PROCESS OF CONSIGNMENT STOCK IMPLEMENTATION

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Abstract: *Consignment stock concept is very important in case of short-term assets management in terms of completely innovative approach helping to manage inventories in which the supplier supplies his inventory and maintains a stock of material at the buyer´s stock. This article deals mainly with the process of Consignment stock implementation itself and considers the approach of Battini, Grassi, Persona, Sgarbossa (2010) by filling new phases and particularizes each separate phase and step. This paper focuses mainly on an analysis finding out possible obstacles while the Consignment stock implementation. Main goal of this paper is to propose a new methodology for the process of the Consignment stock concept implementation. The analysis is based on both quantitative and qualitative surveys held in the Czech Republic.*

Keywords**:** *Consignment Stock Concept, Implementation, Just-in-time, Supply Chain, Inventory Policy, Vendor Managed Inventory.*

JEL Classification: *E21, E23, R41.*

Introduction

CS is a logistic technique in which the vendor, instead of the buyer, is in charge of managing the buyer's inventory and triggering replenishment orders [5]. The consignment stock is an innovative approach to manage inventories in which the vendor removes his inventory and maintains a stock of material at the buyer´s plant [2].

CS is one type of coordination mechanism that is being practiced in industry. It is an innovative approach to manage inventories in which the vendor removes its inventory and maintains a stock of materials at the buyer's plant [20]. In a traditional supply chain where products are sold under wholesale, an upstream entity (supplier) sells a product to a downstream party (retailer) who in turn serves market demand. The retailer owns and controls the inventory and thus incurs the cost of stocking excess inventory to meet demand that exceeds expected demand and/or incurs stock-out costs when demand exceeds supply. Alternatively, under a consignment contract, the supplier maintains ownership and control of inventory, determining the stocking level and product pricing. The retailer is paid a fee marketing the product and handling sales transactions. Thus purely from the standpoint of inventory risk, the supplier will generally prefer a wholesale contract while the retailer will prefer consignment [9].Consignment stock is one of the types of stocks that can be used in logistics. Storage is one of the most important parts of the logistics system. Storage is the connecting link between manufacturers and customers. It ensures, for example, storage of products in its origin, between the point of origin and the point of consumption and also provides the management with the necessary information about the conditions, status and deployment of inventory. The main objective of warehouses but bridge the space and time [14].

1 Statement of problem

1.1 Principle

The consignment stock is an innovative approach to manage inventories in which the vendor removes his inventory and maintains a stock of material at the buyer´s plant [3]. Consignment stock system is an innovative approach to inventory management based on the already mentioned strong cooperation between the two sides. The aim of the partners is a win-win situation. Both of the co-operation will benefit [20]. The Consignment Stock (CS) inventory policy is becoming an important strategy that companies adopt to face new manufacturing and supply chain management challenges. A CS policy implies great collaboration between the buyer and supplier, pushing them towards a complete exchange of information and a consistent sharing of management risks [8].

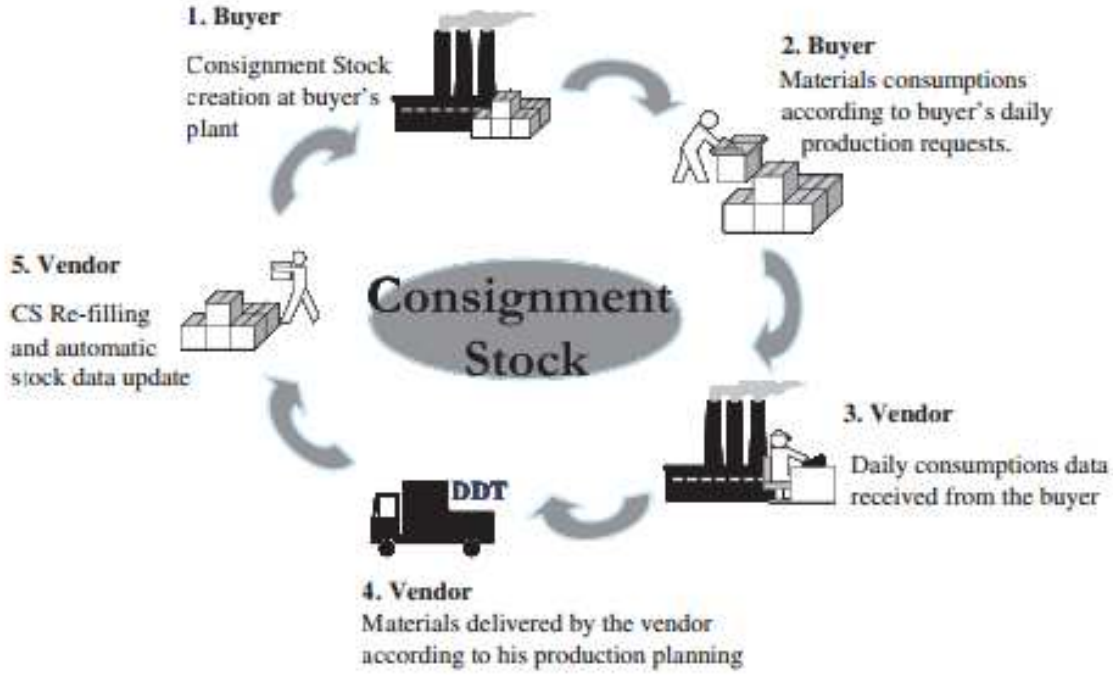
This makes possible a partial suppression of the vendor's warehouse, which can be replaced by that of the buyer. Consequently it is possible to minimize both the ordering and the stock holding costs of the buyer, because materials formally owned by the vendor can be collected (that is, purchased) by the buyer only upon demand. On the other hand, the vendor gets visibility regarding the customer's demand and can use this precious information to schedule production and replenishment orders in an optimal way. As a counterpart, in doing so he is responsible for keeping the buyer's inventory between a maximum (S) and a minimum level (s) and he also supports any additional cost due to stock-outs if his stock management strategy is not suitable to assure the required service level [6].This is a special kind of Vendor management inventory known by the acronym VMI.

The CS policy is already widespread in a number of industrial realities and it is obtaining raised consensus in both small and large contexts, since it offers a partial solution to the 'cycle time reduction' problem and avoids any shortage of materials through enhanced communication between suppliers and buyers. The technique in fact allows partners, the vendor and the buyer, to reduce management costs and increase their flexibility. In particular, the buyer virtually removes the procurement lead time, since the responsibility of the replenishment lies completely with the vendor, who keeps a stock of its property at the buyer's plant: the buyer uses the stock of materials according to his daily production requirements. Outsourcing of materials can easily incorporate the CS policy to enhance supply chain operations [1].

This kind of stock establishes the customer with the supplier. Goods stored at the expense and risk of the supplier and the customer has the right to remove goods as needed within a certain timeframe pay for the goods. Alternatively, it may notify the supplier of the need to supplement the warehouse. This system is enjoying a consignment store usually in the supply of spare parts. In the Czech Republic have used it as manufacturers of computing and manufacturers should also foreign brands of automobiles [18].

Consignment Inventory is inventory that is in the possession of the customer, but is still owned by the supplier. In other words, the supplier places some of his inventory in his customer's possession (in their store or warehouse) and allows them to sell or consume directly from his stock. The customer purchases the inventory only after he has resold or consumed it.

Fig. 1: Consignment stock policy: A conceptual model.



Source: [1]

Consignment stock implementation could be implemented due to the particular reasons. One of the most important is supplier chain finance and logistic costs. In a supply chain, the total costs associated with the inventory [4] consist of following:

- Opportunity costs consisting of warehousing, capital and storage,
- costs associated with inventory as incoming stock level, work in progress,
- service costs, consisting of costs associated with stock management and insurance,
- cost held up as finished goods in transit,
- risk costs, consisting of costs associated with pilferage, deterioration, damage,
- cost associated with scrap and rework,
- cost associated with shortage of inventory accounting for lost sales/lost production.

The key benefit to the customer should be obvious; he does not have to tie up his capital in inventory. This does not mean that there are no inventory carrying costs for the customer; he does still incur costs related to storing and managing the inventory. So what's in it for the supplier? This is where the benefits may not be so obvious—or may not even exist [13]. The supplier has the product or group of products for which believe they will sell and fall into the hands of end users mainly. The trick is that before we get products for end consumers, we need to get to the stock to the retailer. Traders are hesitant whether or not to store products because they do not have complete confidence in the suppliers do not want to invest money and risk to keep them in stock remained something that is not for sale [13].

Increasingly, competition has forced companies to seek stronger cooperation and strengthen the relations with its suppliers. One example of such a cooperation is cooperation between two partners which will help to minimize costs and maximize profits of the entire system. Many researches showed that joint decisions business partners lead to the effective functioning before deciding if every man for himself within the same organization.

Basic elements of consignment stock. Production and delivery of a schedule determined so as to minimize the total annual cost of the entire supply chain. Whenever something is produced, it is sent to the seller, who then sells the products in individual doses. Implementation of the consignment warehouse in cooperation seller and the buyer must be a fixed order. In order to avoid the production of the additional costs, should each machine to produce the maximum capacity [5]. The best way to reduce the investments in inventory is to eliminate the investments altogether. Reducing inventory in this way can be achieved without risk and with full access to the inventory by having someone else hold and / or pay for the inventory. This approach, sometimes known as consignment stocking, transfers both the ownership and the management of replenishment of the inventory to the vendors. Your company only pays for what it uses, when it uses it [15].

Benefits of Consignment Stock. First, the primary benefit that can be derived from a consignment agreement is that it allows the consignee to save money on inventory costs. As the consignee, you do not need to put money on the goods that you sell. You pay the consignor only after you have sold the merchandise. This could mean improved cash flow on the part of the consignee. Next, consignment can actually save you time because you do not have to wait for new inventory every time you run out of stock. Typically, the person or company that consigned the goods will automatically replenish your inventory right after you sell some or all of the consigned goods. It is in the best interest of the consignor to keep the agent well-supplied. Third, a consignment agreement is more convenient compared to a drop shipping arrangement where the retailer only takes orders and does not hold any inventory from the supplier. The consignee will have the merchandise on hand, easily accessible and ready for sale. Moreover, the consignee does not have to worry about goods running out of stock indefinitely, as resupplying the inventory happens regularly under a consignment setup [10].

Risks Associated with Consignment. The party supplying the stock faces the biggest risks under a consignment agreement. For one, the consignor will not receive any money until part or all of the consigned stock has been sold. In effect, the consignor's cash flow may suffer as more money is spent on manufacturing the goods, while cash coming in may be too slow to cover subsequent production runs. Next, the consignor may be exposed to higher product returns if the agents or consignees simply allow the goods to rot or become damaged in warehouses. After all, the consignee does not have any money invested in the consigned merchandise. Without a good profit sharing agreement, the consignee may not be too keen on pushing the consignor's products in the market. In addition, since resupplying or restocking the consignment inventory is done regularly, there is a risk of overstocking or duplicate inventories. This could be detrimental for both the consignor, who would have more goods sitting idly in the agent's warehouse, and for the consignee, who may spend more on inventory storage costs. Lastly, the record keeping systems of the party consigning the goods and the retailer or agent are not always the same. So, a consignment stock may become disadvantageous if it brings about discrepancies in the records of both consignor and consignee. For the consignee, any misplaced item could mean paying for something that has not generated a profit. Meanwhile, inconsistencies on the consignor's side could lead to lost merchandise [10].

2 Methods, methodological approaches

This part presents a methodological framework able to address all the problems emerging when a project for the implementation of CS policy is going to be addressed

in actual industrial situations. Logistics and manufacturing constraints typical of actual industrial systems constitute the base for the model, followed by the ten phases as Battini (2010) describes in more detail below the following concept. During the implementation of the project, it is necessary to accomplish each task independently from the partners' constraints, which should be individually addressed by both partners. Effective communication from the beginning of the partnership is of the utmost importance to reduce start-up times and inception delays. A CS implementation project should be based on a concurrent engineering paradigm, to ensure that the different activities, developed during the execution of the project, will be carried out by a cross-functional buyer-vendor group, with a continuous reciprocal agreement to prevent any delay in implementation time. Only with an integrated approach will the partners realize annual savings and effective implementation of this policy, without incurring high start-up cost [2].

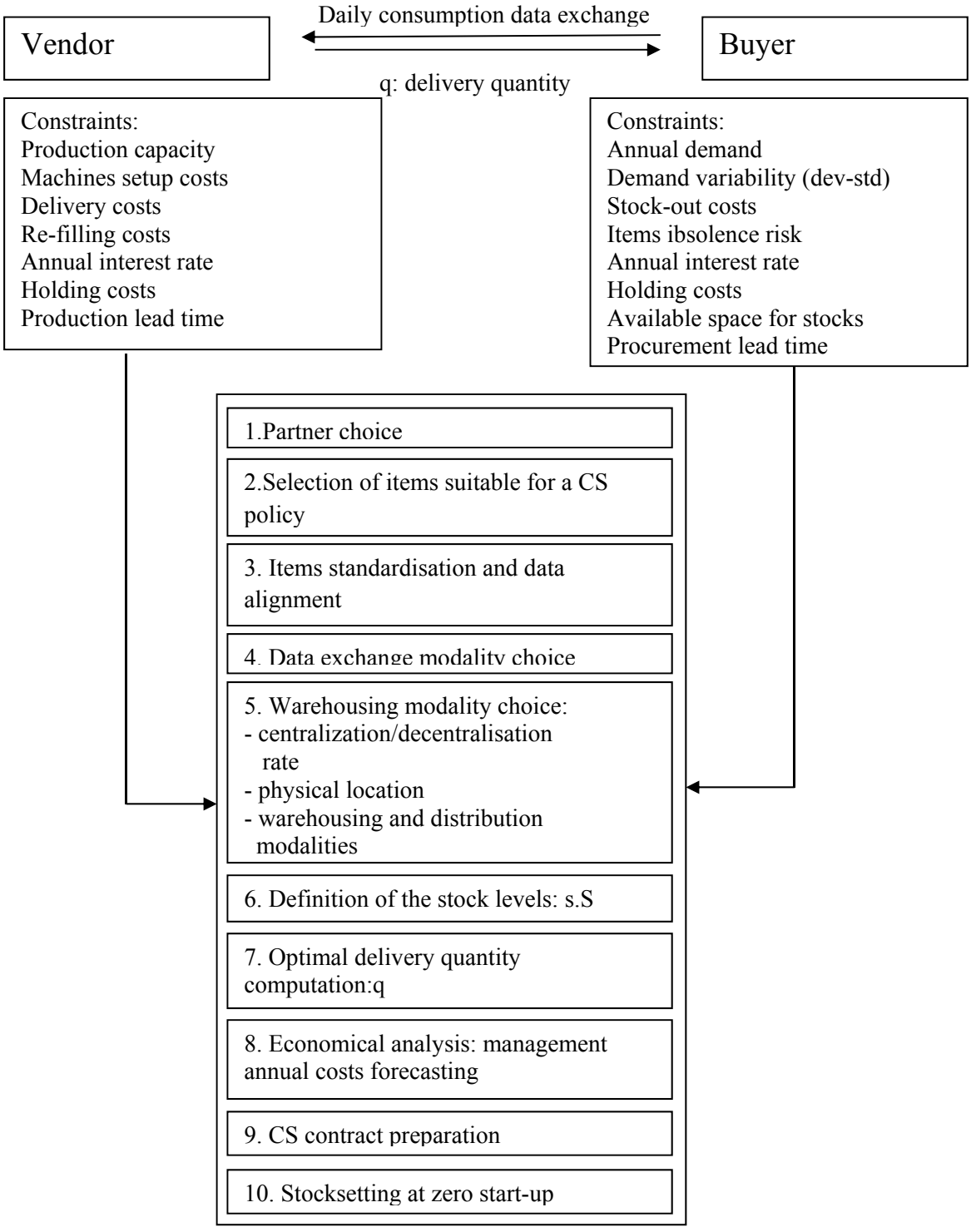
Battini [2] particularizes step two – Selection of items suitable for a CS policy as following:

Tab. 1: Critical factors analysed in step 2 of the framework.

Critical factors
(1) Item annual consumption rate (in pieces and monetary value) (2) Item consumption variability during the year (market demand variability) (3) Item Life cycle (obsolescence risk) (4) Item standardization level (5) Supply criticalities: (variable lead times, high geographic distance vendor-buyer, etc.) (6) Item dimension and physical characteristics (7) Item stock-out costs

Source: [2]

Fig. 2: Methodological framework for CS policy implementation



Source: [2]

For the purpose of this paper, we used both quantitative and qualitative surveys obtained in the Czech Republic held between October 2015 and January 2016. Respondent/organizations were sampled from various industries, company sizes and annual sales. A field of survey used to investigate the research questions therefore a structured questionnaire was utilized as the main data collection as the first step of our research. There were in total 231 companies contacted in different industries and locations of the Czech Republic. 54 companies did not reply with any feedback or refused to participate, thereby we were able compile 177 feedbacks. The response rate was therefore 77%. In additional,

68 participants were small size, 51 medium size and 58 large size companies. The industry distribution of the sample is shown in Table 2.

Tab. 2: Industry distribution

Name of Industry	Number of firms	Percentage
Steal/metal manufacturing	33	19%
Food manufacturing	17	10%
Retail industry	17	10%
Chemical product and Drug manufacturing	16	9%
Paper industry	16	9%
Plastics industry	15	8%
Service industry	14	8%
Building industry	12	7%
Auto/ Auto parts industry	10	6%
Electronics industry	11	6%
Textile manufacturing	9	5%
Wood industry	7	4%
Total	**177**	**100%**

Source: authors

3 Key results

Out of this sample, on one hand we found out that 22% do not use any logistic model due to the fact, that they are either not interested or don't have any need of the adoption based on a kind of industry, type of the material, not such sufficient amount of orders etc. On the other hand, 78% of respondents adopted some of particular logistic models. The distribution of those logistic models share in the Czech Republic shows Table 3.

Out of the 78% respondents using any log.model, the most adopted concept is the Consignment stock (42%), then the Safety stock (36%) followed by the Buffer stock concept (17%). The last option – Others - there is meant be included other concepts such as the Smart bin concept, Kanban or a different agreement on safety stock, delivery conditions, stock optimization bases and different types of partnership based on inventory optimization.

Tab. 3: Share of selected logistic models usage

Type of selected logistic model	No. of answers	% of answers
Consignment stock*	58	42%
Buffer stock*	23	17%
Safety stock	49	36%
Other	8	6%
Total	**138**	**100%**

**MIN and MAX concept*

Source: authors

According to the results of our research, in the second part/step of our research, we contacted some of respondents again in order to discuss the complexity of Battini´s concept [2] with them. Therefore, there was the research investigated with just those respondents using the Consignment stock MIN and MAX concept. For the purpose of our survey, we contacted those 58 respondents that use the Consignment stock MIN MAX concept as found out from the previous research as shows the Table 3. We were able to conduct an interview with 34 companies/respondents, 24 respondents refused to keep on participating. Structured

phone interviews were utilized as the main collection method. Phone interviews conducted with the persons in charge of the responsibility about the Consignment stock concept adoption. During our phone interviews, we paid attention to the comments, arguments and other hints respondents gave to the presented Battini´s [2] process of the CS stock concept implementation.

Tab. 4: Specification of missing steps of the Consignment stock concept

	Missing steps	**Explanation**
1.	Agreement with contractor	Agreement with the full concept of the Consignment stock with contract needed in the very first steps of the process in order to continue in the whole process of implementation
2.	Agreement with internal specialists/departments	Approval from internal specialist necessary in order to continue in the whole process of implementation
3.	Trial version	There might appear particular inconveniences while getting started working with the e-platform for data exchange
4.	Feedback requirement	Crucial part of major projects in general
5.	Suggestions for treatment and process improvement	In case of inconvenience, requirement to find out way in order to improve the process
6.	Implementation of proposed and agreed amendments	After implementation of proposed amendments another feedback/ improvement needed if necessary

Source: Authors

In accordance to the interviews with our respondents that adopted the Consignment stock concept, while there are defined/proposed steps of the Consignment stock implementation process. Table 4 demonstrates the result of identified crucial missing steps of the implementation process presented by Battini [2].

Ad) Agreement with contractor and internal specialists

These steps of the process might stop the whole project in the very beginning. There are some cases when partners just do not agree on those conditions proposed in the contract or that R&D specialists do not find the implementation as secure and do not prove this kind of cooperation with the supplier. It is necessary to have the contract signed Table 5 shows results dealing with the consideration of agreement with a contractor – contract agreement-wise.

Tab. 5: Consideration of agreement with contractor

	No. of answers	**% of answers**
Not at all	9	26%
Before the process of implementation	7	21%
During implementation	15	44%
After implementation	3	9%
Total	**34**	**100%**

Source: Authors

Table 6 demonstrates respondents' opinion on the timing of agreement with internal specialists in the process of the Consignment stock implementation itself. As it is crucial

to ensure safe implementation, approval of internal specialists as it has to be one of the very first factors needed to consider. On one hand, just 15% respondents receive a successful approval and on the other hand, 52% respondents either do not approve or don't receive an approval at all.

Tab. 6: Consideration of agreement with internal specialists

	No. of answers	**% of answers**
Not at all	18	52%
Before the process of implementation	5	15%
During implementation	7	21%
After implementation	4	12%
Total	**34**	**100%**

Source: Authors

Ad) Trial version

Due to the fact, that consignment stock implementation could cause very considerable problems, additional costs, stop of a production of a customer and other unexpected problems; recommendation to start a kind of *trial version*. The supplierwould get an access to the application or the tool used for consignment stock check of information and start delivering according to these pieces of information but still maintaining a strong cooperation with the customer support. There is still a way to avoid probable problems and solve them in advance. According to a research based on seventy contacted companies, which forty-three returned answering the question of whether companies pay an attention to a trial version of the exchange-data-tool usage, see chart below. Thirty-three percent of respondents agreed with at least kind of helping suppliers with the software usage. Thirty-four percent of respondents do not pay any attention to suppliers getting learn how to supply in the new agreed way of CS concept.

Tab. 7: CS concept implementation – trial version usage

	No. of answers	**% of answers**
Yes	4	12%
Rather yes	11	33%
Rather no	7	21%
Not at all	12	34%
Total	**34**	**100%**

Source: Authors

Ad) Feedback, suggestions for treatment and process improvement

Another step includes analysis, definition of stock level as Battini [2] explains, followed by full implementation. The very important step is missing in his concept though. In fact, *feedback, suggestions for treatment* and *process improvement* must not be forgotten in the whole process. Just the implementation itself is not enough to ensure reversible partnership. The supplier should always have the space for discussion and amendment of the settings. Feedback is a huge part of the majority of processes in general followed by improvement phase. According to the above-mentioned research, there is a result – whether companies require and pay attention to feedback from suppliers after the Consignment stock implementation process. Table 8 below demonstrates that 47% of respondents do not pay any attention to any feedback from suppliers and do not play any role in any treatment and process improvement. 26% of respondents ask for at least any feedback.

Tab. 8: CS concept implementation – feedback request

	No. of answers	**% of answers**
Yes	5	15%
Rather yes	9	26%
Rather no	4	12%
Not at all	16	47%
Total	**34**	**100%**

Source: Authors

Moreover, we divided the original concept into 5 basic phases such as a preparatory and analytical phase, trial version, implementation and a final phase. In accordance to the interviews, there were added following steps into the framework considered as crucial from our respondents` point of view as pointed out in the Table 4.

Tab. 9: Process of the Consignment stock concept implementation

A. Preparatory phase

- Partner choice
- Agreement with contractor
- Selection of items suitable for a CS policy
- Agreement with internal specialists/departments

B. Analytical phase, preparation of settings

- Consignment stock contract preparation, start of negotiation process
- Items standardization and data alignment
- Data exchange modality choice
- Warehousing modality choice:
    a) Centralization/decentralization rate
    b) Physical location
    c) Warehousing and distribution modalities
- Definition of the stock levels: *s, S*
- Optimal delivery quantity computation: *q*
- Economical analysis: management annual costs forecasting
- Conclusion of contract
- Sum all the analyzed and agreed settings up

C. Trial version

- Trial system of orders and deliveries according to the e-platform for data exchange including full customer´s assistance

D. Implementation

- Stocks setting at zero and start-up
- Full supplier´s responsibility for orders and delveries

E. Final/post implementation

- Feedback
- Discussion in regards the process running
- Suggestions for treatment and process improvement
- Implementation of proposed and agreed amendments

Source: Authors

Conclusion

Due to the fact how challenging Inventory management is in an extremely competitive environment, we focused on one of the innovative methods of costs and inventory reduction and inventory optimization – Consignment stock concept. In this paper, there was a discussion about particular steps of Consignment stock implementation process presented by Battinni [2]. For this reason, we focused on the proper realistic information, how are some particular logistic models spread in the Czech Republic. Moreover, as we used both qualitative and quantitative research, we were able to amend Battini`s [2] concept.

Firstly, the presented research results showed that 78% of respondents adopted any of presented logistic models and 22% are not interested or don't have any need of the adoption based on a kind of industry, type of the material, not such sufficient amount of orders etc. Both Consignment stock MIN MAX concept and the Safety stock are the most spread logistic models in the Czech Republic as found out from the quantitative survey. Moreover, based on our interviews, deeper look into the respondent´s opinion who adopted just the Consignment stock concept – discussing about the Battini`s [2] concept, we were able to define a few crucial missing steps of the implementation process itself such as: agreement with a contractor and internal specialists in the very beginning of the whole process itself, trial version for suppliers, feedback, suggestions and treatment for the process improvement, implementation of proposed and agreed amendments. After clarifications these missing parts, we were still in touch with respondents in order to find out, whether those specified steps are missing in their implementation process as well.

In conclusion, therefore, there is a greater focus on the complex concept, with specification of those additional particular missing steps we were able to amend the Battini`s [2] concept including the new steps. Future work might focus on analytical and numerical model comparing vendors´ costs (set-up costs, holding costs, obsolesce costs and stock-out costs) with real return on sales.

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Received: 30. 12. 2015
Reviewed: 15. 02. 2016, 04. 04. 2016
Approved for publication: 08. 09. 2016