an agribusiness setup. The study highlights the processes and key strategies that an agribusiness firm can deploy to automate, digitize, and bridge data redundancy hence make prudent financial and operational decisions to achieve success in value creation.

Key words: Business process, data analytics, enterprises, information technology innovations, resource planning

Résumé

Le progiciel de gestion intégré (PGI) est l'une des principales innovations informatiques dans le monde aujourd'hui. En effet, les systèmes PGI sont devenus au fil des ans un élément crucial dans toutes les facettes de l'entreprise, allant des entreprises de plusieurs millions de dollars aux entreprises nommées «table-top». Généralement, les systèmes PGI sont essentiellement conçus sur les différents systèmes d'information : les systèmes de traitement des transactions (TPS), les systèmes d'information de gestion (MIS) et les systèmes d'information exécutifs (EIS) pour synchroniser et intégrer la capture, le traitement, les rapports et la planification des ressources des données afin d'améliorer l'efficacité et l'efficacité dans les organisations. Cette étude vise à cloner les processus commerciaux des entreprises commerciales et à les orienter vers les opérations de configuration agro-industrielle. L'étude met en évidence les processus et les stratégies clés qu'une entreprise agro-industrielle peut déployer pour automatiser, numériser et combler la redondance des données, afin de prendre des décisions financières et opérationnelles prudentes pour réussir dans la création de valeur.

Mots clés : Processus d'affaires, analyse de données, entreprises, innovations des technologies de l'information, planification des ressources

Introduction

The world reliance on agriculture cannot be over emphasised. As one of the top sectors in the global economy, it does not only feed the world but also employs 20% of the world population. Considerably, over the past half century, agriculture output is considered to have more than trebled making it an era of unprecedented agricultural abundance (Alston and Pedley, 2004). Agriculture has evolved from traditional to modernized mechanization of farming practices. Farms are developing and increasingly adapting to sustainable, innovative practices centered on technology. As an era of artificial intelligence (AI) and machine learning (ML) has surfaced with drone technology, robotics, DNA recognition, the worldwide goals of increased yield and food security is within reach.

Generally, ERP system is a standardized software package that combines functionality of multiple business functions into one integrated system (Davenport, 2000). According to Basoglu *et al.* (2007), Organizations can reduce the overall costs, make accurate data available in real time and exchange information with key stakeholders. Data analytics as a science, also draws insight from these raw information sources. A combination of the two is a current trend by which organizations are using to transform strategy to achieve goals. These raw data sources form part of the transaction processing system which is collected day by day and further transformed into useful information by Management Information Systems in an ERP. The importance of ERP and data analytics are enormous; and these include;

- Increased efficiency: Organizations can work faster and coordinately. With the flow of information through the processes, work is facilitated with speed, accuracy and duplication of functions is overcome. Now, most ERP have E-filing function embedded, which makes it simple to keep documents for easy retrieval.
- Improved reporting and planning: Preset reports such as income statements and financial position can be generated in time at the click of a button. Reports can also be compared over periods to aid in decision making or analysis. Budgets can be fed in the system and periodic results measured. Likewise, budgetary control is improved to ensure the judicious usage of resources by setting limits and quotas.
- Data security and quality: Data security is enhanced with the use of ERP and further with cloud storage. Data controls are set to manage who edits, sees, initiate, approves, information in the system. Log activities are recorded to improve security and facilitate fraud detection. Similarly, linkages between data are not broken in the process leaving trails for easy query.

Most ERP's are generically crafted, which limits users to a few functionalities. However, with the trends in systems development and technological advancements, a number of software providers are switching to user customization and cloud services to further strengthen efficiency and effectiveness of the various primary business cycles. The use of ERP's have evolved and developed to augment these cycles across a wide spectrum of industry as more modules are add-ons to improve data collection, synchronization, resource management, talent management, risk management, and financial and non-financial support aimed at achieving operational and strategic goals.

Agriculture is yet to fully experience these revolutions of software engineering and data analytics as it has not being the focus of many software providers as compared to the commerce and general

business. This can primarily due to the broad nature of Agriculture as its business cycle takes long, and are often unstructured processes to complete. To add to the above, the standards set out by the International Accounting Board for adoption of companies and businesses in financial reporting also delayed to release the full standard for agriculture reporting. The IAS 41, the standard set to regulate the preparation of financial statements for agriculture business was released in 2003. This is years after the adaption of ERP's by most businesses. Even in this regard, some aspects of agriculture are not fully covered under the standard. This also affects the current strategies of agricultural enterprises, who tend to consolidate the primary and secondary roles of farming, manufacturing and finishing of their products and by-products. Agribusiness is therefore a transition from subsistence to commercial agriculture with a market-oriented approach to customer satisfaction.

The success of an ERP system in an organization is based on some facets; People, procedures, data, hardware, and software. This forms the core of any information system for which the importance of an ERP can fully be realized. The components of a master database, data fields- for data capturing (inputs), reports (output), and controls to further strengthen the security and ensure accuracy in the database system is a pre-requisite to supplement the core components. Just like any ERP system, there must be the need to understand and review the processes that is carried on from inception to end of the cycle. Agribusinesses have different "modus operandi" such as out grower, in grower, etc. For a typical agriculture business, additional modules will be needed to fully integrate its operations to facilitate full function ability. How can this be achieved? What are the necessary set up requirement? What value creation does this add? How can the process be improved? These are critical questions in ERP set-up and roll-out.

Modules. Table 1 briefly highlights the various modules and the requisite information which will be required/sourced and its related significance in Agribusiness sector. This module will further compares the core functions of an ordinary ERP system for commerce. From the table, it is approved that, there are no huge differences in the function or usage in the commerce industry and that of agriculture. In such a case, it can be concluded that an ERP system can be set up for an agriculture production or farming. The limitation is that fundamental modules embedded in generic packages will not be enough to satisfy full functionality of the ERP. This means that there will be product modifications to the traditional packages or a new customized software to synchronize the process. An intermediary information system for the operations will be needed to bridge the processing of information into the other modules. This module could be termed as the farm management system. What this seeks to achieve is to create a database where data relating to the farm will be maintained and processed. This will be the elementary or primary database for which the other components or modules will be dependent on.

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Processes

An order to delivery (OTD) process can be duplicated for this process. An OTD process covers the core flow from initiating order until the product or service is successfully delivered to the customer. The OTD process consists of various accounting transaction cycles. Accounting transaction cycles refers to the processes that a transaction passes before ending in the General ledger. Getting the basics right is key especially having the right field segmentation and the type of database management system to keep often wether hierarchical database or relational database.

Table 1: Modules needed for Integration

Module/ component	Data required	Purpose
*Accounting OR Finance	Financial transactions from day books, General ledgers, and other modules	To consolidate financial records from all modules and provide indicators for managing key stakeholders, transactions, internal and external stakeholders
*Stores & Logistics	Input requisition	To manage the necessary logistics, inventory and materials requisitions for input or production and storage for produce or output
**Human Resource & talent	Payroll, staff data, alumnus,	To manage human capacity and strategy recruitment of staff as well as other Administrative functions
Farm / Agric Information	Acreage, yield, plant count, Extension officer, inputs allocation	To manage the farm, farmers, plant, extension and training components
***Manufacturing & Processing		To assist with cost associated with manufacturing, input processing and provide information for decision taking on pricing policy and materials improvement
*Sales and Customer		To manage customers, revenue and track ageing receivables to improve cash management
Business Intelligence/Data Mining	Data from all modules	To use current information from various sections of the modules to make predictions about the future and plan accordingly to improve processes and efficiency
***Quality Control	Set standards, food safety requirements, Information from Farm Data Module	Manage quality control, disease control and ensure continuous research and development to improve yield or output
*	Basic modules in almost all ERP's	
**	Not exclusive to all ERP, could be an add on	
***	For business and firms in large production with multi-product processes	

Typically, agriculture begins with identifying the various soil components and what should be cultivated. Further to this, geographic and metric data are required to plan the farm and prepare adequately for the growing season. Based on preset standard, input quantities may be determined or allowed to vary with expected output by increasing the input quantities. This will also be set as a basic indicator for performance measurement at the end of the cycle. As requisition is finalized, procurement cycle commences with quotations assessment, delivery and receipt in the warehouse. Inventory items are then issued to their respective crop units. To facilitate and ensure meticulous decision making, information must be captured for each class of crop cultivated and associated cost

pinned to it. Depending on the quantum or nature of the field, cost can be allocated to each plant for instance, tree crops. The latter is critical as it will be the source for data mining and gathering intelligence to aid in future decisions.

As the season progresses steadily, various agricultural practices are observed in the life stages of the crop; during this, the extension subsystem of the farm manager commences with the periodic update of data and information relating to the field. This step is equally of significance as it captures data on the growth of the farm. For a large maize field, data on germination period, plant count, cobs per plant, tassel period, plant height, maturity date, harvest date, will be collected for each position of the field. Advanced data regarding temperature, rainfall, humidity, soil acidity, e.t.c., can further be collected to boost research and quality control during scheduled field visits. This allows further analysis to be conducted using various internal and external data analytical tools, thus building a firm dimensional relationship between financial and non-financial needs.

During harvest and manufacturing, synergy in the system is increased as produce will be harvested, stored in the warehouse as inventory for production or sold to potential customers. This involves a large connection and reliance on data from the Farm Manager Module, stores module, manufacturing, through to the sales or receivable module. To improve this process, data on weight, yield, and material input will be a primary to determine the amount of finished product and eventually product pricing. As the adage goes, “Production is incomplete without reaching the final consumer”, customer relationship management module makes it possible to manage all customers by relating to their needs such as processing sales orders, managing cash receivable, reaching out to target markets and providing analysis on market trends. As the goal of businesses is to maximize value through profit making and high market share, customer relationship is critical.

New trends. Business processes are perpetual hence as one completes, another begins. To build on value, it is important to analyze, make meanings and plan for the next cycle. Moreover, for data analysis, business intelligence is a strong tool to achieve this. Business processes need optimization from time to time to improve operational efficiency; cater to changing market demands, changing technology, changing customer needs and stay ahead of competition. Data from the various modules can be analyzed to identify trends and make predictions of production cost, yield, inventory, customer engagement, expenses, sales, quality check, revenue, etc. The data can be analysed with third- party software’s such as SPSS, Microsoft Power BI, Tableau and STATA. This helps to make meaning by identifying correlations and other statistical information. Artificial intelligence may help businesses to make accurate predictions based on data stored in ERP.

As afore mentioned the rise of artificial intelligence and “Internet of Things” have opened up new avenues and roles for ERP tools. As such, ERP tools can be integrated with sensors on the field, drones, and metereology services and even integrated with suppliers to provide just-in-time inventory services, provide maintenance and after sales support or perhaps link up with banks to make and receive payments. The possibilities are boundless and businesses need to work with their respective stakeholders regarding which emerging technology is best suited to integrate with ERP to meet their unique business requirements.

Finally, data can be presented in different data visualization forms; preset reports such as bar diagrams, pivot charts, pie diagrams or by way of customization, where the user determines which sets of data relationship to view. Reports can be generated in real-time so that the ERP systems stays updated with relevant data.

Conclusion

The deployment of ERP is critical to the success of every organization. Despite its associated cost, its benefits are priceless and indispensable. going forward, ERPs will contribute significant percentage to the overall value creation of an enterprise when well managed. In agri-business, ERP may seem difficult to deploy, however, an in-depth thought, combined with technical assistance is a preamble towards the integration process. To strengthen the value created, reliance on data analytics is crucial to sustainability and a paradigm shift to strategy formulation, deployment and overcoming competition.

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