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Carolina Ingredients and the Maturation of A Management Information System

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Carolina Ingredients was a successful food ingredient distribution company that relied heavily on its information systems to run its daily operations. Doug Meyer-Cuno, founder and CEO, had recently hired Paul Kunath to administer the company's networks, as opposed to continuing to outsource the management of the information systems to an external vendor. When Paul Kunath came on board, he implemented several improvements to the operating procedures of the company. But, then he ran into a problem. A newly implemented inventory management system was not operating as expected. In a weekly meeting of the executive team, Kunath reported, "Customer service is at risk. Initially when we installed the scanners, we expected to be able to track every ingredient as it moved through the systems. We thought it would decrease time from order to shipping and reduce errors. But the scanners are still not working properly. I've had the vendor here working on it--with no success." Meyer-Cuno then responded, "We've spent what – about $40,000 on the scanners and software? They're still not working? What would it take to fix it? Or should we scrap the whole thing?

Company Background

Carolina Ingredients was established in 1990 as an industrial food ingredient manufacturer, located in Rock Hill, South Carolina. The company offered all-inclusive ingredient and blending services, and then produced and packaged those custom seasoning blends, for business-to-business customers throughout the United States. The global seasoning and spice market was valued at $12.5 billion in 2013 and was expected to grow at about 4.8% per year through 2019. (Thomas, 2014) According to Meyer-Cuno, the seasoning industry was segmented into three categories: retail, industrial, and food service. The retail market was comprised of grocery store chains, specialty high end stores which focused on spices and seasonings, and local specialty gift shops. The food service market focused on chain restaurants, food service distributors such as Sysco, and individually owned restaurants. The industrial market, which was Carolina Ingredients' sandbox, was comprised of food manufacturers and processors. The market space consisted of small regional seasoning manufacturers, larger regional players, and national manufacturers. Carolina Ingredients was the southeastern's largest seasoning manufacturer, focusing on the industrial market. Their seasoning blends were sold in 35 states across the country.

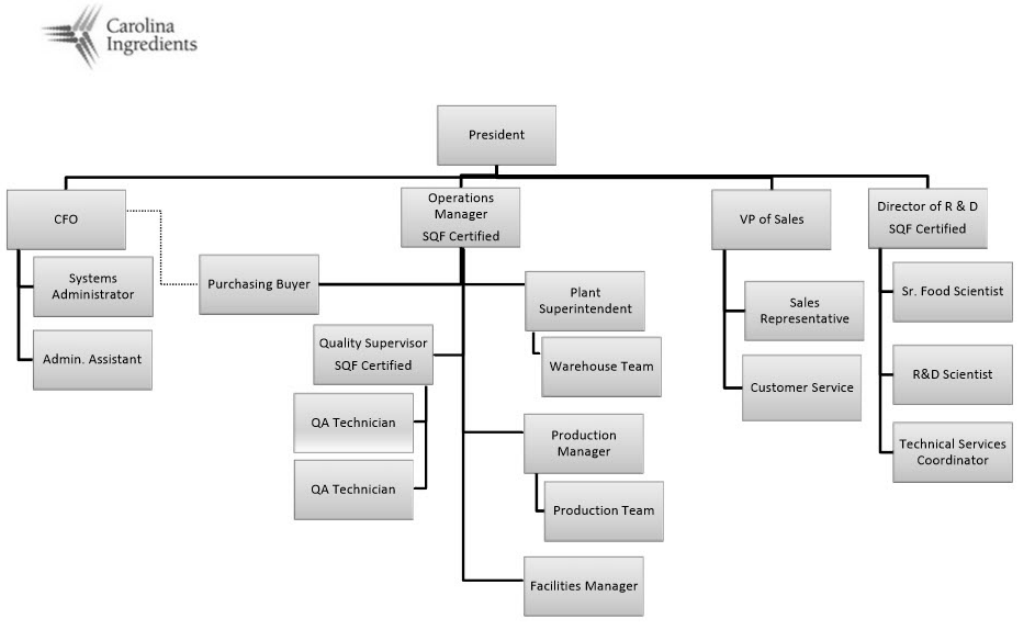
Carolina Ingredients provided safe, high-quality, value-oriented products and services to its customers. In fact, they had earned numerous awards and certifications for food safety and quality, such the Certification of Safe Quality Food (SQF) - 2000 Code. This award was earned after an intensive 3-day audit in which the company's food security, traceability, and safety were deemed to meet the standards of the Global Food Safety Institute.

In addition to providing safe and high-quality products, Carolina Ingredients delivered its products to customers in a timely fashion. For example, a Director of Research and Development at a large poultry company, who was a customer of Carolina Ingredients, provided the following testimonial for the company's website: "I asked for a sample at 11:30am on a Monday morning and received that sample at 10:30 the FOLLOWING DAY! Carolina Ingredients R & D response time is unmatched in this industry and has made my job 100% easier."

The manufacturing systems at Carolina Ingredients operated 40 hours per week, employing approximately 40 people. Fluctuations in demand for their products were minimal with sales analyses showing a slight increase in orders just before the winter holidays. According to Meyer-Cuno, past experience suggested that customers had increased demand for baked goods and food preparation for the holidays.

The leadership team (see Figure 1) at Carolina Ingredients focused on efficient and effective management of processes, especially with respect to sustainability and operating procedures. This focus had paid off as the company was named a finalist for the "South Carolina Manufacturer of the Year" in 2012 by the South Carolina Chamber of Commerce. This was quite an accomplishment as the other companies that were nominated, such as The Boeing Company, Proctor & Gamble, and Cytec Industries, were much larger and more established than Carolina Ingredients.

Figure 1: The Leadership Team for Carolina Ingredients



Improvements in Sustainability

The sustainability efforts at Carolina Ingredients were unique to the industry. As a business-to-business industry, this made them a perfect partner for environmentally sensitive companies. Carolina Ingredients had first incorporated many green initiatives to add value for its customers but the company quickly realized the benefits of being environmentally responsible. According to Meyer-Cuno, "one of our niches is working with customers that have environmental or sustainability programs. And when we started looking at sustainability, we realized we could save money by implementing certain programs. We could actually bring money to our bottom line."

Carolina Ingredients was the first industrial seasoning manufacturer in the nation to be housed in a LEED Silver certified facility. LEED was a certification that a construction project was designed and constructed meeting objectives developed by the U.S. Green Building Council (USGBC). A 60,000 square foot LEED certified facility housed the production facility and office spaces. This building was purchased in 1990 and renovated with the goal of sustainability in 2009. The company's commitment to sustainability and environmental responsibility was seen throughout the whole facility. For example, visitors to the business offices saw an attractive computerized display in the lobby that summarized the efficiency of the facility's energy consumption. In addition, the $5 million facility employed many of the more common LEED certification standards, such as furniture using low volatile organic compounds, use of building materials produced locally, and extensive use of natural lighting.
During the renovation, much of the material removed was recycled and new materials were purchased from local suppliers. Complete replacement of heating and air systems and electrical devices was necessary. The new systems were much more energy efficient. The installation of a

May 2015, Vol. 33, No. 1, p. 45-52
ISSN 2162-3171

roof mounted, 156 unit photovoltaic solar system produced electricity for the facility, meeting the energy needs of both the production facility and administrative offices. According to Meyer-Cuno, since the system's introduction in 2009, the unit had produced more than 201,000 kilowatt hours of electricity. In an average month, close to 3000 kilowatt hours were produced. This photovoltaic system reduced carbon emissions by nearly 25 tons per year.

Additional sustainable initiatives undertaken by Carolina Ingredients included the use of recycled paper for business papers, an in-office recycling program, preferred parking for employees driving hybrid vehicles, and timers on the lights in office spaces. In addition to these initiatives, key sustainability performance indicators were established. Data on these indicators was analyzed and reports were generated on a variety of measures, such as energy consumption, materials recycled, waste produced, and office products consumption. Assessment of performance indicators by Carolina Ingredients, along with LEED certification, helped the company to ensure continuous improvement and to illustrate to its customers that their claim of environmental responsibility was valid. According to Meyer-Cuno, "We are not just another company 'greenwashing'--trying to leverage minimal efforts in sustainability. Our efforts have been meaningful. Approximately 5% of our company's net profits have been realized by sustainable business practices."

Improvements in Operating Procedures

Carolina Ingredients had also made continual improvements to operating procedures over time. In 2010, when the management team realized the centrality that the management information systems had in daily operations, the company's current MIS systems were being managed by an external consulting firm on an as needed basis. Because of the use of an outside firm, the level of control over management of the systems was not satisfactory. Problems with the system required contacting the firm and scheduling maintenance, which prevented timely solutions to problems as they arose. Meyer-Cuno made the decision to hire an internal system administrator to become a part of the leadership team.

Paul Kunath joined Carolina Ingredients in 2010 with over 12 years of experience in corporate systems and network administration. As Paul came on board, he began to assess the current technological systems and safeguards. He found that each employee's work was stored on computer hardware assigned to the department. His examination revealed that most employees were using reasonable methods of creating backups of their own work but there was no consistency in the methods that individual employees were using to back up data. He determined that the most likely reason was because there was no standard operating procedure for backing up data.

Each department had specific productivity software in use for specific tasks. For example, Sue Curtis, in Research and Development, was using a spreadsheet application extensively for calculating ratios and keeping records for her department. Lou Quievryn, the CFO, was using a financial accounting software application for record keeping and automated financial reporting. Energy use was being monitored and reported by Mike Cantore using proprietary software

May 2015, Vol. 33, No. 1, p. 45-52
ISSN 2162-3171

designed for use with solar panel systems. Each department had access to a shared drive to facilitate backups and sharing of files.

Kunath also implemented a process to back up all employee data, applications, and shared drives for Carolina Ingredients. Full backups of the domain controller, the SQL server, the applications server, and the Voice Over Internet System were made three times each day. The backups were stored using the RAID method (a redundant array of independent disks). The full set of backups was then stored off site daily. This system of backups also allowed "rolling back" to previous versions of files for one full week.

In addition to creating a backup process for employee data, applications, and shared drives for Carolina Ingredients, Kunath created documentation of all network and systems administration processes. The documentation included IP addresses, logic maps, passwords and other specific details of this system. Copies of the documentation were then filed in the office of the system administrator as well as provided to the senior management team.

A second project that Kunath undertook was related to improving security procedures and processes at Carolina Ingredients. When Kunath started with the company, the employees exhibited a high level of loyalty and commitment to their work. Security was minimal. However, the very nature of the food industry necessitates a very high level of quality control. Customers and end consumers want all food products to be produced in a tightly controlled, safe environment. In addition, food companies have had to contend with potential threats from bioterrorism since the September 11 attacks on the World Trade Center.

Even though there had been no known security breaches at Carolina Ingredients, Kunath and the management team made the decision to implement a proactive approach toward securing the facility and the company's information systems. Entryways were equipped with keypad locks, allowing access to specific areas to be controlled using a computer system. Access to each area of the facility was made available only to those whose work required access to the area. A video recording system was installed, monitoring most areas of the facility at all times. This increased level of security was an added protection for the company, its assets and the safety of employees. A system of archival for the video recordings was developed. File management systems were implemented that allowed access to digital information only to those employees with a need to access the system. Furthermore, security of the room that housed the computer systems at Carolina Ingredients was improved. Under the changes, the systems were maintained in a room with no windows and independent cooling systems. Entry to the area was controlled by password and key.

Although the changes to back-ups and security procedures were substantial, they did not present much of a problem for Kunath and Carolina Ingredients. All changes were implemented rather smoothly and in a timely fashion. It was at that point that Kunath began to work on a third assignment that presented a bigger hurdle for the company to overcome.

The Production Process

Procurement

May 2015, Vol. 33, No. 1, p. 45-52
ISSN 2162-3171

When Carolina Ingredients placed an order for raw materials with one of their suppliers, the order was entered into the company's Enterprise Resource Planning (ERP) system. A Bill of Lading was received with each new shipment of raw materials and provided details of the materials in the shipment. A Certificate of Analysis also accompanied all raw material. Raw materials were not accepted until the Certificate of Analysis was compared against specification to ensure that the material met required specifications. Lot numbers on the Bill of Lading were compared to the lot numbers on the Certificate of Analysis to make sure they matched.

Material Safety Data Sheets were also received with raw materials and included instructions for handling and storing the product safely, along with physical data, such as the melting and boiling point. Nutritional data, allergen statements and kosher certifications were recorded. All of these steps were designed to insure the integrity and quality of the product met Carolina Ingredients product quality standards.

After careful review of all of the shipment documentation, an employee signed off on the receipt of the shipment. Lot numbers were recorded on each receipt allowing for the traceability of raw material from receipt to batching, production, and shipment of finished goods. Product specifications were scanned and filed electronically with digital copies maintained for several documents.

Once the raw material was fully accepted and logged as received inventory, a barcode was generated from the inventory management system and placed on the package of the raw materials. Upon receipt of the barcode label, the raw materials were finally moved into the warehouse. The exact warehouse location of the product was also stored in the database as part of the product record. Although complex, this process eliminated the need for paper-based inventory management forms and greatly reduced errors due to manual data entry.

Filling an Order

The next step in the production process involved creating the customized product to fill a customer's order. An employee would query the database to find the necessary raw materials for the order and identify their locations in the warehouse. As the products were found in the warehouse, a handheld scanning device was used to scan the barcode and then enter the amount of product being moved from the warehouse to the production area. This scan linked the specific raw materials, along with lot numbers, to the specific product being created for a particular order. The database system was updated in real time, as raw materials were being moved to the production area. Each production area was a separate, fully enclosed, ventilated room to allow a sterile mixing environment with multiple quality control measures. Packaging was also done within that sterile environment to avoid any contamination.

The original lot number that was created when the order was taken was used throughout the production process and was displayed on the packaging of the completed order that was ready to be shipped to the customer. Simply put, the systems at Carolina Ingredients were designed to facilitate a seamless process, tracking raw materials from the initial customer order, all the way to the end product that was ready for shipment.

May 2015, Vol. 33, No. 1, p. 45-52
ISSN 2162-3171

The Enterprise Resource Planning System and Inventory Control

When Kunath began his third project, Carolina Ingredients utilized *Microsoft Dynamics Enterprise Resource Planning* (ERP) software, which gave the employees access to the commonly used productivity tools of *Microsoft Excel, Word and Powerpoint*. The company also had a software *Horizons International* that integrated with the *Microsoft Dynamics* ERP software. *Horizons International* provided an interface between the scanner data software and *Microsoft Dynamics* ERP system. This was important because the manufacturing process at Carolina Ingredients began with the order being received and logged into the *Microsoft Dynamics* ERP. The whole ERP system was then used for logging and displaying correct ingredient measurement, inventory control, and for real time perpetual inventory and cost control, production and material planning.

Recall that the hand-held scanning devices were being used throughout the production facility to facilitate timely data entry and to increase accuracy. Carolina Ingredients had begun using the scanning devices in 2012 after much research was done on currently available scanning systems. The vendor was an established company with a reputation for excellence. Hardware components of the system were warrantied against manufacturer defects for 90 days and the software was covered under no specific or implied warranty. The system was capable of recording the necessary data and was designed to be used with *Horizons International*. The handheld devices and related software were purchased at a cost of over $40,000 to enable Carolina Ingredients to seamlessly track inventory from the time it was ordered through the manufacturing process in real time. The scanning system allowed the use of barcodes to track inventory from the time it was received throughout the production process. At the time Carolina Ingredients received an order from a customer, it was entered into the ERP, a lot number was created, barcode labels were printed and the necessary raw materials were to be flagged in the inventory system as "allocated." The raw materials were then earmarked in the database for use with that specific order. The use of this system reduced the need for manual data entry, lowered the consumption of resources, and minimized the probability of errors.

Problems with Implementation

However, as Kunath led the implementation of the scanner software, he realized that it had not worked as planned when it was originally purchased. At the time of the initial installation of the scanning system, the software had just been released and did not yet contain the module that allowed the scanner software to interact with *Horizons International* and thus the data could not be integrated with the ERP system at Carolina Ingredients. So, the scanner system was initially installed and put into use in the warehouse with plans to continue the implementation to other parts of the company as soon as the appropriate software module became available.

Approximately three months later, the module was delivered and installed at Carolina Ingredients with the hope of allowing the scanner system to be integrated with *Horizons International* and thus the ERP system. And yet, after installation, the module did not work as expected. As stated by Laudon, and reiterated in many MIS textbooks, new software must undergo thorough testing to ascertain whether or not the system produces the desired results.

Test results must be carefully reviewed. In many instances, parts of the system need to be corrected or redesigned. Kunath made multiple attempts at configuration but the scanner system still did not integrate with *Horizons International*. Kunath contacted the vendor for technical assistance. Since the module was relatively new, the technical support providers from the software vendor did not yet have experience with the update, and therefore, they could not easily resolve the problem. The vendor then sent its own technical support personnel to Carolina Ingredients to uninstall and reinstall the system in an effort to get the systems to integrate. The problems between the two systems persisted and time was dragging on. The vendor, who had indicated that the systems would work together upon the sale, assured Meyer-Cuno and Kunath that they would work diligently to develop a new update, or "patch," to the system. The new patch would be made available to Carolina Ingredients as soon as it would be developed but the vendor could not provide a specific timeline for development. But time was dragging on and Kunath was unsure whether the company wanted to wait another three months (or longer) to potentially have a patch installed that was not guaranteed to work. Meyer-Cuno had scheduled a meeting for the leadership team to discuss these issues next week and, in preparation for the meeting, Kunath wrote down four different solutions to the problem that he wanted to present to the group for discussion: 1) consider purchasing a different scanner system and implementing it as soon as possible, accepting the sunk cost of $40,000; 2) continue working with this vendor, even though a solid timeframe for delivery of the patch for the new module was not provided and there was no guarantee that the patch would solve the problem; 3) hire an outside computer systems analysis and design firm to develop a solution to the problem; or 4) dissolve this whole project immediately and revert to manual processes until an acceptable alternative was identified. One way or the other, Kunath hoped the group would be able to come to a decision on how Carolina Ingredients should proceed.

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