

TECHNOLOGICAL ADVANCEMENTS OF ORDER FULFILLMENT WITH THE  
UTILIZATION OF BUSINESS PROCESS MANAGEMENT: A BUSINESS PRACTICUM OF  
LOWE'S COMPANIES, INC.

by

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**Abstract**

This thesis reflects the evolution of order fulfillment at Lowe's Companies, Inc. with the aid of business process management from an intern's perspective. In retail, the process of order fulfillment changes almost daily, which makes it very difficult to keep information systems that manage these operations up to date. However, until the recent CEO of Lowe's Companies, Inc. was brought in, the company had failed to update its technological systems for order fulfillment in an effective way. The study presents managerial insights into the technological advancements being implemented at Lowe's Companies, Inc., with an emphasis on the new order management system (OMS) that they are creating to support their order fulfillment. Further, recommendations are given for ways the company can continue to succeed.

## **Introduction**

On July 2, 2018, Marvin Ellison became CEO of Lowe's Companies, Inc. Shortly after he acquired this role, he addressed the company employees in a meeting about what he discovered within his first week. He stated that during this time he had worked in several stores across the country where he realized one of the main things that needed to be improved. A practice he found was that if he were to purchase one of the kitchen displays in its entirety, one of the store associates would go in an office area and write it on a whiteboard. The process was not reliable, and the technology that Lowe's had been developing at the time was considerably more advanced than what would be required to create this technology. They had a desperate need to focus their technology on the basics, but they had alternatively been inventing programs that were focused on virtual reality and robotics among other things.

My first summer internship experience was during the CEO transition, and this enabled me to see the beginning of the changes in the direction and structure of the company. This included several hiring and firing events of upper-level executives in order to instill a major redirection in the company. During my second summer internship experience, I returned to Lowe's to determine what improvements had been done specifically through business process management with their bulk order fulfillment process within the organization and what could still be improved. The remainder of the paper is organized as follows: Literature Review, Case Study, and Conclusion.

## **Literature Review**

### **Company Background – SWOT Analysis**

Lowe's Companies, Inc. is a Fortune 40 company positioned to thrive in the home improvement industry. With steady competition, the company is consistently attempting to gain

ground on its number one competitor, Home Depot. The home improvement sector is changing significantly due to several internal and external forces. Forces related to strengths, weaknesses, outstanding opportunities, and threats that the company must navigate through are discussed next.

### **Strengths**

Lowe's demonstrates several strengths that enable its revenue to accumulate tremendously. One of the most crucial strengths that Lowe's takes advantage of is its brand acquiring strategy. The Lowe's brand strategy is to continually look to acquire strong brands to include in its portfolio, as they have done recently through an acquisition of Craftsman tools (Isadore, 2017). In addition, sponsorships have played a large part in this brand portfolio as well. The company has been fortunate enough to be the "official home-improvement retail sponsor" of the NFL (Peterson, 2019).

Another strength for this company is its financial stability seen in its current ratio, which is 1.06 (Yahoo, 2019). This ratio explains that Lowe's current assets are greater than its current liabilities. This is only 0.04 less than Home Depot's current ratio, which demonstrates that Lowe's is managing its assets and liabilities nearly as well as its closest competitor.

A final leading strength and core competency of Lowe's is its attention to supply chain in its distribution area and the resources available to support it. Lowe's is focusing more on its supply chain than ever before due to the emphasis that Marvin Ellison has placed on that area of the business. For example, the supply chain focus paired with the emphasis on technology makes ride-sharing services such as Lyft and Uber a delivery option (Wallman, n.d.). With this unique opportunity, Lowe's has been developing plans to enable active drivers to acquire delivery items from stores in a specific area and deliver them directly to customers. This is supplemented

through the company's very own Innovation Labs and other companies such as FedEx that work together to determine a solution for two-hour delivery for this specific company (Howard, 2019). The retail industry as a whole has been pushing for two-hour delivery or other similar aspirations, and the research and development area's ability for Lowe's to be able to foster this idea is crucial to its everyday competition.

### **Weaknesses**

There are certain weaknesses of the company that can be detrimental to its business, but, with the right situational handling, the company can mitigate these flaws. While Lowe's is working on being all-inclusive and attempting to include professionals in its sales and marketing sectors, this is where one of its weaknesses lie. The company is already well-known for appealing to the 'DIY' or 'Do-It-Yourself' consumer, which the company capitalized on during this segment's introduction. Because the company has realized the lost sales it has endured from 'forgetting' the professional consumer base, Lowe's is navigating how to allocate advertising so that the stores appeal to both DIY shoppers and the industry professionals. A Forbes contributor stated that "DIYers are more likely to be millennials," and because of the lack of trade skill professions that the younger generations have been drawn to, this also divides the segments further by a large age gap (Gold, 2018). It is important for the company to take back part of this market from Home Depot while capitalizing on this growing target market in order to gain ground through revenue and net income improvements.

Lowe's places a large emphasis on importing goods to sell to customers. Lowe's is the fourth largest importer in the United States at 287,500 twenty-foot equivalent units (TEUs), which makes this reliability on imports a weakness to the company (Routley, 2019). However,

Home Depot is the third highest importer, and what is affecting Lowe's is affecting this company significantly more (Routley, 2019).

The inability to plan and implement technology has been one of this company's greatest research and development weaknesses for an extended amount of time. The lack of effort towards the effective implementation of technology has drastically put Lowe's behind Home Depot. From personal experience, Ellison explained that the order fulfillment at Lowe's failed to have any technological influence, and the orders could easily be lost. However, the company has recently announced the installment of a twenty-three floor Technology Hub in Charlotte, NC, and the new CIO, Seemantini Godbole, has redirected the scope of technology at Lowe's to be comparable to the competition ("Lowe's," 2019). Lowe's has been trailing Home Depot for some time, and with the cohesion of Ellison and Godbole, the company is finally making the effort to push past Home Depot.

### **Opportunities**

In terms of the macro-environment, Lowe's is provided with several opportunities that enable its revenue to accumulate. One of the most crucial opportunities that a company such as Lowe's can take advantage of is an occurrence of a natural disaster. For example, if a hurricane hits, many individuals may lose power, which leads them to flood home improvement stores in search of products such as generators or batteries. This allows companies such as Lowe's to increase its sales revenue and its media presence by sending out employees to give aid to struggling communities recently affected by these events. Another macro-environmental opportunity for this industry is the ever-increasing advancement of technology. In this day and age, the popularity of smart homes has sky rocketed, causing the home improvement industry to

begin carrying technologically advanced products that enable customers to complete tasks such as turning lights on and off by voice command (HIRI, 2017) .

While the opportunities in the macro-environment are extremely useful to the home improvement industry, there are several opportunities within the industry itself that play a large role in the companies' changing operations. Many companies are navigating how to allocate advertising to DIY customers so that the stores appeal to both this emerging type of shopper and the industry professionals. The DIY emphasis on this segment of the population that are actively buying and renting their first homes creates a large increase in the demand for products at a home improvement retailer. This gives companies like Lowe's the opportunity to capitalize on this growing target market, and with the growth of its technological product line, Lowe's is very well equipped to handle the influx of DIY customers. An inspiring opportunity that Lowe's has been able to take advantage of in the industry is its creation and launch of Generation T. This is a public movement that has been sponsored by many home improvement companies encouraging people to look for trade jobs. These jobs are apprenticeship-based instead of degree-based, and in society now, more and more people go to college to ultimately get degree-based jobs. This movement was started to get people back into the jobs that require trade skills, as the numbers have been greatly declining, and as the movement takes off, Lowe's will be able to capitalize on all of the additional sales from the career growth.

### **Threats**

As with any industry, there is a plethora of threats in the macro-environment that affect each industry in different ways. The tariffs on steel, aluminum, and Chinese imports have threatened Lowe's specifically from the imports of smaller products such as hammers to larger products such as washing machines (Rosenblatt, 2019). This strain is costing Lowe's and other



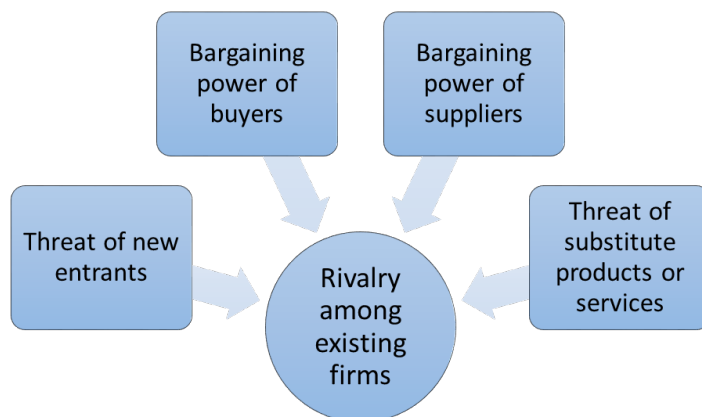
companies affected by the tariffs a significant amount of money and effort to get products from overseas. While natural disasters can positively affect Lowe's, they can also limit the company's productivity due to rerouting products and the inability to traverse through affected areas, creating a large threat to the business. Sustainability as a movement has been radical in the change of the business world as a whole. However, in this specific industry, the push for sustainability contrasts with the acquisition of some products such as lumber. With this product alone, trees are cut down and in order to build, land must be cleared. This creates a threat for Lowe's from this goal to build and improve establishments.

Within the industry, the popularity of renting living space is increasing, which in turn is making the community harder to sell to. Most rentals, apartments especially, do not allow personal alterations to the living space, which in turn creates more of a need for portable items which are cheaper than the larger projects (Gold, 2019). In this industry, the threat of substitution is very high. Lowe's has been trailing Home Depot for a decent amount of time, and with its new CEO, Lowe's is finally making the effort to push past Home Depot.

### Porter's Five Forces Model

**Figure 1**

*Porter's Five Forces Model*



*Note.* This displays the five forces that can have an effect on competition between companies in a specific industry (Dudovskiy, 2016).

The Porter's Five Forces Model, as shown in Figure 1, is used to assess competition in any given industry. In reference to this model, Lowe's is fortunate to be in an industry with a high barrier to entry. Home Depot and Lowe's take up such a large majority of the market that there is a very narrow chance for a competitor to take hold of any significant part of the industry. With this competition, there is a large rivalry between these two brands and tension is very high as these companies fight over larger portions of the market share. There isn't a heavy emphasis on the power of buyers, but suppliers have a lot of power due to the specificity of the products each company sells. The substitutes for the products sold in either store are the products sold in the rival store, leading to an increase of tension.

### **Business Process Management**

Business process management is an essential part of any organization due to the impact it can have on company success as a whole. Dewey (2014) defines this concept as "a method by which a business undergoes inspection of the entire operation of its network to evaluate processes, termed workflow, and to make specific recommendations for improved efficiency and productivity as a way to optimize operations." As an organization goes through its day-to-day operations, the efficiency of a certain process may suffer whether the process has been 'broken' or not. The phrase 'if it isn't broke, don't fix it' is far from what business process management supports.

Initially, according to Dewey (2014), projects were "evaluated independently" of one another. When multiple projects are evaluated without the same constraints, many different interpretations and formats are created. This creates several anomalies within an organization due to the lack of cohesion in the finished products of each task. Dewey (2014) continues to explain that business was perceived as "the sum of its parts" instead of observing how each

process fits together to support an organization as a whole. In addition, the processes of the business were evaluated internally, which tended to develop bias and was only seen through one perspective. As the years progressed, several alterations have been made to this practice which transformed it into what the world knows now as business process management. Today, the process “begins with the retailers, the clients, and/or the customers” which allows the managers to perceive what company problems translate to the customer in order to trace them back through the organization and fix the root of any customer issues that may arise (Dewey, 2014). The collection of information from these stakeholders about a company’s products is the foundation on the start of a company’s process management. This allows a business to adapt to the opinions of product recipients while also ever-changing with society.

This management process is possible with the use of outside professionals that work long-term with a company in order to ensure that bias is eliminated and the big picture of the company is prioritized over the short-term. The professionals are trained to complete the “total evaluation of a company's infrastructure,” however, the common misconception for the process is the addition of “automation and computer software” in the hopes of showing signs of improvement (Dewey, 2014). Simply adding components to a business does not evaluate how the current systems affect the company, but it rather overcomplicates the organization. Decisions about these aspects need to be conducted either as eliminating or improving the component.

Among the goals of business process management are to improve efficiency, decrease costs, lower anxiety, increase motivation, effectiveness, and flexibility (Dewey, 2014). These goals cannot be met in their entirety, however. The big picture of business process management is to never stop improving within the company or organization. If an aspect of a single process is improved upon, the ultimate goal is to always search for an even better way to complete a task

and integrate it with the company's mission. Perfection in this case is unattainable, but should always be what the company strives to reach.

One of the main obstacles that business process managers face is the integration of all departments within a business. Dewey (2016) explains that each department tends to keep to themselves and attempts to make their operations run smoother. The issue is that a company that is disconnected internally does not have all information available to all departments which leads to miscommunication or a lack thereof. Without strong communication and shared applications between departments, data inconsistency is sure to arise. Data inconsistency within a company is detrimental to its operations and has the potential to cost the company a substantial amount of money from one very small mistake alone. To prevent these mistakes from occurring, companies hire business process managers outside of the company to eliminate bias and to create a process that is beneficial for the cohesion of all departments instead of benefitting only one department and hurting others.

The technology that a business operates with can be one of the most influential factors to a company's processes. In addition, the interaction between the process and the consumers is another influential factor. Evans and Lindsay (2016) state "too much emphasis on technology might result in timely and efficient service, but might suggest insensitivity and apathy toward the customer. Too much emphasis on people and their behavior might provide a friendly and personable environment at the expense of slow, inconsistent, or chaotic service." (p. 217). If there is too much of an emphasis on either of these factors, a business would be capping their potential. Therefore, the importance on user interaction design in a business process is massive in order to use technology in a way to benefit the consumer and make operations easier all around.

Process design is the heart of process management. If there is a discrepancy in a business system, the first thing business process managers will turn to is the process design. There is an even greater importance of technology in the process design due to its place in the foundation of a business. “Technology is an integral part of process design that makes today’s service and manufacturing processes operate productively and meet customer needs better than ever,” (Evans & Lindsay, 2016, p. 213). Without the advancements in technology, customer needs could not be fully met, especially as an organization grows.

To streamline process design, businesses use flowcharts to “enable management to study and analyze processes prior to implementation in order to improve quality and operational performance,” (Evans & Lindsay, 2016, p. 214). These flowcharts are essential to any business due to the fact that a repeated process can physically be displayed step-by-step, and the planning for this process is only done once. Evans and Lindsay (2016) also list the questions that are asked about each process as they are being developed below:

“After a flowchart is developed, several fundamental questions can be asked to analyze the process and create a more effective design:

- Are the steps in the process arranged in logical sequence?
- Do all steps add value? Can some steps be eliminated and should others be added in order to improve quality or operational performance? Can some be combined? Should some be reordered?
- Are capacities of each step in balance; that is, do bottlenecks exist for which customers will incur excessive waiting time?
- What skills, equipment, and tools are required at each step of the process? Should some steps be automated?

- At which points in the system might errors occur that would result in customer dissatisfaction, and how might these errors be corrected?
- At which point or points should quality be measured?
- Where interaction with the customer occurs, what procedures and guidelines should employees follow to present a positive image?” (pp. 215-216).

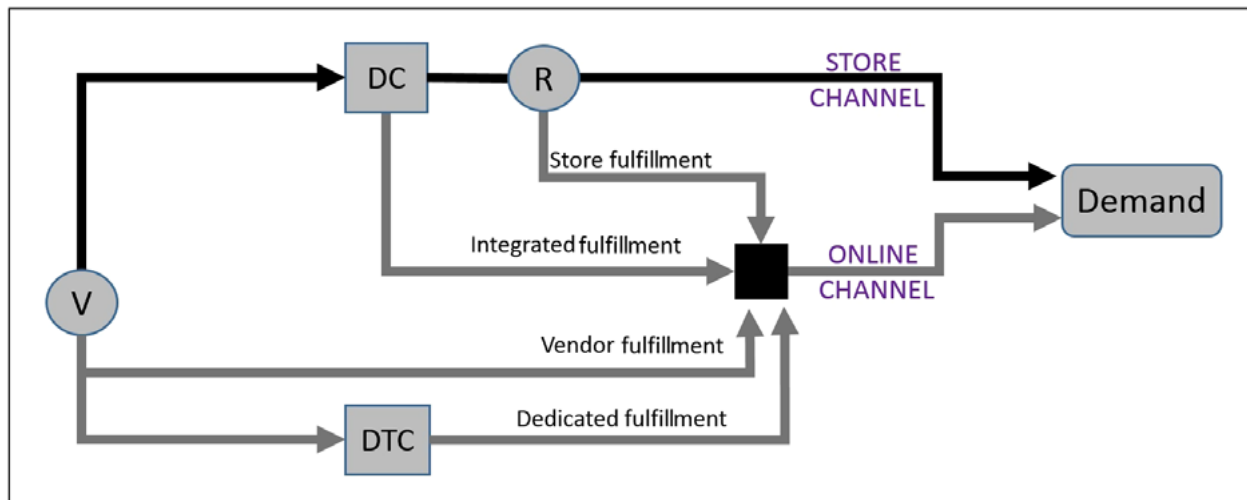
These questions are analyzed for each step of the process in order to ensure that every task is the most streamlined and efficient for the business while maintaining the maximum benefit. Once the steps of a process have been identified, it is put into production.

The additions to a company specifically within the technology space can be tricky within business process management because “designing a service essentially involves determining an effective balance between people and technology. Too much or too little emphasis on one component will lead to poor quality or inefficiency,” (Evans & Lindsay, 2016, p. 217).

Therefore, business process managers must have complete clarity of how they design and develop their flowcharts and processes in order to put the most productive and efficient processes into production.

### **Order Fulfillment**

In retail, the order process can have different variations of complexity in fulfilling the practice of getting a product to a customer. Figure 2 is a representation of the different ways a retail order can be delivered to a customer.

**Figure 2***Order Fulfillment Paths in a Retail Supply Chain*

*Note.* This displays the high-level flow of the paths a generic retailer could have in the fulfillment process (Ishfaq & Raja, 2018).

Due to the many different channels a product can travel through, this can be a complex process in which items may be lost or damaged. An organized fulfillment system allows companies to keep better track of the products and find the most efficient channel to ship a product through.

This is becoming an increasingly important field due to the fact that society is continually focusing on getting products in an efficient and timely manner. While there are many steps that a product may go through to get to the end consumer, these modernized customers do not have the patience to consider a wait for their orders. A mismanaged order fulfillment process will lead to the loss of brand loyalty, frustration, and bad reviews, which will result in a lower net profit due to the decreased revenue and an increase in the costs spent to compensate for individual order issues. An efficient order fulfillment process will lead a company to success in this time of expectancy for a responsive supply chain and little to no mistakes.

## Case Study

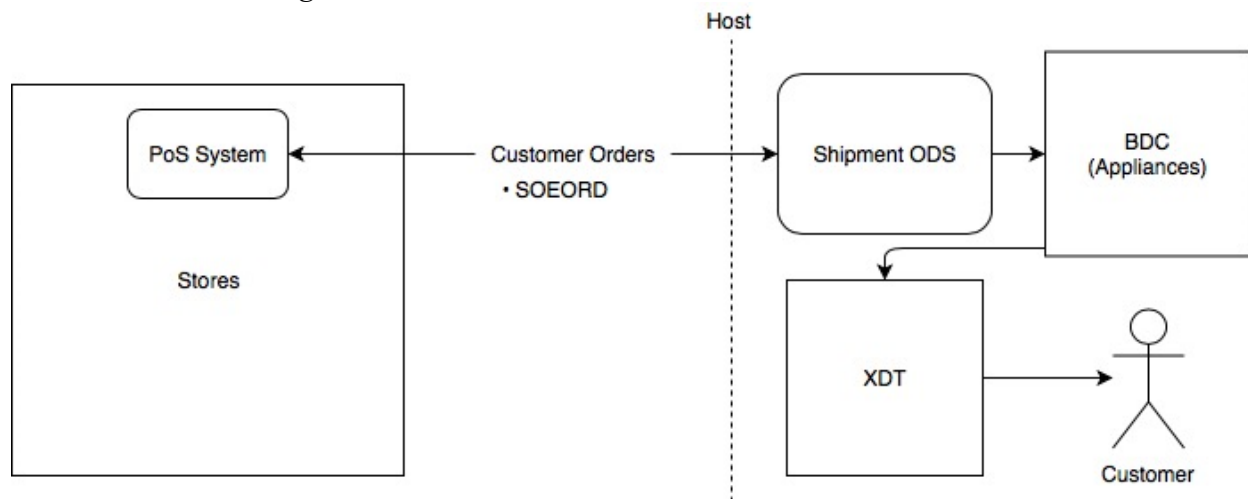
### Current Order Fulfillment Process

The Lowe's Companies, Inc., order fulfillment process was investigated due to the remarks made on its inefficiency at the initial CEO meeting in 2018. The kitchen order example given was an insight to how flawed the current system was. At the time, I was not studying under the employees responsible for this sector of the business, but the following summer I was determined to find out more.

The current high-level order fulfillment process for Lowe's larger products like kitchen appliances is shown in Figure 3.

**Figure 3**

*SOEORD Process Diagram*



*Note.* This shows the high-level flow of a Special Order Express process of Lowe's Companies, Inc.

A customer order is sent to the Point-of-Sale system which then sends the required information through Host, which is the name for their mainframe, to retrieve all the specific information for a certain product. This product information is then sent to their Shipment Order Distribution System (ODS) for the system to communicate with the facilities that will be involved with the transfer of that product. From there, it sends the product information to a Cross-Docking



Distribution Terminal (XDT) from a Bulk Distribution Center (BDC) where the larger appliances are housed. After arrival at the XDT, the product is then shipped to the customer.

On a deeper level, the company has a Special Order Express (SOEORD) application that sends most of its data specifically to their BDCs to process the larger orders, such as kitchen appliances. The company is working on implementing microservices and a different messaging system to change how the SOEORD is constructed to send more real-time orders to the BDCs so they can be sent to the XDTs and out to the customers. In turn, this will allow the orders that are put into the new OMS system to be sent automatically and contain a record of what is sent. In the IBM MQ (Message Query) system that they are transitioning away from, the messages would be sent in “real-time” batches and immediately disappear without a trace once they were sent. This led to many messages being lost and many orders unfulfilled. The company is looking at transitioning from IBM MQ to the Apache Kafka service which has several more beneficial features that will help their business in the future which will be explained later.

### **Supporting Improvements**

Many changes are happening in the company since Ellison’s statement to improve order fulfillment at Lowe’s. According to the new Lowe’s CIO, Seemantini Godbole, they began the process of altering the existing system by remediating their Technical Debt (technology that is outdated that needs to be updated or removed) (Godbole, 2019). During my first internship in that time frame, I observed this take place when my fellow Appalachian State Computer Information Systems & Supply Chain Management intern was tasked with analyzing all of the programs that were being used by Lowe’s and determining if the company needed to update, delete, or develop their own software. Several members of the company explained that the

majority of the technology Lowe's was using was bought from other companies instead of being developed in house.

The rising development of personal software is also one of the major changes being made, and to support such a big change within the organization, Lowe's made the announcement that their new Technology Hub will be built in Charlotte, North Carolina. They are planning to hire 2,000 more technology specialists to focus on creating and evolving their technology. The Technology Hub that Lowe's is building will be 23 stories tall located in Charlotte's South End. According to Seemantini (2019), this will bring a more modern feel to Lowe's and draw in new technology specialists into the Charlotte area. This will drive the emphasis on the company's technology and promote the improvements being made within this sector.

Seemantini also explained that the company "completed network upgrades across the supply chain facilities, retiring old legacy voice conversion technology," while replacing their end-of-life mainframe, updating 200+ infrastructure assets to currently supported versions, and decommissioning "100+ unsupported Windows operating systems" and "40+ unsupported operating systems" (Godbole, 2019). In addition to updating their infrastructure, Lowe's has recently introduced a mobility platform entitled 'Zebra' to assist store associates on the floor in providing the right knowledge and convenience for each customer. This platform is also another avenue that is opening to process customer orders. One effort that the company is making is to condense their order management process into one Order Management System (OMS). When this will be able to be accomplished is unknown by the company, but their order fulfillment will be increasingly better once this is implemented. They are planning on creating a user interface/experience called Omnia that will encompass their legacy Point-of-Sale (PoS) system (Genesis), their mainframe, and their newer PoS system (Sterling). They are planning on having

Omnia in place by the first quarter of next year in addition to the Zebra platform. Consolidating many parts into one interface will help the company's operations to run much more smoothly.

### **Interviews**

As a summer intern with Lowe's, I was expected to conduct several interviews to explore the culture and other areas of interest such as the change in order fulfillment at Lowe's. Brett Bender, an IT specialist at Lowe's had some great insight into the culture and changes in leadership. He explained that the company was in need of leadership that knows technology prior to the addition of the new CEO and his leadership team (Bender, 2019). As the new leadership was put in place there is clear evidence through the new tech hub alone that the company is becoming more technologically advanced. Additionally, before the addition of Ellison and his team, the projects were being implemented way too fast before being tested for an extended period of time. Bender (2019) stated that the projects needed to "mature before jumping too far too fast" in order to avoid making huge investments that end up not working. In another interview with Tim Stall (2019), the Vice President over the Demand and Inventory Planning department, he explained that one of these investments that are being made is the movement of all of the company's files to the cloud. Issues had not been found with this mass transport, but that is not to say they will be non-existent. The last big point Bender (2019) had to add about the company was that the employees are great at communicating up, but as a company they are still working on communicating down from the executives. As an organization they are working on a better communication system through their employees alone while the order fulfillment communication is also being improved.

I also interviewed the Senior Director of IT Solutions, Trupti Prabhavalkar, to begin uncovering the background and progression in order fulfillment at Lowe's. She explained that

her job allowed her to supervise the creation of a “world-class delivery platform” that was in progress with her team (Prabhavalkar, 2019). Prabhavalkar (2019) described a time in order fulfillment before Ellison started at Lowe’s and stated that the third-party logistics company that gave Lowe’s real-time results currently was non-existent. As the company looks to the future, she exclaimed that the company is looking into providing more positions in the back of stores to help with the organization of the products that are shipped through these locations, and the speculation of same day fulfillment is becoming possible through the new system that is in the midst of construction (Prabhavalkar, 2019).

In my interview with Seemantini Godbole (2019), CIO of Lowe’s, there was confirmation of this same day delivery company vision, and she additionally stated that the largest struggle within the organization at that time was getting everyone on the same page with the right technology. The amount of systems that were being utilized prior to Ellison’s arrival were absurd and the company is struggling to pick certain technologies to keep and implement widespread use to further integrate data for example. Change is hard for employees that have used a certain technology for years and there is a decent amount of push back when decisions like these are made.

Jeffrey Damian, VP of Product & Technology, was my most insightful interview subject in regards to order fulfillment specifics. Until recently, a measurement was sent to a store for the store to make a quote and call the customer (Damian, 2019). Lowe’s has been operating with a very store centric mindset which has lead it to struggle enabling a true omni-channel experience that the company has been working towards for years (Damian, 2019). Damian (2019) stated that they need to tackle this issue from a technology perspective and break out of everything that is happening in the store through enabling enterprise selling to sell through any channel. This way,

the company should be able to track the customer resource management perspective and have a centralized way to capture customer engagements (Damian, 2019). Lowe's will be able to support ordering inventory sourcing and payment through this method, allowing not only the order fulfillment to drastically improve, but the customer interactions with the company as well (Damian, 2019).

Damian (2019) explained that the Lowe's philosophy in the 90s and early 2000s was to go "best-of-breed" in technology, but recently they have switched their focus to full solutions. One example of a full solution that the company is implementing is the development of a Java based web app to configure installations where it asks associate questions and comes up with an estimate of labor, which would skip the process of waiting for an employee to get around to creating the quote and calling the customer back (Damian, 2019).

In 2020, the company is going to be computer-aided design (CAD) based for the design departments and there will be major changes to the monolithic solution they have had in place for years, Genesis (Damian, 2019). The modern architecture Lowe's is trying to achieve will depend on breaking up Genesis into microservices and using modern application programming interfaces, better known as APIs (Damian, 2019). Once a customer agrees to the quote for installation, project management is driven by the Installation Management System (IMS), which is run by modern Microsoft Dynamics hosted in the cloud (Damian, 2019).

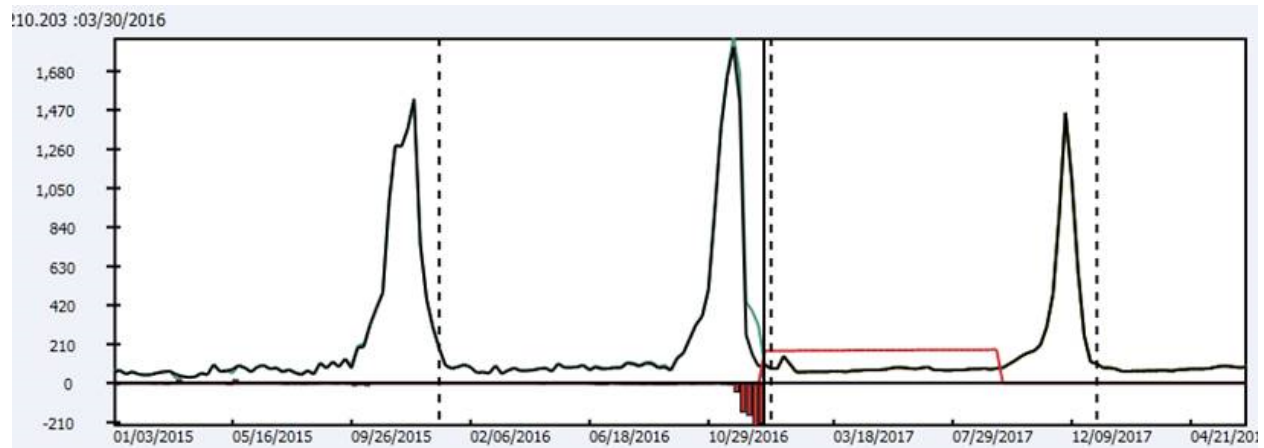
Damian (2019) explained that the long term plan for the improvement of order fulfillment as decided through business process management is to break apart the Genesis box into microservices hosted on Google Cloud, create a new order management system (OMS) to capture and process an order state, and change the perspective to focus on services due to the wide variety of experiences that have to happen depending on how the customer wants to acquire

the product. Because of the vast size of the Genesis system, it is very hard to modify without causing something else in the system to break. However, without this change, the company will never be able to achieve the responsiveness that they desire to give to its customers.

Due to their desire to achieve better responsiveness with their customers, the employees working in the digital sector have been reducing the amount of time between the increase of the number of features and improvements they make from one month to bi-weekly release cycles (Damian, 2019). This is due to how frequently and quickly e-commerce changes daily, so the company has to be able to be responsive to these changes.

### **Personal Impact**

Over the course of my internship I was tasked with configuring the External Profile Upload for the forecasting application, JDA Demand. To have successful order fulfillment, the forecasting must be aligned so there is enough inventory to fill an order. A great supply chain can accommodate seasonality. JDA Demand tracks the trends of sales and demand in order to help us forecast for the next year. Figure 4 is an example of a product displayed in JDA Demand that has seasonality that sells the most units during the Christmas season. There are both expected and unexpected events that may cause the trends from previous years to give us inaccurate forecasts. For example, certain holidays can fall on a different day every year, and in addition there is a very low chance of the same natural disasters happening on the same day every year as well.

**Figure 4***Holiday Seasonality in JDA Demand*

Note. This is an example of two years of actual data and the smoothed forecast of a product that has the most demand during the Christmas season at Lowe's Companies, Inc.

This can greatly affect the demand for Lowe's products. This is where external profiles become important. External profiles distribute the demand with seasonality. JDA Demand wants to distribute sales evenly but this allows Lowe's to distribute them according to actual sales in previous years. Additionally, it reinforces the standard demand allocation throughout the year so that natural disasters do not have an impact on future demand. They correct the abnormalities in the forecast to ensure Lowe's doesn't plan for the wrong demand. Some products like batteries are greatly affected by these events but take generators as an example. If a natural disaster occurs and there is a power outage in a large portion of a community, the Lowe's stores in that area will be swamped with customers trying to buy generators. In July of 2019, Tropical Storm Barry came through Louisiana and affected 27 Lowe's stores. The company sent 147 loads of flood related products out to those stores and 29 of those truck loads were filled with just generators (Ellison, 2019). If the forecast shows a spike in generator sales for the next year, there needs to be a way to normalize the data. An external profile is the corrected forecast for a certain product that can be uploaded to override the automated JDA Demand forecast. With this implementation,

order fulfillment has an even higher success rate than before, and the company is only improving.

My objectives in completing this project were the following:

- To identify the changes that the business stakeholders wanted to make to the current external profiles upload
- Document these changes and determine the validations that each field would have to go through
- Modify the current external profile template to reflect these changes
- Create the upload utility in Java
- Pass on information to other members of the Demand & Inventory Planning Team that I was working with to complete the Unix changes such as these old naming conventions for the external profiles

I started out meeting with Amy Symon, a Demand Solutions Consultant to determine what changes the business wanted to make for the new upload utility and documenting those changes. She wanted to modify the template to include different headers and change the naming conventions to look much simpler and less complex. Figure 5 is a section of the modified template that we agreed upon.



**Figure 5***Selection of External Profile Template*

	A	B	C	D	E	F
1	ITEM GROUP	LOC GROUP	PROFILE DESCRIPTION	REF_YEAR	PERIOD1	PERIOD2
2						
3						
4						
5						

*Note.* This is a snippet of the external profile template to give an example of the new requested headers that the business will use at Lowe's Companies, Inc.

The Demand & Inventory Planning Team created a new contract with the users and prior to changing the code I documented what validations each of these new fields would need. These validations included logical validations such as how many period fields would be accepted in the external profile upload, and format validations for how each field should be formatted such as Item Group that starts with an "I" and has numeric characters after it. I then got the opportunity to implement all of this together in a Java program. By creating and working on classes I was able to configure the application to include the new upload type to the existing generic user interface that the team owns. I was also able to utilize existing Java Reflections generic methods to consume the uploaded data from these templates, and use regular expressions extensively to perform the field format and date validations. I defined the error responses for each possible failed validation and wrote the results to the corresponding success and error files while using the existing exposed REST Webservice interfaces to run numerous test scenarios through the new upload type.

This project provided so much of a benefit to the company mainly due to the fact that it wasn't initially going to be completed. The business wanted the upload utility for the external

profiles, but this feature was going to be left out of the package as it was not in the most viable product process. Therefore, I had the opportunity to give them this utility as a bonus to the team's project. This utility will enable the upload of external profiles to be faster, more organized, convenient, and timely for the business. Without the upload utility, users would have to key each number in for the 52 periods or use flexible editor pages and update three different pages which has more room for error. The team is redesigning several parts of the code because while Lowe's currently uses the JDA 7.8 version of the software, they are moving to JDA 2018.1. Because of the upgrade, none of the data will be automatically transferred. Without this upload utility, not only would it be a longer process to input the profiles, but they would have to reinput all existing profiles. The business would have more difficulty uploading them and they would waste a significant amount of time than with the new process. This will allow them to be more productive and continue with their analysis instead of dealing with this roadblock.

At a higher level, this project is ultimately a huge improvement for the company's order fulfillment especially with the inclusion of business process management. I had the ability to come into the company unbiased and evaluate the current process while recommending changes that could be made, as if I were a business process manager myself. In creating this efficient process, it guarantees that once the team moves to the newer software version of JDA Demand they will continue to be able to correct for unexpected events.

### **Recommendations**

Lowe's has made many great strides in the home improvement industry and there are a few things that I would recommend the company to continue doing in regards to its business process management. The business should continue going straight to the customers to turn the feedback into changes to better the customer experience. This will bring customers back time

and time again because not only will their experience continue to improve, but they will feel like they are being heard and their opinion matters. In addition, the feedback that the customers have been giving the company has lead Lowe's to transform its technology to fit with the customers' needs. The company shows no signs of ceasing to find and create the most efficient technology for its customers either which I highly recommend.

Regarding the redirection from IBM MQ to Apache Kafka in the SOEORD process, I believe this will be an excellent platform to move to. The system can store streams of records with a retention policy for the messages sent and received from each point in the Lowe's distribution system. In addition, the data sent through Kafka would be more simplified, the features can be modified for specified purposes, it guarantees sequential messages that are sent and received with streaming processing, it can transform the data to its desired format on arrival, and the software is currently owned by the company, which would not cost the company any more than it was already spending. The upgrade in this space to Kafka will provide the company with a much better order fulfillment probability with their BDC items than just in the past year, 2018.

In the company's quest for technological improvement, the decision to move more technologies to be built in-house to capture the specific needs of Lowe's was the right move in my opinion. After personally being able to write code and contribute to the company's goal in order fulfillment, I feel Lowe's is going to have a plethora of success in catching up to Home Depot in the market and really beginning to be a large competitor.

The faster the company can get the new OMS system, Omnia, up and running, the better. This will allow the whiteboard in the back rooms of the stores to disappear as it pertains to orders that Ellison explained long ago. The frequency of lost and incorrect orders will decrease because

of the availability of a solid system, and the company would not be able to advance as much as they need to be as competitive as Home Depot without it. The implementation of business process management putting an emphasis on the ridiculous amounts of software that the company hardly used helped it realize that there was so much condensing and creation that it could do itself, saving the company by reducing the overwhelming costs that come with software renewals. If the company continues to reduce on purchasing software and builds its own specified programs itself, I could see the company surpassing Home Depot's market share and becoming the #1 home improvement retailer.

## **Conclusion**

Business process management is able to transform companies that are oblivious to better alternatives, simply because the employees are set in their ways. With an overhaul like this, companies are able to save time and resources that had always been inefficiently spent. Specifically, with order fulfillment, business process management allows the percentage of incorrect and missing orders to decrease and the time taken for customers to receive their orders to be shortened. Companies with the drive to constantly improve business in every way will greatly benefit from the implementation of business process management in all departments.

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