An Inventory Management Readiness Assessment Model

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An Inventory Management Readiness Assessment Model

An Undergraduate Honors College Thesis

in the

Department of Industrial Engineering
College of Engineering
University of Arkansas
Fayetteville, AR

by

Joseph John Castrodale
Abstract

Within the realm of today’s business world, cutting costs is extremely important. One of the largest contributors to the total cost of a business is related to inventory. Even though it is known by business persons that inventory is a major component to cost, not every company realizes how well they are managing their inventory. While inventory management is a valued part of any business, it is not always evident how well an organization is performing in this area. This research has resulted in the development of an Inventory Management Readiness Assessment Tool for use by supply chain professionals. The tool consists of a series of questions related to well-established inventory management best practices, asking the user to give feedback as to their perception of the practices within their organization. With this tool, supply chain professionals across various industries are able to assess how well their organization is implementing inventory management best practices.
This Thesis is approved for recommendation to the Honors College.

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1 Introduction

With any business, cost is a key factor that can determine success or failure. If a company cannot control its costs, it sets up a bad platform for the survival of the company. In the retail industry, one important sector of businesses under examination for cost reduction is in the supply chain. In recent years, the field of supply chain management, including the processes of procurement, order fulfillment, collaboration, inventory management, and others still, has grown into a major area of importance for companies. Throughout the history of supply chain management, professionals have developed many practices and activities that have successfully reduced the total cost related to the supply chain. In the healthcare industry, however, there has not been as much of an emphasis. The Center for Innovation in Healthcare Logistics (CIHL) at the University of Arkansas has been examining this “gap” between the retail and healthcare supply chains, and is looking into how to try and close that gap.

It has been estimated that supply chain costs account for between 40 and 50% of a healthcare provider’s costs (Conway, 2011). This is a very large percentage of operating expenses, leaving great room for improvement. One key way to reduce supply chain costs is to improve inventory management practices, as demonstrated by the retail industry. It is important to note that improved inventory management will not only reduce costs, but also provide other benefits, including increased quality of information and data, rationalization of SKUs, and an overall improvement to logistics services (Pohl et al., 2012).

In total, these four benefits serve as the four fundamental objectives to this project. The first objective, maximizing the quality and accessibility of information, seeks to improve information sent and received within a company so that it is accurate, timely, and measures key processes within the supply chain. The second objective, minimizing cost, is exactly that:
reducing the cost of total supply chain costs, including transportation cost, inventory cost, and medical error cost as a result of supply chain activities, through the implementation of supply chain best practices. The third objective, rationalizing categories and items, seeks to reduce SKU proliferation, help healthcare providers understand which items are profitable and effective, and to identify technologies that aid in managing inventory. The fourth objective, improving medical logistics services, seeks to improve the overall flow of medical logistics services (Pohl et al., 2012). A goal tree describing the effort is depicted in Figure 1. The figure lays out the four fundamentals of the project, as well as each objective’s sub-objectives.

Figure 1: Goal Tree of initial inventory management readiness assessment Model project

An Inventory Management Readiness Assessment Model has been developed. This model is represented by use of a self-assessment tool. A self-assessment tool is a mechanism
through which an individual or organization is able to evaluate their performance in a certain topic. While initially targeted at the healthcare industry, this specific tool allows for organizations from any industry to assess how well they are implementing inventory management best practices. Through a series of questions related to inventory management best practices, the tool allows supply chain professionals to respond based on their perception of their organization’s utilization of said practices. The tool uses this data to generate performance metrics based around the weighted importance of each area of supply chain management related to success in supply chain management, as well as the organization’s weighted importance of success. Through these metrics, the tool assigns tiers of progress towards achieving good-standing in each of the areas, and makes recommendations on how to improve if necessary. This will allow the organization to gain insight into how well they are performing, per industry best practices, in managing their inventory, and overall, how well they are managing their supply chain.
2 Literature Review

An extensive literature review has been performed throughout the development of the readiness model. This section is broken up into two sub-sections. First, an overview of performance measurements and capability, assessment, and readiness models will be discussed. Next, the prior research that has been done related to this topic is examined. Second, a review of the literature used in defining the practices within the tool is examined.

2.1 Overview of Models

Performance measurement is the means by which a company is able to objectively observe successes and shortcomings in various areas of its business. Within the realm of supply chain management, performance measurement is accomplished through the recording of metrics, such as inventory turns, service levels, inventory accuracy and other similar metrics. Benchmarking these metrics against companies of similar size and industry benefits the business in terms of improving current operations, as well as planning for future supply chain initiatives. According to Lee and Billington, many companies do not align performance measurement across the entire company, but rather, allow each site of the business autonomy in performance measurement (1992). This leads to the development of irrelevant metrics, and worse, potentially conflicting measurements between different sites of the same company (Lee and Billington, 1992).

Performance measurements can be represented by use of capability, assessment, and readiness models. Capability and assessment models are a “…representation of some aspects of a system” (Lepasaar and Makinen, 2002). While these types of models are certainly related, they are used to represent two different concepts. Capability refers to the ability of an organization to meet its business goals. This is typically measured in terms of “capability levels,” which are
graphically, numerically, or qualitatively communicated to the user. Assessment refers to evaluating an organization on the process-level. It is concerned with evaluating the effectiveness and management of the processes (Makinen and Lepasaar, 2002). A readiness model combines these two concepts into one model. Through the assessment of effectiveness of processes and the measurement of capability of a company, an organization’s “readiness” to implement a particular business plan is measured.

2.2 Prior Research

A readiness assessment model was developed by Sattar (2012). This model was related to Collaborative Planning, Forecasting, and Replenishment (CPFR). Taking into account previous CPFR models that had been developed, it allowed organizations to evaluate their readiness to implement CPFR concepts into their business by use of an Excel-based tool. This tool had questions related to an organization’s perceived performance in the eight fundamental areas of CPFR. For example, a question may ask “To what extent are quarterly meetings held between business partners?” For this question, as with all of the questions, the user then responds with an integer number on a scale between 1 and 5 (Sattar, 2012). A normalized weight is assigned to each area, either using the pre-built weights, or weights assigned by the user. With the response data collected, a total score is calculated for each area, and is compared to the total possible score for each area (the total possible score being the number of questions multiplied by the maximum score, 5). Dividing the area’s score by the total possible score yields the percent target met. The outcome of the tool for the organization would be a “tier level” describing the organization’s readiness to implement CPFR in each of the eight areas (Sattar, 2012).

Related specifically to the scope of inventory management assessments, the amount of research in this area that has already been performed is rather small. Broadening the scope to all
of supply chain management, however, yields more research efforts. Peter Gilmour of Macquarie University performed research examining the benchmarking of supply chain operations (1999). Gilmour divided eleven topics of the supply chain into three segments, each with a set of “capabilities”. Each capability was broken down into dimensions such as “planning” and “measurement”, each having a set of components related to the dimensions. The research sought to provide insight into the supply chain performance of different industries, including food distribution, automotive manufacturing, and consumer packaged goods. This was accomplished through the development of a questionnaire, asking participating companies to establish their current and future “levels of sophistication” (ranging from Level 1 to Level 4) in each of the components of each capability. On this questionnaire, which was mailed out, for each component of each capability, organization’s would “score” themselves on a scale from 1 to 4, with 4 being the highest. Aside from basic demographic questions, this self-perception criterion is the sole metric on which the study is based upon. This scale was explicitly explained in the assessment, with each value clearly defined. With 90 total elements, the highest score possible was 360. The results of this research yielded not only in a look into the supply chain performance across different industries, but also a look into what elements of the supply chain different industries emphasize. For example, Australian automotive companies, on average, were performing better with regard to supply chain best practices than consumer product companies (Gilmour, 1999).

In 2003, Gunasekaran, Patel, and McGaughey sought to expand companies’ knowledge of supply chain performance metrics. Gunasekaran et al. pointed out that supply chain-related activities add value to companies, however, there is not a large emphasis or knowledge of what constitutes good performance in these activities. This is due, in part, to a lack of research and modeling available in this area. In order to account for this, Gunasekaran et al. began their
research. A comprehensive literature review was performed and resulted in the generation of a list of metrics and measurements “…in the context of the following supply chain activities/processes: (1) plan, (2) source, (3), make/assembly, and (4) delivery/customer” (Gunasekaran et al., 2004, p. 336). Metrics included and defined include “Order lead-time”, “Range of products and services,” and “Total distribution cost” (Gunasekaran et al, 2004). With the list of measurements and metrics, a survey was developed in order to assess the importance of these items across varying industries. Within each of the four activities/processes, participants were asked to rank the measurements and metrics by importance. All metrics were asked to be ranked relative to each other, as to their importance to the organization (Gunasekaran et al, 2004). With the response data collected, the ranks were converted to relative percentages and ordered appropriately to clearly understand which measurements and metrics are perceived as the most important. Similar to ABC Analysis, within each of the four activities, the metrics were categorized into “Highly important,” “Moderately important,” and “Less important.” Of the strategic performance metrics, Level of customer perceived value of product was found to be the most important. This speaks to the importance of non-financial metrics, as opposed to purely finance-based data. Of the supplier metrics, supplier delivery performance was the more important metric. Of the production metrics, percentage of defects, cost per operation hour, and capacity utilization were all perceived as highly important. Finally, of the delivery performance measures, quality of delivered goods, on time delivery of goods, and flexibility of service systems to meet customer needs were perceived as having the highest importance. (Gunasekaran et al, 2004). The result of the research demonstrated that there is a hierarchical structure related to supply chain management best practices, which would give a company insight into how to achieve beneficial strategic and operational goals. The research also showed that the
implementation of these practices led to an increased return on investment, with 76% of respondents stating so (Gunasekaran et al., 2004).

A supply chain operations measurement tool was developed by Lai et al (2002, 2004). This tool was based on the supply chain operations reference (SCOR) model formulated by the Supply Chain Council (Stewart, 1995). The SCOR model consists of the link between businesses and customers, each with the criteria of reliability and flexibility/responsiveness, and costs and assets, respectively. Three dimensions were developed as a result of industry research, while still considering the SCOR model: service effectiveness for shippers, operations efficiency for transport logistics service providers, and service effectiveness for consignees (Lai et al., 2002, 2004). Twenty-six supply chain measurements were identified and separated between the three dimensions and four criteria. Supply chain measurements include items such as “Reduce warehousing costs” and “Willingness to help consignees.” The tool asks respondents to estimate their performance in each measurement on a scale from 1 to 5, 1 being much worse than the competition and 5 being superior to the competition (Lai et al., 2002, 2004). It was initially tested for content validity to ensure the measurements were accurate in assessing what the researches were hoping to assess. Following that, a pilot test was done to further improve the tool and to test content and construct validity. The final tool was sent out to hundreds of sea, freight, air, and third-party logistics companies in Hong Kong. The result of the data gathered from the tool showed that while the different sectors of supply chain organizations have a relatively high level of sophistication in their operations, each sector had different priorities (Lai et al., 2002, 2004). The study cites, however, that their research is limited. Two noteworthy limitations are, firstly, that it is only giving one side of the story; it is an empirical measurement of the perceived performance of the organization from their perspective. Lai et al would like to gather data of the
perceived performance from the perspective of consignees as well (2004). Secondly, only one respondent from each organization was observed, leading to potential bias in the data (Lai et al, 2004).

2.3 Best Practices Review

The tool developed through this research effort is based upon a series of best practices described in Appendix 1. An extensive list of retail inventory management best practices was compiled through a lengthy review of white papers, journal articles, conference webcasts, and other relevant resources. One noteworthy book used in this portion of the literature review is entitled *Inventory Best Practices* by Steven Bragg (2011). This book gives an easy-to-understand overview of over 200 inventory management best practices spread between supplier, manufacturer, and provider perspectives.

The practices researched at this stage in this study may be categorized into “practices” (those concepts which are higher-level in conceptualization and require multiple resources) and “activities” (those concepts which are the base-level of understanding, or are fundamental to implementing a larger, all-encompassing “practice”). While both are being considered as “best practices” their distinction was important in initial practice generation. Both types of best practices were considered in the research, as to ensure a thorough examination of best practices within the supply chain. Table 1 in Appendix 1 summarizes all best practices that were identified at this stage of the research.

For those that are considered practices, many items were identified, including sales and operations planning, ABC classification, itemization, combining a just-in-time system with materials requirement planning, creation of cross-functional teams, distribution requirement planning, radio-frequency identification two-bin systems, and application of six sigma concepts.
Any cursory research into inventory management best practices will identify these practices as being best-in-class. Two noteworthy practices from this list are ABC classification and creation of cross-functional teams. ABC classification focuses on the process of analyzing inventory according to usage, either in terms of value or amount and then assigning it as either “A” (most consumed/valuable), “B” (middle-most consumed/valuable), or “C” (least consumed/valuable). Bragg describes this process as a low-cost, mid-range time-commitment practice that can greatly reduce non-value added time spent searching for inventory in a warehouse (2011). The creation of cross-functional teams focuses on the fostering of business meetings and project teams that include representatives from many disciplines and departments. According to successful Enterprise Requirements Planning company, QAD Inc., cross-functional teams are key to successful implementation of programs, due to the wide assortment of perspectives represented in team meetings (2002). Researching these higher-level concepts led to the research into more specific activities which made them successful practices.

For those that are considered activities, many items were identified. These include updating purchase order information, preparing inventory hot lists, accounting for variability in the reorder point, use of visual controls, collaboration with salespeople, itemization of inventory, elimination of approval of routine purchases, improving picking productivity, liquidation of unwanted inventory, and various activities related to forecasting. Updating purchase order information and preparing inventory hot lists benefit an organization through reduction in non-value added time, as well as control of size of inventory required and when it is needed (Direct Tech, Inc.). Accounting for variability in setting the reorder point is also a large opportunity for inventory controllers. Accord to Hermann and Munch, while many inventory controllers know lead time and demand have variability, it is usually estimated by computing an average;

1 For references for all practices and activities not cited in this section, see Table 7 in Appendix 1
however, a standard deviation should be computed for these values, as it better captures the variability and removes the guess-work from forecasting (2011).

The use of visual controls, such as the Five ‘S’s, focuses on improving the physical space where inventory is stored. Cleaning up storage areas leads to decreases in time spent picking items, decreases in restocking fees, and a reduction in storage space needs (Hermann & Munn, 2011). Eliminating approval of routine purchases focuses on the reduction in bureaucracy with regards to management having to approve orders for standard inventory items. This activity encourages management to give autonomy to subordinates in routine purchasing, so as to reduce non-value added time (Bragg, 2011). Itemization of inventory is another inventory management best practice. As described by the QAD, Inc. Best Practice Inventory Management Training Guide, identifying inventory by its form, fit, and function is crucial to identifying it in an inventory management system (2001). Once identified, proper use of barcoding should be applied, describing the inventory by those attributes. Following this, item status codes should be utilized to describe the different states in which the inventory is in (QAD Inc, 2001). Jon Schreibfeder, president of Effective Inventory Management, Inc., gives a lot of insight into strong inventory management practices. He discusses the benefits of liquidating unwanted inventory, which focuses on identifying and removing inventory that is either slow-moving or excess in count. Once identified, excess inventory may be sold off at a reduced price, substituted for a less expensive item, returned to the original vendor, donated, or thrown away. This will decrease overall carrying costs of the organization (Schreibfeder, 2011). Schreibfeder also discusses the benefits of strong forecasting activities, such as considering external factors in forecasting, comparing forecasted demand to actual demand, increasing forecasting frequency, and centralizing forecasting for stock keeping units. Strong forecasting activities, Schreibfeder...
argues, lead to a reduction in demand variability, which means better inventory control, as well as better forecast accuracy. Also, automating the data collection process, validating collected forecast data, and utilizing an extant forecasting models (such as the economic order quantity or Winter’s method), also aid in the forecasting of stock keeping units (Schreibfeder, 2011). In addition to traditional forecasting activities, Schreibfeder recommends some non-traditional activities as well, such as collaboration with salespeople, where insight can be gained about spikes in demand before hasty adjustments to the forecast are made (2011).

As mentioned, Bragg’s book *Inventory Best Practices*, contained many best practices that aided in this research. In his book, Bragg breaks down each best practice into real-world application, while also giving general cost and time-commitment information. Notable activities drawn from Bragg include setting up a reverse logistics system, reduction of high-usage inventory, supplier rating systems, assigning location codes to storage areas, comparing suppliers based on total landed cost, and buying from suppliers located close. A reverse logistics system is one by which a company handles returns, reworks, repackaging, and other activities related to returned inventory. Though a considerable investment of time and money, a reverse logistics system benefits an organization through capturing profits in the growing resale market. A shift in focus on reducing high-usage inventory is also noted by Bragg. This activity encourages organizations to narrow down their scope of inventory reduction efforts to, at least initially, those products which are regularly-demanded or used. Because these products are consumed regularly, their demand is reasonably predictable, allowing for improvements in managing these inventories much easier compared to other, more sporadic stock keeping units (Bragg, 2011). Assigning location codes to storage areas focuses on organizing a storage space (warehouse, storage closet, etc…) in such a way that employees are able to more easily and efficiently store
and pick items. This eliminates the need for employees to have to memorize a specific item’s location within a storage area, but rather memorize the locations within the storage area itself. This activity aids in inventory picking and storage, and is cost-effective (Bragg, 2011).

Comparing suppliers based on total landed cost focuses on examining the total cost of purchasing an item from suppliers rather than simply relying on the quote given by the supplier, and using that total cost to choose the best supplier. This allows an organization to better understand the cost it will incur from buying from suppliers, and to weigh alternatives objectively (Bragg, 2011). Buying from suppliers located close focuses on finding savings in total landed cost of inventory by purchasing from suppliers physically located close to the organization. This activity not only eases the burden of supplier issues that occur in normal business, this also helps build a long-standing relationship with suppliers and increases order accuracy (Bragg, 2011).

3 Research Methodology

Through discussion and analysis, some practices were discarded as not necessarily being a best practice. Those that were left were included in a review worksheet that was sent out to a small sample of retail and healthcare supply chain professionals for further critique (this is discussed in detail in the Methodology section). The results of these efforts yielded the final list of best practices that are included in the tool. The iteration of lists of practices is detailed in Tables 4 - 6 in Appendix 1.

The method of research utilized in this thesis is empirical research, relying on data from in-industry professionals using the tool. This allows the Inventory Management Readiness Assessment Model to be evaluated and validated. The development of the Readiness Assessment Model is a culmination of the literature review performed, the selection of the practices, the
design of the tool, the sending out of the tool, and an analysis of the results of the first sample of users. This section discusses how the final list of best practices was selected, how the tool was designed, how the tool works, and how the model is evaluated and validated.

3.1 Best Practice Selection

As previously mentioned, the list of thirty best practices was attained through discussions and analysis. In order to gain insight into the relevance of these thirty practices to inventory management, a review worksheet was created. The review worksheet is provided in Appendix 3. The purpose of the review worksheet was to assist with determining which practices to further remove from the list of best practices, for the practices may be outliers in terms of the scope of the “best of the best” inventory management practices. The smaller set of best practices that result from this analysis will be included in the self-assessment tool. A smaller set of best practices will benefit the tool because it will shorten the time required to use it, and therefore, will be more accessible to supply chain professionals. Also, this insight would aid in determining the importance of the relevant practices, which will guide in evaluating how well an organization is performing in using inventory management best practices. The worksheet listed the thirty practices in no particular order, with definitions of each practice in an appendix. Participants were asked to respond to the following questions for each of the thirty practices:

1. Do you use this practice at your organization? (“Y/N”)
2. How familiar are you with this practice? (1 = not familiar / 5 = very familiar)
3. To what extent do you perceive this practice as having a positive impact on an organization? (1 = no positive impact / 5 = very impactful)
4. To what extent do you perceive this practice as being difficult to implement? (1 = not difficult to implement / 5 = very difficult to implement)
Question (1) was asked such that the response is binary, “Y” or “N”, while questions (2) – (4) were asked such that the response was an integer value between 1 and 5. The worksheet was sent out to a small sample of supply chain professionals. A total of seven review worksheets were completed and returned. After receiving the completed worksheets, the results were compiled into a spreadsheet for analysis. Question (4)’s responses were interpreted in reverse (for example, a score of 5 would be translated to a score of 1 for analysis purposes). This is due to the fact that reversing the data allows for the capturing of perceived “easiness” as opposed to perceived “difficulty” of a practice.

3.2 Best Practice Analysis

The data was separated into two groups. First, it is important to know the opinion of a practice given the respondent uses the practice and is familiar with the practice. It would not be valuable to know the opinion of a professional who is not familiar with the practice, as their opinion is more than likely a guess, at best. This grouping of data is achieved by filtering the responses by “Y” for question (1) and responses of 4.0 or greater for question (2). The second grouping of data is organized by those who do not use the practice at their organization, but are still familiar with the practice. This information is valuable in that it gives more insight into the possible reason why an organization may not use a particular practice (for example, a practice may not be viewed as having a positive impact on the business in their experience). This grouping of data is achieved by filtering the responses by “N” for question (1) and responses of 4.0 or greater for question (2).

Of the thirty practices listed in the review worksheet, all thirty were identified as having at least one supply chain professional who uses it and is familiar with it. Considering those professionals who do not use a particular practice, but are familiar with it, ten were identified.
With these practices identified, the averages of the responses for questions (3) (“Easiness”) and (4) (“Positive Impact”) for each practice within each group were calculated. The sample sizes range from at least one to at most seven for each of these averages. Even with these small sample sizes for a practice’s response on Familiarity, Easiness, and Positive Impact, it is still useful to this portion of the research, as no statistical validity is necessary at this stage. Rather, the value of this information is in the basic trends of perceived performance of each practice.

The Positive Impact was plotted against Easiness for each practice within each of the two groups. These graphs were divided into quadrants in order to more easily interpret their meaning.

The top-right having the most impact and being easy to implement, the bottom-left having the least positive impact and being hard to implement. For simplicity, the top-left quadrant will be referred to as “quadrant 1”, the top-right will be referred to as “quadrant 2”, and so on in a clockwise, sequential manner.

Referring to Figure 2, six of the thirty practices fell into quadrant 2, with the majority falling into quadrant 3, a few more falling exactly between quadrants 1 and 2, and only one
falling into quadrant 4. This was not surprising, as the research of these practices ensured that they were already considered best practices by industry standards, and thus it makes sense that those who use and are familiar with these practices would believe they are easy to implement and have a positive impact.

Figure 3: Impact vs. Implementation for those are familiar but do not use the practice

Figure 3 is a bit more perplexing, as the data is more dispersed amongst the quadrants. Two of the highest-performing practices in Figure 3 are consistent with two of the “best of” the best practices from Figure 2. More interesting, however, is that one practice, “Buy from Suppliers Located Close”, in Figure 3 has a considerably higher perception of Easiness to implement than in Figure 2, with only a marginal decrease in perceived Positive Impact.

Figure 2’s data is more valuable in terms of guiding the formulation of the readiness model than Figure 3’s data. In order to narrow down the practices to a list of seven to ten, a requirement of having an Easiness of greater than or equal to 2.5 and a Positive Impact of greater than or equal to 3.90 was added. This left eleven best practices (see Table 6 in Appendix 1) as “Compare Forecasts to Actual Demand” was combined with “Centralize Forecasting of SKUs”. These practices will serve as the bases for questions which will be included in the self-
assessment tool. Digging deeper, the practices’ original data was reorganized by whether the supply chain professional was in the healthcare industry or not. Five of the seven were healthcare supply chain professionals, while two were not. Because the “Familiar and Use” information is more valuable, only this type of data was used for these new groupings. Of these eleven practices, four of them overlapped in terms of having at least one professional from their respective industry use and be familiar with them (Table 8 in Appendix 2). The practices’ Easiness and Positive Impact were then averaged across these new groupings, and plotted in the same manner as before (see Figures 10 - 11 in Appendix 2). Comparing the averages for Easiness and Positive Impact for each practice between the two categories, all four practices were perceived as easier to implement by the healthcare professionals, while the non-healthcare professionals perceived all four as having a more positive impact. The Mann-Whitney U nonparametric statistical test allows the comparison of these two independent groups. This test seeks to test if the distributions of both samples of responses are equally distributed (Gibbons & Chakraborti, 2003). The five healthcare professionals’ responses and the two non-healthcare professionals’ responses were organized in the manner shown in Figure 12 in Appendix 2. For each attribute of each practice, the lowest “Total score” represents the U-test statistic for the sample. The null and alternative hypotheses for this test are as follows:

\[ H_0 = \text{The Healthcare and Non – Healthcare responses are identically distributed} \]

\[ H_1 = \text{The Healthcare and Non – Healthcare responses are not identically distributed} \]

A U test statistic was calculated for each attribute of each practice. Using a level of significance of .05, there is no statistical evidence to suggest that the distributions are not identically distributed. The results are summarized in Table 9 in Appendix 2. As such, while there appears to be a difference in perception of best practices between healthcare and other
industries, this statistical test does not support this claim. A more in depth study with a larger sample size, however, could yield different results.

One of the review worksheet respondents replied not with a completed survey, but rather with an invitation to discuss each practice in detail in a conference call. As a result of the extensive conversation that followed this invitation, much practical insight was captured. In addition to small spelling corrections and definition-tweaking, talking points of interest included the fact that there is not a lot of forecasting performed within the healthcare industry, defining clearly who the audience is that will be using this tool, and how important it is to present the tool to healthcare supply chain professionals within the context of the retail industry.

3.3 Practice Classification

Each of the remaining practices was categorized into one of the four fundamental objectives of the project:

3.3.1 Maximize Quality and Accessibility of Information

- Centralize Forecasting for SKUs - This activity focuses on ensuring that only one organization is charged with the task of forecasting the demand for particular SKUs.
- Account for Variability in Setting the Reorder Point - This activity focuses on examining how an organization calculates its reorder point, ensuring that statistical variation (i.e. standard deviation of lead times and demand) in the reorder point is captured in the calculation. The reorder point is the level of inventory of an item at which a replenishment order is to be placed.

3.3.2 Minimize Cost

- Focus on Reducing High-Usage Inventory - This practice focuses on reducing inventory for high-usage items. Rather than focusing on reducing overall inventory, this brings the
scope of inventory reduction to a smaller scale, which allows for greater attention to
detail.

• **Compare Suppliers Based on Total Landed Cost** - This activity focuses on examining the
total cost of purchasing an item from suppliers rather than simply relying on the quote
given by the supplier, and using that total cost to choose the best supplier. The total
landed cost, also known as lowest total cost, includes costs such as transportation, duties,
taxes, brokerage fees, foreign exchange risk, supplier payment terms, and other costs
associated with the delivery of the item to the organization. This calculation can be
performed by internally developed spreadsheets or third-party software that is available
for purchase.

• **Eliminate Approvals for Routine Purchases** – This practice focuses on the reduction of
bureaucracy involved in acquisition of regularly demanded inventory by managers
relinquishing control. This practice eliminates the need for a manager to approve every
single order, especially when concerned items have regularly known demand. This can be
done well by performing occasional audits of routine purchases or examining larger
purchases after-the-fact.

### 3.3.3 Rationalize Categories/Items

• **Classify Inventory with ABC Classification** - This practice focuses on the process of
analyzing inventory according to usage, either in terms of value or amount and then
assigning it as either “A” (most consumed/valuable), “B” (middle-most
consumed/valuable), or “C” (least consumed/valuable).

• **Assign Location Codes to Storage Areas** - This activity focuses on organizing a storage
space (warehouse, storage closet, etc…) in such a way that employees are able to more
easily and efficiently store and pick items. This eliminates the need for employees to have to memorize a specific item’s location within a storage area, but rather familiarize themselves with the locations within the storage area itself.

- **Itemize the Inventory** - This practice focuses on correctly identifying inventory based on its form, fit, and function. If an item of inventory has a difference in any one of those areas, it should be classified as a unique item type. Similar item types may be grouped using group codes (e.g. UNSPSC codes).

- **Liquidate Unwanted Inventory** – This practice focuses on the classification of inventory based on value related to return on investment. Inventory that does not contribute profitable margins or is not of necessity to the business should be disposed of in one of the following ways: movement of stock to another area of the organization that needs it, substitution of the item for a less expensive one, return of the inventory to the vendor, donating the material to a non-profit organization or throwing the material away.

### 3.3.4 Improve Logistics Services

- **Use the 5S’s** - This practice focuses on improving physical inventory storage. For any storage area for an organization, the area should be sorted (remove unnecessary materials and tools), simplified (neatly arranged materials and tools), swept (conduct a cleaning campaign), standardized (performed the aforementioned ‘S’s at frequent intervals), and self-disciplined (making habit of following the first four ‘S’s). The cross-training of staff is required for successful implementation.
• **Create Cross-Functional Teams** – This activity focuses on the fostering of business meetings and project teams that include representatives from many disciplines and departments.

Within the scope of each objective, questions related to each practice were generated and screened by the team to be used in the self-assessment tool.

4 **The Self-Assessment Tool**

This section describes the development of the self-assessment tool, how the tool works, and how the tool was sent out to industry professionals for use.

4.1 **Self Assessment Tool Development**

The self-assessment tool is Excel-based. Built in a similar fashion to Sattar (2012) CPFR Readiness Assessment Tool. The tool includes a title page, main menu, information on the research effort, the four fundamental objectives containing questions about their relevant practices, and summary pages detailing the scores and results (2012). From the main menu users are able to select which of the four fundamental objectives they will to answer questions about, demographic questions, practice definitions, practice rank-ordering, and their self-assessment scores (see Figure 4). A “Tool Review” button is also available to aid in future improvement of this tool, which simply asks questions about the accuracy, usability, and potential of the tool.

First, the user answers simple demographic questions about their organization. Then, the user is asked to review the definitions of the best practices as presented Section 3.3. Once that is complete, the user then rank-orders and assigns a weight to each practice. This information will be used by the team to design a pre-built weighting of the practices for use in score calculation. After that, the user begins to answer questions about their organization pertinent to each of the four fundamental objectives.
For example, if the user clicks the “Cost Minimization” button, they will be taken to the Cost Minimization page (see Figure 5).

Once a particular objective’s page, the user is able to see all of the practices found within the objective and the questions related to them. The user is instructed to respond to each question on a scale from 1 to 5, with the meaning of each increment clearly indicated in the green box of each objective’s page (1 = Rarely, 2 = Infrequently, 3 = Moderately, 4 = Frequently, 5 = Very...
Frequently). For example, question 1 asks “To what extent does your organization put inventory reduction efforts towards highly-consumed stock keeping units?” If the user believes their organization frequently focuses efforts in inventory reduction towards highly-consumed stock keeping units, the user would click “4” indicating “Frequently”. The user is to do this for all questions under all four objectives until all four have been completed. At any time while using the self-assessment tool, the user may save the file and continue at a later point in time.

Clicking the “View Scores” button from the main menu will take users to the Scores page. The Scores page has three parts: the list of scores the user has given each question (see Figure 6), the score tabulation where users are able to assign weights relative to their perceived importance and normalized weights are calculated (see Figure 7), and finally the score charts, which display the percent achievement relative to each objective (see Figure 8).

![Figure 6: Screenshot from the “Scores” page showing the scores the user input to the self-assessment tool](image)

Figure 6: Screenshot from the “Scores” page showing the scores the user input to the self-assessment tool

![Figure 7: Screenshot from the “Scores” page showing the tabulation of scores](image)

Figure 7: Screenshot from the “Scores” page showing the tabulation of scores
Referring to the score tabulation, as mentioned, the user is able to assign weights relative to their perceived importance of the practices in the “Raw Weights” column. Each practice has been weighted the same as this point in time; however, once first-round feedback is given from industry professionals, the team will be better able to pre-build the weights for each practice in future iterations of this tool. These weights are used to calculate normalized weights, which allows a total score for each objective to be calculated (by multiplying the normalized weight of a particular objective by the sum of the score for a particular objective). The percent target met calculation is the same as that in Sattar (2012). With regards to more accurately assigning representative weights to each practice, data collected from the “Rank Order Practices” page will allow empirical calculations for those weights. Shown in Figure 8, this page asks participants to first rank-order the practices in terms of their contribution to overall effectiveness of Inventory Management best practices.

Figure 8: Score Comparison and Percent Target Met charts displayed on the “Scores” page
As the participant rank-orders the practices, they populate the “Your Rank-Ordered Practices” column in Section 2 (see Figure 9). Once rank ordered, the participant is then asked to assign scores between 1 – 100 to each practice that are consistent with their rank ordering. With this data, average weights can be calculated by equation (1) (Alfares and Duffua, 2008). Equation (1) can be adapted to meet the needs of this application. In equation (1), \( w_{r,n} \) is the weight of rank r for practice n, whereas in the original source research, n represents a criterion. With the aggregation

\[
 w_{r,n} = 100 - \left( 3.19514 + \frac{37.75756}{n} \right) (r - 1) \tag{1}
\]

method for combining criteria ranks for weight calculation proposed by Alfares, the weights for each practice can be averaged in order to obtain a weight for each individual practice (2008).

![Figure 9: Screenshot of the rank ordering review page](image)

Finally, the user is asked to perform a tool review by clicking the “Tool Review” button from the Main Menu. This page has eight questions regarding an evaluation of the tool. These questions are as follows:
1. Please rate the extent to which the important best practices of Inventory Management have been covered in this readiness model.

2. Please rate the extent to which you feel that the terms used in the model are clearly defined and understandable.

3. Please rate the extent to which the model adequately assigns importance, through use of weights for each of the eleven practices.

4. Please rate the ease with which the self-assessment can be conducted.

5. Please rate the extent to which you feel that the model can adequately assess an organization’s Inventory Management readiness.

6. Please rate the extent to which you feel the readiness model can be applied across various industries.

7. Please rate your satisfaction about the user-interface of this tool.

8. Please rate the potential usefulness of this tool to your organization.

The users are asked to respond on a scale from 1 to 5, with 1 being the lowest score, and 5 being the highest score. Also, users are encouraged to leave comments with regards to each attribute to give further opinion on the tool and model.

5 Initial Beta Testers

With the tool completely built and all elements implemented, it was sent out, along with a user’s manual (see Appendix 4), to a small sample of supply chain professionals across various industries and roles, including distributors, manufacturers, and suppliers. The purpose of this initial beta test is to 1) validate the model, 2) gather feedback on how to improve the tool in the future, and 3) evaluate weighting of the best practices. Of the twelve supply chain professionals that were contacted, nine fully completed tools were returned.
5.1 Model Validation and Tool Feedback

The data from the tool review was used for validation of the model presented in this thesis. The average score of the eight questions are given in Table 1.

Table 1: Average Scores of Tool Review Data

<table>
<thead>
<tr>
<th>Question</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inventory management best practices are represented</td>
<td>3.89</td>
</tr>
<tr>
<td>2. Terms are clearly defined</td>
<td>4.44</td>
</tr>
<tr>
<td>3. The model assigns weights appropriately</td>
<td>4.33</td>
</tr>
<tr>
<td>4. Ease of performing the self-assessment</td>
<td>4.78</td>
</tr>
<tr>
<td>5. Quality of assessment of readiness</td>
<td>3.78</td>
</tr>
<tr>
<td>6. Can be applied in various industries</td>
<td>4.22</td>
</tr>
<tr>
<td>7. Satisfaction with user-interface</td>
<td>4.67</td>
</tr>
<tr>
<td>8. Potential usefulness of tool to organization</td>
<td>3.78</td>
</tr>
</tbody>
</table>

For validation of the model, Questions 1, 3, 5, 6, and 8 are most important to consider. For each question, all average scores are well above average, with the lowest average being 3.78.

For validation purposes, of the important questions to consider, the initial response data indicates that the model is representative of inventory management best practice readiness.

As mentioned, qualitative data was also gathered for each question. Important information was gathered with regards to questions related specifically to the model. Comments were made related to the representation of best practices. These included considering other important information, such as MRP (Materials Requirements Planning) and DRP (Distribution Requirements Planning) that are used by higher-end organizations, as well as organizations’ operational data (such as transportation lead time, fill rates, etc…). One important criticism made was the fact that organizations may score high with the tool in terms of readiness, but can still fail to perform. On the other end of the spectrum, another user found the model very simple to understand, while still providing enough insight to start the right conversations within an organization which that could lead to great value.
With regards to evaluating the usefulness and functionality of the tool, Questions 2, 4, and 7 are most important. Referring to Table 1, the average scores for these questions are very positive, with the lowest average score being 4.44. This indicates that the usefulness and functionality of tool is perceived as being high by supply chain professionals. Comments related to the tool itself included the simplicity of the language used being helpful, as well as the ease of using the tool and performing the assessment.

5.2 Best Practice Weighting

As described in Section 4.1, the users were asked to rank the practices, as well as give a score to each practice. The scores given by each user were averaged. Using equation (1), for each user’s ranking for a practice, a weight may be calculated. Using the aggregation method proposed in Alfares (2008), the weights calculated for each participant’s ranking are averaged across each practice. The averages are summarized in Table 2. In Table 2, “raw data” refers to the weights given to each practice by each participant in the “Rank Order Practices” page of the tool (see Table 10 in Appendix 2). “Calculated data” refers to the scores calculated for each practice by each participant’s ranking using equation (1) (see Tables 11 – 12 in Appendix 2).

<table>
<thead>
<tr>
<th>Practice</th>
<th>Raw Data Average</th>
<th>Calculated Data Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralize Forecasting for SKUs</td>
<td>82.22</td>
<td>87.48</td>
</tr>
<tr>
<td>Account for Variability in Setting the Reorder Point</td>
<td>73.22</td>
<td>76.44</td>
</tr>
<tr>
<td>Create Cross-Functional Teams</td>
<td>64.33</td>
<td>72.02</td>
</tr>
<tr>
<td>Liquidate Unwanted Inventory</td>
<td>40.89</td>
<td>69.81</td>
</tr>
<tr>
<td>Focus on Reducing High-Usage Inventory</td>
<td>56.44</td>
<td>69.81</td>
</tr>
<tr>
<td>Classify Inventory with ABC Classification</td>
<td>57.33</td>
<td>66.86</td>
</tr>
<tr>
<td>Itemize the Inventory</td>
<td>37.33</td>
<td>64.65</td>
</tr>
<tr>
<td>Eliminate Approvals for Routine Purchases</td>
<td>52.44</td>
<td>63.92</td>
</tr>
<tr>
<td>Use the 5S's</td>
<td>60.00</td>
<td>61.71</td>
</tr>
<tr>
<td>Compare Suppliers Based on Total Landed Cost</td>
<td>50.44</td>
<td>52.13</td>
</tr>
<tr>
<td>Assign Location Codes to Storage Areas</td>
<td>61.89</td>
<td>50.66</td>
</tr>
</tbody>
</table>
As was originally thought, the practices are not perceived as being equally as important to inventory management best practices. Digging further into the data sets reveals which of the two would be more helpful for implementation into the tool. Table 3 shows the variance of the data for each practice using each method. In Table 3, “raw data” refers to the scores given to each practice by each participant in the “Rank Order Practices” page of the tool. “Calculated data” refers to the scores calculated for each practice by each participant’s ranking. Looking at Table 3, it is easy to see that the variance is higher for every practice using the raw data as opposed to the calculated data.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Raw Data Variance</th>
<th>Calculated Data Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralize Forecasting for SKUs</td>
<td>1269.44</td>
<td>641.80</td>
</tr>
<tr>
<td>Account for Variability in Setting the Reorder Point</td>
<td>337.19</td>
<td>198.89</td>
</tr>
<tr>
<td>Focus on Reducing High-Usage Inventory</td>
<td>796.50</td>
<td>363.61</td>
</tr>
<tr>
<td>Compare Suppliers Based on Total Landed Cost</td>
<td>655.86</td>
<td>184.24</td>
</tr>
<tr>
<td>Eliminate Approvals for Routine Purchases</td>
<td>510.03</td>
<td>451.46</td>
</tr>
<tr>
<td>Classify Inventory with ABC Classification</td>
<td>1197.75</td>
<td>494.16</td>
</tr>
<tr>
<td>Assign Location Codes to Storage Areas</td>
<td>1172.75</td>
<td>506.37</td>
</tr>
<tr>
<td>Itemize the Inventory</td>
<td>777.03</td>
<td>428.28</td>
</tr>
<tr>
<td>Liquidate Unwanted Inventory</td>
<td>481.25</td>
<td>176.92</td>
</tr>
<tr>
<td>Use the 5S's</td>
<td>733.03</td>
<td>337.98</td>
</tr>
<tr>
<td>Create Cross-Functional Teams</td>
<td>1267.11</td>
<td>436.82</td>
</tr>
</tbody>
</table>

This is expected, as there are much fewer combinations of possible ranking sets in ranking the practices when compared to the task of assigning a score from 1 – 100 for each practice. As such, the Calculated Data Weights should be implemented into future iterations of the tool. This will benefit the tool in providing a more accurate score in overall inventory management readiness. A user may choose to ignore these pre-built weights, of course, and assign weights of their own. However, for users who are unsure about the weights, or would like a benchmark to compare their readiness score against, these pre-built weights are valuable.
5.3 Analysis of Assessment Scores of Organizations

Analyzing the scores of each organization gives insight into these best practices, as well as each industry’s performance within these practices. Tables 13 – 14 in Appendix 2 summarizes the individual results by practice. Looking at the average for each practice, the scores are generally positive, with most practices receiving an average score of above 75% by the organizations. The practice that received the highest average score is “Use of 5S’s”, while the practice that received the lowest average score is “Compare Suppliers Based on Total Landed Cost”. In Table 2, “Compare Suppliers Based on Total Landed Cost” received one of the lowest weights by the participants’ opinion, so finding this practice is scored the lowest could mean 1) because it is not a critical practice, supply chain professionals do not spend resources fostering its success or 2) it is perceived as not being a critical practice; however, organizations should devote resources to improving performance in this area. Figure 13 in Appendix 2 shows each organization’s average percent target met. Each organization, save for two, received a score above 70%, with one organization scoring above 90%. For those organizations that scored lower, it will be valuable to see how other organizations within the same industry are performing, so as to see how they may improve in those areas.

Of the nine organizations, four were healthcare providers, three were manufacturers, one was a distributor, and one was a hybrid of a distributor and a manufacturer. Assuming the “hybrid” organization counts both as a distributor and a manufacturer, there were a total of three industries represented. Breaking the percent target met scores apart by industry (see Table 15 in Appendix 2), the average percent target scores were calculated. For all industries, the average percent target met was above 75%, indicating a good level of inventory management readiness. While the differences are small, manufacturers scored higher on average with regards to
inventory management readiness. As the initial motivation for this research was to assess specifically the healthcare industry, it is interesting to note that healthcare providers scored higher than distributors on average. However, it is important to mention that this is a small sample set, and is not representative of those industries.

6 Conclusion

This research presents an inventory management readiness assessment model for use by supply chain professionals across various industries. Across the time span of the research, the scope of the project shifted from the healthcare industry specifically to all industries. This allowed the model to make a larger impact on supply chain management. Through an extensive literature review of inventory management best practices, empirical analysis of said practices, and the building of a tool to represent and validate the model, a working model was produced.

Empirical analysis of the tool review data indicates support for the model being valid in its current state. While not guaranteed to be the only “best of the best” practices in inventory management, the eleven best practices used in the model were well-received by supply chain professionals. For future improvement of the model, even more review on industry-standard best practices should be researched and reviewed to ensure the model represents as many critical best practices as possible. Also, a larger sample of supply chain professionals across a wider span of industries should be developed. Finally, while Microsoft Excel was utilized in this tool for simplicity (as the majority of supply chain professionals have a working-understanding of Excel), implementation of the model into an online-platform would be ideal for data collection and data sharing purposes.

Were the research to be started over again, a few steps in the methodology could have benefited the research. First, the best practice selection described in Section 3.1 could have been
carried out more empirically. For example, a more clear statement of the purpose behind the Review Worksheet, including meaning of the questions to the user, definition of the scale, and other relevant questions pertaining to the practices that would better evaluate their relevance to inventory management. Also, as mentioned, a larger-scale sample of users would better serve the validation of the model. Finally, in parallel with this research, a separate tool could be developed dealing with inventory management performance (rather than readiness). This model would be data-driven, rather than driven by a professional’s perception in readiness. Used in conjunction with the readiness model, this model would be insightful to an organization to compare where they perceive they are capable of performing to what their data indicates they are performing. This would also contribute to the supply chain management field as a whole, being applicable to many industries.

The tool representing the model was designed to be simple, as not to deter users by requiring hours of data collecting, interviews, and data entry. As such, the tool is well-suited for self-assessment; to enable organizations to get a big-picture view of its readiness in implementing inventory management best practices. Internally, it will provide value to an organization through better understanding of how well it is utilizing industry-standard best practices, and where it needs improvement. Externally, given future fine-tuning of the tool and model, as well as an increase in users, organizations will be able to benchmark inventory management readiness against other organizations to get an understanding of its relative performance in its industry.
References


## Appendix 1: Practice Identification

### Table 4: Initial List of Best Practices

<table>
<thead>
<tr>
<th>Centralize Forecasting for SKUs</th>
<th>Increase Forecast Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast to Lead Time</td>
<td>Consider External Factors in Forecasting</td>
</tr>
<tr>
<td>Compare Forecasts to Actual Demand</td>
<td>System Flexibility</td>
</tr>
<tr>
<td>Record Demand for Events</td>
<td>Collaborate with Salespeople</td>
</tr>
<tr>
<td>Record Forecast Discrepancies by Magnitude of Importance</td>
<td>Safety Stock Optimization</td>
</tr>
<tr>
<td>Avoid Promotions</td>
<td>Set Up Reverse Logistics System</td>
</tr>
<tr>
<td>Eliminate Approvals of Routine Purchases</td>
<td>Shrink Supplier Lead Time</td>
</tr>
<tr>
<td>Apply Lean Six Sigma Concepts to Inventory Management</td>
<td>Utilize a Warehouse Management System</td>
</tr>
<tr>
<td>Improve Picking Productivity</td>
<td>Automated Data Collection</td>
</tr>
<tr>
<td>Linear Purchasing</td>
<td>Sales and Operations Planning</td>
</tr>
<tr>
<td>ABC Classification</td>
<td>Create Cross-Functional Teams</td>
</tr>
<tr>
<td>Update Purchase Order Information</td>
<td>Budget Inventory Levels by Month</td>
</tr>
<tr>
<td>Prepare Inventory Hot Lists</td>
<td>Use Audit Reporting to Flag Missing Data</td>
</tr>
<tr>
<td>Be Timely</td>
<td>Itemization</td>
</tr>
<tr>
<td>Set a Tolerance from Vendors</td>
<td>Combine JIT with MRP</td>
</tr>
<tr>
<td>Distribution Requirements Planning</td>
<td>Liquidation of Unwanted Inventory</td>
</tr>
<tr>
<td>Just In Time System</td>
<td>Accounting for Variability in Reorder Point</td>
</tr>
<tr>
<td>Tune Up Preference Lists</td>
<td>Use Visual Controls</td>
</tr>
<tr>
<td>Improve Visual Controls</td>
<td>Assign Location Codes to Storage Areas</td>
</tr>
<tr>
<td>Perform Activity Based Costing</td>
<td>Buy from Suppliers Located Close</td>
</tr>
<tr>
<td>Utilize Capitated Pricing</td>
<td>Compare Suppliers Based on Total Landed Cost</td>
</tr>
<tr>
<td>Perform Cycle Counting</td>
<td>Focus on Reducing High-Usage Inventory</td>
</tr>
<tr>
<td>Install a Supplier Rating System</td>
<td>Pick into Multibin Carts</td>
</tr>
<tr>
<td>Use Price Reduction Strategies</td>
<td>Reduce the Number of Product Options</td>
</tr>
<tr>
<td>Perform a Spend Analysis</td>
<td>Use the 5 S’s</td>
</tr>
</tbody>
</table>
### Table 5: Narrowed-Down List of 30 Best Practices for use in the Review Worksheet

| 1. Classify Inventory With ABC Classification | 16. Use Price Reduction Strategies |
| 2. Account for Variability in Setting the Reorder Point | 17. Reduce the Number of Product Options |
| 3. Assign Location Codes to Storage Areas | 18. Perform a Spend Analysis |
| 4. Perform Activity Based Costing | 19. Tune up Preference Lists |
| 5. Buy from Suppliers Located Close | 20. Update Purchase Order Information |
| 6. Utilize Capacitated Pricing | 21. Use the 5S’s |
| 7. Compare Suppliers Based on Total Landed Cost (TLC) | 22. Centralize Forecasting for SKUs |
| 8. Create Cross-functional Teams | 23. Increase Forecast Frequency |
| 10. Focus on Reducing High-Usage Inventory | 25. Compare Forecasts to Actual Demand |
| 12. Itemize the Inventory | 27. Set up Reverse Logistics System |
| 13. Use Linear Purchasing | 28. Eliminate Approval of Routine Purchases |
| 14. Liquidate Unwanted Inventory | 29. Automated Data Collection |
| 15. Pick into Multibin Carts | 30. Use a Flexible Forecasting System |

### Table 6: Final List of 11 Best Practices for use in the Tool

| 1. Centralize Forecasting for SKUs | 5. Account for Variability in Setting the Reorder Point |
| 2. Focus on Reducing High-Usage Inventory | 6. Compare Suppliers Based on Total Landed Cost (TLC) |
| 3. Classify Inventory With ABC Classification | 7. Assign Location Codes to Storage Areas |
| 4. Itemize the Inventory | 8. Use the 5S’s |
| 11. Create Cross-Functional Teams |  |
Appendix 1: Practice Identification (cont.)

Table 7: Sources for practices mentioned in Section 2.3 that were not cited

<table>
<thead>
<tr>
<th>Practice Name</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updating Purchase Order Information</td>
<td>Direct Tech. “8 best practice tips for inventory management.” <a href="http://www.direct-tech.com">www.direct-tech.com</a></td>
</tr>
<tr>
<td>Preparing Inventory Hot Lists</td>
<td>Direct Tech. “8 best practice tips for inventory management.” <a href="http://www.direct-tech.com">www.direct-tech.com</a></td>
</tr>
</tbody>
</table>
Appendix 2: Relevant Figures, Tables, and Graphs

Table 8: Shared familiar and used practices between healthcare and non-healthcare professionals

<table>
<thead>
<tr>
<th></th>
<th>Healthcare</th>
<th></th>
<th>Non-Healthcare</th>
<th></th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easiness</td>
<td>Positive Impact</td>
<td>Easiness</td>
<td>Positive Impact</td>
<td>Easiness</td>
</tr>
<tr>
<td>ABC Classification</td>
<td>4.00</td>
<td>4.80</td>
<td>3.00</td>
<td>5.00</td>
<td>-1.00</td>
</tr>
<tr>
<td>Variability in ROP</td>
<td>3.25</td>
<td>4.00</td>
<td>3.00</td>
<td>5.00</td>
<td>-0.25</td>
</tr>
<tr>
<td>Total Landed Cost</td>
<td>3.50</td>
<td>4.25</td>
<td>1.00</td>
<td>5.00</td>
<td>-2.50</td>
</tr>
<tr>
<td>Centralize Forecasting for SKUs</td>
<td>3.67</td>
<td>4.00</td>
<td>2.50</td>
<td>5.00</td>
<td>-1.17</td>
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Figure 10: Impact vs. easiness for the “best of the best” practices within Healthcare organizations

Figure 11: Impact vs. easiness for the “best of the best” practices within Non-Healthcare organizations
### Table 9: Results of the Mann-Whitney U Test

<table>
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<th></th>
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### Table 10: Scores assigned to each practice by each organization in the “Best Practice Weighting” page

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<th>Centralize Forecasting for SKUs</th>
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<th>Focus on Reducing High-Usage Inventory</th>
<th>Compare Suppliers Based on Total Landed Cost</th>
<th>Eliminate Approvals for Routine Purchases</th>
<th>Classify Inventory with ABC Classification</th>
<th>Assign Location Codes to Storage Areas</th>
<th>Itemize the Inventory</th>
<th>Liquidate Unwanted Inventory</th>
<th>Use the 5S’s</th>
<th>Create Cross-Functional Teams</th>
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<td>337.19</td>
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<td>655.86</td>
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<td>1197.75</td>
<td>1172.75</td>
<td>777.03</td>
<td>481.25</td>
<td>733.03</td>
<td>1267.11</td>
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### Table 11: Ordinal rankings of each practice by each organization

<table>
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<th>Ordinal Rankings</th>
<th>Centralize Forecasting for SKUs</th>
<th>Account for Variability in Setting the Reorder Point</th>
<th>Focus on Reducing High-Usage Inventory</th>
<th>Compare Suppliers Based on Total Landed Cost</th>
<th>Eliminate Approvals for Routine Purchases</th>
<th>Classify Inventory with ABC Classification</th>
<th>Assign Location Codes to Storage Areas</th>
<th>Itemize the Inventory</th>
<th>Liquidate Unwanted Inventory</th>
<th>Use the 5S’s</th>
<th>Create Cross-Functional Teams</th>
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### Table 12: Calculated weights for each practice using equation (1) by each practice’s ranking

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<th>Account for Variability in Setting the Reorder Point</th>
<th>Focus on Reducing High-Usage Inventory</th>
<th>Compare Suppliers Based on Total Landed Cost</th>
<th>Eliminate Approvals for Routine Purchases</th>
<th>Classify Inventory with ABC Classification</th>
<th>Assign Location Codes to Storage Areas</th>
<th>Itemize the Inventory</th>
<th>Liquidate Unwanted Inventory</th>
<th>Use the 5S’s</th>
<th>Create Cross-Functional Teams</th>
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<tr>
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<td>53.61%</td>
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<td>66.86%</td>
<td>40.35%</td>
<td>73.49%</td>
<td>80.12%</td>
<td>86.74%</td>
<td>100.00</td>
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<td>53.61%</td>
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<td>86.74%</td>
<td>33.72%</td>
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<td>60.23%</td>
<td>93.37%</td>
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<td>80.12%</td>
<td>73.49%</td>
<td>40.35%</td>
<td>46.98%</td>
<td>53.61%</td>
<td>66.86%</td>
<td>60.23%</td>
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<td>33.72%</td>
<td>46.98%</td>
<td>53.61%</td>
<td>93.37%</td>
<td>80.12%</td>
<td>66.86%</td>
<td>86.74%</td>
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<tr>
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<td>73.49%</td>
<td>60.23%</td>
<td>33.72%</td>
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<td>86.74%</td>
<td>66.86%</td>
<td>53.61%</td>
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<tr>
<td>Organization 6</td>
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<td>66.86%</td>
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<td>53.61%</td>
<td>60.23%</td>
<td>40.35%</td>
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<td>93.37%</td>
<td>80.12%</td>
<td>100.00%</td>
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<td>40.35%</td>
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<td>93.37%</td>
<td>33.72%</td>
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### Table 13: Summary of individual organizations’ scores within each practice

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<tr>
<th>Organization</th>
<th>Centralize Forecasting for SKUs</th>
<th>Account for Variability in the Reorder Point</th>
<th>Focus on Reducing High-Usage Inventory</th>
<th>Compare Suppliers Based on Total Landed Cost</th>
<th>Eliminate Approvals for Routine Purchases</th>
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<tr>
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<td>32.00%</td>
<td>40.00%</td>
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<td><strong>AVG:</strong></td>
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<td>75.56%</td>
<td>52.44%</td>
<td>83.70%</td>
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Appendix 2: Relevant Figures, Tables, and Graphs (cont.)

Table 14: Summary of individual organizations’ scores within each practice (cont.)

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<th>Logistics Services</th>
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<tr>
<td>AVG:</td>
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<td>87.41%</td>
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Table 15: Average percent target met by industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Average % Target Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributor</td>
<td>76.00%</td>
</tr>
<tr>
<td>Healthcare Provider</td>
<td>78.00%</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>80.00%</td>
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</tbody>
</table>

Figure 13: Percent target met by each organization
Appendix 3: Review Worksheet

Inventory Management
Relevant Practices Review Worksheet

**Purpose:** We are developing a software tool in order to help supply chain professionals of healthcare providers assess how well they are applying industry-proven inventory management best practices within their company. This tool will then recommend areas of improvement in inventory management.

**Instructions:** We are asking for your input as a supply chain professional to help us with our understanding of inventory management best practices. The following review worksheet will allow you to provide input on whether your organization uses the practice and the relevancy of the practice to inventory management.

Definitions of the practices listed in this worksheet may be found in the Appendix (p. 7 – 10).
### Appendix 3: Review Worksheet (cont.)

**Instructions:** This section of the worksheet is designed to assess whether the following practices and activities are relevant to your organization and to the field of inventory management in general. Please indicate whether or not your organization utilizes the practice by placing an ‘x’ in the space to the left of “Y” or “N”. Then, respond on a scale from 1 to 5 (by placing an ‘x’ in the space to the left of the number) to the following questions about each practice:

- **How familiar are you with this practice/activity? (1 = not familiar / 5 = very familiar)**
- **To what extent do you perceive this practice/activity as having a positive impact on an organization? (1 = no positive impact / 5 = very impactful)**
- **To what extent do you perceive this practice/activity as being difficult to implement? (1 = not difficult to implement / 5 = very difficult to implement)**

<table>
<thead>
<tr>
<th>Practice</th>
<th>(Y/N)</th>
<th>Familiarity</th>
<th>Impact</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(1-5)</td>
<td>(1-5)</td>
<td>(1-5)</td>
</tr>
<tr>
<td>Account for Variability in Setting the Reorder Point</td>
<td>(Y/N)</td>
<td>(1-5)</td>
<td>(1-5)</td>
<td>(1-5)</td>
</tr>
<tr>
<td>Assign Location Codes to Storage Areas</td>
<td>(Y/N)</td>
<td>(1-5)</td>
<td>(1-5)</td>
<td>(1-5)</td>
</tr>
<tr>
<td>Perform Activity Based Costing</td>
<td>(Y/N)</td>
<td>(1-5)</td>
<td>(1-5)</td>
<td>(1-5)</td>
</tr>
</tbody>
</table>
Appendix 3: Review Worksheet (cont.)

5. Buy from Suppliers Located Close 
   (___Y ___N)
   a) __1 __2 __3 __4 __5
   b) __1 __2 __3 __4 __5
   c) __1 __2 __3 __4 __5

6. Utilize Capacitated Pricing 
   (___Y ___N)
   a) __1 __2 __3 __4 __5
   b) __1 __2 __3 __4 __5
   c) __1 __2 __3 __4 __5

7. Compare Suppliers Based on Total Landed Cost  
   (___Y ___N)
   a) __1 __2 __3 __4 __5
   b) __1 __2 __3 __4 __5
   c) __1 __2 __3 __4 __5

8. Create Cross-functional Teams 
   (___Y ___N)
   a) __1 __2 __3 __4 __5
   b) __1 __2 __3 __4 __5
   c) __1 __2 __3 __4 __5

9. Perform Cycle Counting 
   (___Y ___N)
   a) __1 __2 __3 __4 __5
   b) __1 __2 __3 __4 __5
   c) __1 __2 __3 __4 __5

10. Focus on Reducing High-Usage Inventory  
    (___Y ___N)
    a) __1 __2 __3 __4 __5
    b) __1 __2 __3 __4 __5
    c) __1 __2 __3 __4 __5
Appendix 3: Review Worksheet (cont.)

11. Install a Supplier Rating System  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5

12. Itemize the Inventory  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5

13. Use Linear Purchasing  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5

14. Liquidate Unwanted Inventory  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5

15. Pick into Multibin Carts  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5

16. Use Price Reduction Strategies  
   (___Y ___N)  
   a)   1 2 3 4 5  
   b)   1 2 3 4 5  
   c)   1 2 3 4 5
Appendix 3: Review Worksheet (cont.)

17. Reduce the Number of Product Options

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5

18. Perform a Spend Analysis

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5

19. Tune up Preference Lists

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5

20. Update PO Information

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5

21. Use the 5 S’s

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5

22. Centralize Forecasting for SKUs

   
   (___Y ___N)

   a) ___1  ___2  ___3  ___4  ___5
   b) ___1  ___2  ___3  ___4  ___5
   c) ___1  ___2  ___3  ___4  ___5
Appendix 3: Review Worksheet (cont.)

23. Increase Forecast Frequency

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5

24. Consider External Factors in Forecasting

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5

25. Compare Forecasts to Actual Demand

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5

26. Optimize Safety Stock

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5

27. Set up a Reverse Logistics System

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5

28. Eliminate Approvals for Routine Purchases

 isNew Y N
     a) 1 2 3 4 5
     b) 1 2 3 4 5
     c) 1 2 3 4 5
Appendix 3: Review Worksheet (cont.)

29. Automated Data Collection

( ___Y ___N )

a) ___1   ___2   ___3   ___4   ___5
b) ___1   ___2   ___3   ___4   ___5
c) ___1   ___2   ___3   ___4   ___5

30. Use a Flexible Forecasting System

( ___Y ___N )

a) ___1   ___2   ___3   ___4   ___5
b) ___1   ___2   ___3   ___4   ___5
c) ___1   ___2   ___3   ___4   ___5
Appendix 3: Review Worksheet (cont.)

Appendix

1. **Classify Inventory With ABC Classification:** This practice focuses on the process of analyzing inventory according to usage, either in terms of value or amount and then assigning it as either “A” (most consumed/valuable), “B” (middle-most consumed/valuable), or “C” (least consumed/valuable).

2. **Account for Variability in Setting the Reorder Point:** This activity focuses on examining how an organization calculates its reorder point, ensuring that statistical variation (i.e. standard deviation of lead times and demand) in the reorder point is captured in the calculation. The reorder point is the level of inventory of an item at which a replenishment order is to be placed.

3. **Assign Location Codes to Storage Areas:** This activity focuses on organizing a storage space (warehouse, storage closet, etc…) in such a way that employees are able to more easily and efficiently store and pick items. This eliminates the need for employees to have to memorize a specific item’s location within a storage area, but rather memorize the locations within the storage area itself.

4. **Perform Activity Based Costing:** This practice focuses on determining the activities and assigning overhead cost of each activity in the inventory system. Overhead costs are assigned to activities according to actual consumption of resources. After determining all activities involved and the corresponding resource utilization of each activity, costs can be easily assigned to products and services according to demanded activities.

5. **Buy from Suppliers Located Close:** This practice focuses on finding savings in total landed cost of inventory by purchasing from suppliers physically located close to your organization.

6. **Utilize Capacitated Pricing:** This activity focuses on the process of limiting the ability of purchasing specific items with the constraint of a predetermined budget. This activity requires accountability of each department to stay within its predetermined budget. For example, if the budget to purchase item X is $10, and brands A, B, and C cost $2, $4, and $8 respectively, only two of the three items may be purchased in combination, but not all three.

7. **Compare Suppliers Based on Total Landed Cost (TLC):** This activity focuses on examining the total cost of purchasing an item from suppliers rather than simply relying on the quote given by the supplier, and using that total cost to choose the best supplier. The total landed cost (TLC) includes costs such as transportation, duties, taxes, brokerage fees, foreign exchange risk, supplier payment terms, and other costs associated with the delivery of the item to your organization. This calculation can be performed by internally developed spreadsheets or third-party software that is available for purchase.
Appendix 3: Review Worksheet (cont.)

8. **Create Cross-functional Teams:** This activity focuses on the fostering business meetings and project team that include representatives from many disciplines and departments.

9. **Perform Cycle Counting:** This activity focuses on checking inventory partially and frequently during the year and keeping the inventory as accurate and up to date as possible. While it is possible to Cycle Count an entire inventory by hand, it is much more commonly used as a sampling technique to make an inference about the count of items in the whole warehouse; that is, the accuracy of the items in the cycle count can be used to determine the accuracy of the items in the warehouse as a whole.

10. **Focus on Reducing High-Usage Inventory:** This practice focuses on reducing inventory for high-usage items. Rather than focusing on reducing overall inventory, this brings the scope of inventory reduction to a smaller scale, which allows for greater attention to detail.

11. **Install a Supplier Rating System:** This activity focuses on the formulation and implementation of a rating system to be used by an organization to rank their suppliers. The results of this system should be made available to the supplier in order that problem areas can be identified sooner rather than later. While criterion will vary from company to company, common examples include pricing, measures related to flexibility, promptness, and order accuracy.

12. **Itemize the Inventory:** This practice focuses on correctly identifying your inventory based on its form, fit, and function. If an item of inventory has a difference in any one of those areas, it should be classified as a unique item type. Similar item types may be grouped using group codes.

13. **Use Linear Purchasing:** This practice focuses on the division and assignment of key activities of purchasing (sourcing, confirmations, discrepancies, resolutions, etc…) to experts of each particular function. This requires an in-depth understanding of each function in the purchasing process.

14. **Liquidate Unwanted Inventory:** This practice focuses on the classification of inventory based on value related to return on investment. Inventory that does not contribute profitable margins should be disposed of in one of the following ways: movement of stock to another area of the organization that needs it, substitution of the item for a less expensive one, return of the inventory to the vendor, donating the material to a non-profit organization, or throwing the material away.

15. **Pick into Multibin Carts:** This activity focuses on improving efficiency of picking. When an employee is picking multiple orders in one walkthrough, he should have a multibin car which allows him to organize the orders during picking, rather than requiring sorting after picking.
Appendix 3: Review Worksheet (cont.)

16. **Use Price Reduction Strategies**: This practice focuses on investigating strategies to reduce the price of an item/service purchased. Includes strategies such as aggregate purchasing.

17. **Reduce the Number of Product Options**: This activity focuses on reduction in SKUs by physically offering less product options to consumers. Rather than offering many, slightly varied products, offer fewer, more encompassing products. This requires examining the least-used features in the current products offered, deciding which rarely-used features are non-essential, and, based off of this analysis, deciding which products no longer need to be offered.

18. **Perform a Spend Analysis**: This activity focuses on finding new areas of savings, while not losing or compromising previously negotiated areas of savings. Spend analysis is the process of collecting, cleansing, classifying, and analyzing expenditure data.

19. **Tune up Preference Lists**: This activity focuses on the updating of medical preference lists of a healthcare provider. Preference lists should be current and there should be no duplicate PLs.

20. **Update Purchase Order Information**: This activity focuses on the assurance of accuracy and relevancy of PO information in an organization’s system.

21. **Use the 5S’s**: This practice focuses on improving physical inventory storage. For any storage area for an organization, the area should be sorted (remove unnecessary materials and tools), simplified (neatly arranged materials and tools), swept (conduct a cleaning campaign), standardized (performed the aforementioned ‘S’s at frequent intervals), and self-disciplined (making habit of following the first four ‘S’s). The cross-training of staff is required for successful implementation.

22. **Centralize Forecasting for SKUs**: This activity focuses on ensuring that only one person is charged with the task of forecasting particular SKUs.

23. **Increase Forecast Frequency**: This activity focuses on increasing the frequency of forecasting in the organization. It is best practice to forecast monthly, if not weekly.

24. **Consider External Factors in Forecasting**: This practice focuses on increasing forecast accuracy through the increased knowledge of the forecast. Forecasts should include historical data, economic or environmental factors, promotions and events, collaborative information (from customers and/or salespeople), and the forecast horizon (forecasting with lead time in mind).
Appendix 3: Review Worksheet (cont.)

25. **Compare Forecasts to Actual Demand:** This practice focuses on improving the quality of forecasts. Once a business period is over, compare actual demand to forecasted demand to gain insight as to how well the organization is forecasting accurately. It is best to sort discrepancies by greatest magnitude and by ABC classification.

26. **Optimize Safety Stock:** This practice focuses on holding appropriate amounts of safety stock. Different SKUs will require different levels of safety stock. Typically, high-profit items, products with erratic usage and lead times, and items that are typically back-ordered require more safety stock. Items that have consistent usage or low usage (especially expensive low-usage items) require less safety stock. This may also be achieved by requiring shorter lead times from your suppliers.

27. **Set up Reverse Logistics System:** This practice focuses on implementing a system to handle returned items from customers. This includes not only collecting the items, but also an internal method for determining the most profitable or least costly way of disposal of said items.

28. **Eliminate Approval of Routine Purchases:** This practice focuses on the reduction of bureaucracy involved in acquisition of regularly demanded inventory by managers relinquishing control. This practice eliminates the need for a manager to approve every single order, especially when concerning items of regularly known demand. This can be done well by performing occasional audits of routine purchases or examining larger purchases after-the-fact.

29. **Automated Data Collection:** This practice focuses on improving inventory management through the use of automation. Using a unique identifier for every item of inventory (barcode, RFID tag, etc…) combined with scanners streamlines data collection, improving accuracy of information.

30. **Use a Flexible Forecasting System:** This activity focuses on acquiring a forecasting system that is flexible. Flexibility is defined as the ability of a forecasting system to forecast using more than one method or formula. This is required because not every SKU has the same (or even close to the same in some cases) demand patterns; therefore, using the same forecasting formula for all SKUs will result in error.
Inventory Management Readiness Assessment Tool
User’s Guide*

This document provides detailed instructions on how to complete the Inventory Readiness Assessment Tool. Please follow all steps in order to complete the tool. Best practice definitions may be found on the last two pages of this document following the step-by-step instructions.

*This tool was designed using a Windows-based system. If possible, use the tool on a Windows machine to ensure the formatting is consistent with its intended look. Also, please ensure upon opening the tool that macros are enabled.
Step 1 (3 minutes)

- Click "Main Menu" to begin using the tool.
- Click the "Demographic Questions" button and complete the section.
- Place an "x" in the blank corresponding to your response. Please only answer the questions labeled "*Please answer this question*".

Step 2 (5 minutes)

- Click to "Practice Definitions" button to review the best practices that are to be covered in this tool.
- Once reviewed, please click the "Rank Order Practices" button.

Step 3 (10 minutes)

- On the "Rank Order Practices" page, scroll to Section 1
- For Section 1, please place a rank between 1 and 11 (1 being the highest-ranked) each of the practices according to their contribution to overall effectiveness of Inventory Management.
- Once completed, Section 2 should be fully populated. If not, please ensure all ranks, 1 through 11, have been assigned and that there are no duplicates.
- For Section 2, please assign a score between 1 and 100 (100 being the best) that is consistent with your ordinal ranking (Rank 1 is automatically assigned a score of 100). For example, if the 3rd-ranked practice has a lower score than the 4th-ranked practice, an error message should display.
- When completed, please return to the Main Menu.

Step 4 (30-45 minutes)

- Now it is time to begin answering the questions relevent to your organization's involvement in Inventory Management best practices.
- Starting with any of the four button located under "Fundamental Objectives", answer each of the questions by clicking on the button with your corresponding answer.
- The scale of 1 to 5 is defined on each page.
- Once all questions have been answered for each section, please return to the Main Menu.
Step 5 (10 minutes)

• Click the "View Score" button to view your organization's score.
• The table at the top of the page is the tabulation of scores for each practice. A "Raw Weight" of 100 has been assigned to each practice, and your information provided in the rank-ordering section of this spreadsheet will aid in defining those weights.
• Each practice's score is calculated against it's total possible score, and a percent target met is calculated.
• Clicking the "Score Charts" button will snap to the charts generated by the tool.
• The Spider and Bar Score Comparison charts are two ways of showing the same information: "How close does my organization come to meeting the highest potential in performing a particular best practice?"
• The Percent Target Met Bar chart displays visually the percent target met that was calculated.
• Clicking the "Individual Scores" button will take you to your responses for each question for each practice.
• This is helpful in many ways. First, it allows you to see immediately which practices need improvement. Also, it allows you to review your responses in case you believe you were too harsh or too lenient for a particular response. A "Review" button for each fundamental objective is provided at the bottom of each on for easy-review.
• Once completed, please return to the Main Menu.

Step 6 (5 minutes)

• Click the "Tool Review" button
• This portion of the spreadsheet asks you to review the usefulness, usability, and effectiveness of the tool.
• Please respond to each of the 9 questions by clicking on the button corresponding to your opinion on a scale from 1 to 5 (1 being the lowest, and 5 being the highest).
• While not required, your comments, suggestions, and recommendations are appreciated.

Step 7

• When all steps have been completed, please email your completed spreadsheet to jcastrod@uark.edu.
Practice Definitions

- **Centralize Forecasting for SKUs** - This activity focuses on ensuring that only one person is charged with the task of forecasting the demand for particular SKUs.

- **Account for Variability in Setting the Reorder Point** - This activity focuses on examining how an organization calculates its reorder point, ensuring that statistical variation (i.e. standard deviation of lead times and demand) in the reorder point is captured in the calculation. The reorder point is the level of inventory of an item at which a replenishment order is to be placed.

- **Focus on Reducing High-Usage Inventory** - This practice focuses on reducing inventory for high-usage items. Rather than focusing on reducing overall inventory, this brings the scope of inventory reduction to a smaller scale, which allows for greater attention to detail.

- **Compare Suppliers Based on Total Landed Cost** - This activity focuses on examining the total cost of purchasing an item from suppliers rather than simply relying on the quote given by the supplier, and using that total cost to choose the best supplier. The total landed cost, also known as lowest total cost, includes costs such as transportation, duties, taxes, brokerage fees, foreign exchange risk, supplier payment terms, and other costs associated with the delivery of the item to your organization. This calculation can be performed by internally developed spreadsheets or third-party software that is available for purchase.

- **Eliminate Approvals for Routine Purchases** – This practice focuses on the reduction of bureaucracy involved in acquisition of regularly demanded inventory by managers relinquishing control. This practice eliminates the need for a manager to approve every single order, especially when concerned items of regularly known demand. This can be done well by performing occasional audits of routine purchases or examining larger purchases after-the-fact.
• **Classify Inventory with ABC Classification** - This practice focuses on the process of analyzing inventory according to usage, either in terms of value or amount and then assigning it as either “A” (most consumed/valuable), “B” (middle-most consumed/valuable), or “C” (least consumed/valuable).

• **Assign Location Codes to Storage Areas** - This activity focuses on organizing a storage space (warehouse, storage closet, etc…) in such a way that employees are able to more easily and efficiently store and pick items. This eliminates the need for employees to have to memorize a specific item’s location within a storage area, but rather familiarize themselves with the locations within the storage area itself.

• **Itemize the Inventory** - This practice focuses on correctly identifying your inventory based on its form, fit, and function. If an item of inventory has a difference in any one of those areas, it should be classified as a unique item type. Similar item types may be grouped using group codes (e.g. UNSPSC codes).

• **Liquidate Unwanted Inventory** – This practice focuses on the classification of inventory based on value related to return on investment. Inventory that does not contribute profitable margins or is not of necessity to the business should be disposed of in one of the following ways: movement of stock to another area of the organization that needs it, substitution of the item for a less expensive one, return of the inventory to the vendor, donating the material to a non-profit organization or throwing the material away.

• **Use the 5S’s** - This practice focuses on improving physical inventory storage. For any storage area for an organization, the area should be sorted (remove unnecessary materials and tools), simplified (neatly arranged materials and tools), swept (conduct a cleaning campaign), standardized (performed the aforementioned ‘S’s at frequent intervals), and self-disciplined (making habit of following the first four ‘S’s). The cross-training of staff is required for successful implementation.

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