How Does the Arrival of a New Product Affect the Manufacturing Area?

Juan Carlos Ramos Santiago
Master of Engineering in Manufacturing Engineering
Advisor: Rafael Nieves Castro, PharmD.
Polytechnic University of Puerto Rico
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Abstract *— The introduction of a new product within a manufacturing environment significantly impacts operational efficiency, employee workflow, and resource distribution. This research analyzes the effects of integrating a new product into an existing manufacturing system, emphasizing the downstream process. Using a mixed-method approach, the study combines employee workload data, activity categorization, and process evaluations over a three-week period. Key findings highlight that onboarding and training initially dominate resource allocation, with a subsequent transition to on-the-floor support and operational involvement. The study identifies inefficiencies in training duration and meeting structures, offering strategies to optimize time management and accelerate employee adjustment. A structure is proposed to improve productivity, minimize disruptions, and update the transition for future product introductions. This research supports manufacturing areas in becoming more active, robust, and effective when facing product innovation, ensuring consistent product quality and timely market delivery.*

Keywords *— Employee Workload, Manufacturing, New Product Integration, Process Optimization.*

PROBLEM STATEMENT

This section describes the challenges in the manufacturing area when a new product is introduced in production. The arrival of a new product in the manufacturing area is a substantial event that often disrupts existing manufacturing processes, systems, and employees. This disruption can be a result of new manufacturing techniques, equipment changes, additional workforce requirements, or changes to the workflow. Such changes demand a thorough analysis to minimize inefficiencies, control costs, and ensure timely delivery of the product to the market. Understanding and addressing these tasks is crucial for maintaining productivity, quality, and competitiveness in the manufacturing area.

This research analyzes the effects of introducing a new product on a manufacturing area, focusing on the operational, logistical, and resource-related challenges.

PROJECT DESCRIPTION

The arrival of a new product in a manufacturing environment presents significant challenges that impact existing workflows, employee responsibilities, and departmental coordination. This project aims to explore the effects of introducing a new product into an established manufacturing area, focusing on downstream processing. By evaluating the operational shifts that occur during this transition, the study goals to provide practical understandings that facilitate smoother integration and sustained performance.

A central component of the project involves analyzing how employee time is distributed across various key activities during the introduction phase. These activities include technical and job-specific training, on-the-floor commercial support, documentation responsibilities, and participation in meetings. The study measures how these activities develop over a three-week period, emphasizing changes in focus and time allocation as the workforce moves from onboarding to full operational engagement.

To gather data, the research employs a mixed-methods approach that combines quantitative workload analysis with qualitative observation. This dual methodology allows for a comprehensive understanding of the adjustments required in both

human resources and operational infrastructure. The data also uncovers areas for improvement, particularly in the efficiency of training and meeting practices, which are often over-extended during new product introductions.

The project places special emphasis on the role of the Process Development department, which acts as a bridge between Research and Development and full-scale manufacturing. Understanding how this department adapts to the arrival of a new product is critical, as it influences equipment setup, process validation, compliance, and workforce training. Recommendations derived from this study are aimed at improving departmental coordination and readiness for future product rollouts.

PROJECT OBJECTIVES

The primary objective of this project is to evaluate the operational impact of introducing a new product into an existing manufacturing area. The study targets to identify how this transition affects workforce distribution, departmental coordination, and process efficiency, particularly within the downstream processing stage.

Specific objectives of the project include:

1. **Assess the Operational Impact** – Analyze how the arrival of a new product alters manufacturing workflows, including changes in employee time allocation, resource usage, and task prioritization.
2. **Evaluate Workforce Adjustment** – Examine the extent and effectiveness of employee training, onboarding, and engagement during the first weeks of the product's implementation.
3. **Identify Inefficiencies** – Detect non-value-added activities, such as excessive training time or redundant meetings, that could be optimized to increase productivity.
4. **Propose an Integration Structure** – Develop a practical and repeatable model that manufacturing teams can follow to reduce disruption, maintain quality standards, and ensure timely market delivery when launching future products.

These objectives are designed to provide actionable awareness that improves organizational readiness, employee performance, and overall manufacturing efficiency during product introductions.

PROJECT SCOPE

This project focuses on evaluating the impact of introducing a new product within a manufacturing environment, specifically examining changes in operations, workforce dynamics, and departmental coordination. The scope is limited to the downstream manufacturing processes, which include product recovery and purification activities.

The study focuses on a defined three-week period following the product's introduction, during which employee activity is monitored and categorized into four main areas: Trainings, Commercial Support On-the-Floor, Documentation, and Meetings The specific effect in a Process Development department. This timeframe captures the critical transition phase from initial onboarding to active operational engagement.

LITERATURE REVIEW

This chapter will introduce the different aspects in the manufacturing area, like definitions, vision, and objectives. Manufacturing is the process of transforming raw materials into finished products through various methods, including manual labor, mechanism, and chemical processes. It plays a crucial role in the world economy by adding value to raw materials and creating products for consumption. The term "manufacturing" originates from the Latin words "manu factus," meaning "made by hand" [1].

Manufacturing Departments

In a manufacturing company, operations are typically organized into several key departments, each fulfilling specific roles to ensure efficient production. The Production/Operations Department

is responsible for the actual manufacturing of products. It oversees the transformation of raw materials into finished products, ensuring that production processes are efficient and meet quality standards. Functions include production planning, scheduling, and maintenance of equipment.

The Research and Development (R&D) Department focuses on innovation, developing new products, and improving existing ones. It investigates new technologies and methodologies to improve manufacturing processes and product quality, maintaining the company's competitive approach [2].

Quality Control/Assurance Department guarantees that products meet established quality standards and specifications. It conducts inspections, testing, and monitors production processes to detect defects or deviations, ensuring customer satisfaction and compliance with regulations [2].

The Supply Chain Department is responsible for ordering the raw materials and the distribution of finished products. This department manages relationships with suppliers and coordinates the transportation and storage of products. Efficient supply chain management is crucial for meeting production schedules and customer demand [3].

Process Development

The Process Development Department focuses on optimizing and advancing manufacturing processes to ensure efficient, scalable, and cost-effective production of products [4]. The key objectives include designing and developing reliable processes to produce the products, ensuring consistency and compliance with regulatory standards. Transition processes from laboratory-scale to commercial-scale manufacturing. Facilitate the transfer of processes from research and development to manufacturing sites. Collaborate with manufacturing teams to ensure process scalability and reproducibility. This project will focus on how the arrival of a new product affects this department.

Manufacturing Business

Introducing a new product to a manufacturing site is a strategic move driven by several key factors. As consumer preferences change, companies must innovate to satisfy these new demands. Developing new products enables businesses to stay relevant and cater to shifting market trends [5]. In a dynamic market, introducing new products can differentiate a company from its competitors, attracting new customers and retaining existing ones. Relying on a limited product line can be uncertain. By developing new products, companies spread risks across multiple offerings, ensuring positive revenue. These new products can arrive via the R&D Department (Process Development depends on the company), or the company acquired a product from another company.

METHODOLOGY

The following chapter summarizes the structured approach adopted to investigate the operational and organizational impacts of introducing a new product into a manufacturing environment, using a combination of qualitative and quantitative methods to guarantee a thorough and data-informed analysis.

Research Approach

This study uses a mixed-method research approach, integrating both qualitative and quantitative data collection methods to analyze the impact of introducing a new product into the manufacturing area. This approach ensures a comprehensive evaluation of operational, logistical, and resource-related challenges while providing data-driven insights for process optimization.

Research Design

The research goes by an observational and analytical design, combining case study analysis and the voice of the employees. The methodology consists of three key phases:

Preliminary Assessment

Identify the specific manufacturing area affected by the new product.

Collect baseline data on current manufacturing workflows, resource allocation, and employee workload.

Conduct a literature review to understand existing frameworks for managing new product introductions in manufacturing.

Data Collection Methods

Operational Data Analysis: Collection of resources utilization before and after the new product introduction.

Research Schedule

A research timeline will be developed to guide the execution of the study. The schedule includes major milestones and estimated completion dates (See Table 1).

Table 1
Calendar

Task	Start Date	End Date
Literature Review	11/12/2024	02/15/2025
Data Collection	01/19/2025	02/24/2025
Data Analysis	03/01/2025	04/06/2025
Report Writing	03/01/2025	04/06/2025
Final Review & Submission	04/06/2025	04/23/2025

Limitations of the Study

- Access to specific operational data may be restricted due to confidentiality concerns.
- The study's findings are limited to the manufacturing site under investigation and may not be generalizable to all manufacturing industries.

RESULTS AND DISCUSSION

This section presents the distribution of working hours for each employee across three consecutive weeks (This timeframe because the manufacturing process is completed), segmented into four (4) main activity categories: Trainings, Commercial Support On-the-Floor (will be represented in tables in the next section as CS), Documentation, and Meetings. The purpose of this classification is to analyze how employee time is allocated to support onboarding, skill development, and operational needs during the manufacturing process. In Table 2, the total hours worked per employee are tabulated. Then the data will be distributed per week and the categories.

The 4 main activity categories: Training, Commercial Support On-the-Floor, Documentation, and Meetings, have their respective sub-groups:

Training

- Technical Skills Training: Software tools, equipment handling, or specific technical knowledge and safety protocols.
- Job-Specific Training: Hands-on practice related to core job functions. Real-life scenarios and practical demonstrations.
- Onboarding Training: Introduction to roles and responsibilities.

Commercial Support On-the-Floor

- Problem-Solving & Troubleshooting: Identifying concerns and finding quick solutions. Reporting events and suggesting improvements.
- Quality Control: Monitoring processes to maintain standards. Performing checks to ensure consistency.
- Data Collection and Reporting: Recording observations, tracking performance metrics. Providing feedback on operational events.

Documentation

- Performance Tracking: Recording daily activities and outcomes and generating progress reports.
- Incident Reports: Documenting any irregularities, events, or safety breaches.

- Knowledge Sharing: Creating informative content for future use. Recording best practices and lessons learned.

Meetings

- Daily Updates: Brief updates on progress and daily responsibilities. Identifying immediate needs and challenges.
- Problem-Solving: Speaking specific events or tasks in real-time .Brainstorming solutions for current events.

Table 2
Employees' Total Hours Worked

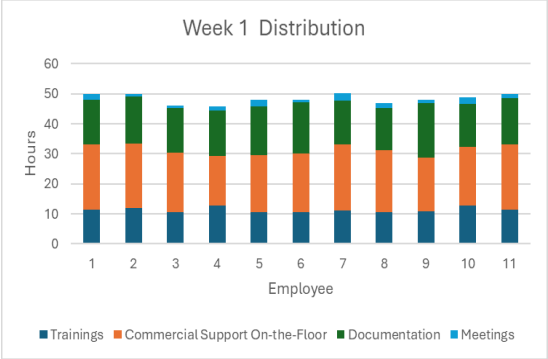
Employee	Week 1 (hrs)	Week 2 (hrs)	Week 3 (hrs)	Total (hrs)
1	50	45	43	138
2	50	43	40	133
3	46	47	42	135
4	46	44	50	140
5	48	49	40	137
6	48	46	42	136
7	50	44	41	135
8	47	42	46	135
9	48	48	45	141
10	49	47	40	136
11	50	49	42	141

Week 1

In Week 1 (See Table 3 and Graph 1 below), the focus was primarily on immersing employees in the manufacturing process, with most of their time dedicated to Commercial Support On-the-Floor and Training.

Table 3
Employees' Total Hours Worked and Distributed Week 1

Employee	Training (hrs)	CS (hrs)	Documentation (hrs)	Meetings (hrs)
1	11.4	21.7	14.8	2.0
2	12.0	21.5	15.7	0.8
3	10.5	19.9	14.7	0.9
4	12.9	16.3	15.1	1.6
5	10.5	19.1	16.3	2.1
6	10.5	19.5	17.1	0.9
7	11.0	22.1	14.6	2.4
8	10.7	20.5	14.1	1.7
9	10.8	18.0	18.0	1.2
10	12.7	19.6	14.3	2.3
11	11.5	21.7	15.3	1.5



Graph 1
Employees' Total Hours Worked and Distributed Week 1

Observations

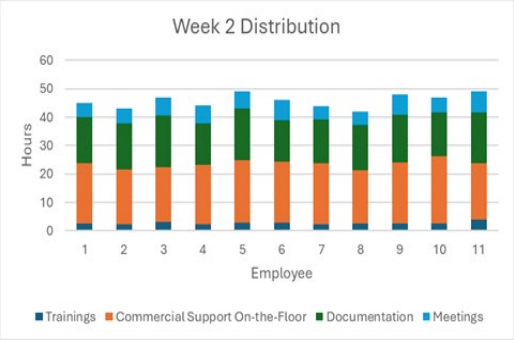
1. Majority of time is allocated to Trainings and Commercial Support On-the-Floor, which is appropriate for onboarding and early immersion to the manufacturing process.
2. There is still a fragment of time spent on Documentation and Meetings, though these are minimal.

Week 2 and Week 3

For Week 2 (See Table 4 and Graph 2) and Week 3 (See Table 5 and Graph 3), the emphasis shifted toward Commercial Support On-the-Floor and Meetings, reflecting a transition from foundational training to more active participation in daily operations, collaboration, and cross-functional coordination.

Table 4
Employees' Total Hours Worked and Distributed by Week

Employee	Training (hrs)	CS (hrs)	Documentation (hrs)	Meetings (hrs)
1	2.5	21.3	16.2	5.0
2	2.3	19.4	16.1	5.3
3	3.1	19.2	18.3	6.4
4	2.3	20.9	14.7	6.1
5	2.8	22.1	18.2	5.9
6	3.0	21.2	14.7	7.1
7	2.3	21.4	15.5	4.7
8	2.7	18.7	15.9	4.7
9	2.7	21.3	16.9	7.1
10	2.7	23.5	15.5	5.3
11	3.9	19.9	17.9	7.3



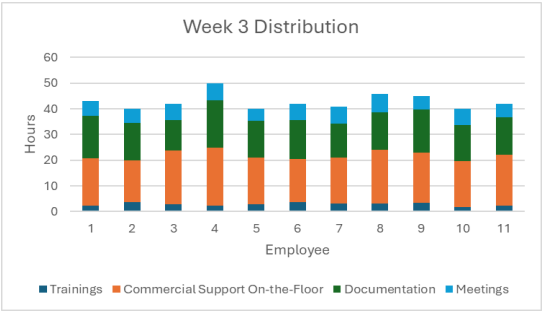
Graph 2
Employees' Total Hours Worked and Distributed Week 2

Observations

1. Shift observed toward Commercial Support (as planned) and increased Meeting time.
2. Training hours have decreased significantly, suggesting employees are moving into more active roles.
3. Time spent on Documentation remains moderate.

Table 5
Employees' Total Hours Worked and Distributed Week 3

Employee	Training (hrs)	C S (hrs)	Documentation (hrs)	Meetings (hrs)
1	2.2	18.5	16.6	5.8
2	3.7	16.1	14.7	5.5
3	2.8	20.9	12.0	6.3
4	2.3	22.6	18.4	6.7
5	3.0	18.0	14.3	4.7
6	3.6	16.9	15.2	6.3
7	3.1	17.8	13.4	6.6
8	3.2	20.8	14.5	7.4
9	3.4	19.6	16.8	5.2
10	1.7	18.0	14.1	6.2
11	2.2	19.9	14.5	5.4



Graph 3
Employees Total Hours Worked and Distributed Week 3

Observations

1. Consistent with Week 2, majority time remains in Commercial Support and Meetings.
2. Documentation and Training are minimal, indicating full integration into the final stages of the manufacturing operations.

DISCUSSION

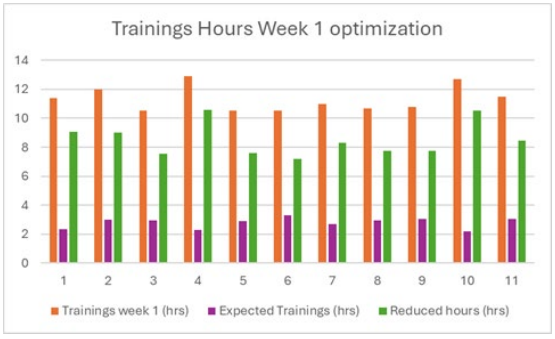
This section provides as interpretation of the research findings, linking them to the study objectives and existing literature.

Week 1 Optimization

If the percentage of Training in Week 1 matches the average training percentage from Weeks 2 and 3, it would result in fewer training hours in Week 1 across all employees. **Table 6** and **Graph 4** show the difference in training hours for each employee in Week 1 if their training time were adjusted to match the average training percentage observed in Weeks 2 and 3. The Reduced Hours column indicates the number of hours that can be reallocated or made available as free time per employee.

Table 6
Reduced Hours Trainings

Employee	Trainings week 1 (hrs)	Trainings (week 2) (hrs)	Trainings (week 3) (hrs)	Expected Trainings (hrs)	Reduced hours (hrs)
1	11.4	2.5	2.2	2.35	9.05
2	12	2.3	3.7	3	9
3	10.5	3.1	2.8	2.95	7.55
4	12.9	2.3	2.3	2.3	10.6
5	10.5	2.8	3	2.9	7.6
6	10.5	3	3.6	3.3	7.2
7	11	2.3	3.1	2.7	8.3
8	10.7	2.7	3.2	2.95	7.75
9	10.8	2.7	3.4	3.05	7.75
10	12.7	2.7	1.7	2.2	10.5
11	11.5	3.9	2.2	3.05	8.45



Graph 4
Employees' Total Hours Worked and Distributed Week 3

Week 2 and Week 3 Optimization

In Week 2 (See Graph 2) and Week 3 (See Graph 3), the distribution of employee hours shows a shift from training to more operational assignments. Most of the time is dedicated to commercial support on the floor and meetings, reflecting a move toward active participation in daily business activities. Training is significantly reduced compared to Week 1, indicating that employees completed most of these tasks. Documentation remains at a moderate level, connected to tracking observations, performance, or deviations.

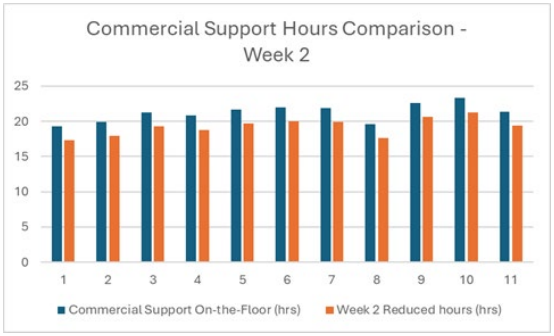
To optimize Week 2 and Week 3, it is fundamental to improve how time is spent across activities, confirming a productive balance. One of the key areas for improvement is meeting time, which can often become excessive or repetitive.

Replacing lengthy status meetings with asynchronous updates or brief, focused sessions can free up effective hours. Commercial support on the floor should also be structured with clear objectives, allowing employees to rotate through different responsibilities and gain a wider operational perspective.

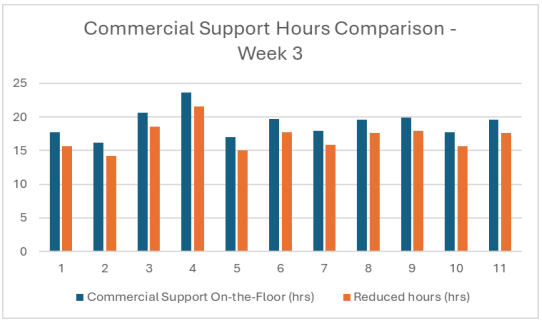
The category that needs to be improved is the Commercial Support On-the-Floor. The Problem-Solving & Troubleshooting subgroup needs to be addressed because when events occur, a fast and efficient resolution minimizes downtime and prevents minor problems from escalating into major interferences.

An effective approach guarantees that solutions are not only quick but also sustainable, addressing root causes rather than just symptoms. If it is only the experts who dominate the technical knowledge and experience needed to correctly identify the problem, analyze its root cause, and implement an effective solution. Involving too many personnel can lead to conflicting opinions, delays, or even incorrect interventions.

This not only wastes time but can also make the situation worse. If it is established which departments are necessary, the workflow can be effective. For Week 2 (See Graph 5) and Week 3 (See Graph 6), if it eliminates the 10-15 minute meetings of the Problem-Solving & Troubleshooting meetings to discuss a minor event, it can be reduced by two (2) hours per employee. These events can be covered in the daily update or Problem-Solving meetings, and no effect on hours worked.



Graph 5
Employees' Total Hours Worked in Commercial Support on the Floor Week 2



Graph 6
Employees' Total Hours Worked in Commercial Support on the Floor Week 3

CONCLUSION

The final section summarizes the key findings of the study, emphasizing their impact and providing final considerations on the research objectives and overall outcomes.

The analysis revealed that training hours in Week 1 significantly exceed the average levels observed in Weeks 2 and 3. By adjusting Week 1 training to match that average (2.80 hours of weekly hours), approximately 8.5 hours less across all employees could be reallocated toward more activities. Require essential training before the start of the manufacturing process. Focus on critical

training topics and defer less urgent content to later weeks. In Week 2, the shift toward commercial support and meetings allowed hands-on learning and team collaboration, though some inefficiencies, such as excessive meeting time and unfocused support activities, were identified.

By Week 3, employees were more embedded in day-to-day operations, with minimal training and increased participation in support and coordination responsibilities. Optimizing and, where possible, reducing the time spent on non-essential training or administrative activities is crucial not only for improving efficiency but also for accelerating employee readiness and engagement.

Excessive training can lead to cognitive overload and disengagement, while poorly structured meetings and documentation can consume time that could be better used for practical learning. By streamlining these activities and focusing on purposeful, timely interventions, organizations can maximize the impact of onboarding, and ultimately foster a more agile, productive, and motivated workforce.

REFERENCES

[1] PBS Learning Media. (n. d.). *What is manufacturing?* [Online]. Available: https://thinktv.pbslearningmedia.org/resource/factories/what-is-manufacturing/.

[2] JRG Partners. (2024, March 3). *The Manufacturing Organizational Structure for Optimal Output* [Online]. Available: https://www.jrgpartners.com/manufacturing-organizational-structure/.

[3] Majumder, S. (2023, January 4). *What is supply chain for manufacturing. Method CRM* [Online]. Available: https://www.method.me/blog/supply-chain-for-manufacturing/.

[4] Patheon. (2024, August 8). *Why process development for biotech and pharma companies matters* [Online]. Available: https://www.patheon.com/us/en/insights-resources/blog/why-process-development-for-pharma-and-biotech-companies-matters.html.

[5] Business RadioX. (2022, May 19). *10 Reasons Why Companies Should Develop and Introduce New Products* [Online]. Available: https://businessradiox.com/10-reasons-why-companies-should-develop-and-introduce-new-products/.