

Managing Operations Case Study Analysis for BYD

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Generating Value

Functions

The creation of goods and services requires all organizations to perform three functions: Marketing, Production/Operations, and Finance/Accounting (Heizer, 2019). Wang Chuan Fu, a former student of the Beijing Non-Ferrous Institute, founded Build Your Dreams [BYD] upon the belief that there was an opportunity within China to meet a demand for high-quality batteries at a low-cost through mindful Production/operations. At the time of BYD's inception, China had battery manufacturing companies, but these firms only produced low-quality goods. While high-quality batteries could be purchased within China, they were expensive and needed to be imported from Japan. To provide a low-cost alternative to Japan's high-quality batteries, Wang Chuan Fu reverse engineered the Japanese battery with the intent for his firm to profit from the sales opportunity. Examining and reverse engineering the Japanese battery provided a unique opportunity for BYD to save costs on research and development, and this benefitted the firm. During this process, Wang Chuan Fu realized it was possible to improve upon the battery's design utilizing safer, cheaper, and more ecofriendly alternatives to benefit the firm and its customers (Allied Business Academies, 2011).

Through thoughtful operations management, BYD utilized its existing finances generated from its battery business to fund an endeavor into the electric car automobile industry. It further improved its finances by utilizing cheap labor rather than expensive machinery to produce the goods it manufactured. This saved BYD production costs, which further benefitted the firm and its customers. As mentioned within the case study, "Electric cars (also known as electric vehicles or EVs) rely exclusively on battery power. With an EV there is no internal combustion engine, muffler, gasoline tank, air and fuel filters, and other parts needed to run a gasoline powered

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system. The vehicle itself also produces no tailpipe emissions, and by getting its power from a more efficient utility company, overall it produces fewer greenhouse gases.” (Allied Business Academies, 2011).

In terms of Marketing, “The company is transferring its cutting-edge technology innovation to the automotive market and at the same time closely following the global trends in green marketing that focus on a higher level of cost consciousness.” (Allied Business Academies, 2011). The result is that BYD’s alternative batteries are more environmentally friendly, the EVs produce zero emissions, and electricity production generates fewer greenhouse gasses than gasoline production. This means that BYD’s products don’t simply benefit BYD’s customers through environmental efficiency and low-cost, but they also made a positive impact for the planet as well. The key to efficient supply chain management is a thoughtful integration of, “products, services, and information that add value for customers and other stakeholders.” By accurately recognizing a need and carefully reimagining its competitor’s production methods and products, BYD created value for itself and its customers through efficient design and utilization of its supply chain (Croxtton, 2001).

Competitive Advantage

BYD, “gained a competitive advantage by finding creative and innovative ways to manufacture batteries of high quality at costs lower than rival Japanese and American brands.” Reverse engineering the Japanese competitors batteries reduced BYD’s costs associated with research and development and allowed BYD to improve upon the design of the Japanese batteries. Doing so positioned BYD to become a leading competitor in its industry. Utilizing cheap labor afforded BYD’s new employees an income and onsite housing because, “BYD employees, including engineers and scientists typically live on the company grounds with BYD

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providing housing and other living expenses.” Additionally, this reduced fixed costs associated with expensive skilled labor, or the acquisition of assets like automated machinery. Overall, creatively adjusting how the organization’s operations management functioned allowed BYD to retain more of its sales profits and fueled its competitive advantage for producing goods that were cheaper to make, safer to use, and more environmentally friendly than its competitor. In the end, these reduced production costs presented BYD’s customers with a cheaper alternative to the high-cost Japanese batteries (Allied Business Academies, 2011).

Compare and Contrast

In 2020, BYD’s net income increased by 162% to \$644 million in US dollars (Bloomberg, 2021). Of this, a portion of the operations profits can be attributed to professional service sales associated with warranty and non-warranty repair and maintenance for BYD’s products Electric Buses (BEBs), EVs, and batteries. “Service operations aim[s] to deliver an experience that leads to customer satisfaction.” Within service operations, teams provide services, customer support, and customer experiences. This adds value by increasing customer satisfaction surrounding the repair and maintenance work performed on BYD’s customer’s equipment. This in turn strengthens the firm’s brand image by satisfying the customer’s need and expectations for product support (Reddy, 2020).

BYD’s manufacturing operations supports, “a framework in which man, machine and material come together to produce a tangible product.” In this case, BYD’s manufacturing operations would deal “with all the supply chain activities such as gathering requirements from customers, procuring raw materials, allocating resources, scheduling the production, maintaining the inventory, and delivering end products to customers.” These manufacturing operations provide value by affordably producing the goods that are procured by the BYD’s customers. This

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is supported by BYD's efforts to reverse engineer the batteries and acquire cheap labor to produce its goods (Reddy, 2020).

The service and manufacturing operations are the same because both fall under operations management which, "involves activities such as planning, organizing and overseeing operational activities to reduce costs and improve profitability." Therefore, both service and manufacturing would be concerned with things like layout, cost, availability of resources, and quality. These two operations differ because service operations provide repairs and customer experiences, whereas manufacturing operations provide the actual finished goods. Each of these operations provides value for their customers by providing an opportunity to strengthen the organization's brand image through high-quality goods or services (Reddy, 2020).

Theories and Techniques

Gross-to-Net

The independent and dependent demand for an item prior to capturing preexisting inventory and planned receipts determines gross requirements (ERP-Information.com, 2021). To determine whether independent or dependent demand models should be utilized we must consider if a product can be properly identified and if a schedule can be determined. If so, dependent models should be utilized because they are preferred to independent demand models (EOQ) due to how well they function for manufacturers, distributors, and a broad spectrum of corporations. Material requirements planning (MRP) is typically applied in a production environment utilizing a dependent demand model. Items that include a "bill-of-material, inventory, expected receipts, and a master production schedule." These items allow us to ascertain overall material requirements, and because MRP allows for a more streamlined structure for dependent

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demand it's often used as the starting point for enterprise resource planning (ERP) (Heizer, 2019).

ERP is an enterprise information system used to identify and plan the resources necessary to grab, generate, distribute, and quantify client orders. The “data file inputs” that BYD would need for a successful MRP system are: “master production schedule, a bill of material, inventory and purchase records, and lead times for each item.” Once determined, the MRP information can be used to improve the operations at BYD because they allow us to build a Gross Material Requirements plan to understand the schedule for the total demand for a particular item before subtracting any preexisting inventory and planned receipts, timelines for ordering from suppliers, or production requirements for a particular date. We should note that when generating MRP calculations, software programs are preferred due to the potential for human error and decreased speed associated with manual entry. Additionally, when working with gross material requirements we must assume that there is no preexisting inventory at BYD. If there is preexisting inventory at BYD we should consider a net requirements plan as it allows us to adjust for that. However, in order to do so we must acknowledge that inventory items also include things like subassemblies and other parts which may not otherwise be considered at BYD (Heizer, 2019).

Compare and Contrast

When comparing PERT and CPM they both follow a variation of six basic steps, “Define the project and prepare the work breakdown structure. Develop the relationships among the activities. Decide which activities must precede and which must follow others. Draw the network connecting all the activities. Assign time and/or cost estimates to each activity. Compute the longest time path through the network [the critical path]. Use the network to help plan, schedule,

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monitor, and control the project.” Additionally, both PERT and CPM have the same objective to define when the project will be completed, defining what the critical and non-critical tasks are, ascertaining the probability of the project being done on a specific date or whether it is behind or ahead of schedule, what the projects risks are, whether the project is under or over budget, whether there are enough resources to complete the project on time, or how to finish the project sooner at the cheapest cost. However, PERT and CPM differ in terms of the terminology they use to define these steps, and PERT applies an “Activity-on-Arrow” network diagram and uses three methods of time projections for its task activities. Whereas CPM utilizes an “Activity-on-Node” network diagrams (Heizer, 2019).

The types of projects that would favor PERT are projects that are time-sensitive, but where the time to complete the activities is unknown and so it is driven by the percentage of the event being complete. The types of projects that would favor CPM are projects that time-sensitive, and where the time to complete the activities is already known. Additionally, CPM focuses on a time-cost trade off where minimizing cost is important. CPM also enables the determination of an estimated time when the project deliverables can be completed, and this enables project crashing to try to speed up the projects delivery date by allocating additional budget funds to resources to enable an earlier completion of critical path activities (GeeksforGeeks, 2020).

The types of projects at BYD that would favor PERT over CPM would be projects that were focused on reverse engineering a product like the Japanese batteries. This is because the technology contained within the batteries was unknown at the time and there was no telling how long it would take to reverse engineer how the product worked or find viable substitutes for the raw materials utilized within the Japanese batteries. The types of projects at BYD that would

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favor CPM over PERT would be projects surrounding the design of electric vehicles. This is because BYD already had the batteries created, and already owned the automobile manufacturer that could produce the finished products so this would have enabled a known timeline to be created to establish an estimated time when the project deliverables could be completed.

Four Primary

When jobs are entered into a work center, BYD's managers would decide how to sequence the job completions. Sequencing, or "dispatching", is accomplished by identifying the priority rules that should be used to release "dispatch" jobs to the work centers. Priority rules are particularly relevant within facilities driven by processes and procedures. BYD falls into this category because it is a manufacturing job shop, but this would also apply for other such process driven facilities like clinics and print shops. The four main priority rules are: first come, first served (FCFS), shortest processing time (SPT), earliest due date (EDD), and longest processing time (LPT) "The choice of which priority rule to choose depends in part on how each rule performs on four criteria: the priority rules try to minimize completion time, maximize facility utilization, minimize number of jobs in the system, and minimize job lateness" (Heizer, 2019).

When considering these rules, SPT appears to be the best technique for "minimizing job flow and minimizing the average number of jobs in the system.", but its biggest disadvantage is that the longest jobs are continuously pushed back in preference of shorter jobs. In order to utilize SPT, BYD must first recognize that there would be difficulty getting to the longest job and this may create a backlog of the more difficult jobs. If BYD is seeking the quickest way to tackle jobs it may wish to consider SPT since it allows for more jobs to be completed, but there is concern that SPT may cause BYD's practices to be perceived as unfair by its customers. If BYD utilizes FCFS and receives 20 jobs, then the very first job they receive would be completed

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first and each of the subsequent 19 jobs would be completed in the order in which they were received. In comparison, if BYD utilizes SPT and receives the same number of jobs then the jobs that can be completed quicker are tackled first. Similarly, if BYD utilizes EDD and receives the same number of jobs then the jobs that are due sooner are tackled first. However, if BYD utilizes LPT and receives the same number of jobs then the jobs that take the longest are tackled first (Heizer, 2019).

All things considered, BYD should consider FCFS as the best method of handing orders for all its customers because FCFS since it has the advantage of “appearing fair to customers”, and this is vital within service systems. EDD takes SLAs into account that may be missed under the other methods by allowing us to “[minimize] maximum tardiness”. This is a necessity for jobs that have a high penalty associated with delays for due dates, and it’s for this reason that it works so well when this is of concern. LPT, on the other hand, is much better for planning jobs that could take a long time to complete. All things considered, the best way to tackle jobs at BYD may potentially be to utilize a hybrid of FCFS and EDD. This would not only be fair to BYDs customers, but it would also account for instances where missed SLAs might cause BYD to lose money (Heizer, 2019).

Theory of Constraints

The Theory of Constraints (TOC) is a subject that focuses on things that restrict or constrain a firm’s capacity to reach its objectives. These constraints can sometimes be physical resources such as manpower, tools, or raw materials and intermediary goods; however, they can also be nonphysical items such as procedures, motivators, or employee training. Being able to spot and remediate these constraints through TOC is a crucial step towards removing any roadblocks that would prevent a firm from reaching its goals. The five steps involved in the TOC

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process are: recognizing the constraints, developing a plan to overcome the constraints, focusing resources on overcoming the constraints, recognizing and reducing the impact of the constraints by enabling key stakeholders to assist with automating or offloading them or by utilizing process improvement to avoid them, and utilizing continuous improvement by revisiting the constraints to detect new opportunities for improvement once all constraints have been resolved. The processes that BYD might have applied utilizing TOC could've been reverse engineering the Japanese batteries, discovering viable ecofriendly and cost saving alternatives to the battery components, developing their first electric vehicle, and developing either a quick charge battery or battery replacement stations. Applying TOC to these processes would have been advantageous because it could have reduced their time to market for both the batteries and their EVs; it would have also allowed them to quickly establish the infrastructure necessary to support their EVs which would have made them better equipped to compete with firms such as Tesla (Heizer, 2019).

Forecasting System

The steps used to develop a forecasting system are determine the purpose for the forecast, select what needs to be forecasted, determine the start and end point for the forecast, choose the appropriate qualitative or quantitative statistical forecasting model, acquire the data necessary to forecast, produce the forecast, and verify and apply the forecast results. These steps enable a way to initiate, design, and implement a forecasting system to predict needs for things like the demand for service operations or manufacturing operations within the BYD case study. A forecasting system designed around service operations or manufacturing operations would be specifically utilized by BYD to predict how much raw materials, intermediary goods, parts, or finished goods or services would be needed or produced during a certain period. My prediction

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for the result of implementing a forecasting system for the top-selling product line at BYD would be that there would be less waste in terms of tangible products, materials, or goods needed to produce or support this product. Additionally, there would be fewer resources spent idly awaiting intangible customer interactions that depend on customer arrivals or calls for service based on an unknown need. Ultimately instituting such a forecasting system would lower costs for BYD and its customers (Heizer, 2019).

Supply Chain Risk

Within all supply chains there are major risks such as supplier failure to deliver which can be mitigated by “Using multiple suppliers; effective contracts with penalties; subcontractors on retainer; [or] preplanning.” There are also risks of supplier quality failures which can be mitigated by, “Careful supplier selection, training, certification, and monitoring”. There is also risk of outsourcing which can be mitigated by, “Tak[ing] over production; provid[ing] or perform[ing] the service yourself.” There is also risk of logistics delays or damage which can be mitigated by “Multiple/redundant transportation modes and warehouses; secure packaging; effective contracts with penalties.” There is also risk to distribution which can be mitigated by “Careful selection, monitoring, and effective contracts with penalties.” There is also risk of information loss or distortion which can be mitigated by “Redundant databases; secure IT systems; training of supply chain partners on the proper interpretations and uses of information.” There is also political risk which can be mitigated by “Political risk insurance; cross-country diversification; franchising and licensing.” There is also economic risk which can be mitigated by “Hedging to combat exchange rate risk; purchasing contracts that address price fluctuations.” There is also natural catastrophe risk which can be mitigated by “Insurance; alternate sourcing; cross-country diversification.” There is also theft, vandalism, and terrorism which can be

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mitigated by “Insurance; patent protection; security measures including RFID and GPS; diversification.” (Heizer, 2019).

If we consider the 2011 earthquake and tsunami that devastated parts of Japan we can see how negatively businesses were impacted by this remarkably impactful natural disaster which began with an earthquake off the northeastern coast of Honshu, Japan. The earthquake led to extensive destruction within Japan and launched a chain of events that “initiated a series of large tsunami waves that devastated many coastal areas of the country, most notably in the Tōhoku region (northeastern Honshu).” This natural disaster completely shut down supply chains within and beyond Japan. At the time of this disaster, I recall my organization had a large order pending for laptops, but the Intel computer chips contained within these laptops were being produced within Japan, therefore our order was halted for several months because firms were unable to produce their computers due to the missing intermediary good (computer chips). I would imagine that this issue must have affected BYD in much the same manner because most automobiles these days run on computer chips. BYD could mitigate exposure to supply chain disruptions caused by natural disasters such as these by selecting service operations and manufacturing operations locations in areas that are not prone to natural disasters, or by purchasing natural disaster insurance such as flood and earthquake insurance (Rafferty, 2011).

Summarize

Just-in-time (JIT) concentrates on “continuous improvement and applied problem solving” by generating or supplying goods right when they are needed. Practicing JIT cuts the cost of quality by reducing scrap, rework, inventory investment, and damage costs that are linked to inventory and this lowers costs. Having excess inventory tends to hide poor-quality as having too many goods on hand often leads to the delayed discovery of defects in the supply chain.

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Practicing JIT allows for reduced inventory and this reduces storage costs, enables an easier future state of the JIT system, and provides a more consistent quality surrounding the finished goods. Additionally, JIT quickly uncovers low-quality goods and supplies which allows us to quickly detect the potential sources of errors. In the end, JIT enables an “early warning system” surrounding quality problems within the organization and its vendors. This allows us to quickly resolve training or supply chain issues before they impact customers and require expensive recalls (Heizer, 2019).

Toyota Production System (TPS) was conceived by Toyota’s Eiji Toyoda and Taiichi Ohno, and it “consists of two pillars that are Just-in-Time (JIT) and Jidoka” (Jasti, 2015). “For Toyota, Jidoka means that a machine must come to a safe stop whenever an abnormality occurs.” (Toyota, 2021). TPS has three main components, “continuous improvement, respect for people, and standard work practice”, and all three of these components are causally related to Lean. TPS is “A production system based on the philosophy of achieving the complete elimination of all waste in pursuit of the most efficient methods.” (Toyota, 2021). Continuous improvement necessitates establishing a business culture that is infused with a value system that urges that it’s the employee’s obligation to perform process improvement on a continuous basis. To do this, TPS relies on a process meeting called Kaizen which reviews work cell procedures with the intent to improve upon them. During these meetings incremental changes are made to try to improve upon the process by adjusting the work area or process (Heizer, 2019).

Organizations that practice Lean operations reduce waste by striving for excellence through “continuous learning, creativity, and teamwork.” A few ways they do this is by respecting and developing their employees, empowering their employees, developing worker flexibility through cross-training, building processes that standardize to produce a more

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consistent product, developing collaborative partnerships with their suppliers, and eliminating waste by only performing activities that add value to the process (Heizer, 2019). Lean was developed by Toyota but is not restricted to the auto industry and has been modified to be utilized within other industries as well (Jasti, 2015).

These concepts are all interrelated because all three of these processes reduce waste and these concepts were all developed by Toyota. Additionally, “Toyota Motor Corporation's vehicle production system is a way of making things that is sometimes referred to as a "lean manufacturing system," or a "Just-in-Time (JIT) system," and has come to be well known and studied worldwide.” For Toyota, these concepts don't simply act as way to prevent negative outcomes, but rather a way to standardize and level set expectations of excellence throughout the organization (Toyota, 2021).

The disadvantage for using just in time (JIT) at BYD would be that in order to practice this concept it would require smaller production runs. However, BYD relies on cheap labor rather than expensive machinery so communicating a stopping point for the production runs may prove to be a challenge for BYD. The advantages of implementing just in time is that it would bring all the existing problems within the supply chain to the surface. During my research I found that BYD has received complaints about their BEBs stalling, stopping, and breaking down. implementing JIT within BYD may help reduce these problems by bringing their causes to the surface (Levy, 2019). The disadvantage for using the TPS is that to utilize Jidoka there must be a way for the production line to communicate that a stop is needed. By utilizing manual labor rather than machinery this may prove difficult to effectively implement within BYD without an effective poka-yoke to stop the production line. Additionally, TPS requires knowledgeable employees who are empowered to make decisions, but BYD only employs cheap labor therefore

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training would be needed for BYD's current employees. The advantage for using this system is efficiency and a reduction in waste. The disadvantage of utilizing Lean is that as mentioned earlier it reduces waste by striving for excellence through "continuous learning, creativity, and teamwork." However, BYD employs cheap labor that may not be very well educated. In order to implement Lean within BYD they would need to invest in their employee's education and training, and with BYD's current practices this may prove to be difficult. The advantage of using Lean is reduced waste and fewer product recalls.

Total Quality Management

Total Quality Management (TQM) principles and tools focus on establishing and adhering to expectations of excellence for both the firm and their supplier's resources surrounding inputs and outputs, and the customer's expectations of the firm's products and services. TQM commands continuous improvement for "people, equipment, suppliers, materials, and procedures" to strengthen the firm's products and services that are provided to its customers. The seven concepts behind an effective TQM program are "(1) continuous improvement, (2) Six Sigma, (3) employee empowerment, (4) benchmarking, (5) just-in-time (JIT), (6) Taguchi concepts, and (7) knowledge of TQM tools." (Heizer, 2019).

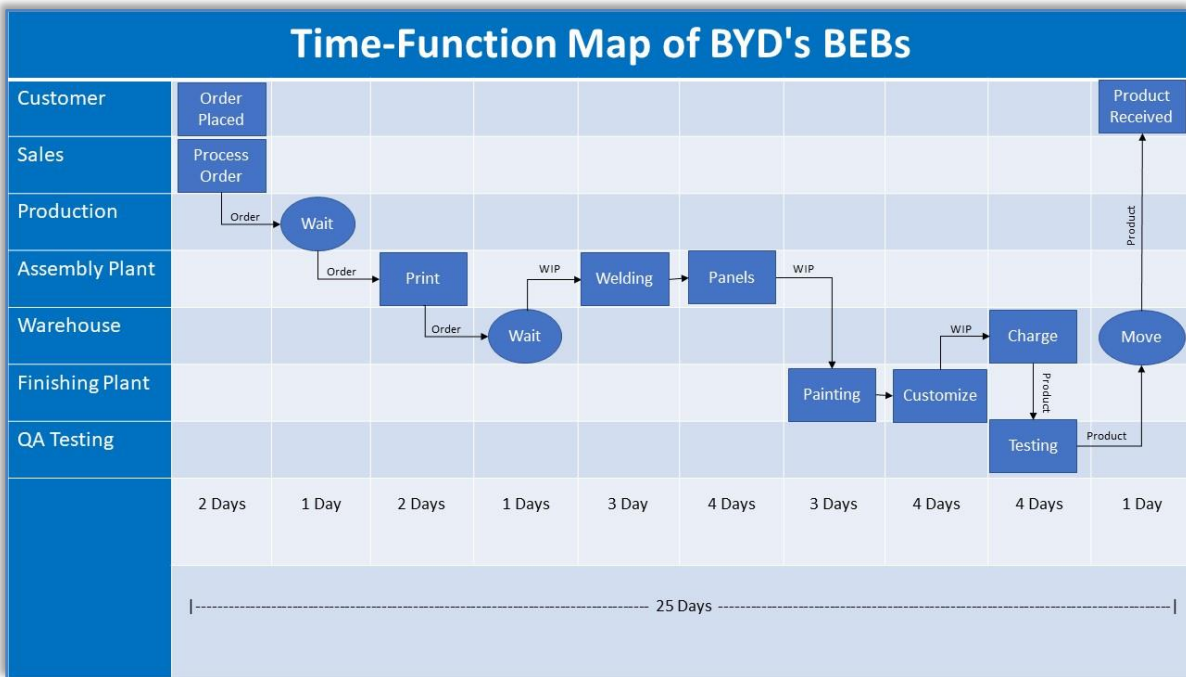
One way TQM could be used to improve quality in the latest line of products at BYD by constantly seeking out new ways to improve upon the inputs and outputs relating to their products; another way would be by finding the most efficient way to execute their processes and procedures. They could empower their employees by "involving [them] in every step of the production process" to enable them to create the most effective and efficient outputs; they could also benchmark their Key Performance Indicators (KPIs) against that of another global leader in innovation to understand how they became the best at innovating. Additionally, they could

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practice just-in-time (JIT) ordering to ensure that their raw materials and intermediary goods were defect free and not wasting precious warehouse space; they could also utilize Taguchi concepts by removing the effects rather than removing the causes to increase production efficiency. Finally, they could increase their understanding of TQM tools to find other means to make their products and services of excellent quality (Heizer, 2019).

Data Analysis

Process Map

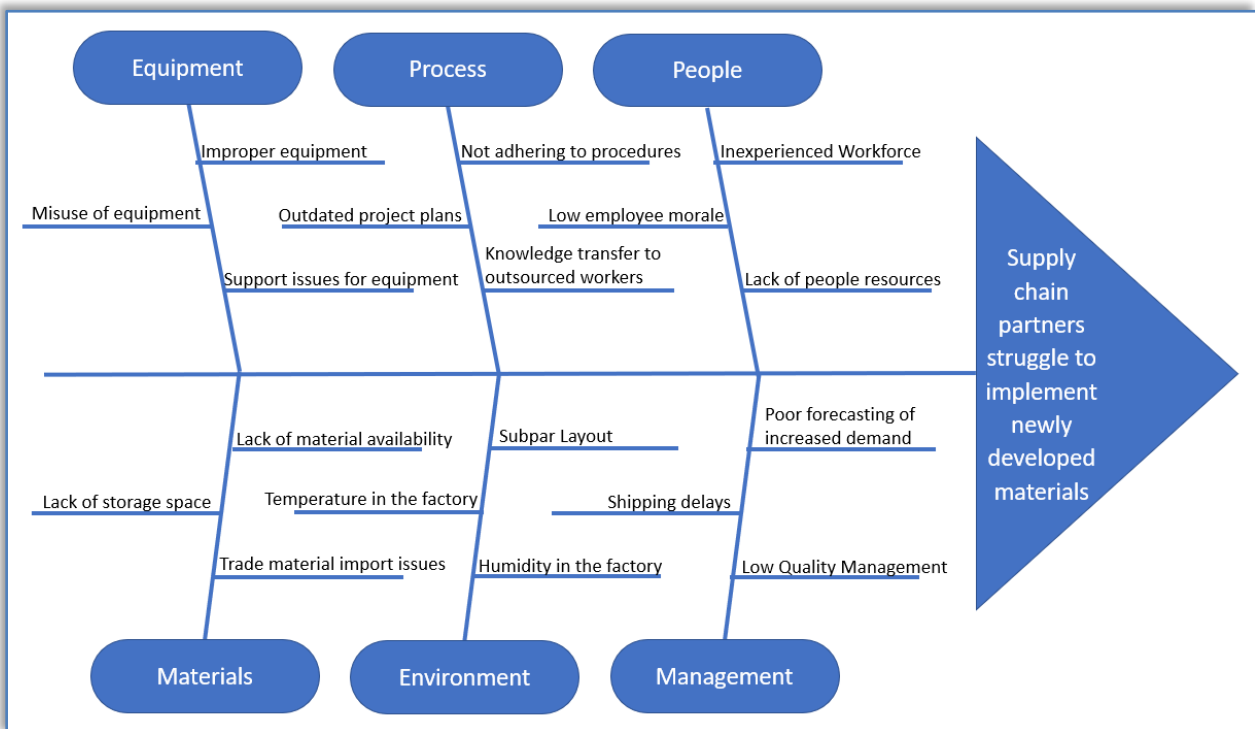


A time-function map, or a process map, is a modified time-function flowchart that allows for process analysis and design (Heizer, 2019). BYD could use a time-function map to indicate the total time necessary to complete activities in its BEB building process as well as the time to process each activity. Creating these maps allows us to easily identify and eliminate wasted steps, step duplication, and delays. In reviewing BYD's process for generating a BEB, seen above, an operations manager could visualize opportunities to reduce wait time in the warehouse,

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or to eliminate wasted steps. One way we could reduce the overall processing time of the order would be automating printing the customer's order straight to the assembly plant's printer after the sales department processes the order. By making minor tweaks to the process an operations manager could utilize this value map for process improvement to efficiently get the finished product into the customer's hands (E for Electric, 2019).

Diagram



BYD's supply chain partners might have struggled to implement BYD's newly developed materials due to various equipment, process, people, materials, environment, and management causes. If we focus on equipment, we can recognize that BYD relied heavily on the workforce as opposed to machinery; if the supply chain partners had the improper equipment to generate the supplies, misused the equipment they had, or had a lack of support for the equipment they had this might lead to a negative outcome. If we focus on process, we can recognize that this was an innovative technology that had brand new processes; if the supply

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chain partners were not adhering to procedures, had outdated project plans due to poor communication, or experienced knowledge transfer issues to outsourced workers this too would have led to a negative outcome. If we focus on people, we can recognize that because this was a brand new technology, and BYD focused on cheap people resources rather than equipment, no people resources would have been experienced; if the workers were inexperienced, if low wages led to poor employee morale, and if they had a finite number of employees available this too would have led to a negative outcome. If we focus on materials, we can recognize that this was a brand-new technology and BYD's suppliers would have been scrambling to acquire the proper materials; if they experienced issues relating to lack of material availability, lack of storage space, and trade material import issues would have led to a negative outcome. If we focus on environment we can recognize that the environment would have played an important role; if the factory layout was poorly setup it may have created congestion for the workers, if it was too hot it would have been a distraction for the workers, and if it was too humid it may have caused an issue for the equipment, materials, and workers which would have led to a negative outcome. If we focus on management, we can see that as this was a brand-new technology so there would have been limited data available to predict demand; if the forecasting for raw materials, intermediary goods, or finished products was poor, if there was shipping delays, or if the management was inexperienced this too would have led to a negative outcome (Heizer, 2019).

Data

Factor	Weight	Mexico City	Columbia, SC
Political Risk	0.25	70	80
Transportation Costs	0.20	40	90
Labor Productivity	0.20	85	75
Rental Costs	0.15	90	55
Labor Costs	0.10	80	50
Taxes	0.10	90	50

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Considering the data and options listed above, the company should locate its new manufacturing plant in Mexico City. As seen below, Mexico City would be the more favorable location because when you multiply the weight by the score assigned to each factor it produces a total weighted score of 73 points for Mexico City. Whereas, for Columbia, SC the total weighted score is only 71.25 points. Due to the higher total weighted score relating to a larger score assigned to factors such as labor productivity, rental costs, labor costs, and taxes, Mexico City attained a higher total weighted score as compared to Columbia, SC. This higher total weighted score makes Mexico City a more favorable location when compared to Columbia, SC (Heizer, 2019).

		Potential Locations		Weighted Scores	
Factor	Weight	Mexico City	Columbia, SC	MC Score	Columbia Score
Political Risk	0.25	70	80	17.50	20.00
Transportation Costs	0.20	40	90	8.00	18.00
Labor Productivity	0.20	85	75	17.00	15.00
Rental Costs	0.15	90	55	13.50	8.25
Labor Costs	0.10	80	50	8.00	5.00
Taxes	0.10	90	50	9.00	5.00
Total Scores				73	71.25

Inventory Management

ABC Analysis					
Item	Annual Demand	Cost/Unit	Inventory Value	% Total Inventory Value	Class
G2	300	\$1,500.00	\$450,000.00	41.38%	A
F3	500	\$500.00	\$250,000.00	22.99%	A
A2	3000	\$50.00	\$150,000.00	13.79%	A
C7	1500	\$45.00	\$67,500.00	6.21%	B
D1	6000	\$10.00	\$60,000.00	5.52%	B
B8	4000	\$12.00	\$48,000.00	4.41%	B
E9	1000	\$20.00	\$20,000.00	1.84%	C
I5	1750	\$10.00	\$17,500.00	1.61%	C
J8	2500	\$5.00	\$12,500.00	1.15%	C
H2	600	\$20.00	\$12,000.00	1.10%	C

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Total Inventory Value	\$1,087,500.00	Sum A	78.16%
		Sum B	16.14%
		Sum C	5.70%

Activity Based Costing (ABC) inventory systems provide a way for an organization to categorize inventory based on its importance. They also allow an organization to better comprehend direct and overhead expenses based on the most critical activities and categorize them based on their value. In the end, this allows the company to paint a better picture of the areas in the organization that produce the highest profit. The spreadsheet above is intended to review a scenario in response to the organization believing that it might have some inefficiencies in its inventory management process for the ten items above. Upon review of the initial columns provided: item, annual demand, and cost/unit, an additional column was created called subtotal which multiplies the annual demand by the cost per unit. This column was then sorted based on the highest subtotals. After this was achieved, a percent of inventory column was added which tabulates the items subtotal divided by the projected total of all items to acquire the percent of the total that the item represents (Study.com, 2021).

When researching ABC analysis’s it was determined that “the Pareto Principle states that 80% of your inventory costs comes from just 20% of your inventory. This is known as the 80/20 rule and it helps shape the results of your ABC Analysis.” As we can see from the image above, Class A items are the highest total items that typically comprise 80% of the inventory, and in this case, they comprise about 78.16% of the total. In comparison, Class B items have a lower total which typically comprises 15% of the inventory, and in this case, they comprise 16.14% of the inventory. Finally, Class C items typically make up only about 5% of the inventory, and in this case, they comprise 5.70% of the inventory. Based on this ABC Analysis, I would recommend that the company focuses on producing the Class A items first since they comprise the largest

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sales within the inventory, then Class B, and finally Class. Making this change would improve the inventory management system because the company would produce its highest sales items first, then midrange sales items, and finally their lowest sales items. Doing so would ultimately allow the company to maximize its profits (Baker, 2021).

Sustainability

Triple Bottom Line

The emerging concept of the triple bottom line can be used to enhance operations management at BYD by considering people, planet, and profit (Heizer, 2019). When implementing these components BYD would focus on its impact within society, its environment, and economics. One component of the triple bottom line that I believe is most often neglected by all companies is the planet. When we consider Business Sustainability in relation to the triple bottom line there is difficulty in measuring the people and planet bottom lines because they are qualitative. However, profit is quantitative, so it is more easily measured than people and planet. When there are quality concerns people often speak out, but the planet doesn't have the capability to speak on its own behalf regarding quality concerns. I believe the lack of qualitative and quantitative measurements surrounding the planet is the reason it is most often neglected (Kenton, 2021).

In considering these components as they relate to the triple bottom line, we must consider how Business Sustainability 1.0 considers implementing the bare minimum sustainability efforts to please their shareholders and maintain its brand image. At BYD their efforts started out strong by reducing the environmental impact of the electric battery components by providing safer and more affordable alternatives to the Japanese battery components. However, their efforts also focused on utilizing cheap labor by taking them out of their current environments and providing

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them with onsite housing. Making these efforts placed BYD in the Business Sustainability 1.0 category. When we consider Business Sustainability 2.0 practices, they tend to take the triple bottom line into account to show that the organization cares about environmental, social, and economic concerns. Although BYD advertises that they provide charitable contributions and an apprenticeship program these efforts are superficial due to BYD's practice of utilizing cheap labor (BYD, 2020). Both Business Sustainability 1.0 and 2.0 take the inside out approach where the company avoids negative side effects by improving its impact on the triple bottom line. However, Business Sustainability 3.0 takes the outside in approach where it creates positive effects by providing active contributions to make the planet better by making its improvement efforts an integral part of its corporate offerings (HSG University of St. Gallen, 2016).

ISO 14000

The ISO 14000 standard empowers organizations with useful tools to help manage their environmental obligations (ISO.org, 2021). “In April of 2001, the State Council of China decided to set up the General Administration of Quality Supervision, Inspection & Quarantine of the People's Republic of China (AQSIQ), by merging the former CSBTS and the former State Bureau of Import & Export Inspection and Quarantine (CIQ SA) and, at the same time, to establish the Standardization Administration of the People's Republic of China (SAC) and Certification and Accreditation Administration of the People's Republic of China (CNCA) under AQSIQ.” The SAC is permitted by the State Council to carry out administrative duties by “undertaking unified management, supervision and overall coordination of standardization work in China. The SAC represents China within the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC) and other international and regional standardization organizations; the SAC is responsible for organizing the activities of the Chinese

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National Committee for ISO and IEC; the SAC approves and organizes the implementation of international cooperation and the exchange of projects on standardization.” (ISO.org, 2021)

BYD integrates ISO 14000 standards in its manufacturing plants by following the China Compulsory Certification (CCC) regulations, environmental labelling guidelines, and establishing a document management system and 5-star quality rating system. Their rating system is built on the perspective of “compare, support, compete, exceed”. It rates “the quality control of factories on system, processing, and product dimensions.” As of 2020, 2.13% of BYDs factories were rates as 5-stars (ideal). 26.59% were rated as 4-stars (excellence), and the remainder of their factories were rated as acceptable. All BYD plants were certified for ISO 9001 in 2015, and 30 factories passed the IATF 16949 certification in 2016. “Passenger vehicles, buses, and safety-related components (trimming, lights, seat belts, rearview mirrors, etc.) have passed the China Compulsory Certification (CCC).” Additionally, BYD established a Human Resource Management policy which follows the guise of “equal opportunity, based on capability” it is based on the labor law, labor contract law, and follows standards set in “ISO 9001, ISO 14001, OHSAS 18001, and SA 8000.” They have also banned “age, gender, geographic location, ethnic group, tradition, social caste, religion, physical disability, and political tendency” discrimination during the hiring process. Additionally, child and forced labor are prohibited and they claim to promote local recruitment within their local communities to create jobs and stimulate the local economies (BYD, 2020).

Corporate Responsibility

Several corporate responsibility principles I found were creating family-friendly workplaces, providing economic security for their employees, investing in their employees’ educations, partnering with employees by sharing burdens and benefits in good times and bad,

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and providing a safe and secure workplace (PBS.org, n.d.) According to BYD's 2019 CSR Report, BYD is acting responsibly towards its environment, society, and local economies. However, in March 2020, the Australian Strategic Policy Institute (ASPI) published a report that explained that between 2017 and 2019, BYD, along with 82 other well-known firms tapped into resources such as Uighur Muslims and other ethnic minorities. These new resources were transferred to China from Xinjiang under the guise of re-educating them within "re-education camps". These camps confined its residents within prison style walls and transferred them on segregated trains to factories where they were forced to provide labor for corporations for free. While this new source of labor was certainly a competitive advantage for BYD there are vast ethical concerns and penalties associated with the concept of forced labor. If we consider the corporate responsibility principles mentioned earlier, we can see that none of these principals were adhered to in BYD's practices between 2017 and 2019. Simply saying in BYD's 2019 CSR Report that child and forced labor are prohibited does not take away the fact that they were practicing forced labor for two years, and by doing so BYD completely ignored its corporate responsibility (Xiuzhong Xu, 2020).

BYD's forced labor was subjected to intimidation, segregated into dormitories and forced to commute on dedicated trains, personally threatened, subjected to constant surveillance, made vulnerable and dependent by threats made against their relatives in Xinjiang, had military-style policing while working within the factories. Additionally, they were disallowed from practicing their religion, forced to learn mandarin, and forced to sing the Chinese national anthem. I feel that if BYD genuinely cared about its corporate responsibility they would be upholding some level of fairness surrounding its workforce. The reality appears to be that BYD is more concerned with pleasing its shareholders than making a positive impact and adhering to its

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corporate responsibility. While everything BYD claimed to do looks great in their CSR report, in order to act more responsibly BYD needs to practice what it claims it practices (Ochab, 2020).

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