

The Value of Non-Value Activities

W. Terry Dancer
Arkansas State University

Harshita Chopra
Arkansas State University

Anh Duong
Arkansas State University

The essence of manufacturing is first an idea, then a facility, then the purchase of raw materials, then hiring of labor, then we turn on the electricity and transform raw material into our product. This essence gives a foundation we can build on. Many believe only value-added activities such as materials and labor add value to the product. However, others believe that activities such as inspections, machine setups, and even wait time adds value to the product. The premise of this paper is anything you are willing to pay for has value, even if it labeled a “so-called” non-value-added activity and buyers willingly pay for non-value added activities every time a product is purchased. The question becomes: “What is the value of Non-Value added activities?”

Keywords: value-added activities, non-value-added activities, business, economics, lean manufacturing

INTRODUCTION

The essence of manufacturing is first an idea for a product, then a place to make the product, then the purchase of raw materials, then hiring of labor, then we turn on the electricity and transform our raw material into our product. There is far more to manufacturing than idea, place, raw materials, labor, and electricity, but the essence gives us a foundation we can build on.

We may begin to identify all the activities necessary to turn raw materials into a finished product ready for sale by broadening the essence of manufacturing. Once we identify all the activities necessary to make our product, time will indicate how each activity may be refined, streamlined, improved, or perhaps eliminated.

The genesis of this paper happened about 20 years ago when I made a trip to the local library to pick up my wife and go to lunch. While waiting for her to come out to the car, I watched a young man working on the foundation for an addition to the Public Library.

I watched for about 15 minutes as this young man moved the rebar from where it was dropped off by the truck to where it was needed to reinforce the concrete. Earlier that morning I taught my cost class about the nature of moving materials and the classification of moving materials as a non-value-added activity. It was extremely hot this day. August in Arkansas. As I watched, I asked myself if what this young man was

doing in fact did not add any value to the project. I asked myself: What is the value of non-value-added activities?

The Essence of Manufacturing

W. Kenton defined manufacturing as: “Processing raw materials or parts into finished goods through the use of tools, human labor, machinery, and chemical processing” (Kenton, 2024). Manufacturing allows businesses to sell finished products at a higher cost than the value of the raw materials used. Large-scale manufacturing allows goods to be mass-produced using assembly line processes and advanced technologies as core assets. Efficient manufacturing techniques enable manufacturers to take advantage of economies of scale, producing more units at a lower cost. Kenton also announced the fact about manufacturing that the industry’s contribution to GDP was a little more than \$2.85 trillion for the third quarter of 2023, about 10.3% of output (Kenton, 2024).

To support recognizing which activities are necessary for manufacturing, let’s consider the case of Tesla, Inc., a prominent player in the automotive industry known for its innovative approach to manufacturing electric vehicles (EVs). Tesla, founded by Elon Musk in 2003, aimed to revolutionize the automotive industry by producing sustainable electric vehicles with cutting-edge technology. One of Tesla’s key challenges was establishing efficient and scalable manufacturing processes to meet the growing demand for its EVs.

By leveraging vertical integration, lean manufacturing principles, and technological innovation, Tesla redefined the traditional automotive manufacturing model and set new standards for efficiency, quality, and sustainability in the EV market (Parkinson, 2024). What does the Value-added Activity mean? “Value is only valuable if someone values your value”, as business agility expert Nigel Thurlow has simply put it, identifying value through your customers’ perspective is critical to success. (Krasteva, 2023).

According to Krasteva’s perspective, value-adding activities are all actions that produce actual value for your customers. Any activity that cannot be eliminated is a value-added activity. Since a rational manufacturer would not pay one cent for something with zero value, if we pay anything for a process or activity, the process or activity must have value by default. Such actions move your product or service one step closer to satisfying your customer’s expectations. Anything customers are willing to pay for has value.

In a manufacturing organization, the value-added activities transform the product from raw material to its finished form. It means that A process, object, or service must be physically changed. Finally, value addition means getting things done right on the first try. This means neither you nor your customer has to incur further costs to make it perfect. Any rework done to make a product or service acceptable to the client is not a value-added activity (quality gurus.com, n.d).

Lean Manufacturing

Creating customer requirements are shifting many manufacturing companies from mass production of standard products to small-lot production of customized products, with even greater emphasis on quality. Value in Lean constitutes everything that the customer is willing to pay for. A cornerstone of Lean thinking is properly identifying value by shifting the focus to the customer. Two questions as “What do the customers want?” and “What are the customers willing to pay for?” are the customer-oriented plans that firms should follow to renovate their lean manufacturing. A people-oriented approach that empowers a team to take action to achieve improvements, lean is the best way to effectively use a company’s most valuable resource its people. (Hyder, 2021).

“Lean manufacturing is built on the premise that reducing waste, eliminating redundancies, and operating with precision is key to succeeding in the marketplace” (Hyder, 2021). To understand the history of Lean, we must go back to the start of modern manufacturing. Henry Ford revolutionized manufacturing with mass production techniques, characterized by standardized products and continuous flow production. This system enabled Ford to produce large quantities of vehicles efficiently, with perfectly fitted and interchangeable components, exemplified by the success of the Model T.

Dujack explained five basic principles of lean manufacturing as follows:

- Identify Value: Clarify the end value desired, focusing on customer satisfaction.

- Map the Value Stream: Track the steps in creating value, removing wasteful activities.
- Create Flow: Establish a smooth flow of materials, information, and work.
- Establish Pull: Base production on customer demand to reduce overproduction.
- Seek Perfection: Continuously improve processes for leaner production.

By following these principles, industrial companies can shed inefficient processes and activities and focus on the practices that deliver the greatest value to their end customers. In turn, this approach to manufacturing results in less waste, greater profits, and improved customer satisfaction (Dujack, 2024).

In lean manufacturing, there are eight types of waste, that can negatively impact efficiency and productivity. These are:

- Defects: Any abnormalities or flaws in a product that result in its rejection or require rework. Defects lead to wasted time and resources.
- Overproduction: Producing more than is needed or before it is needed. Overproduction leads to excess inventory, which incurs additional handling and storage costs.
- Waiting: Idle time or delays in the production process due to inefficient workflow or process bottlenecks. Waiting wastes valuable time and resources.
- Non-Utilized People: Failing to fully leverage the knowledge, skills, and abilities of employees. Not involving employees in problem-solving or improvement initiatives leads to wasted potential.
- Transportation: Unnecessary movement of materials or products within the production process. Excessive transportation leads to increased lead times and potential damage to products.
- Inventory: Excess inventory beyond what is needed for immediate production or customer demand. Inventory ties up capital and valuable space and can become obsolete or damaged over time.
- Motion: Unnecessary or excessive movement of people, equipment, or materials within the production process. Excessive motion can lead to fatigue, injuries, and decreased efficiency.
- Extra Processing: Performing unnecessary or redundant steps in the production process that do not add value to the final product. Extra processing consumes resources without providing any benefit to the customer (Skhmat, 2017).

Value Added Activities

Value-added activities have main three key features:

1. **Value for money:** Modification of raw materials to finish goods is not sufficient to be sold to customers, the products or goods must have some value for the customer will be willing to pay for such as processed food.
2. **First-time charm:** This indicates that things need to be done on the first try that neither the manufacturer nor the customer has to do again to make it perfect (*Value Added Vs NonValue Added Activities*, n.d.).
3. **Modifications or transformation:** Activities that transform the raw material into finished goods for which customers are willing to pay such as furniture.

These three key features identified as what constitutes a value added activity is a statement of opinion and not a statement of fact. Though many may believe these key features do indeed represent activities considered value-added, not all those in manufacturing agree.

Value-Added Versus Non-Value-Added Activities

Croft (2024) wrote, “Conducting non-value-add analysis is the process of reviewing and understanding each activity in the process to identify if it adds value in the eyes of the customer. Non-value-adding activities usually include unnecessary steps, redundancies, delays, or anything that leads to inefficiency without enhancing the product or service.”

In general, if an activity does not meet **all three** of the following criteria, it is a waste:

1. It transforms people, information, or materials.

2. It is done right the first time.
3. The customer wants it and is willing to pay for it.

If you cannot say yes to all three above, the activity is non-value-adding. (Croft 2024).

Activities that do not meet the features mentioned above May be considered non-value-added activities. Examples of Non-Value added activities (which are consistent with much of what Skhmot wrote about) are described below:

- **Wasting time:** wasting times indicate the time being wasted waiting for people, materials, and equipment to be available to perform the activity.
- **Overproduction:** manufacturing more products than the demand for the product can be a waste for the company.
- **Unnecessary motion:** excessive movement or shift of people or equipment without benefit can be a waste of time and energy.
- **Excess inventory:** holding onto a large quantity of raw material can cause excess inventory and thus can increase inventory expenses.
- **Defects:** Products manufactured with low quality or don't meet customer requirements are considered defects.
- **Unnecessary processing:** all the process or review steps that are beneficial to the production. (Ohno, 1988).

There are many other examples of non-value-added activities. In Six Sigma, the goal is to recognize and eliminate non-value-added activities for manufacturing development. (*Non-Value-Added NVA* (2024)).

However, I think it important to note that these comments represent an opinion, not a statement of fact. What one may consider a non-value-added activity may be considered a value-added activity by others.

Classification Scheme for Non-Value-Added Activities

Lean manufacturing which was previously known as Toyota Production System (TPS) introduced two types of waste (Saukkoriipi, 2004). These wastes are described below:

- **Pure waste (non-essential):** processes or activities that add no value to the product at all are known as pure waste. Activities that increase the waste of time, and delay delivery time negatively impact the activity of the organization and also harm the reputation of the company. For instance, inventory or equipment that no one uses are pure waste (*Understanding Value Added Vs. Non-Value Added Activities*, 2023).
- **Necessary (essential):** Waste that assures the consumer receives the product or service we provide but does not directly add value is referred to as necessary waste. Quality assurance is among the best instances of a procedure that fits within this category (*Understanding Value Added Vs. Non-Value Added Activities*, 2023).

There are three different ways to differentiate between pure and unnecessary waste: value stream mapping, the Kanban method, and Gemba walk basic steps. This helps organizations to identify the pure and necessary waste.

Non-Value-Added Activities in Manufacturing

At first glance, these activities might seem redundant, but they play a crucial role in maintaining operational stability, quality assurance, and overall efficiency in manufacturing. Here's why some non-value-added activities are still essential in manufacturing, explained through the following points. (Bhim, Grag, Sharma, and Chandandeep, 2010).

Walking to Retrieve Product or Raw Material

Walking to gather materials is typically seen as non-value-added because it doesn't directly contribute to product transformation. However, having resources readily available is crucial for a smooth production process. A well-organized workspace with an efficient layout can reduce unnecessary walking, improving productivity. Nonetheless, occasional walking might be necessary for safety checks, stock

verification, or material quality assurance, highlighting why some non-value added activities are still important (Bhim, Garg, Sharma, and Chandandeep, 2010).

Inspecting Products

Inspection is generally categorized as non-value-added since it doesn't change the product's nature or add perceived customer value. However, inspections are indispensable for quality control, ensuring that defective products don't reach customers. While a customer may require 100% inspection, making it technically value-added, most inspections serve as a safety net against defects. Inspectors are key to maintaining product quality and avoiding costly rework or recalls despite not contributing to product transformation (Bhim, Garg, Sharma, and Chandandeep, 2010).

Searching for Tools

While searching for tools is seen as wasteful, it underscores the need for organized workspaces with easily accessible resources. This activity may not directly contribute to product creation, but if workers can't find the necessary tools, it can lead to delays, frustration, and reduced productivity. Proper tool management, with designated storage and clear labeling, can significantly decrease this type of waste and improve workflow efficiency (Bhim, Garg, Sharma, and Chandandeep, 2010).

Setting up the Machine

Machine setup involves preparing equipment for operation and is often considered non-value added. However, proper setup is essential to ensure machines run correctly and efficiently. An effective setup process reduces errors, minimizes downtime, and ensures consistent product quality. Although setup doesn't transform products, its role in preventing defects and maintaining production flow makes it a critical activity in manufacturing (Bhim, Garg, Sharma, and Chandandeep, 2010).

Checking Paperwork and Drawings

Checking paperwork and drawings is typically viewed as non-value-added, yet it is essential in ensuring production accuracy. This step helps avoid costly errors by confirming that all documentation is correct and updated. While it may seem administrative, these checks are crucial for maintaining consistent quality and compliance with design specifications (Bhim, Garg, Sharma, and Chandandeep, 2010).

Asking Questions Before Proceeding

Asking questions may seem non-value-added since it doesn't directly contribute to production. However, clear communication is vital to avoid errors, ensure safety, and maintain an efficient production flow. By encouraging workers to ask questions and seek clarification, manufacturers can foster a more collaborative environment, reducing the risk of mistakes and improving safety (Bhim, Garg, Sharma, and Chandandeep, 2010).

Identifying Non-Value-Added Activities

Non-value-added activities are difficult to identify. Some of the activities cannot be easily identified and eliminated as some of them seem to not add any value but are necessary for the quality. It takes more time to identify the non-value-added activities and take steps to eliminate them (Non-Value-Added (NVA), 2024).

Six Sigma's goal is to evaluate the NVA and eliminate it to improve the overall organization process and their efficiency. According to Six Sigma, the detection of NVA is described below:

- **Process Mapping:** In the process mapping, they prepare a visual representation of the whole manufacturing process and identify all the activities and steps relevant to production. Therefore, it becomes easier to visually identify the NVA that are consuming the resources without benefiting.
- **Time and motion Studies:** This process requires observing and measuring the time required to complete the process. By observing the waiting time and the unnecessary motion and deflect in the product, the NVA can be identified.

- **Root cause analysis (RCA):** This process needs to identify the root cause of NVA and eliminate the root cause. This might create issues in the flow of work in the production.
- **Value stream mapping:** This process also requires creating a visual representation of the whole workflow process starting from raw materials to customer delivery. Thus, it can identify the NVA that are not adding value to the workflow.
- **Customer Feedback:** management can also gather information from customers through feedback. The customer feedback on the quality and value of the services and products helps the management to identify the NVA.
- **Financial Performance:** In the end, the advantages of handling non-value-added tasks lead to better financial results. Lower expenses, more effectiveness, and more customer value can all have a beneficial effect on the bottom line and raise profitability. (Non-Value-Added (NVA), 2024).

Activity-based Costing and management is used to identify, manage, and measure the organization's used and unused resources and capacity (Saukkoriipi, 2004). When applying ABC, it is considered that products consume activities and that activities consume resources (such as labor, machinery, equipment, material, and energy). Resources that are used up have costs. ABM is neither a financial system nor a tool for decreasing costs. Instead, it is a method for organizing an organization's continuing operations and business procedures to ensure it achieves its strategic goals. The benefits of ABM include identifying the most profitable items, the most valuable customers, whether procedures contribute to adding value or not, and where improvements should be focused (Saukkoriipi, 2004).

Process to Eliminate Non-Value-Added Activities

If a company wants to streamline operations while reducing waste and striving to continuously improve, processes must be undertaken to allow for the elimination of all that is unnecessary. Some of those processes would include:

- **Transportation:** Creating movement between operations, designing a U-shaped production line, and avoiding overproducing work-in-process (WIP) items are some strategies to reduce transportation waste (Skhmot, 2017).
- **Inventory:** Some countermeasures for inventory are buying raw materials just when and in the quantity required, cutting buffers between manufacturing steps, and setting up a queuing system to stop overproduction.
- **Motion:** Keeping the workstation neat and orderly, situating equipment close to the production site, and positioning things ergonomically to minimize straining and stretching are a few motion countermeasures (Skhmot, 2017).
- **Waiting:** The design of processes to guarantee continuous flow or single-piece flow, the use of standardized work instructions to level off the burden, and the development of adaptable, multi-skilled people who can swiftly respond to changing work needs are some countermeasures for waiting.
- **Overproduction:** Three strategies are available to combat overproduction. First off, utilizing a "Tact Time" guarantees a consistent manufacturing rate between stations. Second, shorter setup times make manufacturing small batches or single-piece flow possible (Skhmot, 2017). Thirdly, the quantity of WIP can be managed by implementing a pull or "Kanban" mechanism.
- **Over-processing:** To combat over-processing, one easy strategy is to consider the job needs from the perspective of the client. Prioritize the client's needs above all else, make only the numbers required, and produce to the customer's desired standard of quality and expectation.
- **Defects:** There are four ways to address flaws (Skhmot, 2017). First, identify and concentrate on the most common defect. Second, create a procedure to identify anomalies and ensure that no faulty products are sent further in the manufacturing process. Thirdly, rework the procedure to prevent errors from occurring. Finally, employ standardization work to guarantee a flawless and uniform manufacture

Benefit of Eliminating Non-Value-Added Activities

Non-value-added activities cause various waste in the organization, eliminating these wastes can improve the production process and benefit the organization (Non-Value-Added (NVA), 2024).

Some of the major advantages are mentioned below:

- **Cost reduction:** Non-value-added activities can increase the production cost by using raw materials, labor, and overhead expenses. By realizing and reducing the NVA, the cost of production can be reduced and thus product can be increased with the overall financial performance.
- **Increased Efficiency:** by reducing the streamlined steps and saving time and effort, the company can increase its production efficiency and speed up its production process.
- **Enhance productivity:** By freeing up resources for value-added tasks, workflows may be optimized and needless stages eliminated, which boosts productivity. This may result in more or less production with the same amount of resources (Non-Value Added, 2023).
- **Enhanced customer Value:** By eliminating non-value-added activities, the company can utilize their saved time and resources to increase the quality of the product and thus they can achieve maximum customer satisfaction by producing quality products.
- **Competition Advantages:** In the marketplace, lean and efficient operations can provide a competitive edge. More efficient producers of goods or services are frequently in a better position to offer competitive pricing or creative solutions, providing them a competitive advantage over rivals.
- **Resource Optimization:** Identifying and eliminating non-value-added operations promotes resource optimization, encompassing labor, equipment, and supplies. Better resource allocation and use across the board may result from this.
- **Employee engagement:** When workers are involved in worthwhile projects that have value-added, they frequently experience higher levels of job satisfaction. Process simplification and the removal of non-value-added tasks might result in more interesting and satisfying work for staff members.
- **Improved Quality:** By implementing value-added operations, firms can frequently improve the caliber of their goods or services. This occurs as a result of activities that directly affect the end product receiving more focus and funding.
- **Adaptability to Change:** Organizations that implement lean principles, which emphasize waste reduction and continual improvement, are better equipped to adjust to shifts in the market, consumer preferences, or in legal requirements. In the fast-paced business world of today, this adaptability is essential.
- **Environment Impact:** Process simplification and waste reduction frequently lead to a lesser environmental impact. As companies and customers grow more aware of sustainability and environmental responsibility, this is becoming more and more crucial. (Non-Value Added, 2023).

A Closer Look at Some Non-Value Added Activities

My first job was at the age of 10. I was hired to pick tomatoes from Bradley vine tomato plants. I only lasted a week. This was in 1959. Since this first job I have worked a variety of jobs since 1959 and started a couple of manufacturing endeavors.

I want to relate some of the “so-called” non-value added activities thru my work experience and share how these activities manifest in actual work situations.

One activity that continuously appears as non-value added is waiting. During my summers while in college I worked at Georgia Pacific Plywood Mill in Fordyce, Arkansas. Part of my job was to push wet sheets of 4 feet by 8 feet sheets of plywood into a dryer.

The kind of dryer I am talking about is not one you might find in your utility room. This dryer was 30 feet wide and 200 feet long. The sheets I pushed into the front of the dryer would come out the back of the

dryer ready to get to the next process where the adhesive was applied and then the sheets pressed into sheets of plywood.

The dryer had 8 levels of sheets. I would load one level, the machine would draw the loaded sheets into the dryer and then automatically move to the next level. The problem was on occasion sheets would splinter and sheets from one level would get into another level and soon the dryer would back up because the sheets would not flow freely to the other end.

When the dryer stopped up the machine would stop and the clean out process would begin. For me, this meant waiting on the platform while the dryer was cleaned out. Sometimes this was only a few minutes, sometimes it was hours, and one time it was still stopped up when I came back to work for my next shift.

While I was waiting, nothing was getting dried but I was still getting paid. Usually I would just wait but sometimes when the clean-up was expected to take a while, I would get moved to doing another task somewhere else in the factory.

Another activity that is considered a non-value added activity is walking to get needed materials and supplies. During the time between the time I graduated from College and the time I entered the Army I worked at River Marine Corporation. River Marine manufactured Aluminum and Fiberglass boats.

I worked on the fiberglass line where fiberglass and fiberglass resin was shot thru a machine resembling a gun onto the mold. I would then take a small roller and roll the mixture of fiberglass and resin into a smooth surface. Four people worked at my station.

On my first day I arrived at the work station, met the others on the crew. I then observed two members of the crew left our work space and went to pick up some needed materials and supplies. They were gone for about an hour. During this time, no work was taking place at the station. Nothing happened until the needed materials were picked up. We started at 7 and the first mold was finished and ready to move on down the line about 8:30.

No product was made during the first hour because workers walked to get needed materials and supplies. I suggested the suggestion box that one of the crew should get there an hour early, pick up the needed materials and supplies, and then work on the mold could begin at 7:00. Two months after I got into the service, I got a check from River Marine for \$500 and a thank you for the suggestion.

Another non-value added activity is defects. Products that were considered less than first rate upon completion. At River marine in the Aluminum part of the factory, a certain number of aluminum boats would be pulled from the line and deemed "irregulars". Though all the Materials, labor, and overhead that went into an "irregular" were the same as those going into a first-quality boat, the boat could not be sold as first quality.

One of two things would happen. The "irregulars" went thru additional work and it was turned into a first quality boat. Or, the "irregular" was sold to a local boat dealer and locals were able to buy these boats at a discount. But in both situations, money was spent or revenue was sacrificed because the product was not manufactured first quality.

Another activity considered Non-Value is counting items. Counting items once the product is completed. Ordinarily this would be the packaging part getting the product ready to sell to the consumer.

I had a small manufacturing business where I made fishing lures. I managed to get the product into Wal-Mart for a time and sold about 5,000 units. However, I was told I needed 23 more products to continue selling to Wal-Mart. So I had to give up my Wal-Mart experience.

10 of the plastic lures went into each package. So once I finished making the product, I had to count our 10 lures, place in a plastic bag, and then staple the label to the bag. Counting the 10 lures for each bag added nothing to my production but was a necessary part of my manufacturing process. This activity could not be eliminated.

Waiting, walking to get materials, defects, and counting inventory are all considered by many to be non-value added activities. From my closer look at a few non-value added activities, some may be eliminated and others may not.

CONCLUSION

If you look up the word value in the dictionary, you will find something along the lines of relative worth, merit, or importance. It is interesting to answer the question; how much would you pay for something with no value? No worth. No merit. No importance. The obvious answer is nothing. However, companies pay substantial sums in manufacturing for so-called “non-value added” activities. This is why the worth of non-value-added activities is a complex and often debated topic. On one hand, these activities consume resources such as time, energy, and materials without directly contributing to creating value for the customer. They can lead to inefficiencies, increased costs, and reduced productivity within an organization and their value is equal to zero.

However, it’s essential to recognize that not all non-value-added activities are inherently wasteful. Therefore, while non-value-added activities may not directly contribute to the bottom line, their worth lies in the opportunity they present for identification, analysis, and improvement. The worth of non-value-added activities lies in their potential to drive process improvement and organizational efficiency, rather than in their direct contribution to value creation. Identifying and addressing these activities can unlock hidden value within an organization, making them a critical focus for continuous improvement efforts. Certain non-value-added activities, such as quality assurance inspections, may be necessary for specific operations, but they often lead to inefficiency and higher costs. To align with lean manufacturing principles, these activities must be minimized or eliminated. Lean manufacturing addresses these inefficiencies through continuous improvement and key practices such as just-in-time (JIT), 5S, and standardization. By streamlining processes and reducing waste, manufacturers can boost efficiency and enhance product quality, creating a balanced strategy to meet customer demands. As companies embrace lean methodologies, they become more competitive in the ever-changing manufacturing industry. A focus on continuous improvement helps organizations build a sustainable approach that balances efficiency, quality, and flexibility. The idea non-value added activities have no value is misguided. Every day in America consumers pay millions, perhaps billions, for what some call non-value-added activities. This is clear when one considers the fact companies add costs for Wait time, Inspections, Quality Assurance, Setups, walking to get materials, counting inventory, and other activities to the price of their products and consumers pay the price, or they go elsewhere and still pay the price.

Bottom line, non-value added activities do not exist. Any cost incurred in the manufacturing of a product is a cost that must be covered thru regular and ongoing sale of the product or service. Each day, customers willingly pay the price that includes all costs incurred, including the non-value added activities. Do companies strive to eliminate waste and continuously improve? Absolutely. But given the question, “how much would you pay for something that has no value?” The answer is always the same: Nothing. Absolutely nothing. So what is the value of non-value added activities? At a minimum, any cost for any of the so-called non value added activities has a value equal to the price paid for the activity. And this is a price customers are willing to pay. And the proof is in the purchase of the product. What is the monetary or material worth of so-called non-value-added activities? It is the price paid for the activity.

REFERENCES

- Ali, S.N. (2015). *Productivity Improvement of a Manufacturing Facility Using Systematic Layout Planning*.
- Alwi, S., Hampson, K.D., & Mohamed, S. (2002). *Non value-adding activities: A comparative study of Indonesian and Australian construction projects*. Research Gate.
- Belokar, R.M., Kharb, S.S., & Kumar, V. (2012). An Application of Value Stream Mapping In Automobile Industry: A Case Study. *International Journal of Innovative Technology and Exploring Engineering*, 1(2), 231–236.
- Bhim, S., Garg, S., Sharma, S., & Chandandeep, G. (2010). Lean implementation and its benefits to production industry. *International Journal of Lean and Six Sigma*, 1(2), 157–168.

- Bragg, S. (2023, December 21). Non value added activity definition — Accounting Tools. *Accounting Tools*. Retrieved from <https://www.accountingtools.com/articles/nonvalue-added-activity>
- Croft, D. (2024) *Guide: Non-value add analysis*. Retrieved from <https://www.learnleansigma.com/guides/non-value-add-analysis/>
- Dictionary.com. (n.d.). *Value*. Retrieved from <https://www.dictionary.com/browse/value>
- Dujack, E. (2024). *The 5 lean manufacturing principles explained and visualized*. Retrieved from <https://www.l2l.com/blog/5-lean-manufacturing-principles>
- Hyder, S. (2021). *How Covid-19 has changed Lean manufacturing practices: A case study with iBaset*. Retrieved from <https://www.forbes.com/sites/shamahyder/2021/02/22/how-covid-19-has-changed-lean-manufacturing-practices-a-case-study-with-ibaset/?sh=16399bcf7e80>
- Kenton, W. (2024). *Manufacturing: Definition, Types, Examples and Use as Indicator*. Retrieved from <https://www.investopedia.com/terms/m/manufacturing.asp#:~:text=Key%20Takeaways,tools%20before%20the%20Industrial%20Revolution>
- Krasteva, I. (2023). *Understanding Value Added vs. Non-Value Added Activities*. Retrieved from <https://businessmap.io/blog/value-adding-vs-non-value-adding-activities>
- Learn Lean Sigma. (n.d.). *Guide: 8 Wastes*. Retrieved from <https://www.learnleansigma.com/guides/8-wastes>
- Line View. (2015). *Lean and continuous improvement*. Retrieved from <https://lineview.com/en/operational-support/lean-and-continuous-improvement/>
- Non-Value Added. (2023, December 1). *Six Sigma Development Solutions, Inc*. Retrieved from <https://sixsigmadsi.com/glossary/non-value-added/>
- Ohno, T. (1988). *The Toyota Production System: Beyond Large-Scale Production*. Portland, Oregon: Productivity Press.
- Parkinson, G. (2024). Musk flags “Manufacturing Revolution” in EVs, but says Tesla is not really.
- Prodan, L. (2023). *Comparing lean manufacturing vs. traditional manufacturing*. Retrieved from <https://liviuprodan.com/comparing-lean-manufacturing-vs-traditional-manufacturing>
- Quality Gurus. (n.d.). *Value-added vs Non-value-added activities*. Retrieved from <https://www.qualitygurus.com/value-added-vs-non-value-added-activities/>
- Six Sigma Development Solutions, Inc. (2024, January 17). *Non-Value-Added (NVA)*. Retrieved April 20, 2024, from <https://sixsigmadsi.com/glossary/non-value-added-nva/>
- Six Sigma Development Solutions, Inc. (2023, June 27). *Necessities vs. Eliminations: Decoding Necessary Non-Value Adding*. Retrieved April 20, 2024, from <https://www.isixsigma.com/dictionary/necessarynon-value-adding-nnva/>
- Skhmot, N. (2017). “*What is Lean?*”. Retrieved from <https://theleanway.net/what-is-lean>
- Techsolve.org. (2020). 8 wastes of lean manufacturing. Retrieved from <https://www.techsolve.org/8-wastes-of-lean-manufacturing/?v=d2cb7bbc0d23>
- Watts, M. (2023). *Boosting efficiency: How Non-value-added reduction leads to cost savings*. Retrieved from <https://www.isixsigma.com/dictionary/non-value-added/>
- Williams, L. (2024, March 10). *What Does a Material Handler Do? (With Requirements)*. Retrieved from <https://www.indeed.com/career-advice/careers/what-does-a-material-handler-do>
- Womack, J.P., & Jones, D.T. (1996). *Lean Thinking- Banish waste and create wealth in your corporation*. Simon & Schuster, New York, NY, USA.