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The development of a multi-layer outsourcing strategy in production planning: The case of Manifattura Berluti

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I would like to dedicate this space to those who, with dedication and patience, have contributed to the realization of this research paper.

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I would also like to extend my gratitude to the entire production planning team of Manifattura Berluti, where I had the opportunity to spend a year as an intern, for the skills acquired and the results achieved together.

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Giulio Magnini

Summary

1 Abstract

The present research is developed on the operational evidence found in the production reality of Berluti, highlighting back-planning analyses oriented toward optimizing the allocation of seasonal production orders.
To date, no studies have been presented on order allocation in multilevel environments within manufacturing enterprises.
In fact, the papers analyzed, have essentially limited the research process by studying a linear production structure.
This topic is particularly interesting from a production perspective because multidimensionality broadens the range of variables and opportunities in the strategic allocation of external processing.

The article will therefore explore the facets that a multi-level manufacturing model can express, especially when adapted to a highly competitive environment.

In this manner, we will be able to delve into the system that surrounds strategic outsourcing choices and introduce an innovative tool integrated with ERP, MES and APS[1], which will allow a conscious optimization of allocation strategies in a challenging production environment.

2 Introduction

In this research, I will analyze the different dynamics that lead to the development of a strategic allocation process under multilevel manufacturing conditions.
For this reason, i deepened the views of several scholars in the field of order allocation, highlighting different shortcomings.
Indeed, in the broad topic of outsourcing, many researchers have explored the strengths of traditional structures under static production conditions.
To our knowledge, this is the first paper to develop an applied theory for planning and outsourcing orders to various suppliers based on an integrated tool linked to production departments.
In this outsourcing system, balanced on supplier skills and technical product requirements, the intrinsic value of individual processes is amplified, improving the production outcome.

The specificity of this treatise, which will evolve into several chapters on Berluti's manufacturing reality, lies in examining manufacturing strategy from the perspective of production planning.
Today, most production enterprises have chosen the path of standardization and offshoring their production cycles to achieve cost advantage.
The LVMH Group, on the other hand, has gone against the trend, investing in production facilities and savoir-faire, encouraging its advancement to new generations.
In this manner, the Group has charted a new course in the range of production strategies, creating an integrated production process with the local district and establishing a network for sharing best practices. These concepts are at the heart of the business model that drives LVMH's success and ensures its future, a model anchored in a long-term vision and entrepreneurial spirit, which builds on the heritage of each Maison and stimulates creativity.
During the discussion, we will explore the reasons and strengths of this choice as well as possible critical issues.

- [1]ERP: Enterprise Resource Planning.
- MES: Manufacturing Execution System.
- APS: Advanced Planning and Scheduling

Carrying out this dissertation, I had the opportunity to study several business cases on allocation dynamics in which production planning analysis was absent, limiting the possible integration of datasets from operational departments.

To fill this gap, I started my research by studying the constant evolution of multilevel outsourcing-oriented planning strategies.
As a result, I realized the vision that has emerged over time, highlighting the structural and prospective boundaries of a traditional strategy, characterized by low-level coordination.
The absence of prior information flow from the various departments can indeed jeopardize the company's success and cause delays in meeting delivery schedules.

Studying the Berluti case study, I realized the potential of applying a prospective model to an interconnected production structure, which enhances manufacturing through:

- Reduction of low-value activities
- Deletion of missing ones
- Optimization of production resources
- Decrease in production lead times and downtime
- Identification of critical issues
- Enhancement of service provided
- Reduction of inefficient warehouse occupancy
- Increase warehouse turnover

To empirically demonstrate the research questions presented in the following paragraphs, i reviewed an illustrative case study on Manifattura Berluti, a leading manufacturer of men's footwear and part of the LVMH Group, thus providing a clear example of a management philosophy that respects the historical values of savoir-faire and proposes incremental innovation in production techniques.

Through my work experience in Manifattura Berluti, as a Production Planning Analyst in the management of external orders, I also understood the key role of scheduling in achieving economic balance, through the processing of data capable of improving departmental performance.
This will enable a long-term production vision through the creation of a structured supply chain in relation to the milestones defined in the plan.
During the discussion, you will have a clear understanding of the strategic functionality of production planning, able to establish continuous implementation processes through prospective analysis based on manufacturing information flow.

Concluding the case study, I will present an innovative tool based on multi-period/product planning (MPMP), developed based on production needs and considering customer deadlines as stringent constraints (Jalali et al., 2020). This tool, integrated into the current production planning system, has the potential to automate the allocation process according to the scheduling constraints defined by the departments involved.

In conclusion, this work will bring a distinct added value to the literature, resulting from a direct approach to the business reality, through primary source data, which enables understanding the concepts expressed.

3 Literature Review

3.1 Production Planning and Strategic Outsourcing Management

Production planning is a set of operations aimed at organizing production resources to meet customer orders and maximize the level of service in terms of speed, flexibility and adherence to delivery dates, while limiting the total cost of the production process from supply chain operations.

Production planning is functional also at managerial level, enabling the creation of a production process based on the needs of the customer, transforming the intrinsic elements of a given business into an added value.
To achieve this goal, the planning team begins with an extensive back-planning analysis that, starting with the requested delivery date, allows to calculate the time interval in which to start a production stage or redeliver the semi-finished product to avoid delays.

In the strategic planning of productive cycle time, it's therefore essential to define priority and succession constraints (Finish to Start, Start to Start), to then be able to exploit the potential shortening of processing activities and derived processes about raw material procurement, logistics and training.
As we will be able to understand by studying the many cases of linear manufacturing outsourcing, proper planning of the resources involved allows incremental changes to the process, while meeting the technical constraints and expected delivery date for the individual phases.

The main limitation expressed in the literature on production planning is the lack of specific treatises on the subject within complex production realities, highlighting its implementation over time.
Indeed, so far, few studies have been presented on the prospect of developing an outsourcing strategy based on multi-stage allocative dynamics and dependent on production-related variables.
This is because the international literature has mainly focused on linear case studies, in which the organizational bottleneck of dynamic allocation among different suppliers is not addressed.
This complexity arises from the multiplicity of entities that require coordination to ensure compliance with production schedules, material procurement and quality control.
In fact, the multi-level condition requires much more structured production planning, developed on specific software, capable of analyzing the progress of external processing.
Accordingly, as expressed by De Giovanni (2021) in IBM's case, the adoption of AI systems supports synchronization between production planning and demand forecasts, reducing potential risks.

Manufacturing companies, especially luxury ones, require the ability to cope with the demands of a fast-changing market, whose focus is the relationship with the end customer.
For this reason, businesses structured on multilevel allocation systems cannot rely on a standardized production chain, as the operations performed by individual workers change according to the product design.
This digression on the production organization aspects is essential to understand the challenges of handling production cycle planning on multiple levels and to explore the contributions of the international literature on this field.

Recent studies on allocation choices are often based on mono-product systems, whose allocation plan is restricted to standardized and non-binding tasks, compared to the condition of multi-product ones, which outsource the entire processing while sharing the development.

This issue is clearly expressed in the study of Lee and Sung (2008), assuming a single-machine scheduling problem with unconstrained interchangeability between suppliers and building a structure aimed at achieving a single task unrelated to the overall process.
The treatise shows that the authors' vision is lacking in perspective toward growth and process optimization.
Indeed, considering the simpleness of the procedures, the system does not require a substantial amount of supply chain coordination and the establishment of dedicated outsourcing strategies.
In fact, under static conditions, the traditional model succeeds in reducing overall costs and improving production efficiency; whereas the definition of multi-level strategies is focused on a changing business model, based on multiple specialized structures, requiring careful back planning for proper allocation from the release date to the target market.
The linear allocation model thus has the advantage of creating an essential business for small companies, developed on standard production processes and low-value activities, limiting the risks inherent in the multi-level condition, characterized by contractual, logistical and raw material procurement risks.
For this purpose, it's necessary to consider a model connecting internal scheduling and outsourcing plan, to integrate the manufacturing capabilities of suppliers and the technical requirements.
The reason is that an isolated approach to the relations with the supplier, which does not include continuous feedback, could lead to frequent stalls and inefficient use of human resources.
In fact, overly static planning of individual phases, caused by a lack of coordination among the resources involved, risks compromising the effective achievement of project milestones.

Carrying on the discussion on outsourcing techniques, we note that manufacturing organizations often choose the traditional model as a short-term solution to unplanned issues, such as unexpected increases in demand or complexities in craft processing.

We can highlight these elements within the treaty of Coman and Ronen (2000), in which the allocation problem is formulated as an enhancement of the productive sphere, without setting up the operating algorithm toward a lasting outsourcing condition; that would strengthen the firm's position over its competitors, mitigating the inherent risks of the time-based structure.
Mishra et al. (2009), on the other hand, analyzed the issue of *Integrated Linear Programming* (ILP) in a changing business environment, applying the concept of *"Theory of Limits",* in the management of technical constraints.
This concept, firstly introduced by Goldratt (1992) as a systems approach, assumes that every organization has at least one factor that limits the achievement of the target performance.

The model develops accordingly, starts examining its own limitations and then outlining strategies, the author promotes this concept as constant improvement, defining an algorithm based on contribution margin as a decision index related to production bottlenecks, thus defining priority choices in terms of product mix.
However, this decision-making tool has some operational constraints in the event of a new production process; moreover, it doesn't promote a production plan based on backward planning, which allows to properly schedule milestones since the final deadline.

In addition, Mishra's analysis is structured on marginal processes concerning the achievement of production results.
Since these activities are usually not very challenging, it is not essential to establish a shared strategy between the companies, unlike strategic outsourcing, which, due to the composition of processes, requires synergy between supplier and company.

The reason is that, in a multi-product business condition, the proposed algorithms cannot explain the connection between allocation and schedule compared to the economic-productive outcomes of the past seasons.
In the examined solutions, choices are pursued to simplify the processing of internal departments based on exclusively economic indicators such as contribution margin.
In contrast, evidence-based planning allows to plan orders according to delivery dates and technical capacity, mitigating the impact of fixed costs on the budget.

During the review of recent literature, I noted a single paper, published by Chen and Li (2008), which considers some of the elements highlighted in the development of the operational allocation system.
While from the perspective of strategic planning and scheduling, Lee et al. (2002) propose an innovative theory, outlining an advanced planning model in the manufacturing supply chain, to integrate allocation decisions and minimize order delays.
In this way, Lee creates an allocation system based on the required deadlines on which to set up outsourcing process development.

While considering this perspective, it's important to integrate timing into the organizational control of departments but setting too stringent deadlines could increase the risk of delays If the supply chain is unprepared compared to orders change.
Based on these insights, it's then attractive to conduct an operational analysis under periodic order variability constraints, which proposes a dynamic strategy for the allocation of external orders to emphasize stakeholder capabilities and increase internal productivity.

A common limitation of all the allocation models analyzed, is that of setting an unlimited capacity as a constraint in the analysis of multi-variable technical plans.
Therefore, ignoring a relevant factor in the periodic planning of external orders, which is related to capacity and supply constraints, would require a separate coordination strategy.
In conclusion, a major downside of almost all previous studies is the limited number of subcontractors involved in the growth process.

In fact, as analyzed by De Giovanni and Duhaylongsod (2018), under multilevel conditions, supplier integration into product innovation positively influences the achievement of Operational Performance.
Furthermore, in many cases, the excessive focus on cost constraints didn't enable the strategy to be oriented toward production targets such as lead time, technical capacity and quality.
Finally, the absence of prior back planning for the periodic evaluation of orders precludes the scheduling of a long-term production plan, capable of forecasting peak demand and inherent risks.

This represents an evident gap in the effective implementation of strategies in the current environment, where the local allocation of orders provides the opportunity to improve the workflow management of in-house departments, avoiding excessive risks from fixed investment costs.
Furthermore, in a production planning facility where multilevel outsourcing is a cornerstone in achieving corporate purposes, seasonal allocation becomes essential to define intermediate milestones and evaluation steps.

From the analysis of these planning aspects came the desire to study the functional flow process that enables a luxury company to efficiently allocate seasonal and permanent orders between departments.

We will be able to answer the research questions presented below and fill the highlighted gaps through the study of strategic allocation within the planning model and introducing a specific multi-layer allocation tool.

To fully understand the principles described in the case study, I will attempt to answer the following research questions:

3.1.1 RQ1: *"How does multi-period and multi-product outsourcing (MPMP) develops within strategic production planning?".*

3.1.2 RQ2 *"What are the essential features of pre-emptive Supply Chain Management concerning multi-level order allocation planning?".*

3.1.3 RQ3: "*What are the production and management risks resulting from a strategic outsourcing choice?*

3.1.4 RQ4: *"Through which systems is evaluated the production performance of external contractors in the realization of complex production processes?*

3.2 Results of the review

Concluding the analysis of the research conducted, we can clarify that in the recent international literature landscape, the analysis related to the relevant topic of outsourcing within structured enterprises in dynamic markets has obvious gaps.
In fact, this theme, which plays a key role in the development of modern production strategies, by combining outsourced production with specialized subcontractors, allows companies to optimize their processes and create a synergistic environment of sharing and coordination.
The constraint of this concept is that, when applied to linear production structures, is limited to the simple execution of low-value-added tasks with the main objective of cost minimization under conditions of unlimited capacity and homogeneity of supplier capabilities.
Therefore, in multiproduct contexts, production planning enables improved efficiency and decision control by reducing bottlenecks in the final departments, improving warehouse space allocation, internal capacity and outsourcing low-value-added.

The strategic organization of external allocations then also becomes a managerial tool that can develop synergies with external resources through meetings and training that increase productivity and create a long-term path of collaboration, enabling the creation, integration and protection of value.

We can therefore conclude that production planning and strategic management of external orders are fundamental to emphasize the value of the company, innovate its processes through a technological push and finally allow the enhancement of the brand on a global level.
All this in order to present the product not as the final element of the process, but as a source of new opportunities and relationships with customers and partners, within a constantly evolving system.
The company thus becomes a place of integration between processes and technologies that create an innovative drive, aimed at a proposal that meets the desires of customers.
In the course of the research, we will be able to apply the theoretical concepts reported, explaining the application of the strategic outsourcing model together with the development of scheduling, in continuous relationship with the corporate strategy.

3.3 Research hypotheses and conceptual model

The research process, developed on strategic and multilevel allocation systems, has revealed some important gaps.

First, the literature over time has mainly focused on the development of a traditional model of outsourcing, developed on a repetitive production strategy directed toward a restricted range of enterprises, without the capability of developing comprehensive production processes with the limiting aim of minimizing the manufacturing cost, without defining constraints and considering the variability of production.
Secondly, the literature apparently does not treat production planning as an aggregative process for the management of internal departments and the coordination of external orders, capable of developing long-term production plans that exploit the potential of collaboration with stakeholders.
Furthermore, within a manufacturing company, the functional position of production departments can be ennobled by the strategic application of data and concepts that also have a strong impact on managerial decisions, through integrated management of the different departments.
Finally, in such an intricate production environment that requires extensive scheduling of every task, production planning will play a focal role in making the business model sustainable by emphasizing the production system through analysis of sales forecasts, management of production launches and supervision of external suppliers.

The purpose of this study is to provide meaningful recommendations and guidelines for the strategic management of multichannel outsourcing, in order to grasp the innumerable potential inherent in a Business Model integrated with the surrounding production environment

With the aim of filling these gaps, this research will focus on the study of production allocation planning, specifically delving into the tools and technologies that enable the efficient completion of production orders through different stages.
In conclusion, after understanding the managerial and production facets of this model, i will present an application tool, feeding through the data present on the software and improving the decision-making process of order allocation to the different suppliers, structured around the constraints required by production managers.

3.4 Analysis Methodology

The method adopted for this research is a business case study, developed to understand the strategic role of Production Planning in defining and managing a multi-layer allocation program.
To reach this goal, I undertook an in-depth analysis of some of the leading peer-reviewed articles that have covered the topic of manufacturing outsourcing arrangements, particularly highlighting the many case studies on traditional-linear allocation and understanding the limitations of such frameworks, when applied to complex manufacturing systems such as MPMP.
A one-year internship at Berluti's Production Planning Department gave me a privileged position to observe this phenomenon.
In fact, the information on which the following discussion is based comes from primary data that i collected and specific interviews with key planners and production managers.

Thanks to these opportunities, I was able to understand and apply the argumentative theme identified in the literature review to the case study. In addition, direct activity in production departments, active participation in improvement projects and collaboration with different teams have enabled me to gather essential information and data for the case study.

4 The Case Study: *Berluti 1895 Paris*

4.1 The history of the brand

Figure 1: Alessandro Berluti - The first Boutique in Paris - The iconic Alessandro

Berluti's story begins in 1895, when a young Italian of 30 arrived in Paris with his creative energy to become a master shoemaker.[2]
His first model, a shoe with strings without superficial seams, takes his name Alessandro, while the Maison his surname, Berluti.
Even today the *Alessandro* model is re-proposed with the most varied coating techniques to provide it with both classic and modern colors.

In the twenties of the '900 Torello Berluti, Alessandro's fifth son, collects the legacy of his father sharing the same taste for materials and refinement. With its linear models inspired by Art Deco, Torello attracts the attention of prestigious clients such as Jean Cocteau, Marcel Achard and Jules Roy.
In 1928 the first Berluti boutique was inaugurated in rue du Mont Thabor in Paris, later moved to 26 rue Marbeuf, close to the Champs-Elysées.

The family history of the Berluti brand continues with Torello's son, Talbinio who, having completed his studies in architecture, follows in his father's footsteps. In 1959 the young man added to the traditional tailor-made production a new luxury ready-to-wear line of footwear with immediate availability.
However, it's Talbinio's cousin, Olga Berluti, who in the early '60s takes over the direction of the Maison bringing a breath of innovation.
Her vital and young spirit makes the boutique a lively place of creativity and exchange, where she receives clients such as Roman Polanski, Yves Saint Laurent, Pierre Bergè and Karl Lagerfeld.
In the early 80s Olga perfects the Venice Leather used by the Maison and develops the Berluti Patina proposing a palette of colored shades for men's footwear.

[2] www.berluti.com

During her management, Olga Berluti created five new footwear lines: "Tatoués", "Guerrier", "Dandy", "Esprit de la Couture", and "Lasso".
She also collaborates with Andy Warhol for the realization of the *Andy* moccasins, iconic shoes still part of the permanent collection of Berluti.

The brand, now brought to media fame by Olga, was purchased in 1993 by the LVMH Group and since then has been part of the luxury brand portfolio of the French giant.[3]

The headquarters remain in Paris in rue Marbeuf, while all the manufacturing production of footwear is located in the province of Ferrara.

In addition to being a prestigious shoemaker, Berluti has always been the symbol of a certain a*rt de vivre.*

- In 1996 the first worldwide advertising campaign was carried out.
- In 1998 the second Berluti store opened on Conduit Street in London, then in 1999 Berluti landed in Japan where it opened a third store in Tokyo Aoyama and in 2001 both the Milan boutique and the second store in Paris on Boulevard Saint-Germain.
- In 2003 the launch of small leather goods, in 2005 that of large leather goods and the international expansion by opening stores in New York, Hong Kong and Beijing.
- In 2011 Alessandro Sartori becomes artistic director and presents a new Berluti line with ready-to-wear items for men. Olga Berluti becomes creative director of Berluti.
- In 2012 Berluti's first Autumn/Winter show was held during Paris Fashion Week. After five years at the helm of the artistic direction, Alessandro Sartori in 2016 leaves the place to Haider Ackermann, still in charge today.

To date, the brand's growth continues inexorably with the opening of new stores including Beverly Hills and Macau, with the constant increase of online sales.

Berluti is a synonymous of excellence in men's clothing and footwears, its exclusive heritage consists mainly in know-how and skills related to leather processing but what makes Berluti a leader in its field are the innovations and reinterpretation of ancient methods, to achieve a constantly renewed catalogue. One of these innovations that completely changed the company's work and offerings was Olga Berluti's invention in 1980 of the *patina*. The latter, made entirely by hand, is an exclusive know-how that encompasses a series of carefully guarded techniques, handed down over time from one colorist to another, enabling the creation of a chromatic range with nuances and transparencies that sublimate the leathers. Each upholstery is executed entirely by hand, making each Berluti article unique, defining its soul and character.

The brand's turnover is growing steadily and reached 150 million euros in 2017.

Today, Berluti's identity is expressed in the skills and competencies of the resources specialized in highly innovative production processes, maintaining the savoir-faire transmitted in more than a century of history.

[3] www.lvmh.it/le-maison/moda-e-pelletteria/berluti/

4.2 Know-How

The knowledge and skill of its artisans is the cornerstone of a fashion company that produces niche products. In fact, thanks to a business model geared to proposing value through the quality of its products and the expertise of its resources, Berluti can manifest an offer in line with the complex demands of the market and capable of surprising customers by meeting their expectations.

The strengths of the Berluti brand, in addition to the quality of the product and raw materials, are made-to-measure and the art of patina.

4.2.1 Bespoke Shoemaking

A custom-made shoe is a shoe whose proportions and style are made according to the customer's morphology and wishes. A made-to-measure Berluti shoe requires about 250 operations, 50 hours of assembly and 3 meetings with a master shoemaker. It’s in fact the unparalleled know-how of the artisans that makes a Berluti shoe unique.

It all begins with a meeting with the master shoemaker, where the customer is at the center of the creation. In one of the world's boutiques, a conversation is born between two passionate people. The master shoemaker is there to listen to the customer's desires, understand his habits and share his knowledge, from the line of the last, the thickness of the sole, the patina, the Venice or exotic leather, and the tattoo. All options are explored to define the unique pair of shoes:

- *Measure*

  Six to ten measurements are necessary to understand the morphology, volume, sensitivity and pressure points of the customer's foot. The measurements are taken by the master shoemaker using a measurement sheet on which he reports all the information needed to make the last.

Figure 2: The Shades of Patina

- *Shape Size*
  The shape of the shoe is gradually carved into a piece of hornbeam wood with the "paroir", a steel-bladed tool. This last will be finished through a particularly technical step that requires great precision so that the shape respects the morphology of the foot while maintaining the elegance of the line.

- *Fist Trial*
  During the second appointment, the customer can try on a model of his shoes made of temporary leather, based on the shape developed.

- *Shaping and Inclination of the Shank*
  The patternmaker begins by covering the last with an adhesive layer, on which draws the design and then reproduces on a paper pattern. It is from this pattern that the leather pieces will form the upper and will then be cut out and assembled by the seamstress.

Figure 3: The shape of shoes

- *Assembly*
  After finishing the upper, we move on to the assembly phase. There are different types of shoe construction: Norwegian, Welt and Bible. This is a very technical phase and takes a total of 30 hours. All gestures in this phase must be precise, following the lines of savoir-faire.

4.2.2 The Art of Patina

At a time when most men's shoes were black or brown, Berluti revolutionized this classic vision in the 1980s by introducing and developing the *Art of Patina*. Venezia leather interacts beautifully with the colors, creating a patina unique to each shoe, created by the handwork of Maison's expert colorists.

- First, the shoes are cleaned and the surface layers of shoe polish are removed.
- Next, the leather is stripped, lightened with transparent polish, then patiently massaged using essential oils rich in natural pigments and waxes. Follows the long work of coloring with pigments and nourishing cream.
- The final stage is glazing, which brings out the luster of the artisan's artistic patina.

The range offered includes colors that are emblematic of the Berluti spirit and bear very evocative names: Feuille d'Automne, Caviar, Rouge Saint-Emilion, Nero Grigio or the famous Tobacco, a tribute to the warm amber hue of the first Alessandro models from 1895.

4.3 The manufacturing establishment

The company's headquarters are in Paris, while the production plant has been in Ferrara since 1993, located in a region renowned for the excellence of its artisans in the leather industry.

Berluti has decided to expand its production as the Maison influence has grown, moreover, the brand has transformed the entire manufacturing system of shoes and leather articles.

The investment in a modern workshop was born from the need to support the growth of the product development departments and to protect Berluti's Savoir Faire. The new plant was inaugurated in 2015, with its 8000 m2 surface reflects the growing path of the Maison, the exterior of the building is characterized by glass and wood facades that give a strong architectural characterization to the workshop designed by Parisian architect Philippe Barthélémy.

Figure 4: External view of Berluti production plant (Manifattura Berluti)

Inside the building is possible to find the office and collective activities area (locker rooms, break area, school, atelier, Agora), the logistics area and the production.

The Agorà is divided into two macro areas: one dedicated to the development of prototypes and Special Orders and a larger one for production; both have their own departments of Nesting, Cutting, Stitching, Assembly and Finishing.

In recognition of the importance of the craftsmanship excellence and of its master leatherworkers, Berluti has established the *Académie du Savoir-faire* to train future generations of leather craftsmen. The need for new artisans and the lack of adequately trained profiles in the territory to preserve the savoir-faire created the need for the Académie.

The school is managed directly by the company's artisans, alternating theoretical and practical lessons, where students have the opportunity to develop their talents and to undertake the profession of craftsman.

The Académie is recognized at European level as a training center of excellence in the field of footwear and leather goods production and is supported by a close partnership with public authorities.

Figure 5: Internal view of Berluti production plant (Manifattura Berluti)

4.4 Berluti's Business Model

The company's business model focuses on an innovative and integrated value chain, aimed at creating a finished product that reflects the heritage and expectations of international customers. Berluti is a niche manufacturing company, characterized by specialized production steps that allow the business to differentiate itself from competitors. The business model is developed on a technical structure, aimed at managing the production process according to new launches and production location choices. The development of the production cycle depends on an unlimited number of variables, such as organization, logistics and planning. This requires a high level of coordination among the various teams to plan each choice in a shared and rational way, limiting the risks arising from imprecise management of the pre-production stages.

Berluti, to optimize the production capacity relies on suppliers selected according to the volume of orders to be handled, in fact in the definition of the business model is necessary to provide for a

thorough management plan for external suppliers, sharing objectives and risks and seeking to create a relationship based on continuous coordination.

In traditional manufacturing companies, the management of production departments manifests itself on a vertical line, where information flows top down. This is not the case for Berluti, which has chosen to focus its business model on the skills and abilities of its resources, investing on savoir-faire and craftsmanship in a modern production facility located in Italy.

The business model of a company whose core business is the development of products of excellence, based on highly sought-after skills and professionalism, must necessarily stem from the needs of the customer, who from the moment he enters into the boutiques is the protagonist in the creation of his shoe.

In this way, the managerial chain begins in Paris, where the guidelines to be followed for the new season are defined, analyzing growth indices in terms of production, sales and international growth.

Then, after outlining the structural basis, the managerial plan is shared with the various teams in the production structure, making the necessary changes in case of erroneous forecasts. Once the plans are defined, the various production teams work within a specific deadline to avoid delays in the final sale.

Specifically, the planning team is responsible for the technical and quantitative implementation of the management plans at the operational level, organizing the production steps according to the individual lead times required for each process.

Through a heterogeneous and cooperative management system, the corporate structure becomes a place of functional and strategic cohesion among the various departments, the added value of which allows for continuous implementations and corrections, aimed at anticipating a risk or acting accordingly.

In conclusion, the choice of a bottom-up managerial production system offers great advantages and potential in the direct relationship between the production plant and top management but has the drawback of greater managerial complexity in organizing the multiple elements inherent in such a model.

A company that combines excellent craftsmanship with the competitiveness of the luxury market must necessarily have a very careful balance between the various organizational phases, starting from the supply chain to the choices of commercial positioning and sales, dependent on the political and social events of the countries of reference.

This is the only way to ensure extremely accurate sales service, coordinating the development of the production stages.

In this way, by calculating individual lead times, the entire process is organized, from material requirements to strategic outsourcing choices.

In the next paragraphs, we will enter Berluti's production reality, studying firsthand how the production process takes place, focusing on the planning department, which is the coordinating hub of the entire process. We will understand the different complications and critical junctures that take a luxury product from the designer's drawing to the customer's hands.

4.5 Production Structure and Development

In this section i will answer to the second research question, explaining the Supply Chain Management components underlying a sustainable outsourcing strategy[4].

In an industry as competitive and fast-paced as the apparel industry, supply chain management is crucial, it's the driving force behind a successful fashion season and a brand's ability to quickly navigate the latest styles.

Supply chain management in the fashion business requires some special considerations because the industry is based on short product life cycles and driving demand. Each product is then closely related to the company's style, and as a result, novelty is a progressive innovation of successful models in which customers have found their expectations.

Having defined the stylistic aspects that recall the marketing proposals, it's necessary to meet with the production management and intermediate buyers to understand the feasibility of the product, analyzing this aspect in the different target markets and solving the related issues on the realization of the project and on the use of certain raw materials.

In such a condition of integration between different departments, the features required by the initial design may be complex to achieve at the production level, depending on the novelty of the processes (De Giovanni, 2019).

There are two ways to solve this limitation: modify certain details to simplify its implementation or try to develop the new design while respecting the characteristics of the enterprise and innovating its processes.

Introducing products with new features to the market is a prerogative of the leading brands in the industry, which can boast exclusive know-how, continually expanded by an inexhaustible desire for research in materials processing. The commercial success, profitability, as well as timing of activities and long-term success of the brand, depend on the characteristics of new products. Once the design is defined, prices and samples are established, based on forecasted or actual sales, material purchases and production begin. At this point, logistics takes care of the distribution of items as determined by the supply chain, based on actual sales received and forecast analysis.

The next stage is sales, understood as actual sales for wholesale and internal orders for retail:

- **Retail**: distribution and sales channel made up of mainly mono-brand and company-owned stores. The company and the store work together to predict the tastes of the end consumer and define the right assortment for each store.
- **Wholesale**: distribution and sales channel formed by independent stores, there is no co-ownership between the supplier company and the store. Each of them orders the desired products from several brands and often has the exclusive right to sell limited editions.

4.6 The Manufacturing Process

The production structure that transforms numerous raw materials into a quality finished product involves several entities in a complex process, that requires continuous coordination and improvement.

[4] Answer to the RQ2 *"What are the essential features of pre-emptive Supply Chain Management concerning multi-level order allocation planning?".*

As introduced earlier, this case study will deliberately focus on the production and planning dynamics inherent in the development of outsourcing strategies; therefore, we will not delve into the multitude of surrounding processes that are equally important to the development of the value chain.

To complete the production cycle effectively, all internal resources must be involved, optimizing internal production capacity by enhancing the added value of savoir-faire.
The complexity thus increases exponentially when one considers the network involved in the production cycle of a luxury brand, whose brand identity is centered on the savoir-faire of its resources and on the quality of its raw materials.

It's therefore clear that all factors, from sourcing to planning, must be fully integrated to achieve the best performance and reduce time to market as much as possible. The task of making the production process efficient concerning launch times and customer expectations lies primarily with the company's supply chain (Sacco and De Giovanni, 2018).
In any industry, and even more so in the fashion industry, the transition from raw material to finished product requires numerous production skills and techniques.
The development and transformation of raw materials into finished products, is an intricate process that requires continuous updating, avoiding static risks from delays in sourcing or processing.

Only by optimizing internal coordination and monitoring its progress through targeted controls is possible to create a unique product on the market that represents a benchmark and an icon of style recognized worldwide.
Berluti's sourcing process is structured in the company's production facility, where the procurement and storage of raw materials (leather, soles, laces) is managed and sent to subcontractors on a per-process basis.
As a result, for the completion of the various production cycles, semi-finished products make multiple moves, always passing through the Berluti plant's direct quality control before moving on to the next stage.
Once the product is completed, the batch, based on certain priorities, is shipped to Paris and then distributed to stores, from where the initial orders and directions originated.
This system allows for the creation of a unique process innovation while remaining faithful to the lines introduced by Alessandro.

The business model of a company, which makes competence and production quality its trademark, focuses on three main elements: **Supply, Production and Distribution.**

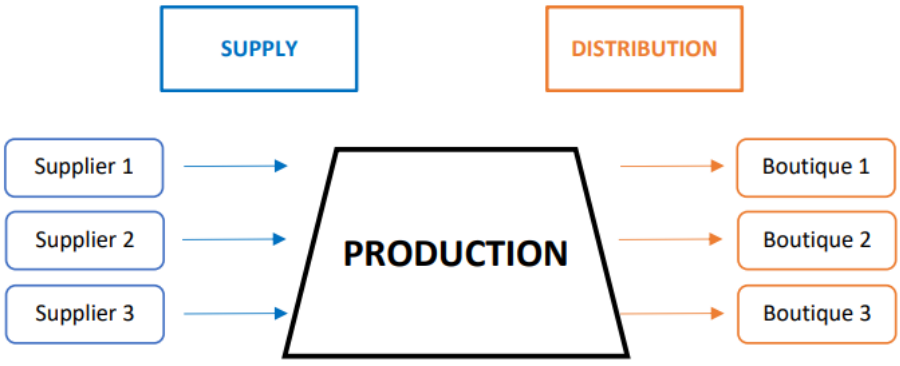


Figure 6: The Production Process

4.6.1 Supply

Supply Chain Management is the synchronization of the company's multiple activities with those of related enterprises to align the flow of materials, services and information with customer demand.
In this way, Berluti considers supply chain management as the starting point to refer to for any strategic analysis. In this context, the rapid development of technology and digitization has provided Berluti with new and more effective tools to deal with these kinds of challenges, such as the use of ERP management software for the analysis of resource and material requirements or blockchain technologies for cross-data management.
The supply chain thus becomes a management process, integrated with internal bodies and developed in coordination with external suppliers to extend the organization's objectives beyond the corporate level and facilitate external relationships.

The focal points that make this process effective are:

- Flexibility
- Reliability (punctual deliveries)
- Delivery, lead time
- Stock levels

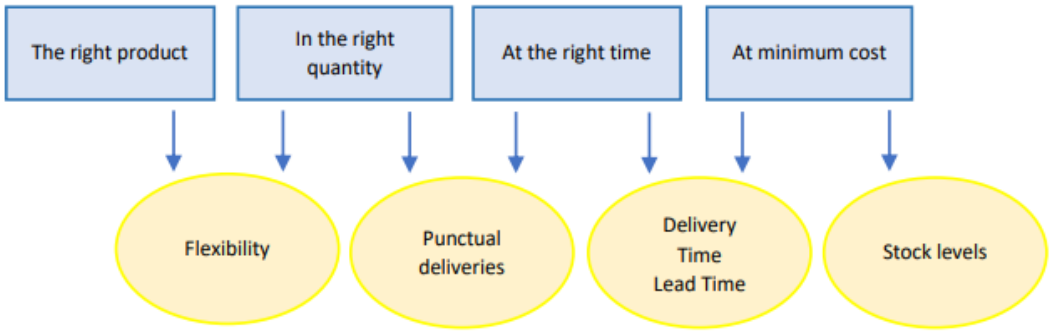


Figure 7: Supply chain objectives

For Berluti, the most substantial part of this process is the supply of leather.
This is because leather is an animal-derived material and has several uncontrollable variables at the production control stage; indeed, the development of new colours often takes a long time for the supplier to design.
In addition, because it's common to all branded products, it manifests high demand compared to the limited supply available.
All other components, such as metallics and consumables usually do not present major supply or application issues. This means that the impact of these materials on the supply chain can be considered negligible compared to the criticality inherent in the availability of leather from the various certified tanneries in the country.

This is the flow of Berluti's distribution network, which integrates the movement of goods to stores and to the end customer. Berluti, therefore, despite being a small company in terms of volumes produced, has a rather complete and articulated supply chain, which requires management applied to the entire production system.

4.6.2 Production

Berluti's production takes place mainly within the Berluti factory where an innovative plant with 250 employees enables each production phase to be carried out in-house. At the end of each phase, the quality control team certifies the transition to the next one, up to the final control; in this way the excellence of the "Made in Italy" product is guaranteed, limiting errors and issues related to the individual department.

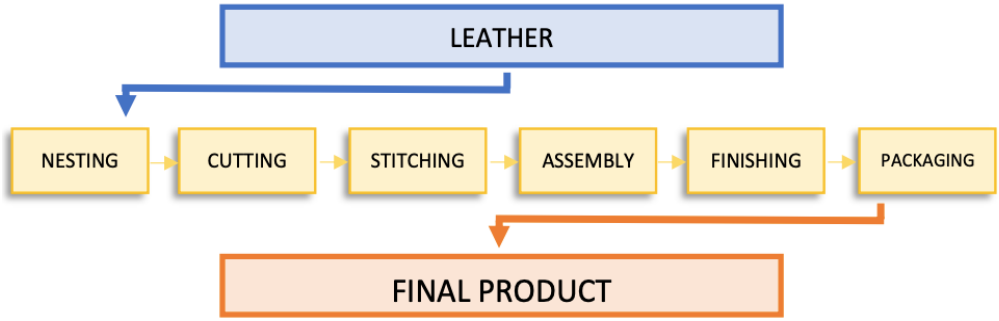


Figure 8: The development of the production line

The facility production chain is structured on the following processing stages, on which the finished product is then developed:

- **Nesting**: The initial phase of positioning the skins is done using a laser projection tool that traces the lines. Through this tool, it is possible to exclude any defects in the leather that would compromise the final product and make it fall outside the brand's quality standards. Furthermore, to position the shapes in the most suitable way, it is important to consider the orientation of the leather, which influences its properties and reactions to stresses during production.

- **Cut**: Cutting is a special stage, which is performed on separate tables according to the technical characteristics of the product:

1. *Cutting with Blade Machine*: a partially automated tool that is applied to most traditional models (French-shoe), without special processing (engravings, decorations, exotic leathers).
2. *Cutting by Hand*: Used for models characterized by exotic fine leathers that are strictly limited and complicated.
3. *Die Cut*: Necessary in case of special shapes or applications on the upper part, which due to the complexity of the workmanship requires a specifically developed tool.

- **Hemming**. This stage is done entirely by hand by skilled artisans who establish the upper and the shoe's heel, stitching and gluing any front applications. This process requires a detailed lead time due to the different processing complexities.

- **Assembly:** Assembly is the central phase of the process and, considering the production structure of Berluti's MPMP, unlike traditional models, it does not take place on a predefined route where each operator performs a certain step for standard products; rather, it

is carried out on mobile platforms and dislocated stations, which allow for rapid change from the assembly of one product to another.

In addition, the storage of assembly materials is managed by "Modula," vertical warehouses integrated into the software system.
The main assembly stages are:

1. Form Picking and Pre-assembly
2. Bottom Application and Finishing
3. Unmolding
4. Hand Stitching
5. Prep. Cart Outer Assembly
6. Applying Insole
7. End Assembly

- **Finishing:** Also known as Patina, is the concluding process that differentiates and identifies Berluti, includes a series of steps carried out entirely by hand that create a distinctive and inimitable patina, that allows the customer's character to be expressed on the shoes.

Figure 9: The different shades expressed by the Patina

At the same time, in-house production is supported by several external suppliers, with whom the various departments hold periodic meetings to develop a sustainable collaboration, in order to maintain a high level of production and limit problems, entrusting each subcontractor with different phases depending on their skills (Maranesi and De Giovanni, 2020).
Berluti, through specialized professionals, trains its suppliers to produce according to the company's standards, however, managing dozens of suppliers requires great attention from the Production Planning team and the Purchasing Department, to adhere to scheduling, delivery and quality indexes times and patterns.

The efficiency of operations and relationships with each of them is a key point of production planning management; in fact, a delay resulting from any area, procurement, production or logistics can jeopardize the delivery of a product on the set date.

4.6.3 Distribution

Once production is completed, products are sent weekly to the central warehouse in France, from where are then directed to the 60 boutiques around the world, according to the demands of different markets.
At the same time, products are sold on the website and in wholesale, in order to differentiate sales channels.
As a result, the cycle restarts from the needs and demand of the boutiques, developing new seasonal designs and confirming successful products on the international market.

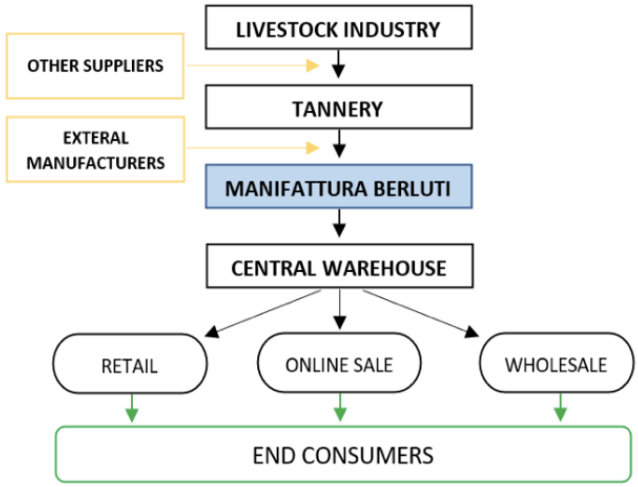


Figure 10: The distribution cycle, from supply chain to Boutiques

Strategic production management is differentiated by the various items produced in the facility, each with specific technical requirements:

- Shoes
- Belts
- Leather goods

These products differ both in the production cycle and in the planning process, consequently this requires strong specificity in the definition of production plans in order to meet the lead and delivery time of a certain volume of required products.
The company's business formula is centered on a highly distinctive business model, which allows management to plan strategic choices according to production and commercial objectives.
Berluti's model, as seen in the dedicated section, is developed through collaboration between the different managers of the Paris headquarters and the Ferrara production plant, establishing horizontal coordination among:

- Production Manager
- Production Planning Manager
- Manager of Control
- Manager of Supply Chain
- Head of Industrialization
- Purchasing Manager
- Responsible of Quality Control
- Warehouse Manager

In this way, through periodic meetings between the various area managers, it's possible to update the production plan in line with business developments; a clear example is the necessary change in management plans caused by the pandemic and the war in Ukraine, two catastrophic events that required a strong dynamism in the reactive phase and in the subsequent decisions.
Following these events, the production planning team had to readjust the preliminary production analysis, reducing orders and promoting the online boutique.

In general, a business management capable of reacting to external events should have a dynamic structure, so as not to passively suffer such situations but to be able to readjust its choices and exploit the potential.

4.7 Production Planning

In this paragraph, i will outline the fundamental components of production planning, to be able to develop an external order allocation strategy in a multi-process context, highlighting the activities required to support such a strategy[5].

In the phase of defining managerial decisions, on seasonal launches, production loads and the propensity to outsource, the role of planning is crucial in choices related to the production environment. Berluti's planning is the cardinal point between managerial and functional choices.
In fact, all production flows are organized to ensure continuity in the succession of phases without interruption.
The central goal of scheduling is to coordinate all process players as best as possible to meet required delivery dates and seek system sustainability.

In this perspective, for drafting strategic and outsourcing-oriented production plans, each production activity must be planned according to the following parameters:

- The volume of work to be performed
- The delivery deadlines to be met
- The risk arising from extraordinary events
- The available production capacity
- The availability of raw materials and components

The absence of even one element can easily jeopardize the launch of an entire batch of items.
It's therefore essential to analyze the logical process that follows a managerial decision, based on a discussion between departments to optimize production capacity through accurate retro-planning, so as to be able to handle peak orders.

After analysing market demand forecasts, the supply chain issues new production orders for all existing macro-categories every fortnight. At this point, the planning team monitors the evolution of orders and verifies that all minimum production limits are met, based on a measured report of past sales and production. In the case of special and urgent orders, an attempt is made to handle the exception with greater operational flexibility. Once these analytical issues have been resolved, the approved orders are introduced into the system, releasing the batches to the various departments according to priority.

[5] Answer to the RQ1: "How does multi-period and multi-product outsourcing (MPMP) develops within strategic production planning?"

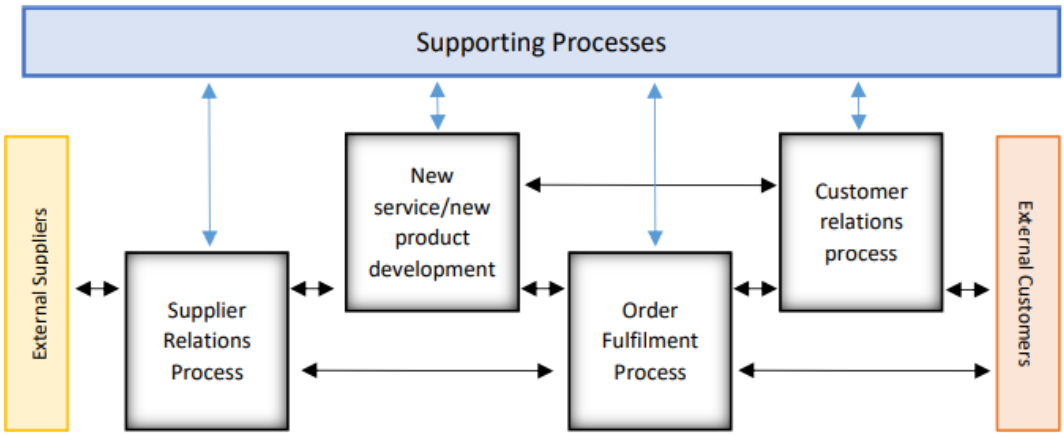


Figure 11: Production Planning Supporting Process

In order to better manage the intricate system of data and information on semi-finished products and product inventories, Berluti uses a *Material Requirement Planning* system, designed to coordinate all related processes from purchasing to the production of finished products. Using the MRP management report, production and purchasing can be planned according to factors required for launches, such as market demand, lead times or available stocks.
The basic principle is the optimization of stocks in relation to business needs and the development of new products. For this reason, it is necessary to manage resources in relation to market orders so as to plan the production flow in each section and avoid unforeseen events that may affect productivity.

To calculate the correct ratio, it's necessary to rely on 3 data, detailed here:

- The production schedule: the number of finished products needed in a certain period, based on market movements.
- The BOM: defines all the elements necessary for the realization of the product.
- Inventories: The quantity of inventories and finished goods and its inventory management (FIFO, LIFO).

The MRP system is more effective in the complexity of a luxury business than a traditional fixed-interval system, firstly because it leads to lower inventory levels. Secondly, it is not based on historical analysis, but rather on future forecasts, ensuring better management of batches of products with variable demand.

Finally, it's useful for production planning, which can periodically monitor production indices.
This system tracks the production plan of individual products and acts accordingly, scheduling purchases and logistics.

The potential of this model allows for better management of external resources and seasonal allocation by monitoring progress.

This approach also enables a better management of the deadlines of the various batches from external suppliers and changes the production planning of subsequent stages accordingly.

- *Advanced Planning System (APS)*

This software serves as decision support in production and logistics processes. Through advanced mathematical algorithms, allows to simulate future batches, being able to predict possible bottlenecks and capacity peaks.
These tools allow optimal planning on a weekly basis, but do not monitor the periodic variations between different batches in real-time, resulting in the need to control these events separately.

- *Supply chain event management (SCEM)*

Based on the idea that unforeseen events in the supply chain, such as a delay in the delivery of raw materials, should be handled automatically as soon as they occur.

This highly specialized process is supported by the "*Enterprise Resource Planning"* (SAP)[6] software, which allows to examine the material requirements and releases of different models between the various production departments.
Consequently, the purchasing department is responsible for analyzing the required quantities concerning what's available in the warehouse and existing production.
The required new component quantities are ordered from the respective suppliers to ensure that the lead times are in line with the correct launch date of the articles.

However, in day-to-day reality, the management of events and contingencies with suppliers is not easy, as component procurement problems cause complications in the scheduling of the production line.

The main objective of the team is to draw up production plans for all departmental activities. During this activity, each team member monitors daily the progress of batches against what was planned, sharing key points with the team. In this way, everyone is also up to date on the realities for which he's not directly responsible and can prevent risks coming from another production area.
In this circumstance, it's crucial to ensure the correct alignment of the plans to guarantee a continuous flow of all phases and to respect the established lead times.
All plans are developed with the support of a dedicated planning software, called CyberPlan[7] and developed on the needs of the team, which independently performs the global planning of the entire production portfolio by examining all possible causes and ensuring the best feasible scheduling.

The two dedicated software, developed together with the IT team, provide several advantages:

- Increase the service level.
- Improve production plans.
- Guarantee delivery dates.
- Reduce unproductive stocks.
- Reduce preparation times.
- Increase production rates.
- Reduce the percentage impact of stalled unfinished products.
- Reduce lead times for external production steps.

[6] SAP*:* stands for *"System Application and Product in data processing"* is an ERP system that supports and automates most business processes. It's characterized by being: *Modular, Integrated and Open*, making interactivity between different corporate departments possible and effective.
[7] CyberPlan is a complete *manufacturing resource planning* (MRP) and advanced planning and scheduling (APS) software used on a daily basis by many leading manufacturing companies to plan and schedule their productions.

This whole structure allows team members to spend more time and energy monitoring the day-to-day activities that take place, to improve the compliance rates of both internal departments and external manufacturers against what is planned.

In order to better overview the realized schedule and all the information in the database, the preventive analyses are updated with the current production plan; so as to assess the progress and gaps of the production structure, studying lead time variables and preventing possible delays of certain batches.
Finally, by processing the data from the planning software, it's possible to proceed to the evaluation of external suppliers, studying the rate of adherence to plans and any shortcomings in the productive partnership.

4.8 The Strategic Management of Multi-layer Outsourcing

Berluti's entry into the LVMH group and its international expansion in the men's leather goods market meant that the Ferrara factory's production capacity was unable to manage the entire production process in-house.
For this reason, in addition to trying to optimize the production capacity of internal departments through ERP systems, the planning choice to cope with the long-term peak was to collaborate with specialized external structures to carry out highly complex production steps, accompanying the supplier in a training and growth program.
Due to the complexity of the production processes required to manufacture the brand's products, the selection of manufacturers fell on a few companies that represent benchmarks in the sector, with years of experience in leather processing.
The requirements of lean-production facility lead to a management of production relations with the outside world based on daily updates on the progress and on any problems, the timely reporting of which could avoid internal risks.
This system, based on a multi-level process, enables inventory reduction and a more reactive response to market demands. At the same time, however, all this leads to a rather complex item production cycle, with frequent exchanges between departments, requiring a detailed plan.
This is because, in a multi-product system, Berluti's process does not involve a highly repetitive and standardized assembly line but rather a high degree of specificity in individual processes that enhances the contribution and skills of resources.
The role of planning in managing and regulating this flow of information is decisive.
Each manufacturer involved in the process has its specifications in terms of delivery times and processing methods. This greatly amplifies the company's challenge in coordinating processing, intertwining internal and external stages.
Precisely to minimize ordinary risks, production plans are discussed and updated together with the external team, trying to balance the progress of the different batches and meet the established deadlines.

Berluti currently collaborates actively with 10 external suppliers for shoes; each of these has a minimum weekly loading capacity, which varies according to the specific production and must be respected to keep the production chain active.
As this collaboration is structured on several levels, it requires continuous coordination with production and an accompanying path for the development of the required skills.

Therefore, for the effective management of batch outsourcing, the planning team draws up specific analyses about the supplier's experience on a specific model, the cost of the individual phase, the

capacity in terms of means and resources and above all the timing between take-over and delivery (Lead Time).
In this way, the skills and capabilities of the subcontracting company are enhanced, to develop a synergetic relationship through periodic planning and training comparisons.
In the strategic management of relations with external companies, it is necessary to define certain technical constraints to delineate the relationship.

The company dynamics that support multilevel outsourcing choices are different, in particular:

- Techno-productive
- Quality
- Demand forecasting
- Reduction of production lead time
- Management of strategies and policies
- Customer-supplier relationship

To be able to meet the deadlines imposed by the final market, the planning team draws up specific production plans every fortnight, in which the maximum completion dates of the various processes are analyzed to regulate progress concerning what was established upstream.

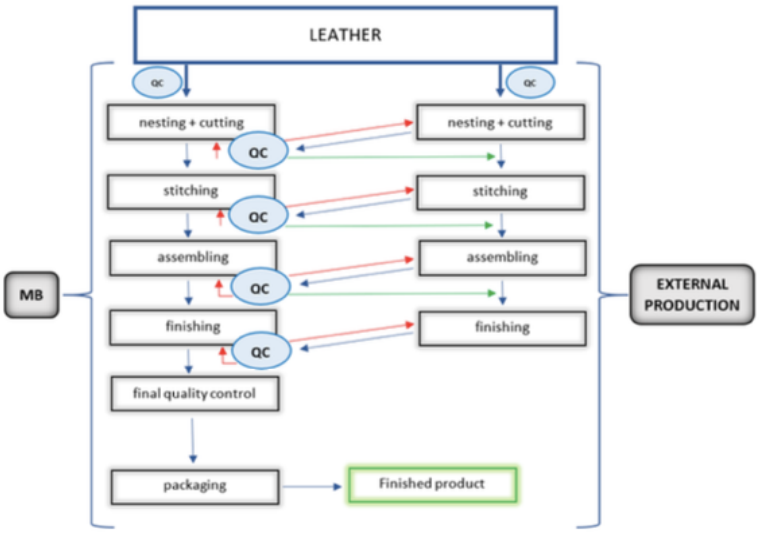


Figure 12: The production process of individual phases[8]

The illustrated system represents the different logistic routes of the production chain, which increases the flexibility of Berluti's production capacity by varying the internally managed percentage according to the production load in different seasonal peaks. At the same time, it avoids the risk associated with binding investments in facilities and machinery for the expansion of the production site, which in case of wrong forecasts risk creating high fixed costs and related problems.
Subcontractors involved in this relationship are monitored on a daily basis by representatives of the various business teams to achieve the required production efficiency and quality margins.

[8] MB: "*Manifattura Berluti*"
QC: "Internal Quality Control"

During the process of partnership with external suppliers, once a stage is completed, the semi-finished article returns to the factory for thorough quality control, which verifies its execution and allows it to proceed to the next stage; as a result, the product makes several moves to complete the production stages.
This production system, therefore, allows for fewer bottlenecks in internal departments, an effective and dynamic production planning and less risk of internal expansion.
On the other hand, it obviously requires a greater commitment in terms of logistical and management costs in planning and accompanying the outsourced phases.

The main advantages of a long-term strategic outsourcing perspective are manifold:

- Innovative: Exploiting the sharing of best practices to develop innovative projects.
- Organizational: An integrated planned strategic allocation allows the supply and production chain to be organized and flowing, reducing downtime.
- Economic-financial: Containment of overall process costs, sharing of risks and investments.
- Development of synergies and collaborations: Enables the transfer of skills and knowledge to external resources, fostering the development of Savoir Faire.

In this way, production planning can choose to outsource a certain number of products depending on the evolution of the sales trends and the complexity of certain processes.

In addition, in order to ensure the security and effectiveness of this manufacturing reality, it is essential to differentiate subcontractors by specialization and location, in order to avoid the risk of generating a monopoly leverage and getting locked into unsustainable relationships.

Currently, after struggling with the international socio-economic constraints of the pandemic, the company has gradually resumed its production standards, Berluti is planning to increase its production capacity in the short term by relying on outsourcers, seeking to differentiate stages among multiple suppliers to significantly reduce the negative impact of external causes.

4.8.1 Optimization Strategy and KPI for Outsourcing Choices

In the case study review, we highlight the tools and indicators useful for evaluating the production performance of external suppliers[9].

When a company achieves growth in market demand and success for its products, it's faced with the crossroads of expanding its production process, whether to invest in an in-house structure or turn to external suppliers.
Berluti, as we have analyzed, has chosen the outsourcing route to expand its production structure. By choosing this path, designed a strategic outsourcing system that is different from traditional strategies, relying not on suppliers for simple tasks but for a true execution process, which requires continuous feedback to develop an effective and lasting partnership.
When choosing suppliers for strategic collaboration, it is essential, as we have already pointed out, to be able to differentiate between vendors in order to have an enhanced production line in case of external constraints.

[9] Answer to the RQ4: "Through which systems is evaluated the production performance of external contractors in the realization of complex production processes?

To limit the likelihood of such cases, it's important to develop an accurate back-planning system that, starting from the requested delivery date, outlines the different stages accordingly.

Supplier selection is in fact one of the most important activities for the company and has a substantial impact on overall productivity.
Choosing vendors affects the quality of workmanship, adherence to scheduled deadlines and the management of the collaborative relationship.
Factors influencing the selection process may vary depending on production skills and managerial ability in adhering to terms:

- **Cost**: Evaluation of the materials, resources, time and risk involved in a particular delivery. Economic terms are evaluated not only with traditional ROI or TCO systems, which are limited to monetary aspects, but TVO (Total Value of Ownership) is used, where the risk associated with the sustainability of the supplier is also evaluated.

- **Quality**: The ability to meet quality criteria in different categories (materials, dimensions, design and durability), variety of systems (production lines and techniques).

- **Lead time:** the fundamental adherence to deadlines, which if not met risk creating bottlenecks in departments, ultimately affecting the end goal.

- **Reputation and ethical standards**: Supplier compliance with ethical, sustainability and corporate governance (ESG) principles.

When the enterprise defines the working relationships with the chosen suppliers, it begins the second stage of strategic outsourcing, which is the optimization of production management among the individual suppliers. In fact, the planning step effectively begins with the definition of the different batches of individual models which the supplier will produce in the new season, i.e., prices, timing, and quality constraints.

Then, when orders increase, the choice is made to implement the outsourcing strategy based on a set of constraints:

- The loads: How much a supplier can produce in a given time period.
- The delivery compliance rate: The percentage ratio between what is planned and what is delivered.
- Seasonality: The adherence to schedules through planning in the proper management of back-planning strategies, in order to deliver batches for the relevant season.
- Technical constraints: The specialization of professional resources, investment in means and facilities.

Having defined these constraints for each supplier, in the following sections we will figure out how to develop a tool to allocate batches in the most efficient way, according to the Knapsack problem, based on the cross-section of different software and input data.
In this way, it becomes possible to indirectly manage the flow of orders and target these to the various vendors based on the respective period's loads.

4.8.2 The complexity and risks of Strategic Production Management

During this paragraph, i will report on the strengths and potential limitations concerning the production structure under a complex outsourcing strategy[10].

In the company context described, structured to be able to manage production departments, outsourcing choices are based on internal production capacity, launches for new seasons and permanent product orders that have been successful in previous collections.
This structure is designed to manage a variable production line, focused on shorter periods that follow the two main seasons: Fall/Winter and Spring/Summer, hence the need to plan the entire production layout to meet the final deadline.
To achieve this, it's necessary to implement the organization of the entire supply chain based on predictive analysis to anticipate future capacity peaks, establishing advance purchases of consumables, defining milestones and intermediate checks to analyze progress.
This environment requires the management of internal production capacity, with the eventual purchase of machinery and hiring of personnel and of external departments, by sourcing new suppliers.

In addition, the allocation on a seasonal basis, leads to high costs in the industrialization phase and continuous coordination between teams, for the development and launch of new models on the market.

This system includes several risks inherent in the dynamic condition of production planning, such as:

- Risk of incorrect supply chain management
- Failure to meet delivery deadlines of intermediate stages due to incorrect scheduling and coordination.
- Logistical constraints due to the handling of semi-finished products.
- Risk of queuing of semi-finished products in the production sliders due to lack of internal capacity.
- Risks related to services and the external environment, such as natural disasters and social events.

4.9 Berluti, strengths and weaknesses of a multi-layer facility

In the previous section, we followed the path linking management choices to production ones, verifying how closely these are linked.
In a specific and characterizing sector such as luxury, which requires not only accuracy in the production process but above all meticulous attention to organizational and management aspects, it's important to develop a strategy that allows the Production Planning team to follow the guidelines undertaken by management in the business model, applying those to production needs.
In fact, this orientation to the production development strategy allows the company structure to be organized accordingly, making the added value explicit through a continuous coordination system from production to management.

[10] Answer to the RQ3: "What are the production and management risks resulting from a strategic outsourcing choice?

A dynamic business model is thus able to transmit organizational solutions to the various departments that monitor manufacturing and then take action to mitigate its constraints.

From the case study presented above, we have understood how the integrated business system must therefore be structured around four main points:

- The corporate target
- A competitive and attractive market offer
- The essence of the company: as a combination of representative values and ideals
- The strategic market positioning

Through this integrated management philosophy, it is possible to prevent risks from the external environment, seize opportunities, and develop functional synergies with surrounding entities.

In contrast to the static business system approach, which we analyzed earlier, a company formed under a dynamic multi-stage approach and integrated into business development can shape itself according to production, logistics and business constraints.

Figure 13: The Iconic Shoe Production

The case study analysed here effectively represents the concept of an external order allocation strategy within a competitive environment, capable of adapting to surrounding developments through a back-planning strategy linked to manufacturing progress at various stages.
A clear example is the choice of developing synergistic relationships with external suppliers to plan ahead for the allocation of new orders.
This increases operational agility, reducing internal workloads and fixed costs, optimizing risk management and the achievement of business objectives.

Therefore, this system needs to be adapted to a multilevel network that relies on strategic outsourcing and actively involves stakeholders in project progress.
Since, as we saw in the risk analysis, it has many complexities in supply chain management and flow planning that, if poorly managed, would have a negative impact on linear outsourcing organizations.

To achieve this balance, the role of managers is fundamental, who have to analyse the constraints and variations of the system described, in order to obtain the best result in economic terms, keeping the attention on the excellence of raw materials and on a service of captivating boutique.

This production organization, applied to an extraordinary reality, in organizational methods and product conformation, with a targeted customer base, allows emphasizing the aforementioned features, developing a business environment that is agile in dealing with variability.

In the context described above, it's important to emphasize the concept of continuity in terms of performance and the ability to maintain one's points of reference in an intricate system that leads the company to continuous evolution; therefore, it's essential to structure a process that enhances know-how and skills with a view to progressive improvement.

In this way, the company becomes a carrier of values that express different cultures and nationalities, proposing value that is appropriate to their expectations, designing innovative products and ensuring service in line with product accuracy.

5 Analysis

The method adopted to conclude this research is an in-depth investigation of the business case, focused on understanding how the strategic allocation of seasonal and permanent production orders is currently arranged within a luxury leather firm such as Manifattura Berluti.
In this section we will analyze the evolution of the multiproduct allocation process, applying the theoretical insights discussed in the previous sections and then implementing the existing setup.
This in order to develop a new tool for the analysis and allocation of seasonal launches organized on the technical perspective of individual processing and specialization of different suppliers.
To develop this tool empirically, i will adopt a "Current State" type of analysis, focusing on three different stages:

- **AS IS**: Analysis of the current situation.
- **BRP:** *"Business process reengineering",* description and development of the dynamic allocation tool, process of reorganizing and reshaping the analyzed system in order to improve the results.
- **TO BE**: Functional and academic goal of the project and future implementation.

A year-long internship in the Production Planning Department of Berluti 1895 Paris, offered me a privileged position to observe this phenomenon from the inside.
Indeed, through direct participation in decision-making meetings with suppliers for the day-to-day management of external allocations, discussions with different production departments and the development of continuous improvement projects, i was able to collect and process a large amount of data and information.
In the next section, we will leverage these data in the analysis of the "Strategic Order Allocation Tool," developed based on the gaps identified in the process and allocation tools currently in use, in order to decide on the distribution of new seasonal orders based on the constraints and skills of subcontractors.

5.1 As-Is

The first important step when entering a transition phase is to analyze the details of the existing corporate situation that will be involved in the redesign. This means outlining a picture of the company's processes and workflows, managerial and relational competencies, roles and responsibilities, organizational and cultural constraints, technological and organizational criticalities.

All this falls under the so-called AS-IS analysis. These mapping procedures take place on the basis of the data and information currently in use and is based on precise evaluation criteria.
Next, priority indices are defined, identifying objectives and milestones that allow for a proper understanding of the current situation, so that effective and impactful changes can be implemented.
At present, the planning team relies on an integrated system with CyberPlan planning and SAP ERP software for the strategic planning of external orders but in terms of the specific choice of periodic order allocation, the current procedure is implemented manually, with the resulting time and organizational impact on decision makers and production constraint setting.

In this specific case, the starting situation is the definition of the semiannual allocation plan for shoes orders for the 2023 Berluti Summer Season. This plan developed together with the managers of the Paris office is the starting dataset in which the planning team analyzes the quantitative data, the features of the new models and the delivery dates requested in the international boutiques.
The target of Manifattura Berluti in the development of external planning is to be able to allocate the quantities of orders requested, to a specific supplier, selected on certain internal KPIs and respecting the minimum capacity constraints of the subcontractors, in order to be able to complete the lead times of the individual operations and proceed to the subsequent processing phases, limiting the risks of delays related to the revision of incorrect production.

5.2 Business Process Reengineering

After analysing the current situation, in the allocation of orders in a complex production environment, i realized how important is to develop an allocation tool structured on the crucial information from the different elements involved, in order to improve this process.
In particular, the availability to responsible teams of clear communication about constraints and components in new production steps means that a certain stage is addressed to suppliers who have the machinery and expertise to perform it.
This is the case, for example, with constraints related to the cutting stage, which, depending on the materials or product design, has to be done by hand, machine, or die cut.
In this way, the contribution of individual departments facilitates the definition of allocation constraints, which in the absence of prior coordination between departments risks being imprecise and unreliable.
In order to prepare the re-engineering of the strategic order allocation plan for the new season in a complex production environment, i started from the current assessment of the process in May 2022.
In fact, by studying the company's current system for allocating new orders for the 2023 season, on the various internal and external departments, i understood the elements in which to intervene to improve the planning process.
At present, the system for allocating orders to outsiders is represented by a document in which, on the basis of the prospective capacity in the forecast periods, the different models and processes are manually allocated to the different suppliers; this system lacks prior discussion with the

departments responsible for the outsourcing process and the definition of constraints that can make the system agile in the event of new orders.
In fact, to define an optimal allocation system, starting from the assumption that the definition of the pricing system is established upstream, it's essential to understand the components that characterize a given product and then structure the entire process around its characteristics.
To this end, I met with the various department heads involved in supplier management to understand the needs and limitations of individual operations.
The definition of these process constraints will allow to simplify the allocation percentages and order management, both for the following season, in relation to new launches and for the implementation of current orders on the market, without the risk of having to re-plan the entire timetable, adapting it to any new technical-production constraints.

The development of a dynamic allocation system that reflects this strategic dimension of production planning has a significant influence on the development of the company's processing, because a good strategy combined with proper supplier management allows for the improvement of lead times, a reduction in the ratio of repairs to overall production and the possibility of defining weekly plans in relation to feedback from the supplier.
Conversely, failure to define order boundaries in advance of the technical capabilities of departments, increases the risk of stagnation of semi-finished products while waiting for processing to be completed. This is a clear issue within the industry's production structures, since as these processes are complex and non-standardized, it's not possible to create a continuous production chain that would make the flow efficient; rather, each product has its own specificities with respect to shape, materials and model.

5.2.1 Database

The data used for the analysis and development of the allocation model is initially based on the current allocation document and the analysis of external Production Plans, which are drawn up every fortnight for the management of production batches and returns.
These documents are structured on the CyberPlan software, which, based on the input provided, suggests an optimal plan for the management of the production steps, analysing all possible scenarios and ensuring that the plan is as reliable as possible and then adapted by the planners.

By studying the process of creating these plans, i understood the functional features for the development of the new allocation tool. In fact, starting with multiple extractions from the SAP management software, i set up a database showing all products and the related production stages for the new season (Requirements, lead time, BOM).
In this way, i prepared an initial document in which the components of the individual products are highlighted:

- Tag number
- Material code
- Product description
- Order type
- Collection
- Stock category
- Delivery date
- Quantitative identification

I then obtained a realistic design basis on the models and related processes, so as to have final feedback on the feasibility and reliability of the allocation model and the different formulas developed on the production specifications of the suppliers.

Chart 1: Resume Sheet of the Allocation Tool

Manufacturing Database				Deadlines				Cutting Technical Constraints				Quantity		Suppliers Strategic Allocation					
Cd. Mat.	Category	Tool	Concatena	Launch Date	MESE REQ	QTY TOT	Scritto	Macchina	Fustella	Mano	Vulcanizzato	Laser	No Laser	1000	1500	3500	5000	7900	9000
X1	Sandalo	Macchina	MacchinaSandalo	01/03/23	2302	130	1	1				130	0	GAMMA	ZETA	-	GAMMA	GAMMA	ALFA
X2	Sandalo	Macchina	MacchinaSandalo	01/05/23	2304	116	1	1				116	0	GAMMA	ZETA	-	GAMMA	GAMMA	ALFA
X3	Sandalo	Macchina	MacchinaSandalo	01/05/23	2304	318		1				0	318	-	-	DELTA	DELTA	DELTA	ALFA
X4	Sandalo	Mano	ManoSandalo	01/05/23	2304	388				1		0	388	-	-	DELTA	DELTA	DELTA	ALFA
X5	Sandalo	Mano	ManoSandalo	01/05/23	2304	462				1		0	462	-	-	DELTA	DELTA	DELTA	ALFA
X6	Sandalo	Macchina	MacchinaSandalo	01/05/23	2304	564		1				0	564	-	-	GAMMA	GAMMA	GAMMA	ALFA
X7	Sneaker	Vulcanizzato	VulcanizzatoSneaker	01/04/23	2303	666					1	0	666	-	-	LAMDA	LAMDA	LAMDA	LAMDA
X8	Sneaker	Vulcanizzato	VulcanizzatoSneaker	01/04/23	2303	0					1	0	0	-	-	-	-	-	-
X9	Sneaker	Vulcanizzato	VulcanizzatoSneaker	01/03/23	2302	1295					1	0	1295	-	-	LAMDA	LAMDA	LAMDA	LAMDA
X10	Sneaker	Vulcanizzato	VulcanizzatoSneaker	01/04/23	2301	590					1	0	590	-	-	LAMDA	LAMDA	LAMDA	LAMDA
X11	Sneaker	Vulcanizzato	VulcanizzatoSneaker	01/03/23	2302	1111					1	0	1111	-	-	LAMDA	LAMDA	LAMDA	LAMDA
X12	Scarpe	Fustella	FustellaScarpe	01/02/23	2301	319	1		1			319	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X13	Scarpe	Fustella	FustellaScarpe	01/02/23	2301	834	1		1			834	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X14	Scarpe	Fustella	FustellaScarpe	01/02/23	2301	379	1		1			379	0	BETA	EPSILON	-	BETA	KAPPA	KAPPA
X15	Scarpe	Fustella	FustellaScarpe	01/03/23	2302	745	1		1			745	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X16	Scarpe	Fustella	FustellaScarpe	01/03/23	2302	561			1			0	561	-	-	BETA	BETA	ALFA	ALFA
X17	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	339	1		1			339	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X18	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	262			1			0	262	-	-	BETA	BETA	ALFA	ALFA
X19	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	0	1		1			0	0	-	-	-	-	-	-
X20	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	284			1			0	284	-	-	BETA	BETA	ALFA	ALFA
X21	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	765	1		1			765	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X22	Scarpe	Mano	ManoScarpe	01/04/23	2303	488				1		0	488	-	-	ALFA	BETA	ALFA	KAPPA
X23	Scarpe	Mano	ManoScarpe	01/04/23	2303	626				1		0	626	-	-	ALFA	BETA	ALFA	KAPPA
X24	Scarpe	Macchina	MacchinaScarpe	01/04/23	2303	386	1	1				386	0	ALFA	EPSILON	-	BETA	KAPPA	KAPPA
X25	Scarpe	Macchina	MacchinaScarpe	01/04/23	2303	569	1	1				569	0	ALFA	EPSILON	-	BETA	KAPPA	KAPPA
X26	Scarpe	Macchina	MacchinaScarpe	01/04/23	2303	622	1	1				622	0	ALFA	EPSILON	-	BETA	KAPPA	KAPPA
X27	Scarpe	Macchina	MacchinaScarpe	01/05/23	2304	86		1				0	86	-	-	ALFA	ALFA	ALFA	ALFA
X28	Scarpe	Macchina	MacchinaScarpe	01/05/23	2304	86		1				0	86	-	-	ALFA	ALFA	ALFA	ALFA
X29	Scarpe	Fustella	FustellaScarpe	01/05/23	2304	946	1		1			946	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X30	Scarpe	Fustella	FustellaScarpe	01/05/23	2304	567	1		1			567	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X31	Scarpe	Macchina	MacchinaScarpe	01/02/23	2301	261	1	1				261	0	ALFA	EPSILON	-	BETA	ALFA	ALFA
X32	Scarpe	Fustella	FustellaScarpe	01/02/23	2301	0	1		1			0	0	-	-	-	-	-	-
X33	Scarpe	Fustella	FustellaScarpe	01/01/23	2212	460	1		1			460	0	BETA	EPSILON	-	BETA	KAPPA	KAPPA
X34	Scarpe	Macchina	MacchinaScarpe	01/02/23	2301	897	1	1				897	0	ALFA	EPSILON	-	ALFA	ALFA	ALFA
X35	Scarpe	Fustella	FustellaScarpe	01/03/23	2302	186			1			0	186	-	-	BETA	BETA	KAPPA	KAPPA
X36	Scarpe	Fustella	FustellaScarpe	01/03/23	2302	201	1		1			201	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X37	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	409		1				0	409	-	-	ALFA	BETA	KAPPA	KAPPA
X38	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	509	1	1				509	0	ALFA	EPSILON	-	BETA	KAPPA	KAPPA
X39	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	269		1				0	269	-	-	ALFA	ALFA	ALFA	ALFA
X40	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	424		1				0	424	-	-	ALFA	ALFA	ALFA	ALFA
X41	Scarpe	Fustella	FustellaScarpe	01/03/23	2302	546			1			0	546	-	-	BETA	ETA	KAPPA	KAPPA
X42	Scarpe	Macchina	MacchinaScarpe	01/05/23	2304	299	1	1				299	0	ALFA	EPSILON	-	ALFA	ALFA	ALFA
X43	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	327	1		1			327	0	BETA	EPSILON	-	BETA	KAPPA	KAPPA
X44	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	319	1		1			319	0	BETA	EPSILON	-	BETA	KAPPA	KAPPA
X45	Scarpe	Fustella	FustellaScarpe	01/05/23	2304	208	1		1			208	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X46	Scarpe	Macchina	MacchinaScarpe	01/05/23	2304	693		1				0	693	-	-	ALFA	ALFA	ALFA	ALFA
X47	Scarpe	Mano	ManoScarpe	01/03/23	2302	330				1		0	330	-	-	ALFA	BETA	KAPPA	KAPPA
X48	Scarpe	Mano	ManoScarpe	01/03/23	2302	212				1		0	212	-	-	ALFA	BETA	ALFA	KAPPA
X49	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	0	1		1			0	0	-	-	-	-	-	-
X50	Scarpe	Fustella	FustellaScarpe	01/04/23	2303	596	1		1			596	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X51	Scarpe	Fustella	FustellaScarpe	01/05/23	2304	544	1		1			544	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X52	Scarpe	Fustella	FustellaScarpe	01/05/23	2304	384	1		1			384	0	BETA	EPSILON	-	BETA	ALFA	ALFA
X53	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	448	1	1				448	0	ALFA	EPSILON	-	TETA	ALFA	ALFA
X54	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	397	1	1				397	0	ALFA	EPSILON	-	TETA	ALFA	ALFA
X55	Scarpe	Macchina	MacchinaScarpe	01/03/23	2302	692	1	1				692	0	ALFA	EPSILON	-	TETA	ALFA	ALFA
X56	Scarpe	Macchina	MacchinaScarpe	01/01/23	2212	496	1	1				496	0	ALFA	EPSILON	-	BETA	ALFA	KAPPA
X57	Scarpe	Macchina	MacchinaScarpe	01/02/23	2301	195	1	1				195	0	ALFA	EPSILON	-	ALFA	ALFA	ALFA

In the Resume Table shown, i have elaborated the main data useful for the creation of the tool, in particular:

- **The Material Code**, which will be the vertical axis of the entire tool, will allow fot the analysis of the components and constraints of each code and its assignments that will determine the production cycle.

- **The Category**, i.e. the distinction between "Sandal", "Sneaker" and classic "Shoes", this type of constraint is important since individual suppliers often specialize in certain product categories, such as "LAMDA", which is focused on the manufacture of “Vulcanized Sneakers”, due to the particular connection between the upper and the sole.

- **The Processing tool**, which is an important constraint on the orientation of the processing cycle, as a certain code, belonging to the 'Hand Cut' category, can only be assigned to suppliers who have the skills and machinery to carry out this processing.

  This description is highlighted in the **"Concatenate"** column where the two constraints, the category and the production tool, are combined, so that the allocation formulas and summary tables can be set up with respect to the constraints set by the production managers.

- **The Launch Date**: i.e. the maximum date by which the particular model in the ordered quantities must arrive on the storefronts of international boutiques.

- **The Month of Request**: i.e. the maximum month in which the quantities must return to Manifattura Berluti, after the processing carried out among the various suppliers, for final control and shipment to Paris, from where these will then be distributed to all the global boutiques.

- **The Total Quantity**

- **The presence of LASER processing**, characteristic of the Brand, which determines another constraint in the definition of the production process of the individual Material Code, since it adds a processing carried out externally, which, as shown in the relative partial quantities, is only carried out on certain models.

- **The Strategic Allocation**: is the summary schedule of spreadsheets in which various allocation formulas are determined, based on the specific strategic needs of the planning period, compared to technical components, monthly capacity, lead time and prospective time analysis.

The challenge of developing this strategy allocation tool lies precisely in the essential role played by individual suppliers.
Indeed, the skills and competencies acquired through specific training make the contribution of each subcontractor crucial to the product creation process.
This complexity is evident in the development of the tool's database, which in order to be functional must be based on detailed data, such as the inherent constraints that allow the allocation system to determine the outsourcing process while providing an implementable solution to the inherent variability of environmental realities.

Once these constraints are established, the tool is implemented on the basis of individual assignment tables for each process, through which, by reasoning by individual material codes, it is possible to determine the deadlines to be assigned to the individual supplier, using this formula:[11]:

=IF.ERROR (IF (QtyTot=0; "- "; IF (ALFA = "is able to carry out the processing"; QtyTot; IF (OR(ALFA= "isn't able to carry out the processing"; the percentage of progressive capacity available > 100%); "-" ; QtyTot)); "-")

In this way, we are able to assign processing stages based on the technical capacity table and progressive capacity, resulting in output expressed in total quantity; we thus have a relative view both for processing, with respect to the supplier, and overall, with respect to all products in the pipeline.
Similarly, from this data we can define the maximum date by which the specific stage must be released to the supplier in order to meet the maximum deadline.

Below is the formula by which it was applied to the tool, showing the example of finishing, consequently it is then applied to all other processes starting from the last one, as shown.
This formula applied on the basis of realistic and verified data enables to establish a representation of the possible pipeline scheduling.

[11] Note that, the formula expressed as an example refers to only one of the several variations and interweavings between data and suppliers, developed to obtain the final output.

= IF. ERROR (IFS (Supplier = ALFA; (Launch Date - 30-LeadTimeALFA * 7); Supplier = KAPPA; (Launch Date – 30 - LeadTimeKAPPA * 7); Supplier = LAMDA; (Launch Date – 30 - LeadTimeLAMDA * 7)); "-"

Chart 2: Weekly Order Allocation

Supplier "Taglio I"	Supplier "Laser"	Supplier "Taglio II"	Supplier "Orlatura"	Supplier "Montaggio"	Supplier "Finissaggio"	Week "Taglio I"	Week "LASER"	Week "Taglio II"	Week "Orlatura"	Week "Montaggio"	Week "Finissaggio"
GAMMA	ZETA		GAMMA	GAMMA	ALFA	30/2022	38/2022	-	40/2022	48/2022	4/2023
GAMMA	ZETA	-	GAMMA	GAMMA	ALFA	38/2022	46/2022	-	48/2022	4/2023	12/2023
-	-	DELTA	DELTA	DELTA	ALFA	-	-	-	-	-	12/2023
-	-	DELTA	DELTA	DELTA	ALFA	-	-	-	-	-	12/2023
-	-	DELTA	DELTA	DELTA	ALFA	-	-	-	-	-	12/2023
-	-	GAMMA	GAMMA	GAMMA	ALFA	-	-	40/2022	48/2022	4/2023	12/2023
-	-	LAMDA	LAMDA	LAMDA	LAMDA	-	-	4/2023	5/2023	7/2023	8/2023
-	-	-	-	-	-	-	-	-	-	-	-
-	-	LAMDA	LAMDA	LAMDA	LAMDA	-	-	52/2022	53/2022	3/2023	4/2023
-	-	LAMDA	LAMDA	LAMDA	LAMDA	-	-	4/2023	5/2023	7/2023	8/2023
-	-	LAMDA	LAMDA	LAMDA	LAMDA	-	-	52/2022	53/2022	3/2023	4/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	43/2022	46/2022	-	47/2022	50/2022	52/2022
BETA	EPSILON	-	BETA	ALFA	ALFA	43/2022	46/2022	-	47/2022	50/2022	52/2022
BETA	EPSILON	-	BETA	KAPPA	KAPPA	41/2022	44/2022	-	45/2022	48/2022	51/2022
BETA	EPSILON	-	BETA	ALFA	ALFA	47/2022	50/2022	-	51/2022	2/2023	4/2023
-	-	BETA	BETA	ALFA	ALFA	-	-	48/2022	51/2022	2/2023	4/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	51/2022	2/2023	-	3/2023	6/2023	8/2023
-	-	BETA	BETA	ALFA	ALFA	-	-	52/2022	3/2023	6/2023	8/2023
-	-	-	-	-	-	-	-	-	-	-	-
-	-	BETA	BETA	ALFA	ALFA	-	-	52/2022	3/2023	6/2023	8/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	51/2022	2/2023	-	3/2023	6/2023	8/2023
-	-	ALFA	BETA	ALFA	KAPPA	-	-	52/2022	2/2023	5/2023	7/2023
-	-	ALFA	BETA	ALFA	KAPPA	-	-	52/2022	2/2023	5/2023	7/2023
ALFA	EPSILON	-	BETA	KAPPA	KAPPA	50/2022	52/2022	-	53/2022	4/2023	7/2023
ALFA	EPSILON	-	BETA	KAPPA	KAPPA	50/2022	52/2022	-	53/2022	4/2023	7/2023
ALFA	EPSILON	-	BETA	KAPPA	KAPPA	50/2022	52/2022	-	53/2022	4/2023	7/2023
-	-	ALFA	ALFA	ALFA	ALFA	-	-	6/2023	8/2023	10/2023	12/2023
-	-	ALFA	ALFA	ALFA	ALFA	-	-	6/2023	8/2023	10/2023	12/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	3/2023	6/2023	-	7/2023	10/2023	12/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	3/2023	6/2023	-	7/2023	10/2023	12/2023
ALFA	EPSILON	-	BETA	ALFA	ALFA	44/2022	46/2022	-	47/2022	50/2022	52/2022
-	-	-	-	-	-	-	-	-	-	-	-
BETA	EPSILON	-	BETA	KAPPA	KAPPA	36/2022	39/2022	-	40/2022	43/2022	46/2022
ALFA	EPSILON	-	ALFA	ALFA	ALFA	45/2022	47/2022	-	48/2022	50/2022	52/2022
-	-	BETA	BETA	KAPPA	KAPPA	-	-	46/2022	49/2022	52/2022	3/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	47/2022	50/2022	-	51/2022	2/2023	4/2023
-	-	ALFA	BETA	KAPPA	KAPPA	-	-	47/2022	49/2022	52/2022	3/2023
ALFA	EPSILON	-	BETA	KAPPA	KAPPA	46/2022	48/2022	-	49/2022	52/2022	3/2023
-	-	ALFA	ALFA	ALFA	ALFA	-	-	50/2022	52/2022	2/2023	4/2023
-	-	ALFA	ALFA	ALFA	ALFA	-	-	50/2022	52/2022	2/2023	4/2023
-	-	BETA	ETA	KAPPA	KAPPA	-	-	45/2022	48/2022	52/2022	3/2023
ALFA	EPSILON	-	ALFA	ALFA	ALFA	5/2023	7/2023	-	8/2023	10/2023	12/2023
BETA	EPSILON	-	BETA	KAPPA	KAPPA	49/2022	52/2022	-	53/2022	4/2023	7/2023
BETA	EPSILON	-	BETA	KAPPA	KAPPA	49/2022	52/2022	-	53/2022	4/2023	7/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	3/2023	6/2023	-	7/2023	10/2023	12/2023
-	-	ALFA	ALFA	ALFA	ALFA	-	-	6/2023	8/2023	10/2023	12/2023
-	-	ALFA	BETA	KAPPA	KAPPA	-	-	47/2022	49/2022	52/2022	3/2023
-	-	ALFA	BETA	ALFA	KAPPA	-	-	48/2022	50/2022	53/2022	3/2023
-	-	-	-	-	-	-	-	-	-	-	-
BETA	EPSILON	-	BETA	ALFA	ALFA	-	-	-	-	-	-
BETA	EPSILON	-	BETA	ALFA	ALFA	3/2023	6/2023	-	7/2023	10/2023	12/2023
BETA	EPSILON	-	BETA	ALFA	ALFA	3/2023	6/2023	-	7/2023	10/2023	12/2023
ALFA	EPSILON	-	TETA	ALFA	ALFA	47/2022	49/2022	-	50/2022	2/2023	4/2023
ALFA	EPSILON	-	TETA	ALFA	ALFA	47/2022	49/2022	-	50/2022	2/2023	4/2023
ALFA	EPSILON	-	TETA	ALFA	ALFA	47/2022	49/2022	-	50/2022	2/2023	4/2023
ALFA	EPSILON	-	BETA	ALFA	KAPPA	38/2022	40/2022	-	41/2022	44/2022	46/2022
ALFA	EPSILON	-	ALFA	ALFA	ALFA	45/2022	47/2022	-	48/2022	50/2022	52/2022

The weekly breakdown of seasonal orders thus allows to analyze the allocation data from two different perspectives:

- The one of the major company, shown in the table, i.e. the possibility of visualizing and programming on a large scale the maximum date, expressed in weeks, by which the specific order must be released to the system.
  In this way, having calculated the technical setup and shipping times, different departments can be organized in relation to a given peak, adjusting the schedule or implementing the outsourcing of a given product.
- The supplier perspective, displayed in the graphs by processing, in this way the company can manage orders after the release to the supplier and plan in the long term the maximum date by which that code should have completed all of its individual processing.

This analysis of allocation results, developed on production constraints and implemented both in advance and during the course of production, allows planners to prioritize in relation to a particular time frame.
Thus, suppliers can be directed toward a particular processing deadline and reschedule other batches during less crowded periods.

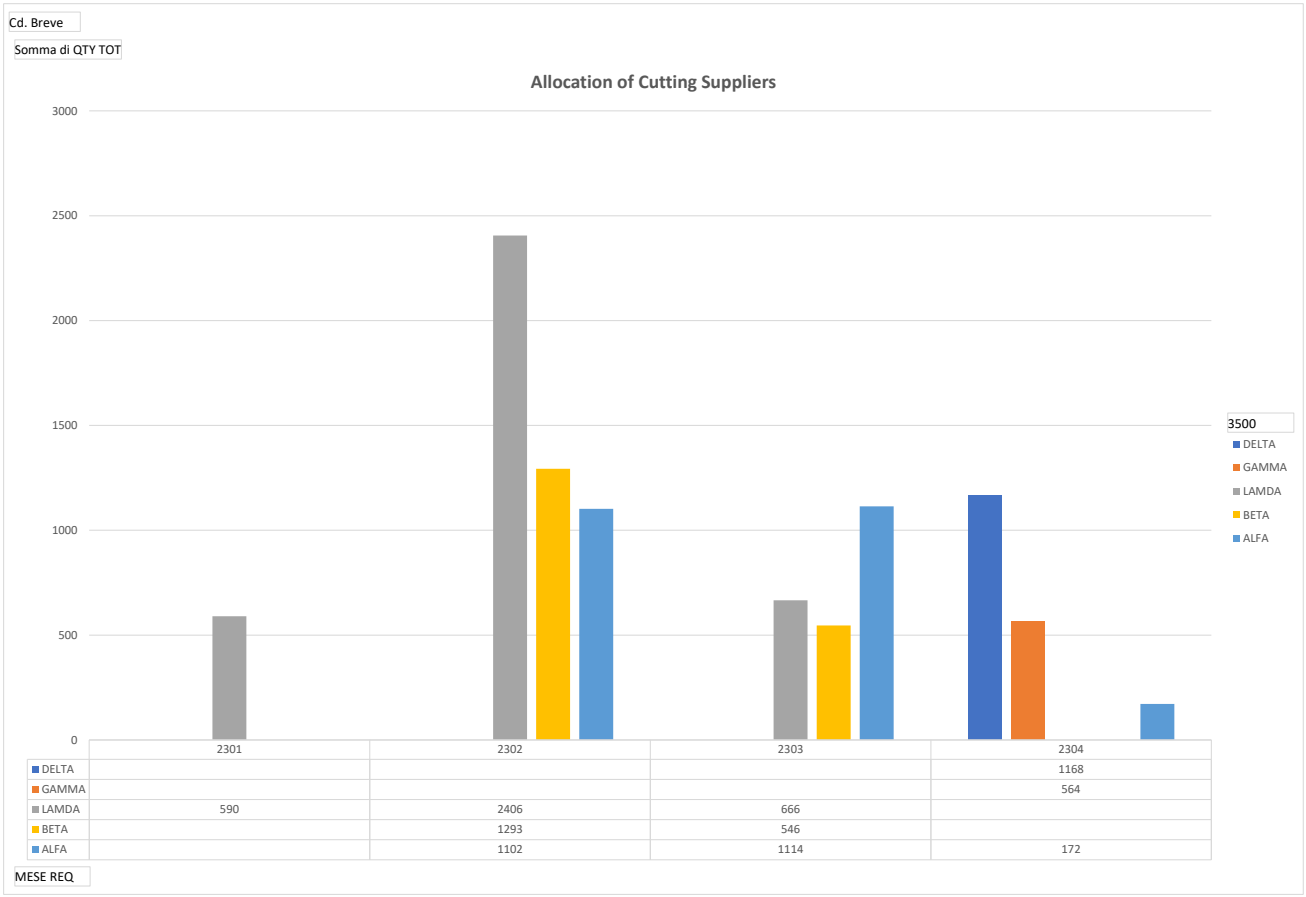
Moreover, being developed both globally, covering all orders of a certain season, and by product category, processing and specific supplier, the diagram allows the Production Planner to have both a photographic view of the company's situation and to be able to analyze critical individual operations in detail.

An example of the dynamic nature of the allocation tool are the charts elaborated below, in which one can have a specific view of the main external processing stages (Cutting, Edging, Assembly and Fixing), highlighting the relationship between individual supplier orders and final deadlines (Month Required)

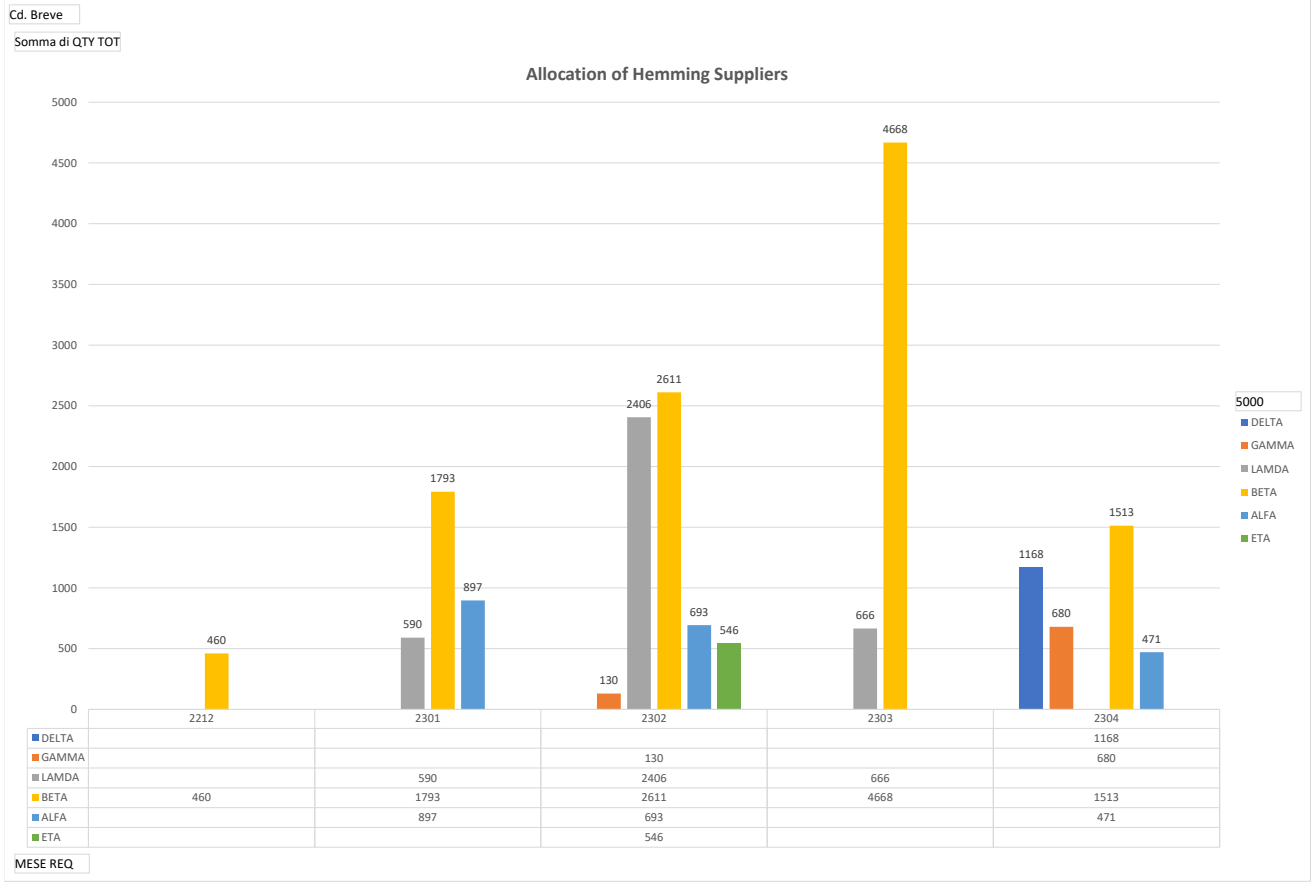
In fact, the graphs shown allow planners to follow the development of the orders assigned in the production plan and to display those in individual stages of development between different suppliers.

In conclusion, the allocation tool presented allows a final analysis to be carried out in relation to the scheduling of orders performed in the run up to the start of the season.
In fact, by processing the fulfilment dates of the individual operation codes, obtained through a returns analysis performed on the SAP software, one can compare the planned data with the returned data and calculate the conformity rates of each supplier's production plan.

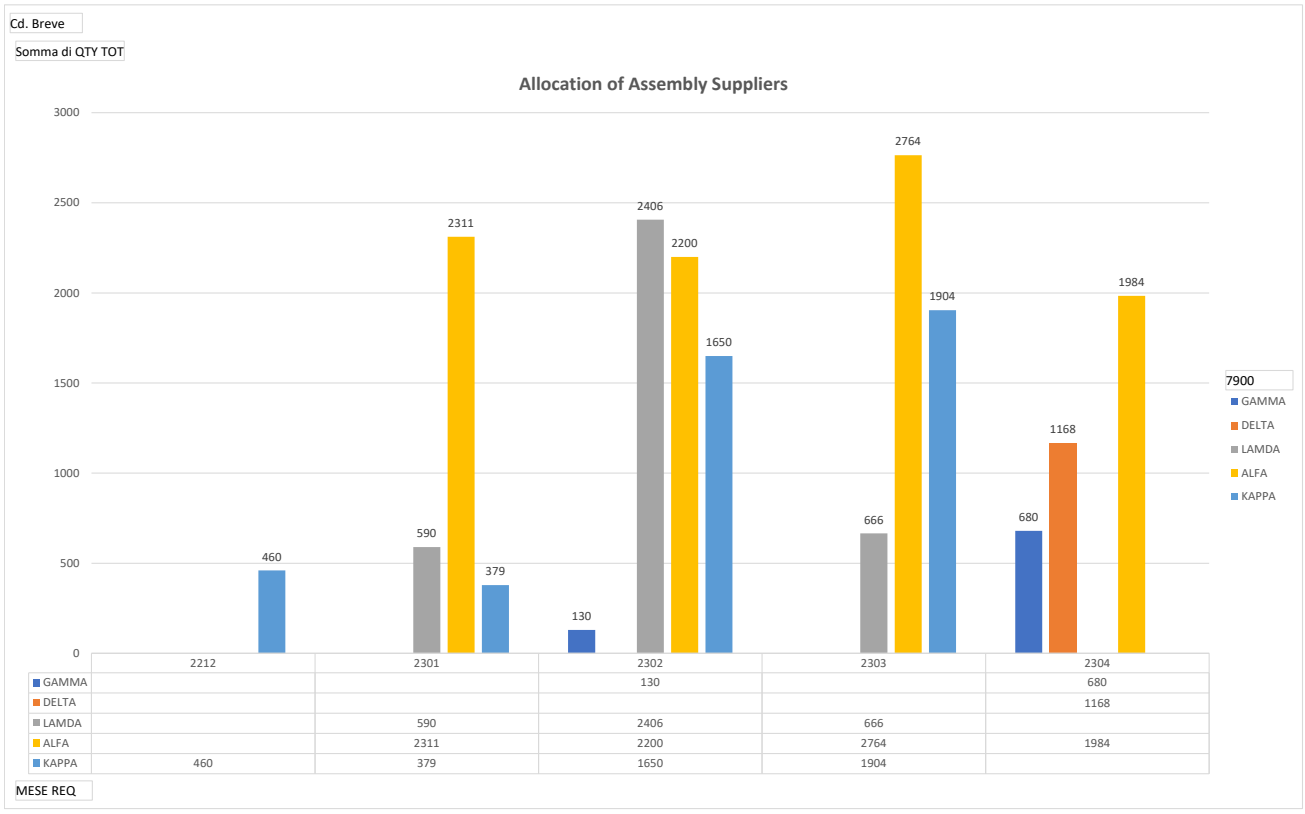
Thus, in the event that these results do not reach a minimum conformity rate of 70% of the previously established final lead time, it will be necessary to evaluate together with the supplier's management the aspects that led to this low performance.

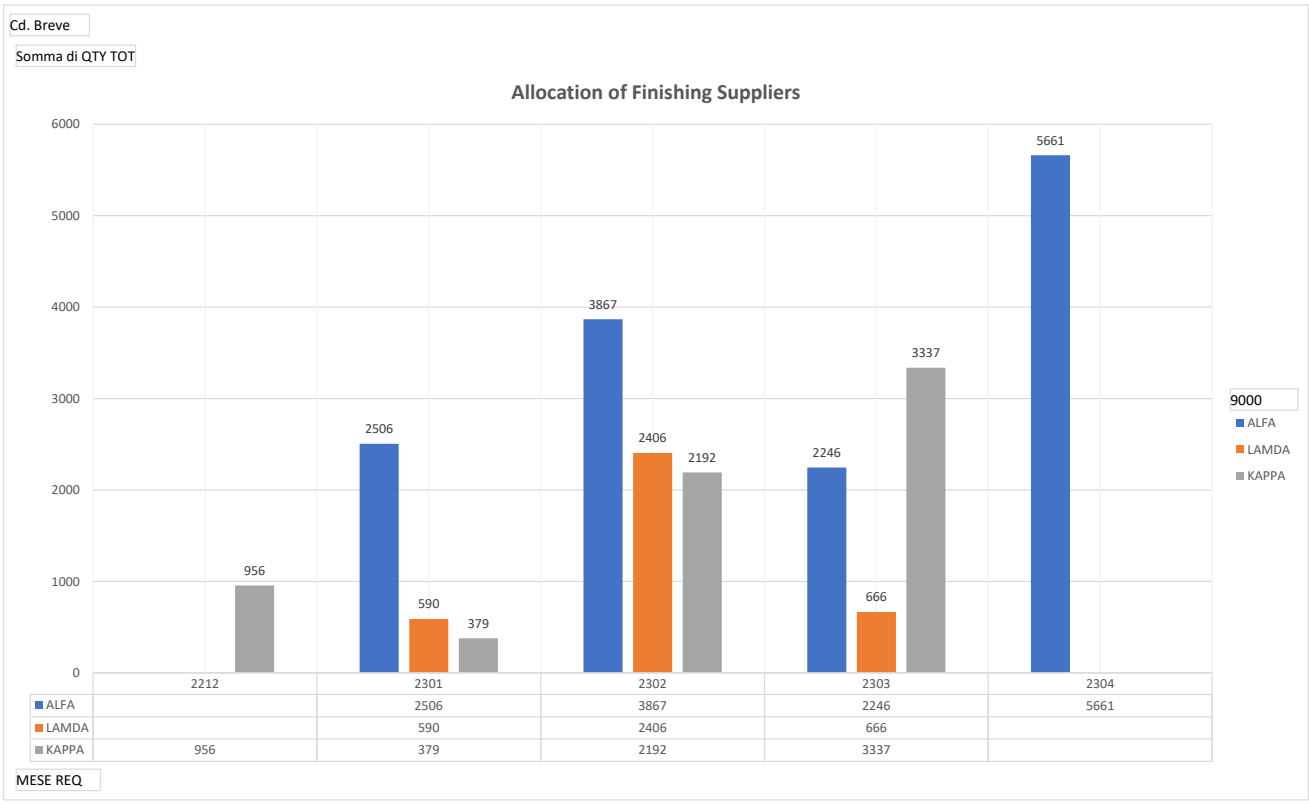


	2301	2302	2303	2304
DELTA				1168
GAMMA				564
LAMDA	590	2406	666	
BETA		1293	546	
ALFA		1102	1114	172



	2212	2301	2302	2303	2304
DELTA					1168
GAMMA			130		680
LAMDA		590	2406	666	
BETA	460	1793	2611	4668	1513
ALFA		897	693		471
ETA			546		


Cd. Breve
Somma di QTY TOT
Allocation of Assembly Suppliers
3000
2500
2000
1500
1000
500
0
460
590
2311
379
130
2406
2200
1650
666
2764
1904
680
1168
1984
7900
GAMMA
DELTA
LAMDA
ALFA
KAPPA
2212 2301 2302 2303 2304
GAMMA 130 680
DELTA 1168
LAMDA 590 2406 666
ALFA 2311 2200 2764 1984
KAPPA 460 379 1650 1904
MESE REQ


Cd. Breve
Somma di QTY TOT
Allocation of Finishing Suppliers
6000
5000
4000
3000
2000
1000
0
956
2506
590
379
3867
2406
2192
2246
666
3337
5661
9000
ALFA
LAMDA
KAPPA
2212 2301 2302 2303 2304
ALFA 2506 3867 2246 5661
LAMDA 590 2406 666
KAPPA 956 379 2192 3337
MESE REQ

5.3 To Be and Results

Throughout the various paragraphs within the treatise, it becomes clear how the reported case study is an example of dynamic and innovative management in line with the feature of the modern market. We have been able to verify the hypotheses initially posed, while during the literature review, we highlighted the limits of a static and excessively linear Production Planning Allocation Model, in the Berluti case study, on the other hand, we demonstrated the advantages of a strategic development of the seasonal order in complex conditions, developing a model based on the specific constraints and features of suppliers.
In this way, the complexity inherent in the huge amount of data and variables to manage, is displayed more clearly.
In fact, thanks to a high degree of integration between the departments involved in the definition of the product features, in the development of specific training and in the strategic planning of the individual operational phases, it's possible to structure a long-term planning suitable for continuous implementations:

- Foresee future opportunities posed by the market
- Reduce the risks arising from an excessively static and linear developed structure in front of unplanned changes.
- Reduce lost time and improve warehouse management
- Improve production efficiency and effectiveness
- Empower the various department subcontractors by making them part of the company's managerial evaluation.
- Increase corporate sustainability, both economically and environmentally.

Finally, in order to improve the strategic management of a multi-layered outsourcing system, it is essential to process the allocation of orders by defining strict milestones for individual processes and sharing those with the supplier from the outset.
In this way, the implemented tool enables the processing of data on individual suppliers and the drafting of an early plan with hypothetical processing dates, which will be updated during production. Thus setting up long-term scheduling, on which the supply chain is drafted, avoiding delays and risks in the lengthy procurement process involving various internal and external entities.

Therefore, we can conclude that an allocation system, developed on the basis of the production specifications and consequent integration in relation to the suppliers' know-how, enables the optimization of the entire management process concerning external suppliers and ensures the efficiency of internal departments, while respecting both capacity and lead time constraints.

6 Conclusion

This paper is driven by the desire to investigate the role of Production Planning in the allocation of external orders under complex production conditions, such as multilevel dynamics.
By examining the different facets of the Production Model in the case study, we filled the gaps identified in the previous literature review.
This was achieved by studying Berluti's business reality from the inside, a company that fully expresses the representation of a modern operating system, capable of adapting its production model to the variability of the market, relying on a synergic relationship with its suppliers and customers.
Thus, the structure adapts to the needs of contemporary business, being dynamic in relation to changes in orders or unexpected peaks in demand.
These capabilities enable the development of an excellent product, expressing the value of craftsmanship in iconic pieces. Indeed, through an innovative production model, the strengths of the strategic allocation can be exploited.

In this way, by relieving the pressure of internal departments towards suppliers, the company can meet the due dates established in the various supply chain phases and deliver batches of products to the several boutiques.

Figure 14: The Iconic Process

The research therefore identifies some key elements in strategic outsourcing systems and apply these into a dedicated tool.
Which, through the involvement of various departments in the definition of production constraints, enables planners to develop an allocation chart balanced on the specific skills of suppliers and the know-how of internal departments.
In this way, by implementing the production process through bi-weekly plans, allows to adjust the allocations according to the feedback from the departments.
In fact, the production cycle is not carried out on a linear basis over a single production area, as is the case in offshoring systems, but varies according to the different production elements.
In this way, planning has the task of leading the focus of divisions on targeted and shared purposes.

In conclusion, an organization interconnected with its environment enables a strategic exchange of information with suppliers and fosters long-term synergies.

We can therefore understand how, in Berluti's proposed structure, production planning influences the performance of departments and affects the overall business direction.

In this way, any extraordinary event will not surprise the production set-up, thanks to the structured system of coordination and feedback between the different stakeholders, enabling deadlines and final delivery to be met.

7 Future Research

This case study could be the basis for further research that develops insights into outbound order planning and allocation strategies in complex production contexts.
In particular, it would be interesting to investigate the development of this multilevel system in different markets and production conditions and to analyze its strengths and weaknesses also in relation to offshoring approaches of other luxury companies.
In addition, it would be fascinating to figure out how to integrate the proposed strategy allocation tool in the case of a considerable increase in orders and how to handle the resulting need to expand the range of suppliers on which to calibrate the tool.

In conclusion, the topic of outsourcing systems under complex production conditions is rich of possibilities in the development of new allocation strategies and tools that can improve the seasonal scheduling of manufacturing companies.

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8.1 Figure and Chart Index

Summary

This research stems from the desire to fill the gaps highlighted in the literature on the topic of strategic outsourcing in complex production conditions.
Indeed, in the recent bibliography on the broad topic of outsourcing, several researchers have explored the strengths of traditional layouts under static production conditions.
This is because manufacturing facilities are often built around low-variability production chains, in which processing is straightforward and focused on a restricted range of products.
In this way, production proceeds in batches according to the availability of raw materials, reducing the economic impact of each process.

In fact, this condition is appropriate for small and medium-sized manufacturers who have a standardized product mix and do not see outsourcing as an attractive opportunity but rely on a single generic supplier for limited periods of time and avoid investing in strategic planning of their production pattern.
To our knowledge, this is the first paper that develops an applied theory for production planning and outsourcing orders in multi-level conditions, based on an integrated tool linked to production departments.
This outsourcing system, in fact, balanced on the suppliers' skills and products' technical requirements, allows the intrinsic value of individual processing to be explicated and increases the capability level of internal departments.

To achieve this purpose, I was inspired by the case study of Berluti, a leading footwear manufacturer that, based on the high complexity of its raw materials and operations, opted to center its production model on a multi-layered plant.
With the aim of managing different processing within the production process and thus not requiring a fixed batch pattern but instead being able to switch the production model according to planning-driven priorities.
This paper was developed on the operational evidence found in the production chains of Manifattura Berluti, evidencing, in particular, the back-planning analyses geared toward enhancing the allocation of seasonal and permanent shoes orders.
The article will therefore explore the many facets that a manufacturing business model can express, especially when adapted to a highly competitive and innovative environment.

The complexity of multilevel system development stems from the numerous elements that need to be coordinated to ensure adherence to production schedules, material procurement and quality control.
In fact, under static conditions, the traditional model succeeds in reducing overall costs and improving production efficiency; whereas the definition of multi-level strategies is focused on a changing business model, based on multiple specialized structures, requiring careful back planning for proper allocation, from the release date to the target market.

This condition, therefore, demands an adequate supply chain to meet the demands of the end customer, which results in specialized production processes based on careful scheduling of in-house processing.
In addition, by outsourcing part of the 'production advancement to selected suppliers, the added value of individual stages is increased, reducing pressure on internal departments in case of order peaks and establishing a shared growth process.

In fact, we can clarify that in the recent manufacturing landscape, the analysis related to the topic of outsourcing within market-integrated firms has obvious gaps.
First of all, the literature over time has mainly focused on the establishment of a traditional outsourcing model, developed on a production strategy aimed at a narrow range of enterprises, without the ability to establish complete production processes with the limited goal of minimizing the cost of production, not defining constraints and considering the variability of production.
Secondly, the literature apparently does not treat production planning as an aggregative process for the management of internal departments and the coordination of external orders, capable to manage long-term production plans that exploit the potential of collaboration with stakeholders.

Furthermore, within a manufacturing company, the functional position of production departments can be ennobled by the strategic application of data and concepts that also have a strong impact on managerial decisions, through integrated management of the different departments.

Finally, in such an intricate production environment that requires extensive scheduling of every task, production planning will play a focal role in making the business model sustainable by emphasizing the production system through analysis of sales forecasts, management of production launches and supervision of external suppliers.

Having outlined the main gaps, the purpose of this study is to provide meaningful recommendations and guidelines for the strategic management of multichannel outsourcing in order to capture the innumerable potentials inherent in a Business Model embedded with the surrounding manufacturing environment.
In order to explore the evolution of strategic outsourcing within the Berluti business case, I have prepared several research questions in order to better understand the facets of this topic:

- *RQ1: "How does multi-period and multi-product outsourcing (MPMP) develops within strategic production planning?".*
- *RQ2 "What are the essential features of pre-emptive Supply Chain Management concerning multi-level order allocation planning?".*
- *RQ3: "What are the production and management risks resulting from a strategic outsourcing choice?*
- *RQ4: "Through which systems is evaluated the production performance of external contractors in the realization of complex production processes?*

Berluti's story begins in 1895, when a young Italian arrived in Paris with his creative energy to become a master shoemaker.
His first model, a shoe without an external seam, took his name Alessandro while the Maison his surname, Berluti.
To this day, the Alessandro pattern is still revived with a variety of finishing techniques, which makes the style unique.

The family history of the Berluti brand continues, developing a unique and innovative product but was, Olga Berluti, who in the early 1960s took over the management of the Maison brought innovation to the brand, made the boutique a vibrant place of creativity and exchange and in the early 1980s perfected the Venetian leather used by the Maison and developed the Berluti Patina, proposing the revolution of colored shades for men's footwear.
During her stewardship, Olga Berluti created five new footwear lines, also collaborating with artists such as Andy Warhol to create the Andy loafers, still part of Berluti's permanent collection.

The brand, brought to media notoriety by Olga, was purchased in 1993 by the LVMH Group and has since been part of the French giant's portfolio of luxury brands.

Today, Berluti is a synonymous of excellence in men's clothing and footwear, its exclusive heritage consists mainly in know-how and skills related to leather processing but what makes Berluti a leader in its field are the innovations and reinterpretation of ancient methods, to achieve a constantly renewed catalogue.
To date, the headquarters remain in Paris on rue Marbeuf, while all footwear manufacturing is located in the province of Ferrara.
Over the years, the brand's growth continues inexorably with the opening of new stores around the world and with the steady increase in online sales.

The company's business model focuses on an innovative and integrated value chain, aimed at creating a finished product that reflects the heritage and expectations of international customers.
This structure is aimed at managing the production process according to new launches and order allocation. In fact, the development of the production cycle depends on an unlimited number of variables, such as organization, logistics and planning. This requires a high level of coordination among the various teams to plan each choice in a shared and rational way, limiting the risks arising from inaccurate management of the pre-production stages.
Berluti's business model is centered on enhancing the craftsmanship of its resources and innovation in production techniques, for this reason, the flow of information is developed from the bottom up, so as to establish a feedback loop system and coordination between departments and management.

The production chain begins at the French headquarters, where the underlying themes of the new season are defined, analyzing growth indices in terms of production, sales and international rise.
Then, after outlining the structural basis, the management plan is shared with the various teams in the Ferrara production facility.
Once the plans are discussed and confirmed, the manufacturing teams work independently following a specific schedule, which defines process milestones, to avoid slowdowns and delays on the final launch.
Accordingly, the planning team is in charge of the technical and quantitative implementation of the management plans at the operational level, scheduling production steps according to individual lead times.

Specifically, production planning is a set of operations designed to organize production resources to meet customer orders and maximize the level of service in terms of speed, flexibility and meeting delivery dates, while limiting the total cost of the production process from supply chain operations.

In strategic production planning of cycle time, it’s therefore essential to define priority and succession constraints (Finish to Start, Start to Start), in order to then take advantage of the potential shortening of processing activities and related procurement of raw materials, logistics and training processes.
In fact, the main limitation expressed in the literature on production planning is the absence of research focused on the key role of planning within challenging manufacturing environments, showing its implementation over time.
Indeed, in the design of managerial decisions, on seasonal launches, production loads, and outsourcing propensities, the role of planning is evident in decision-making and in the progression of strategic processes.
Thus, Berluti's planning is the cardinal link between managerial and operational approaches.

In fact, all production flows are organized to ensure continuity in the succession of phases without interruption, while the aim of scheduling is to coordinate all process players as best as possible to meet required delivery dates and seek system sustainability.

In this perspective, for drafting strategic and outsourcing-oriented production plans, each production activity must be planned according to the following parameters:

- The volume of work to be performed
- The delivery deadlines to be met
- The risk arising from extraordinary events
- The available production capacity
- The availability of raw materials and components

It's therefore essential to analyze the logical process that follows a managerial decision, based on a discussion between departments to enhance production capacity through accurate retro-planning, so as to be able to handle peak orders.

Simultaneously in a complex, multi-level production system, prior organization of the supply chain is crucial; in fact, it's the driving force behind a successful fashion season and a brand's ability to quickly navigate the latest styles.

Supply chain management in the fashion industry then requires some special considerations because the industry relies on short product life cycles and peak demand.
Therefore, the entire supply chain needs to be organized in relation to the production plan for different designs, developed by the planning team. All this in order to be able to release lots to suppliers according to the preventive schedule, avoiding delays caused by lack of raw materials.
The supply chain starts with the definition of stylistic elements in relation to marketing analysis and the success of past models. Having defined the stylistic aspects, it's essential to assess the applicability of that design in the production system, engaging with production managers and raw material suppliers to solve related issues.

Once the feasibility of the project is confirmed, the process of acquiring materials and the subsequent production of the first pairs begins.
Berluti's sourcing process is structured in the company's production facility, where the procurement and storage of raw materials (leather, soles, laces) is managed and sent to subcontractors on a per-process basis.
The supply chain thus becomes a management process, defined in coordination with external suppliers to extend the organization's objectives beyond the corporate level and facilitate external relations.
As a result, for the completion of the various production cycles, semi-finished products make multiple moves, always passing through the Berluti plant's direct quality control before moving on to the next stage.

To better manage the intricate system of data on semi-finished items and product inventory, Berluti uses a *Material Requirement Planning* system, which is designed to coordinate various steps in relation to production progress.
In fact, through the MRP management report, production and purchasing are planned based on the factors needed for launches, such as market demand, lead time or available inventory.

This system is more effective in the complexity of a luxury business than a traditional fixed-interval system, firstly because it leads to lower inventory levels. Secondly, because it's not based on

historical analysis, but rather on future forecasts, ensuring better management of product batches with variable demand.
Finally, it is useful for planning, allowing productivity to be always kept under control.

Finally, this system keeps track of the production plan of individual products and acts accordingly, scheduling purchases and logistics.
This highly specialized process is supported by the "*Enterprise Resource Planning"* (SAP) software, which allows for examining the material requirements and releases of different models between the various production departments.
Accordingly, the purchasing department is in charge of analyzing the necessary requirements based on inventory availability and existing production.
The required quantities of new components are then sorted from appropriate suppliers, ensuring that delivery times are in line with the correct launch date of the related articles.

After having achieved this stage, the main target of the manufacturing planning team is to develop production plans according to all departmental activities, during this operation, each planner monitors daily the progress of batches against what was planned, analyzing any possible constraints and modifying the schedule accordingly. In this way, by sharing key elements with the team, everyone is up to date on other realities and can prevent risks from external suppliers.

In this circumstance, it is critical to ensure that the schedules are properly aligned to guarantee a seamless flow of all steps and to meet established delivery times.
All plans are defined through the support of dedicated planning software, called CyberPlan and designed according to the team's needs, which independently performs comprehensive scheduling of the entire product portfolio by examining all possible causes and ensuring the best feasible timeline.

The two dedicated software programs, manage to support the planning process, and allow:

- Increasing service levels.
- Improving production schedules.
- Guarantee delivery dates.
- Reduce unproductive inventories.
- Reduce preparation time.
- Increase production rates.
- Reduce the percentage impact of stalled unfinished goods.
- Reduce lead times of external production steps.

The whole structure, therefore, allows team members to spend more time and energy monitoring daily activities to improve compliance rates of internal departments and external manufacturers in relation to what was planned.
However, in the day-to-day reality, the management of events and contingencies with suppliers is not easy, as component procurement cause complications for the scheduling of production line.

Indeed, strategic production management differs for the various items produced by the company, each with specific technical requirements:

- Shoes
- Belts
- Leather goods

These products differ both in the production cycle and in the planning process, consequently requiring strong specificity in the definition of production plans to meet the lead time of the required batches.

In fact, as expressed below, the footwear production chain is structured on multiple processing steps, on which the finished product is then developed:

- **Nesting**: The initial stage of leather placement is carried out with a laser projection tool, through which any defects in the leather that would compromise the final product can be excluded.

- **Cutting**: Cutting is a special stage, which is performed on separate tables according to the technical characteristics of the product:

1. *Cutting with a blade machine*: a partially automated tool that is applied to most traditional models (French Shoes)
2. *Hand cutting*: Used for patterns characterized by exotic fine leathers that are strictly limited and complicated.
3. *Die-cutting*: Necessary in case of special shapes or applications on the top, which due to the complexity of processing require a specially developed tool.

- **Hemming**: This step is done entirely by hand by skilled craftsmen who establish the upper and heel of the shoe, stitching and gluing any front applications. This process requires detailed lead times because of the varying complexities of workmanship.

- **Assembly**: Assembly is the central step in the process and, considering the production structure of Berluti's MPMP, unlike traditional models, it does not take place on a predefined route where each operator performs a certain step for standard products; rather, it takes place on mobile platforms and dislocated stations, which allow for rapid switching from the assembly of one product to another.

- **Finishing**: also known as Patina, is the final process that differentiates and identifies Berluti; it includes a series of steps performed entirely by hand that create a distinctive and inimitable patina on the shoe

At the same time, in-house production is supported by several external suppliers, who carry out specific stages of the production cycle according to their expertise and with whom the various departments meet periodically to establish sustainable collaboration and meet production indices such as the compliance rate.
This system, which focuses on the special character and novelty of the crafting, creates a unique outsourcing strategy while remaining faithful to the lines introduced by Alessandro in 1895.

At this point, having completed the production of the first batches, logistics takes care of the distribution of the items to Paris, according to the requests of the different boutiques and the analysis of forecasts.

The next stage is sales, divided between:

- **Retail**: distribution and sales channel consisting mainly of single-brand and company-owned stores. The company and the store work together to predict the tastes of the end consumer and define the right assortment for each store.

- **Wholesale**: distribution and sales channel consisting of independent stores, there is no co-ownership between the supplying company and the store. Each of them orders the products

Berluti's entry into the LVMH group and its international expansion in the men's leather goods market meant that the Ferrara factory's production capacity could not handle the increase in orders.
For this reason, the design choice to cope with the long-term peak was to collaborate with external specialized structures to carry out very complex production steps, accompanying the supplier in a training program on the savoir faire of the brand.

Factors influencing the selection process may vary depending on the production cycle, skills and managerial abilities:

- **Cost**: Evaluation of the materials, resources, time and risk involved in a particular delivery. Economic terms are evaluated not only with traditional ROI or TCO systems, which are limited to monetary aspects but TVO (Total Value of Ownership) is used, where the risk associated with the sustainability of the supplier is also evaluated.

- **Quality**: The ability to meet quality criteria in different categories (materials, size, design and durability) or variety of systems (production lines and techniques).

- **Lead time**: the fundamental adherence to deadlines, which if not met risk creating bottlenecks in departments, ultimately affecting the end goal.

- **Reputation and ethical standards**: Supplier compliance with ethical, sustainability and corporate governance (ESG) principles.

This design, based on a multi-level process, enables inventory reduction and a more responsive reaction to market demands. At the same time, however, all this involves a rather complex production cycle, with frequent exchanges with external suppliers, requiring a detailed plan.
This is because, in a multi-product system, the allocation process is not based on a repetitive and standardized assembly line, but on product-specific steps that require a dynamic production chain focused on resource enhancement.

The role of planning in managing and regulating this flow of information is decisive.
Each manufacturer involved in the process has its specifications in terms of delivery times and processing methods. This greatly amplifies the company's challenge in coordinating the cycle of individual products, which perform a processing at a particular supplier and then continue with the subsequent step at Manifattura Berluti or another external supplier.
Precisely to minimize ordinary risks, production plans are discussed and updated together with the external team, trying to balance the progress of the different batches and meet the established deadlines.
Therefore, for effective batch outsourcing management, the planning team draws up dedicated analyses on the supplier's experience on a certain pattern, on the execution time of the individual phase, on the capacity in terms of means and resources and above all, on the timing between take-over and delivery (lead time).
In the strategic management of external relations, it is, therefore, necessary to define certain technical constraints to delineate the partnership.
In order to be able to meet the deadlines imposed by the end market, the planning team draws up biweekly production schedules, in which the ultimate execution dates of the various tasks are examined to regulate the advancement compared to what was established upstream.

In the manufacturing context described, structured to be able to manage multi-layer production departments, outsourcing strategies are based on capacity peaks, launches for new seasons and permanent orders that have been successful in previous collections.
Indeed, such system would not be efficient in a traditional facility; in fact, it is designed to handle a highly variable production line focused on innovative products with various compositions that follow the two main seasons: Fall/Winter and Spring/Summer.

This production design, therefore, allows for fewer bottlenecks in internal departments, dynamic production planning and less risk on internal expansion.
On the other hand, it obviously requires a greater commitment in terms of logistical and management costs in scheduling and accompanying the outsourced phases.

Then, the strategic organization of external allocations becomes a managerial tool, able to develop synergies with external resources through meetings and training, that increase productivity and create a long-term path of collaboration, enabling the creation, integration and protection of value.

Thus, we can conclude that production planning and strategic management of external orders are essential in improving the company's production performance, innovating production methods through a technology boost, and finally enable global brand awareness.

The main benefits of a long-term strategic outsourcing perspective are manifold:

- Innovative: Leverage the sharing of best practices to develop innovative projects.
- Organizational: An integrated strategic allocation allows the supply chain to be organized and flowing, reducing downtime.
- Economic-financial: Containment of overall process costs, sharing of risks and investments.
- Development of synergies: Enables the transfer of skills and knowledge to external resources, fostering the development of Savoir Faire

In addition, in order to ensure the security and effectiveness of this manufacturing reality, it is essential to differentiate subcontractors by specialization and location, in order to avoid the risk of generating a monopoly leverage and getting locked into unsustainable relationships.

This environment, therefore, requires careful management of in-house production capacity and related resources, including the possible purchase of machinery and hiring of personnel.
In addition, the allocation of orders to different production processes on a seasonal basis lead to high costs in the industrialization and a consequent organizational complexity to meet production deadlines for the market launch of new models.
The decision for a multi-level development of the production process, therefore, entails several risks that planning is called upon to manage, inherent in the dynamic condition of the production processes, which must be carefully considered in the preliminary stages:

- Risk of incorrect supply chain management
- Failure to meet delivery deadlines of intermediate stages due to incorrect planning and coordination.
- Logistical constraints due to the handling of semi-finished products.
- Risk of queuing of semi-finished products in the production trolleys due to lack of capacity.

- Risks related to services and the external environment, such as natural disasters and social events.

Therefore, to succeed in rendering the multilevel system sustainable and efficient, it's necessary to conduct an extensive scheduling of the different batches, according to the established deadlines, evaluating the overall lead time and considering the different shifts between internal departments and suppliers.

In this scenario, the leadership of planning is significant, which through the drafting of bi-weekly plans, elaborated on the dedicated software Cyber Plan, defines the release priorities of different models and coordinates the production process of the suppliers.

In the final chapter of the article, after having carefully analyzed the evolution of the strategic allocation process within the Berluti case study, i applied the theoretical elements discussed to develop an innovative tool, designed to optimize the commitment of the planning team in the allocation of seasonal orders, based on constraints and subcontractors' know-how.

To empirically elaborate this tool, i first analyzed the current background, identifying possible points for improvement and then defined the data set and objectives on which to create the strategic allocation. In fact, through direct participation in managerial meetings with suppliers, i have been able to collect and process a large amount of data and information.

The challenge of designing this strategy allocation tool lies precisely in the essential role played by individual suppliers.
In fact, the skills and expertise acquired through specific training make the contribution of each supplier crucial to meeting production performance.
This complexity is evident in the definition of the database, which, in order to be functional and adaptable over time, has to rely on the insights derived from the industrialization phase.

Once these elements have been established, the system defines a specific allocation strategy for each production stage, related to the different production parts.
Then, based on these variables, the lots are assigned to the various suppliers, establishing the maximum week of release and processing, in order to respect the lead times shared with the planning team.
Indeed, we can assign processing phases based on technical skills and progressive production capacity, obtaining the result expressed in residual quantity.
Furthermore, we can obtain both a view of the production cycle of the single material code and in relation to the orders assigned for the next season.
Similarly, from this data, we can define the date by which the specific stage must be released to meet the ultimate deadline.

Thus, suppliers can be directed toward a particular processing deadline and reschedule other batches during less crowded periods.

In addition, the development of this agile strategic order allocation model enables Berluti's production structure to be upgraded and, furthermore:

- Anticipate future market opportunities.
- Reduce risks from an overly static structure under unplanned changes.
- Reduce downtime and improve inventory management.
- Improve production commitment and effectiveness.

- Empower various departmental subcontractors by making those part of the company's managerial assessment.
- Increase corporate sustainability, both economically and environmentally.

Thus, the allocation tool described allows for a prior analysis in relation to the allocation of the different models. In addition, given the operational approach, this system allows the implementation of outsourcing criteria in relation to the new variables found and the ultimate assessment on the production outcomes achieved.
Finally, the case study analyzed represents a relevant source of information for allocation strategy research.
Indeed, due to both the challenging luxury clothing market and the sophisticated production method, Berluti provides an effective representation of external order allocation strategy in a dynamic environment, able to adapt to surrounding trends through a back-planning strategy linked to production progress.

This enhances operational agility, reducing internal workloads and fixed costs, optimizing risk management and the achievement of business purposes.