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Improving the Multi-Brand Channel Distribution of a Fashion Retailer

Tiago Silva[1], Teresa Pereira[1,2], Luís Pinto Ferreira[1], F. J. G. Silva[1]

[1]*ISEP – School of Engineering, Polytechnic of Porto, R. Dr. Antº Bernardino de Almeida, 431, 4200-072 Porto, Portugal*
[2]*Research Center of Mechanical Engineering (CIDEM), School of Engineering, Polytechnic of Porto, 4200-072 Porto, Portugal*

Abstract

One has seen exponential growth in the number of clients and in the quantities ordered in the fashion retailing multi-brand channel. It has, therefore, become essential to improve the channel's distribution process in order to meet the customers' orders in the shortest time, and in a cost-effective manner, thus complying with the delivery terms agreed upon with the market. To this end, one studied aspects such as the mapping of the supply flow process, the occupation of space and the spaghetti-dash diagram of four current distribution process activities. Besides these, one also analyzed the calculation of productivity, cycle times, takt time, as well as the service level designed, with the purpose of preparing a system to evaluate company performance. In addition to these studies, one resorted to the ABC and SWOT customers' analyses in order to develop the improvement proposal, which was characterized by: (a) changes in the layout, (b) improvements in the supply flow, (c) implementation of gravity carriers, as well as more ergonomic forms of transport, and (d) the use of computer applications developed in Visual Basic language for the distribution process. Based on this proposal, one succeeded in increasing the amount sorted out by the distributor in an eight-hour shift to 294 articles (11,23%). Cycle time was reduced from 0,015 minutes/article to 0,013 minutes/article (13,33%), which allows for the segregation of articles in time for the next collections. In addition, the occupied space was reduced to 47 m^2 on average per collection (1,39%), which is translated into a reduction of 1 498 468 meters (23,34%) in the average distance covered per collection. Furthermore, the number of workers was reduced, on average, by five employees (12,82%) per collection. The storage capacity of the finished product was also increased by 535 boxes (11,30%). The total investment needed to achieve these changes is established as being 23 754,42 €; yet, the payback time involved will only be six months, resulting in a cumulative profit of 84 504,23 € by the end of the fall/winter 2020 collection.

Keywords: Improvement; Layout; Logistics; Picking; Productivity; Supply flows.

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1. Introduction

The efficiency and effectiveness of logistic operations are of crucial importance when determining the level of an organization's competitiveness today [1]. The globalization of the market, great competition, short product lifespans, high productivity and the reduction in time-to-market are all factors which condition operation performance [2]. Gaining a competitive edge is directly related to the appropriate choice of warehouse layout, since this produces immediate effects both in the initial capital invested as well as in operational costs [3]. On the shop floor, between 55% and 75% of the total warehouse costs are generated by the most time-consuming activity in the area of logistics, which is known as order-picking [4]. The selection of suitable equipment for storage, transportation, order picking and sorting essentially determines the level of warehouse automation, and this ultimately influences the performance achieved [5]. The implementation of a WMS (Warehouse Management System) to support warehouse management allows for an increase in efficiency as well as a reduction in costs, when compared to a manual management system [6]. The work described in this article was developed at a fashion retail company. Its purpose was to improve the distribution process of a multi-brand channel so that, in the period between the FW17 (Fall/Winter 2017) and FW20 (Fall/Winter 2020) collections, one could meet the customers' orders in the shortest time and at the lowest cost possible, thus complying with the due date for delivery agreed upon with the end consumer. The article is divided into six sections: section 1 consists of the introduction; section 2 presents a review of literature dealing with the analysis and optimization of warehouses; section 3 describes the methodology used to carry out this research work; section 4 presents all the practical work developed at the company; section 5 contains the results obtained: and section 6 consists of the conclusion of the study.

2. Literature Review

There are countless studies in literature pertaining to the subject of warehouse analysis and optimization. These deal with the identification and elimination of waste, with the subsequent adoption of the most suitable strategies of distribution for each organization, thus enabling a significant increase in logistic performance. In the case study of a warehouse belonging to a tea producer, an algorithm was developed to generate work orders according to the combinations of the picking and packaging operations. This led to the elimination of extra storage and to a reduction in operation time [7]. In a warehouse owned by a producer of interior design objects, it was demonstrated that logistic performance could be improved by means of the Warehouse Management System, in which VSM (Value Stream Mapping) allowed for the identification of the activity area where waste was being generated. In addition, Genba Shikumi allowed for the categorization of the weight of identified waste [8]. In another study, which considered a rectangular warehouse with a rack system, an algorithm was developed to support decision-making for a warehouse layout. This enabled minimizing space and reducing the costs associated to material flow [9]. In line with the results achieved in a study undertaken of German supermarket distribution centers, it was concluded that, if the picking process time is less than that of the mobile rack displacement process, it is advantageous to use the computational results suggested in order to minimize the space taken up by the racks [10]. The use of bar codes for the two-bin system, used in a logistics warehouse at an electronic components company, resulted in the elimination of unnecessary movements, as well as in a reduction of waiting time and the distance covered [11]. In the case of a company in the tire industry, the implementation of the RFID (Radio Frequency Identification) system led to a reduction in the costs of logistics and to better service rendered to the end customer [12]. An ABC analysis of product rotation at a company in the automotive sector encouraged the change in material management from FIFO (First-in First-out) to FEFO (First-expired First-out). A new layout was also determined, and the calculation for the number of bins required enhanced logistic performance [13]. The most time-consuming activity in logistics, which is termed "picking", consists of removing articles ordered by the customer from the warehouse stock. This must be carried out at the right moment and in the required quantity, with the subsequent delivery of the final product to the customer in the best possible conditions [14]. The mapping of processes by means of the spaghetti diagram, as well as through the business process model and notation, contributes to the efficient and effective identification and elimination of non-value adding activities. The business process model and notation consists of a notation method based on flowcharts used to define business processes. Namely, it combines graphic features and support data, with the ultimate aim of providing further details of the process at hand [15]. The spaghetti diagram involves plotting lines on the gemba layout, which reproduce the observation of the flow of material movements, as well as that of information and human resources [16]. The principal performance metrics or the KPI (Key Performance Indicator) used in the development of this study, and which will support the evaluation of the process are: P (Productivity), CT (Cycle Time) and TK (Takt Time). Productivity measures the product's capacity to transform input (resources) into output (products); namely, productivity consists of maximizing the use of resources, offering the customer a product at the lowest possible cost [17]. Cycle time measures the time between successive articles; it is defined by the lengthiest activity, known as the bottleneck, which conditions production rate [18]. Takt time is the term used to refer to the time cycle which meets customer requirements and is the heartbeat of distribution [19].

3. Methodology

The methodology used to undertake this study was divided into various stages. The first of these consisted of a review of literature, which was supported by scientific articles dealing with the field of warehouse analysis and optimization. The purpose here was to ensure a coherent support for the empirical research presented. During the second stage, one proceeded with the activity of mapping the process, as well as that of the supply flow and the occupied space. Spaghetti diagrams were also drawn up, and a calculation of the performance measures was carried out to allow for an analysis of the distribution process used in the multi-brand channel. The critical points and potentialities were thus identified. It was in the third stage that one drafted the proposals for improvement in the distribution process of the multi-brand channel. In the fourth and last stage, one proceeded with the implementation of the suggested proposals, which was supported by the Pan, Do, Check, Act (PDCA) methodology.

4. Improvements in the multi-brand channel distribution process

The distribution process used by the multi-brand channel of a fashion retail company is organized in four activities, which are designated as: multi-brand pick by line; storage of the finished product; storage of raw materials; and product expedition.

4.1. Mapping of the current distribution process

The logistics warehouse at the company (see fig. 1) occupies an area of 8 700 m^2, in which 2 497 m^2 are associated to the channel studied. While 1 125 m^2 are allocated to the multi-brand pick by line activity, 750 m^2 are used for the storage of the finished product, 422 m^2 are taken up by raw material storage and 200 m^2 are used for product expedition.

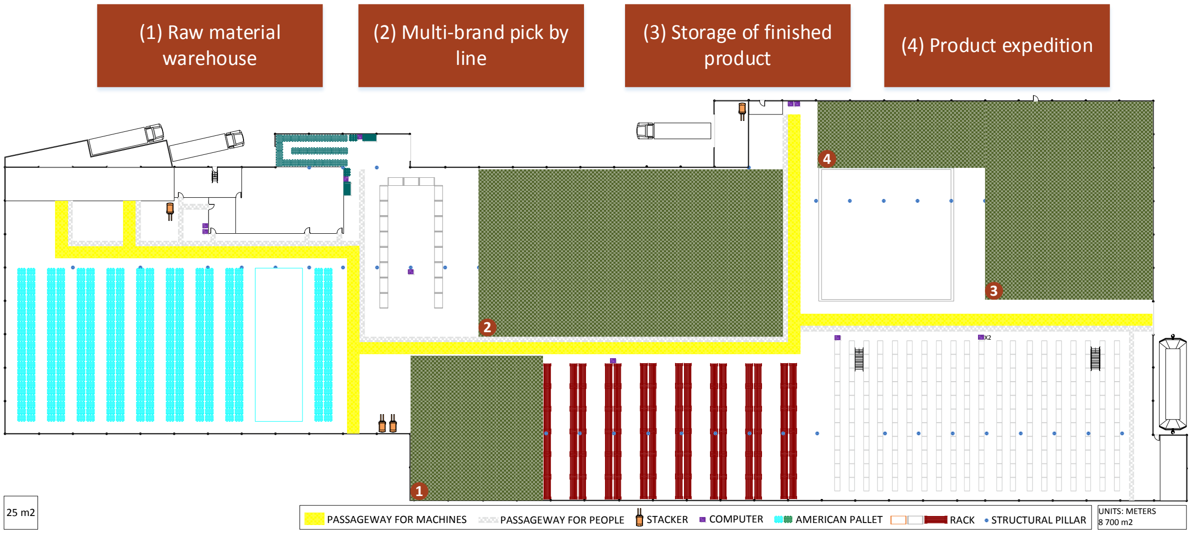

Fig. 1. Layout of the logistics warehouse at a fashion retail company (current distribution process).

4.2 Evaluation of the performance of the current distribution process

An ABC analysis of the packaging process allowed one to conclude that, for the spring/summer 2017 collection, 30 661 boxes were packaged for 2 069 customers. Of these, 1 to 15 boxes were packaged for 1 526 customers, between 16 and 37 boxes were packaged for 399 customers, while 38 to 1 031 boxes were packaged for 144 customers. Thus, 6,96% of the customers are considered to be class A, 19,28% are considered to be class B and 73,76% are considered as class C. One also analyzed the product family for which the largest number of article displacements occurs in the raw materials warehouse in order to execute the multi-brand pick by line activity. One was thus able to determine the number of pallets moved (see table 1): the trousers range is responsible for most of the pallet movements, and is followed by the family of seamless items, jackets and coats and, lastly, shirts and knitwear.

Table 1. Number of pallets moved for each product family.

Product family	Total nº of boxes	Nº of boxes/pallet	Total nº of pallets
Trousers	11 148	30	372
Seamless items	9 120	25	365
Knitwear	1 542	25	62
Jackets and coats	5 695	20	285
Shirts	3 717	30	124
Total	31 222	26	1 208

The results obtained from the spaghetti diagram, which plots the activities associated to the current distribution process of the multi-brand channel, allowed one to determine the distance covered per article, per box or per pallet in each of the activities (see fig. 2).

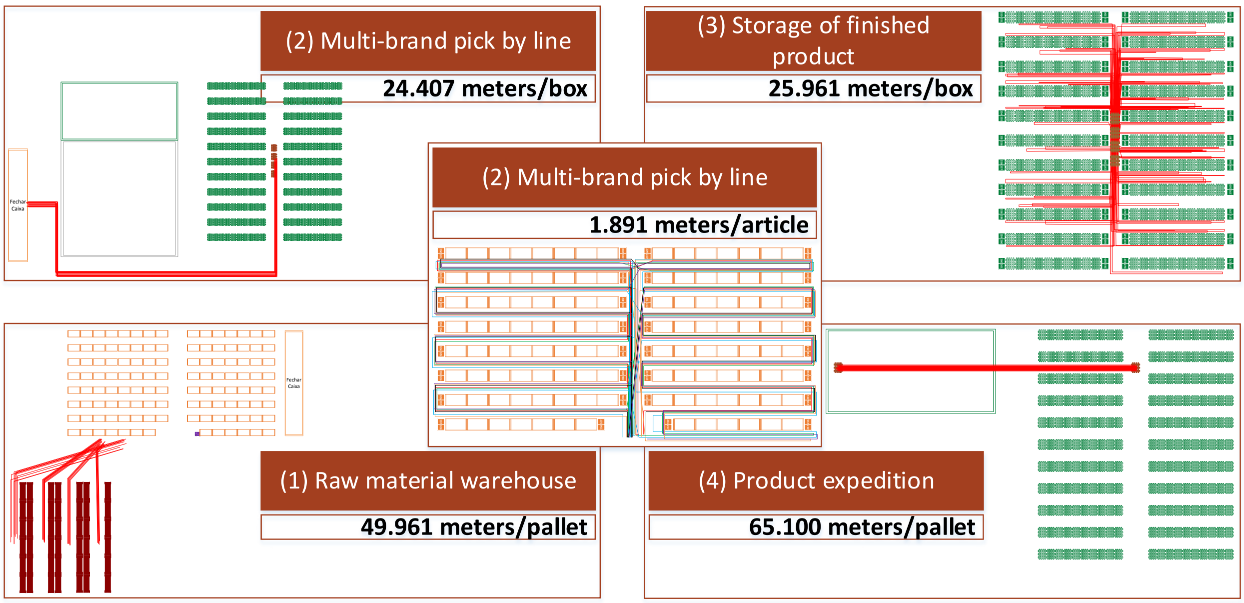

Fig. 2. Representation of the spaghetti diagrams for the activities of the current distribution process.

While 5 164 887 meters were covered for the spring/summer 2017 collection, it is expected that 5 632 942 meters will be covered for the fall/winter 2017 collection. The distance which will be covered for the spring/summer 2018 collection is estimated at 5 702 230 meters while, for the fall/winter 2018 collection, it is expected to be 6 210 981 meters. The number of meters covered for the spring/summer 2019 collection is foreseen to be 6 287 542 meters, and for the fall/winter 2019 collection it is estimated to be 6 848 483 meters. Finally, the expected distance covered for the spring/summer 2020 collection is 6 828 797 meters, while the fall/winter 2020 collection will be 7 438 012 meters. Takt time was established for each collection by combining two types of data. Firstly, one considered the time available for the distribution of the articles ordered by customers from each collection, which was determined as being 31 680 minutes. Subsequently, one also took the expected quantity ordered into account. When comparing these aspects to the cycle time of 0,015 minutes/article, it was concluded that under current operation conditions, it will be impossible to fill the orders placed by customers within the agreed time with the end consumer for the collections of spring/summer 2019, spring/summer 2020 and fall/winter 2020 (see fig. 3).

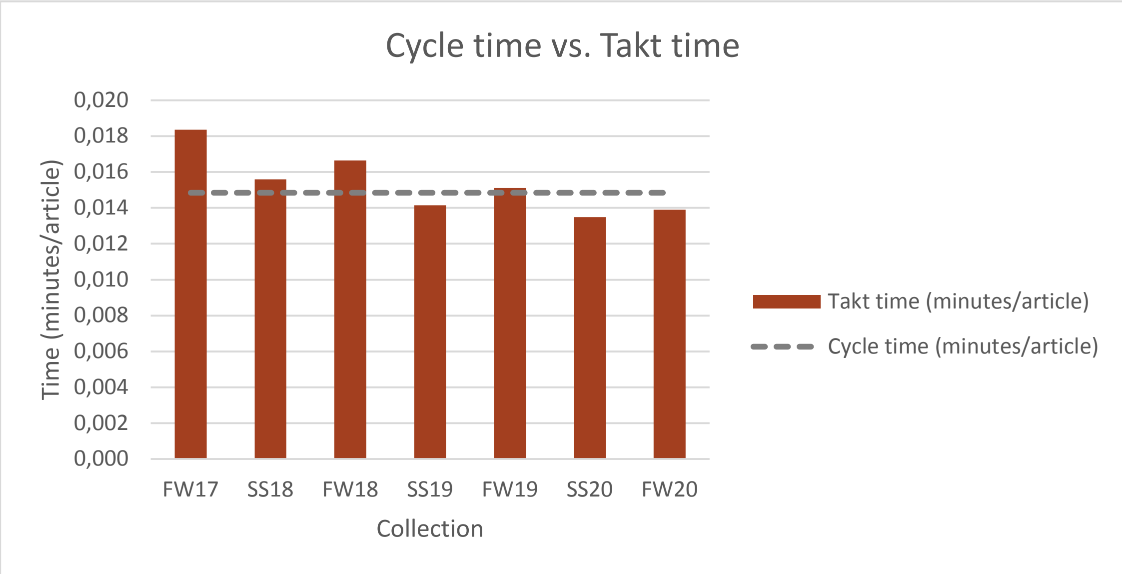

Fig. 3. Comparison of takt time per collection with the cycle time of the current distribution process.

In order to determine the area taken up by the four activities in the current distribution process of the multi-brand channel between the FW17 collection and the FW20 collection, one obtained the predicted number of customers per collection until the year 2020. One then established the ratio between the total occupied area per activity for the SS17 collection and the total number of customers for the SS17 collection. By using the product of the values reached, it was then possible to predict the area which would be taken up between the FW17 and FW20 collections. These results are presented in table 2.

Table 2. Prediction of the area occupied (m^2) between the FW17 and FW20 collections.

Activities	Area (m^2)							
	SS17	FW17	SS18	FW18	SS19	FW19	SS20	FW20
Multi-brand Pick by line	1125	1185	1305	1400	1495	1589	1684	1779
Storage of finished product	750	790	870	934	997	1060	1123	1186
Raw material warehouse	422	445	490	526	561	596	632	667
Product expedition	200	211	232	249	266	283	300	317
Total	2497	2631	2897	3109	3319	3528	3739	3949

The analysis undertaken of the distribution process points to the following problems:

- Electronic mail is used to send orders of the work to be executed by the multi-brand pick by line activity;

- Display and manual printing of the BI (Business Intelligence) report to provide information of the customer's order status;
- Identification of boxes sent to customers is manually filled in;
- Transporter labels and their respective invoices are manually printed.

4.3. Mapping of the proposed distribution process

The performance assessment of the current distribution process pointed to a proposal of reversing the rack order for the multi-brand pick by line activity, which would also be divided into three zones: customers requiring the greatest number of completed boxes will be placed in proximity of the box closure zone and, consequently, near the storage area for finished products (see fig. 4). In the same manner, three supply zones were created at the beginning of the corridors for each type of customer. One also devised transport carts which were more ergonomic and adapted to corridor width. With regard to picking, the creation of a transport kanban significantly increased efficiency in the task of removing boxes, which impacts positively on article picking. An analysis of the product family allowed for the design of an organization model to be used in the storage of raw material. Consequently, the product types requiring more pallet movement were placed closer to the supply zone. The calculation of the distance covered validated an alteration to the layout of the storage area for finished products. Here, one reversed the order of arrangement of the pallets used for the storage of the finished product and moved this to a section which adjoins the pick by line activity. One additionally introduced two gravity carriers, which connect the box closure zone with the finished product storage area. It was thus possible to eliminate the task of transporting the boxes which had to be put away.

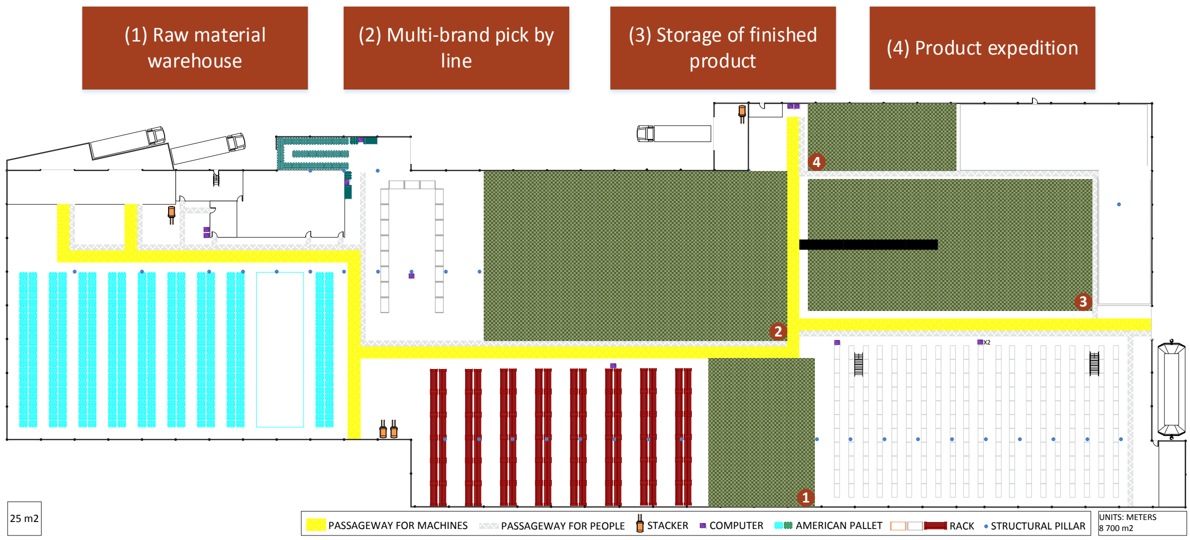

Fig. 4. Layout of the logistics warehouse at the fashion retail company (proposed distribution process).

In addition to the activities aimed at optimizing the layout and supply flow, the following improvements were also implemented:

- The development of an application for product expedition, which will print invoices and transporter labels automatically;
- The development of an application which will enable work orders to be sent automatically to the brand-line pick by line activities, as well as to the raw material storage section. Thus, it will no longer be necessary to send work orders by electronic mail;
- The change in the packing list layout allows the operator to visually decipher all the information which is relevant for the tasks involved in the final distribution process;
- The development of an application for the weighing of boxes.

5. Results achieved

The results one achieved can be seen in Table 3. By resorting to the proposed distribution process, one can increase the quantity separated by each distributor during an 8-hour shift by 294 articles. Furthermore, the minimum cycle time of 0,015 minutes/article can be reduced to 0,013 minutes/article, which will enable separating articles in the time available for the next seven collections. With occupied space now reduced on average by 47 m^2 per collection, the average distance covered has decreased by 1 498 468 meters per collection. In addition, one was able to reduce the number of workers required for each collection by 5 on average. One also saw an increase of 535 boxes in the storage capacity of the finished product.

Table 3– Results achieved in each distribution process.

Metrics	Current distribution process	Proposed distribution process	Difference
Space occupied (m^2)*	3 310	3 264	1,39%
Capacity of the PBL MM (customers)*	2 198	2 220	0,99%
Capacity of the finished product warehouse (boxes)*	4 200	4 735	11,30%
Capacity of the raw material warehouse (pallets)*	378	324	14,29%
Productivity (articles/worker/8-hr shift)*	2 325	2 619	11,23%
Cycle time (minutes/article)*	0,015	0,013	13,33%
Distance covered (m)*	6 421 284	4 922 816	23,34%
Human resources (workers)*	39	34	12,82%
Investment (€)**	-	23 754,42	-

* Average values for the period between the fall/winter 2017 and fall/winter 2020 collections.
** Total investment value for the period between the fall/winter 2017 and fall/winter 2020 collections.

Through the implementation of the improvements presented, which imply an initial investment of 21 010,54 €, and an average investment of 391,98 € for each collection (FW17 a FW20), one expects a total profit of 84 504,23 € by the end of the FW20 collection (see Figure 5).

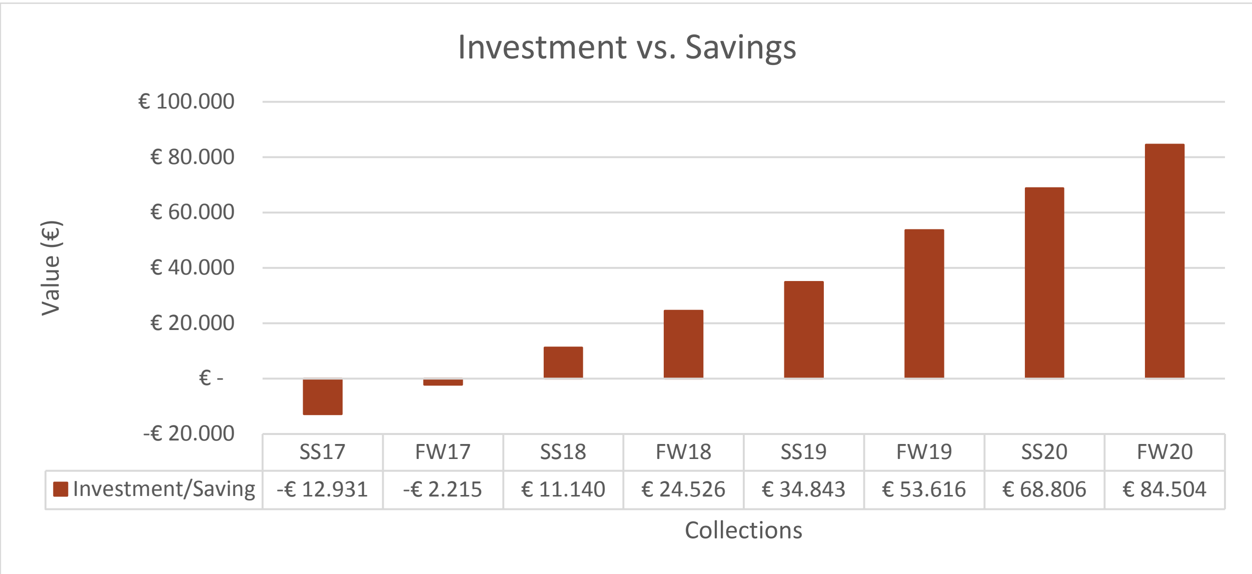

Fig. 5. Relation between investment and savings per collection.

6. Conclusions

The pick by line activity of the multi-brand channel is known to determine the rate at which customers' requests are met. By considering this fact and comparing takt time between the fall/winter 2017 and fall/winter 2020 collections, with a cycle time of 0,015 minutes/article, one was able to reach an important conclusion. Namely, if work was to proceed under the current conditions, it will be impossible to fill the customers' orders within the time requested for the spring/summer 2019, spring/summer 2020 and fall/winter 2020 collections. By implementing the proposals described in this paper, one was able to increase the quantity separated by each distributor during an 8-hour shift by 294 articles. The minimum cycle time of 0,015 minutes/article was also decreased to 0,013 minutes/article, which will make it possible to separate articles in time for the next seven collections. The following changes were also undertaken: an average reduction of 47 m^2 in the space taken up for each collection, a decrease of 1 498 468 meters in the average distance covered for each collection, an average reduction of 5 workers per collection, as well as an increase of 535 boxes in the storage capacity of the finished product. In addition, and when compared to the current distribution process, there will be a greater capacity to ensure the distribution of the seven forthcoming collections to over 22 customers. The proposal presents an initial investment of 21 010,54 € for the spring/summer17 collection, and an average investment per collection of 391,98 € for the period between the fall/winter 2017 and fall/winter 2020 collections. This will result in a sum total of 23 754,42 €, which the company will be able to pay off in only six months, with a total accumulated profit of 84 504,23 € by the end of the fall/winter 2020 collection. Due to the work undertaken for this study, overall performance of the distribution process for the multi-brand channel was clearly enhanced. This points to the importance of optimizing warehouse operations at a fashion retail company and how this can positively impact on the improvement of the services rendered to the customer. This ultimate result is achieved through the minimization of costs, as well as by the reduction of delivery dates, and better quality in the service provided to the end customer.

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