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Different Types of Inventory Control in Brazilian Companies

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Abstract

Effective inventory control is a requirement for operational processes to run smoothly and requires in turn that inventory data be reliable. Undesirable effects may otherwise be produced in different areas of the organization such as a reduction in service level or a drop in operational efficiency because of unforeseen stoppages or rescheduling of production caused by inventory inaccuracy. This study seeks to identify how different types of inventory control affect inventory accuracy. This is a descriptive research and the approach adopted was the use of multiple cases - seven case studies in Brazilian companies. The main results include a classification of inventory control operations so that the companies could be classified as: high, medium and low inventory accuracy practices. In addition, the study correlates different types of inventory control with the inventory accuracy index for each of the seven companies and shows the relationship between the types of control, the importance attached to inventory control by the organization, the number of inventory items and the accuracy index.

Key words: *Inventory control; inventory accuracy; process; cycle counting; bar code*

1. INTRODUCTION

The control of inventory accuracy has been the subject of increasing attention in recent years as companies increasingly seek to reduce logistics costs and reduce inventory levels. Inventory accuracy has thus become an essential requirement for logistics decision making.

The term inventory accuracy is used to refer to the relationship between the quantity of material actually found and the quantity recorded in the information system [1] and is currently the subject of many studies. DeHoratius and Raman [2] examined approximately 370,000 stock inventory records in 37 stores and 2 distribution centers and found an inaccuracy level of 65%.

In a benchmarking study into good inventory control practices at 16 US logistics operators (LOs), Collins et al. [3] propose that LOs with an accuracy index of more than 99.9% be considered as having world-class performance. These companies use cycle counting (CC) and Radio Frequency Identification (RFIDs) as a form of inventory control and devote around 3,600 man-hours per year and approximately 5% of the annual budget to the inventory control process. In Brazil, a study carried out by IMAM (Instituto de Movimentação e Armazenagem de Materiais) in 2003 with 162 Brazilian companies in various sectors found that average inventory accuracy level was 92.75% [4], highlighting an

opportunity to identify ways of improving inventory accuracy indexes.

There are many causes and effects of inventory inaccuracy in organizations and in the supply chain. One important effect of inventory inaccuracy is difficulties with inventory replenishment [5]. Other effects include larger purchasing and production batches and uncertainty as to whether demand will be met [6].

Some forms of inventory control are known to have an impact on inventory accuracy, as reported by authors such as Wilson [7], Brown et al. [8], Piasecki [9], Waller et al. [5], Rossetti et al. [10] and Huschka [11]. These studies sought primarily to identify the impacts but did not describe in detail how different types of inventory control affect inventory accuracy.

The main aim of the present study was therefore to identify how different types of inventory control can affect inventory accuracy. The article has six sections including this introduction. The second section gives details of the applied research method. The third section consists of a literature review on: inventory control, inventory accuracy, inventory control processes and CC. The fourth section provides descriptions and the analysis of the cases, the fifth section presents the results, and the conclusions are put forward in the sixth section.

2. RESEARCH METHOD

Seven cases were used in this research and the findings were then compared with those reported in the literature. Studied companies are from different sectors of the economy and they had used different control practices and inventory levels of deployment. The selection criterion is based on Patton [12].

The used ways to collect data consisted of documentation analysis, accuracy indicators and inventory reports, interviews and direct observation. The interview questions were structured and prepared based on a research protocol for the case studies. The script for the interviews was based on the findings of the literature review and validated in the first case study. Two managers were interviewed for each company.

It was decided to analyze the data by relating it to the findings of the literature review and the conclusions of similar inventory control studies. When used in conjunction with the findings of the literature review, the material collected from interviews, documents and direct observation allowed a systematic approach to the interpretation of the areas being investigated. This approach consisted of five steps, which are shown in Table 1.

Table 1. Research approach

Stages in the Analysis		Details of the Analysis
1	Analysis of the causes and effects of inaccuracy	The data collected in the interviews is compiled according to the causes and effects of inaccuracy so that the average impact of each cause or effect can be determined. Based on the average impact, a list of the main causes and effects and the findings of the literature review is then drawn up.
2	Analysis of the inventory control processes	The material receiving, production data capture and shipping processes are analyzed to determine the level of control in each company. Later, a more detailed analysis of each process is carried out.
3	Analysis of the use of CC	It is established whether the company uses CC, what inventory control methodology is used and if there is an action plan to correct discrepancies. This data is correlated with the inventory accuracy index.
4	Analysis of the use of bar coding (BC)	It is established whether the company uses BC and what improvement is associated with this.
5	Relationship between the different types of inventory control and the inventory accuracy index	The impacts of the different types of inventory control on the inventory accuracy index are analyzed and correlated with the number of direct items controlled by the companies.

A content analysis was carried out for the data analysis, performing then the triangulation between respondents and collected documents. The use of multiple sources of data collection aimed to increase the validity (construct, internal and external) and reliability of the survey [13].

3. LITERATURE REVIEW

This section discusses the concept, causes and effects of poor inventory accuracy as reported in the literature. Different types of inventory control are reviewed.

3.1 Inventory accuracy

Accuracy conveys the idea of precision. Inventory accuracy level can be defined as the quantity of physical material divided by the quantity of material recorded in the information system [1] expressed in percentage.

Table 2. Summary of the causes of inventory inaccuracy

Causes	Authors
Incorrect inventory records update	[7], [2], [5]
Small salaries	[8]
Damaged material	[16]
Errors in inventory records	[19], [20], [2], [16], [5]
Bar Code not used	[8]
Cycle counting not properly implemented	[19], [8]
Clear procedures not defined	[16]
Insufficient training	[8]
Supply	[20]
Materials transport frequency	[2], [5]
Incorrect identification	[7]
Inventory counting interval	[20]
Incorrect material location	[7], [20], [16]
Number of stored items	[14]
Obsolescence	[16]
Theft	[2], [16], [5]
Inconsistent material movement records	[19]
Product value	[20]
Product variety	[20]

The study by Rinehart [14] can be considered the first paper on inventory inaccuracy. It analyzes the causes and effects of inventory discrepancies in a US Federal Government Agency. Other pioneering authors who contributed to the study of accuracy were Iglehart and Morey [15], who analyzed the impact of inaccuracy due to information uncertainty on inventory levels in a US Naval Department.

Inventory inaccuracies usually hide high costs resulting from operational mistakes and even theft. These costs can reach millions of dollars depending on the size of the company and the sector in which it operates. A survey carried out by the US National Supermarket Research Group reported that supermarkets in the US lost approximately 2.30% of total sales in 2001 as a result of: internal and external theft, incorrect receiving of goods, damaged products and pricing errors [16].

A study on the use of inventory management techniques in 96 medium-sized Brazilian companies found that 31% of them had reasonably reliable accuracy data; only 24% reported that stock accuracy was within the planned range [4].

Inventory inaccuracy can be caused by a variety of factors, ranging from issues related to processes and labor to insufficient investment in technology. Table 2 summarizes the main causes of inventory inaccuracy found in the literature.

It can be seen that among the main causes of inventory discrepancies, the most frequently mentioned by the authors in the literature review are errors in records (involving basically receiving, production data capture, moving, shipping and returns). Two other errors frequently observed are those caused by incorrect location and theft.

Inventory inaccuracy has a series of effects on company performance. The main ones are shown in (Table 3), where the literature reviewed is classified according to the effects the authors observed. Of the main effects shown in Table 3, those most frequently mentioned in the literature are an increase in costs, an impact on service level and a loss of operational efficiency.

Table 3. Summary of the effects of inventory inaccuracy

Effects	Authors
Internal logistics costs increase	[15], [19], [8], [16]
External logistics costs increase	[5], [16], [10]
Urgent deliveries	[19]
Production planning difficulties	[19], [8], [6]
Corporative image damage	[16]
Service level decrease	[19], [8], [16], [5], [10], [16]
Loss of operational efficiency	[19], [16], [6]
Demand management difficulties	[16]
Retail decrease	[19], [20]

3.2 Inventory control processes

Many of the errors associated with inventories can be solved without the need for major investments. Training employees and increasing employee awareness can help improve inventory accuracy [8, 5].

For Rinehart [14] the most notable way for reducing inventory inaccuracy is the setting up of an inventory control procedure, constant adjustment of this procedure and systematization of the document exchange process. Rinehart concludes that operations had to be stopped when carrying out an inventory count to avoid making incorrect adjustments because of time constraints and that the discrepancy index was directly related to the number of items stored and the number of times each item was moved. In other words, the greater the number of stock-keeping units (SKUs) stored, the greater the tendency for the accuracy index to be below the expected value.

Some important inventory control processes are: receiving raw material, production data capture and shipping records update. Because of the continuous

reports and direct observation. Table 4 summarizes the main features of each company.

Interviewees were asked about the possible causes of inaccuracies in the company and the impact of each

flow of material and information involved in these processes, they have a direct impact on inventory accuracy. Following are some important comments regarding each of these processes:

1. Receiving: according to Piasecki [9], this is the process of receiving materials, controlling the number of receipts per day, checking the order specifications against the physical material and the invoice, the number of parts per package, identification of the materials, checklists and others;
2. Data capture: for Bauer et al. [18], production data capture can be manual (information is captured by means of specific forms and entered into the system at the end of the shift or after production has finished), based on data collection equipment (production records are maintained with the aid of BC readers) or, lastly, based on an automatic data capture system (production data are transmitted automatically from the machine to the information system). The last approach ensures that inventory information is more reliable and up-to-date so employees have to carry out fewer operations on the data;
3. Shipping: according to Piasecki [9], the shipping process must include checking the packing list, number of parts per package and identification label, as well as checking the invoice against the packing list. Checklists, amongst other things, should be used in the process.

Other approaches are needed to improve inventory accuracy: employee training, higher salaries for those involved with inventory, CC and the introduction of BC [8].

The process of cyclically counting materials can have various names like cycle counting or cyclical inventory. To match the terminology most used in publications, the term cycle counting (CC) is used in this paper. According to Arnold [19], CC is a method that involves counting materials within the current year according to a schedule previously determined by the organization. CC must take into account the financial importance of the materials and the extent to which they are critical to the process; during the course of a year, the more important materials are counted more often, and the less important materials less often.

CC is one of the means used to eliminate sources of error in inventory information and increase the frequency with which inventory audits are carried out. It must therefore be seen as an activity whose purpose is to identify discrepancies and determine their true causes [20, 21, 22, 23, 24, 10].

4. CASE STUDIES

This section describes the case studies of seven Brazilian companies. The case studies were based on interviews, analysis of documents, information systems cause on inventory control processes and company performance.

Table 4. Features of the companies studied

Company	FS1	FS2	FS3	FS4	FS5	FS6	FS7
Industry	Auto	Auto	Auto	Electronic	Auto	Bank furniture	PCB
Product	Driving system	Great variety	Stamping	Wire cables	Car calotte	Bank furniture	Printed circuit board
Number of employees	280	500	400	800	40	100	120
Number of SKUs	2.900	1.700	500	5000	100	3000	500
Monthly production (units)	60.00 un	528.00 un	480.00 un	720.00 un	104.00 un	50 un	2.500 m ²
Inventory accuracy index	99,0%	99,4%	85,0%	70,9%	97,2%	65,0%	99,4%

Legend: Auto – automotive; Electronic - electronic components; PCB - Printed circuit board

If the effect occurred in the company, this was recorded as **Y (Yes)**, together with the impact on the issue referred to, using the weights **none, low, medium, high and very high**. If the effect did not occur in the

Table 5 - Causes of inaccuracy in the companies studied

Causes	FS1		FS2		FS3		FS4		FS5		FS6		FS7	
	Y/N	Degree of Impact	Y/N	Degree of Impact	Y/N	Degree of Impact	Y/N	Degree of Impact	Y/N	Degree of Impact	Y/N	Degree of Impact	Y/N	Degree of Impact
Are inventory records updated after physical counting?	Y	none	Y	low	Y	low	Y	very high	Y	low	Y	low	Y	low
Are there material damage in moving and keeping?	N	none	Y	none	Y	low	Y	low	Y	medium	Y	medium	N	none
Are there errors in material moving records?	Y	low	Y	very high	Y	very high	Y	medium	Y	medium	Y	low	Y	very high
The update is automatic inventory?	Y	none	Y	none	Y	none	Y	none	Y	medium	Y	none	Y	medium
Are there procedures for material handling?	Y	low	Y	high	Y	low	Y	low	Y	low	N	low	Y	low
Do the employees that handle materials have proper training?	Y	none	Y	very high	Y	low	Y	high	Y	none	N	low	Y	low
Do the employees that physical count materials have proper training?	Y	none	Y	low	Y	low	Y	low	Y	low	N	none	Y	medium
Is material checked when receiving from supplier?	Y	medium	Y	very high	Y	high	Y	none	Y	low	Y	low	Y	high
Is material checked when expediting to customers?	Y	none	Y	low	Y	high	Y	high	Y	medium	Y	low	Y	high
Do raw materials have quality inspection?	Y	none	Y	low	Y	medium	Y	none	Y	low	N	none	Y	none
Is there rework during material processing?	Y	low	Y	low	Y	medium	Y	very high	Y	low	Y	medium	Y	none
Does material processing generate scrap?	Y	none	Y	low	Y	low	Y	high	Y	medium	Y	medium	Y	low
Is raw material properly identified?	Y	low	Y	low	Y	low	Y	low	Y	none	Y	none	Y	none
Is raw material packed in standard packages?	Y	none	Y	none	Y	low	N	none	Y	low	N	none	Y	none
Is work in process properly identified?	Y	none	Y	very high	N	low	N	none	Y	low	N	none	N	low
Is work in process packed in standard packages?	Y	none	Y	none	Y	low	N	none	Y	none	N	none	N	low
Is finished product properly identified?	Y	low	Y	low	Y	low	Y	none	Y	low	Y	medium	Y	low
Is finished product packed in standard packages?	Y	none	Y	low	Y	low	Y	none	Y	low	Y	low	Y	low
Do materials have a fixed position in inventory?	Y	none	N	none	N	none	Y	low	Y	none	N	none	N	none
Do materials have a random position in inventory?	Y	low	Y	very high	Y	medium	N	none	N	none	Y	low	N	low

4.1 Analysis of the different types of inventory control

During the course of the interviews and the direct observations, eight processes that have a direct impact on inventory control in each of the companies were investigated:

- Receiving;
- Quality control;
- Storage;

company, an **N (No)** was recorded. The results are shown in (Table 5).

Interviewees were asked if they could identify other causes in addition to those listed in the questionnaire. Most reported that errors in the bill of materials were an important cause of inventory inaccuracy.

They were also asked about the possible effects of inaccuracy in the company. The results are shown in Table 6. The criteria used to identify the effects and their impacts are the same as those used to identify the causes in Table 5.

During the course of the case studies, the importance of using other forms of data collection besides interviews became apparent, as much of the data presented in this section could only be included because it was obtained during direct observation and analysis of the documents and records that had been made available. The data analysis, described in Section 5, attempts to identify any relationships in the data collected using the various instruments.

- Line feeding;
- Data capture;
- Storage of the finished product;
- Shipping;
- Returns.

Of the processes analyzed, the three that generate the greatest inventory discrepancies according to the literature and the interviewees were selected (receiving, data capture and shipping).

Table 6. Effects of the inventory inaccuracy in the company

Effects	FS1		FS2		FS3		FS4		FS5		FS6		FS7	
	Y / N	Degree of Impact	Y / N	Degree of Impact	Y / N	Degree of Impact	Y / N	Degree of Impact	Y / N	Degree of Impact	Y / N	Degree of Impact	Y / N	Degree of Impact
Increase internal logistics costs (opportunity capital, storage, handling, insurance, etc.)?	Y	low	Y	low	N	none	Y	very high	Y	low	Y	medium	N	none
Increases the external costs of logistics (transport, administrative, etc.)?	Y	low	Y	medium	N	none	Y	medium	N	none	Y	high	Y	medium
Generates conflicts between the sectors?	Y	medium	Y	high	Y	medium	Y	medium	N	none	Y	medium	Y	low
It causes emergency deliveries?	Y	high	Y	very high	N	none	Y	medium	N	none	Y	low	Y	medium
Generates material impact on the planning and production?	Y	very high	Y	medium	N	none	Y	medium	Y	low	Y	high	Y	very high
Generates interference in the process of partnership with customers and suppliers?	Y	medium	Y	high	N	none	Y	very high	N	none	Y	medium	N	none
Generates an impact on operational efficiency?	Y	very high	Y	medium	Y	low	Y	high	N	none	Y	high	Y	high
Generates impact in the volume of sales of the company?	Y	low	N	none	N	none	N	none	N	none	N	none	Y	low

To allow these processes to be clearly identified, they were broken down into activities: six activities for the receiving process; three for the data capture process; and six for the shipping process. The choice of these three processes was based on the reports of the semi-structured interviews and the direct observations carried out during the case studies. Table 7 shows which activities the companies in the case studies carry out as part of the three processes. Each company is designed as "FS#".

Companies FS1 and FS2 had the greatest level of control in the receiving process. The only company that carried out all the control activities for this process was FS2, which, in spite of the large number of items received every day, has a strict procedure for controlling the receiving of goods. The company makes heavy use of the WMS system (Warehouse Management System), bar code readers and a specific area for checking and identifying materials. Another point of note in the receiving process in companies FS1

and FS2 is the issuing of the incoming invoice, which is done immediately after the physical check so that the inventory balances are updated more quickly. In the data capture process, the companies with the best performance were FS1 and FS3, which use bar code reading (BC), an approach that can make data collection more reliable.

For companies FS1, FS2 and FS7, the shipping process was the process with the greatest degree of control. FS1 and FS2 both use BC in the shipping process and also have a well-organized storage facility and a good system for controlling the shipping of goods. This approach is a consequence of the strict controls adopted by the company's clients and the penalties incurred if the wrong materials are sent.

FS7 has a strict inspection system covering labeling, packaging and the checking of material quantities and specifications against order quantities and specifications. It also has an organized area for inspection before loading and shipping.

Table 7. Identification of processes by activity

Process	Activity	FS1	FS2	FS3	FS4	FS5	FS6	FS7
Receiving	Physical check	X	X		X	X	X	X
	Order check	X	X				X	X
	Control form	X	X	X		X		X
	Identification	X	X	X		X	X	X
	BC reading		X					
	Divergences treatment	X	X		X		X	
Data capture	Manual		X		X	X	X	X
	Semi automatic	X		X				
	Automatic							
Shipping	Control form	X	X	X			X	X
	Physical check	X	X	X	X	X	X	X
	Package	X	X	X				X
	Identification	X	X	X		X	X	X
	BC reading	X	X					
	Low customer complaint	X	X			X		X

It can be seen from Table 8 that the companies with the greatest degree of control in their processes were FS1 and FS2, whose processes ensure that inventory discrepancies are less likely to occur during receiving, data capture and shipping. In other words, there is a greater likelihood of a higher inventory accuracy index, primarily as a result of the use of a bar coding (BC) system, strict control of processes, the organization of the physical space and the method for identifying materials.

Table 8. Types of inventory control

Company	Number of SKUs	Type of inventory control			Average IAI
		Inventory control process level	Periodic inventory	CC BC	
FS1	400	High	Yes	Yes Yes	99,99%
FS2	1700	High	Not	Yes Yes	99,40%
FS3	500	Medium	Not	Yes Yes	85,00%
FS4	5000	Small	Not	Yes Yes	70,90%
FS5	100	Small	Yes	Not Not	97,20%
FS6	3000	Medium	Yes	Not Not	65,00%
FS7	500	Medium	Yes	Yes Not	95,42%

By analyzing the individual activities in the inventory control processes, using cycle counting (CC) and BC, data can be organized so as to allow an analysis of the various types of inventory control, the number of inventory items in the company and the average Inventory Accuracy Index (IAI). This information is shown in Table 8.

It can be seen from Table 8 that although FS1 has the best accuracy index, it has a much smaller number of items (raw materials and finished products) than FS2, which has around 67% more direct items. In other

words, although the results for FS1 are excellent and the company has good inventory control processes, FS2 also has a good index, particularly if the number of direct items that the company controls is taken into account.

FS5 and FS7 have good accuracy indexes. However, it was evident from the interviews and observation of the companies' operations that they have relatively simple operations in terms of materials control and number of items, factors that have a direct impact on inventory control. Hence, an increase in the movement of materials and number of items could directly affect the inventory accuracy index.

Of the companies studied, FS4 and FS6 had the poorest inventory control in terms of the number of activities for each control process, the use of CC, the use of BC and the inventory accuracy index. A relationship can therefore be identified between the extent to which the different types of inventory control analyzed in this study are used and the inventory accuracy index, a finding that corroborates the conclusions of Brown et al. [8].

5. ANALYSIS OF THE CASES

This section analyzes and discusses the cases described in the previous section. It covers the main causes and effects of inventory inaccuracy; the characteristics of the inventory control process; an analysis of the use of CC; and an analysis of the use of BC. Based on the findings of the literature review, the main causes of inaccuracy in the studied companies were identified together with their main effects. Table 7 summarizes the information provided by interviewees when they were questioned about the impact of each cause on inventory record inaccuracy.

Table 9. Causes of inaccuracy, number of companies and intensity

Impact Categories	None	Low	Méδιο	High	Highest	Medium impact
Causes	(value = 0)	(value = 1)	(value = 2)	(value = 3)	(value = 4)	
Are there errors in the registration of the movements of the	0	2	2	0	3	2,57
Is material checked when receiving from supplier?	1	2	1	2	1	2,00
Is material checked when expediting to customers?	1	2	1	3	0	1,86
Is there rework during material processing?	1	3	2	0	1	1,57
Do the employees that handle materials have proper training?	2	3	0	1	1	1,43
Does material processing generate scrap?	1	3	2	1	0	1,43
Are inventory records updated after physical counting?	1	5	0	0	1	1,29
Are there procedures for material handling?	0	6	0	1	0	1,29
Do materials have a random position in inventory?	3	2	1	0	1	1,14
Is work in process properly identified?	3	3	0	0	1	1,00
Is finished product properly identified?	1	5	1	0	0	1,00
Are there material damage in moving and keeping?	3	2	2	0	0	0,86
Do the employees that physical count materials have proper training?	2	4	1	0	0	0,86
Is raw material packed in standard packages?	2	5	0	0	0	0,71
Is finished product packed in standard packages?	2	5	0	0	0	0,71
Is inventory update automatic?	5	0	2	0	0	0,57
Do raw materials have quality inspection?	4	2	1	0	0	0,57
Is raw material properly identified?	3	4	0	0	0	0,57
Is work in process packed in standard packages?	5	2	0	0	0	0,29
Do materials have a fixed position in inventory?	6	1	0	0	0	0,14

Table 10. Survey of the effects of inaccuracy

Impact Categories	None (value = 0)	Low (value = 1)	Medium (value = 2)	High (value = 3)	Highest (value = 4)	Medium impact
Generates material impact on the planning and production?	1	1	1	1	3	3,00
Generates an impact on operational efficiency?	1	1	1	3	1	2,67
Generates impact the volume of sales of the company?	1	2	2	1	1	2,17
Generates conflicts between the sectors?	1	1	4	1	0	2,00
Generates interference in the process of partnership with customers and suppliers?	3	0	2	1	1	1,83
Increases the external costs of logistics (transport, administrative, etc.)?	2	1	3	1	0	1,67
Increase internal logistics costs (opportunity capital, storage, handling, insurance, etc.)?	2	3	1	0	1	1,50
Generates impact the volume of sales of the company?	5	2	0	0	0	0,33

To calculate the average impact, the number of companies that specified a particular impact value was multiplied by the impact value (from zero to four) for each of the five levels of impact and the total was then divided by the number of companies. For example, the calculation for the first cause was: $(0 \times 0 + 2 \times 1 + 2 \times 2 + 0 \times 3 + 3 \times 4) / 7 = 2.57$. In Table 9 causes of inaccuracy are ranked using this classification.

The cause of inaccuracy with the highest average impact (2.57) is “errors when recording the movement of materials”; in fact, this had the greatest number of extremely high impacts (three). This same cause of inaccuracy can be attributed to errors when recording material in the system, errors in the process of recording production data and errors in the process for issuing outgoing invoices.

Table 10 summarizes the results of the survey in the seven companies and shows the impact that each effect has in each company. The average impact was calculated using the same criterion as for the causes in Table 9.

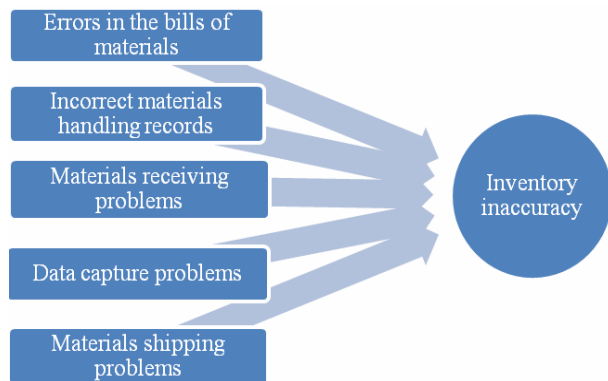


Figure 1. The main causes of inventory inaccuracy

Interviewees were also asked whether other factors influenced inventory inaccuracy in the company. Errors in the bills of materials were identified as one such factor, as six of the seven companies studied referred to this. Based on the case studies and the review of the literature, the main causes of inventory inaccuracy can therefore be identified in Figure 1.

The main effect of inaccuracy highlighted by the companies is the impact on materials and production planning, which had the highest average impact (3.00) and the greatest number of companies reporting an

extremely high impact (three companies). The negative effects of inventory inaccuracy in the companies studied were greater than those initially anticipated when the study was being prepared. Throughout the case studies, the interviewees declared almost unanimously that inaccuracy has a major influence on materials and production planning, extending beyond operational losses arising from production stoppages or reduced manufacturing batch sizes as a result of inventory discrepancies identified when the scheduled material is being produced.

6. CONCLUSION

The case studies revealed an important cause that has not been identified in the literature: errors in the bill of materials. This error is related to data being incorrectly recorded and/or failure to update data after product structure is changed.

This study has shown the direct influence that receiving, data capture and shipping have on inventory accuracy. These processes are thus important elements of inventory control and play an essential role in improving the inventory accuracy index and keeping it at a satisfactory level.

The study has also shown that most of the companies that used CC had a better inventory accuracy index. In FS1, this jumped from less than 80% to 99.99% after a significant improvement had been made to the process for controlling raw materials.

It can be seen that for CC to be implemented effectively, the causes of any discrepancies must be analyzed and action plans used to correct them. CC is thus an important tool for identifying and overcoming shortcomings in the inventory control process.

Of the seven companies studied, three (FS1, FS2 and FS3) use BC and one (FS4) is in the final phase of implementing it. In the companies using this technology, it was apparent that BC had contributed directly to the high quality of the inventory control, particularly as a tool for use in receiving, data capture and shipping operations. Implementation of a BC system can be considered an important requirement for achieving greater control of inventory processes and, consequently, greater inventory accuracy. The companies with the best inventory accuracies (FS1 and FS2) had the greatest control of receiving, data capture and shipping processes and used CC and BC systems.

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Različite vrste kontrole inventara u brazilskim kompanijama

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Rezime

Efikasna kontrola inventara predstavlja zahtev operativnim procesima da teku glatko i zahteva da podaci o inventaru budu pouzdani. U suprotnom, neželjeni efekti mogu da nastanu u različitim oblastima organizacije, poput smanjenja nivoa usluge ili pada operativne efikasnosti zbog nepredviđenih zaustavljanja ili promene rasporeda proizvodnje prouzrokovanih netačnošću inventara. Ova studija teži da identifikuje kako različite vrste kontrole inventara utiču na preciznost inventara. Ovo je deskriptivno istraživanje, a primenjen pristup je upotreba više slučajeva – sedam studija slučajeva u brazilskim kompanijama. Glavni rezultati uključuju klasifikaciju operacija kontrole inventara tako da kompanije mogu da se klasifikuju kao kompanije sa dobrom, srednjom i lošom praksom tačnosti inventara. Pored toga, studija povezuje različite vrste kontrole inventara s indeksom tačnosti inventara za svaku od sedam kompanija i pokazuje vezu između vrste kontrole, značaja vezanog za kontrolu inventara u organizaciji, broja elemenata inventara i indeksa preciznosti.

Ključne reči: kontrola inventara; tačnost inventara; proces; brojanje ciklusa; barkod