DIALOGUE

Dawson Dialogue

Slow Moving Inventory

'All dressed up and nowhere to go'

DAWSON CONSULTING

a Dawson Group company

About the authors

Wayne Patch OAM, Senior Consultant.

Wayne Patch, a Senior Consultant with Dawson Consulting, has over 10 years of logistics experience with an emphasis on inventory management. Working with private and public sector organisations, Wayne has assisted with improving inventory management performance. Activities performed include inventory management system design, selection, implementation and optimisation; policy and procedures review and development; as well as inventory management strategy development. Wayne was recently awarded an Order of Australia Medal for his contribution to logistics, in particular his efforts with inventory management.

Fred Wintle, Managing Partner

Fred Wintle is a managing partner of Dawson Consulting and specialises in the functions of planning, process analysis & design and organisation structure especially as they relate to the supply chain. Fred has had a wide variety of experience in various industries, both in line-management roles up to Chief Executive level and in providing management consulting services. Fred has lead recent assignments in the retail and banking and finance industries including business planning, process re-design, cost management and organisational structure. Fred has been engaged in professional consulting for fifteen years including a period as State Director, Consulting, for a "big five" accounting firm.

With economic slowdown a global reality, companies are stepping up their efforts to find operating efficiencies and reduce capital requirements. The name of the game is no longer grow at any cost. Now, the cost of generating sales – return on assets (ROA) and return on investment (ROI) – carry significant weight. As part of an overall effort to become more efficient and compete in a tough economic environment, we suggest organisations need to review their approach to inventory management. We believe that concentrating in this area will produce significant and short-term results.

For most major international companies inventory management focus has only really applied to fast moving stock items. This is mainly because of the revenue generating ability these items have for the business. Suffice to say that international organisations have done fairly well managing inventory for fast movers (refer Figure 1).

Fast moving inventory performance – 1995 to 2000[1]	
Inventory days of supply:	Dropped 16% to 63 days[2]
Inventory % of revenue:	Dropped from 19% to 15%
Inventory turns:	Up by 12% to average of 5.4 annual turns
Average cash-to-cycle time[3]:	Reduced 10% to 100 days

But think of the stock that companies have to carry that doesn't turn over so quickly; the so called slow moving inventory (SMI). Our experience shows that the management of SMI has not been quite as stellar. Companies can have hundreds or thousands of SKU's sitting in the warehouse sometimes costing millions of dollars each year just gathering dust sitting on a shelf until they are needed.

One issue that has hindered the progression of thinking in this area is the approach most companies have taken to SMI. There are many instances where organisational policies, competing priorities, system support and staff training or the lack thereof has resulted in inappropriate quantities of slow moving items being held. Dawson Consulting's experience in this area has revealed that for the majority of companies holding SMI levels of up to 15-20% is well in excess. Companies who are addressing this situation are yielding one-time returns of over 200% and on-going returns from reduced carrying charges above 25%.

Computing system constraints and a sales-based approach to business contribute to the emphasis on

fast moving items. At the time when most systems were built and organisations were implementing systems, computer power was expensive so focus was given to developing programs that concentrate on the items 'that mattered' – the fast moving items. Even then, short cuts were taken. Consequently, functionality for the slow moving items was rudimentary or non-existent.

Despite these limitations, which in some instances may extend back to the 1970s, many organisations have not addressed the situation. Rather- time has been allowed to entrench existing thought processes in relation to SMI. Computer power, for instance, is no longer a constraint as there are algorithms readily available to more accurately determine a company's inventory requirements. This, in addition to the fact that it is easy to deploy change to a company's policies and procedures in this area, is assisting organisations with making informed decisions about the inventory holding requirements of its' slow moving items.

The name of the game is no longer grow at any cost

So what is slow?

What constitutes 'slow moving' will vary from organisation to organisation. However, from a requirements determination perspective, slow moving items may be classified as ***items that have less than six months of demand in the preceding 12 months***. As a result, the 'slow' moving items within a consumer goods inventory such as groceries, may not be classified as slow moving within other categories. At the other extreme, there may be some organisations such as those in a maintenance, repair and operations (MRO) environment where ***most*** stock items, like spare parts, may be considered to be slow. This broad criterion is based on the ability to apply ***time series based forecasting*** techniques. So in essence, slow moving items are items that cannot be forecasted in the normal way.

Accordingly, the need to consider SMI and the emphasis that should be given to the item depends on the nature of the inventory. In some instances, the most appropriate policy on slow moving items is to remove them altogether. Within the fast moving consumer goods (FMCG) environment, an item that 'does not move' is out. Where it is impractical to remove such items from the inventory altogether, which is typical of an MRO environment or organisations that support MRO customers; appropriate management methods need to be devised and applied.

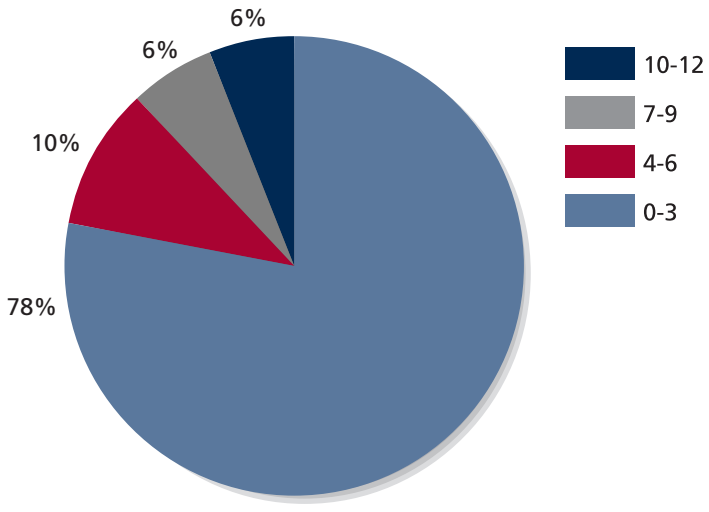
So who then would benefit most from reviewing their SMI management practices? Generally, it is those organisations with relatively old inventory management systems in place and a large number of slow moving items that benefit most from such a review. Industries such as automotive, defence, industrial equipment and spare parts providers are all prime grounds for benefit.

Australian truck retailer

A recent project carried out by Dawson Consulting using the new analysis techniques, with a leading Australian truck retailer provides such an example of the actual benefits realised through reviewing SMI management practices.

This retailer sells a popular light to medium range of trucks and at present; over 50,000 of these trucks

Figure 2 – Parts inventory movement (months of demand)



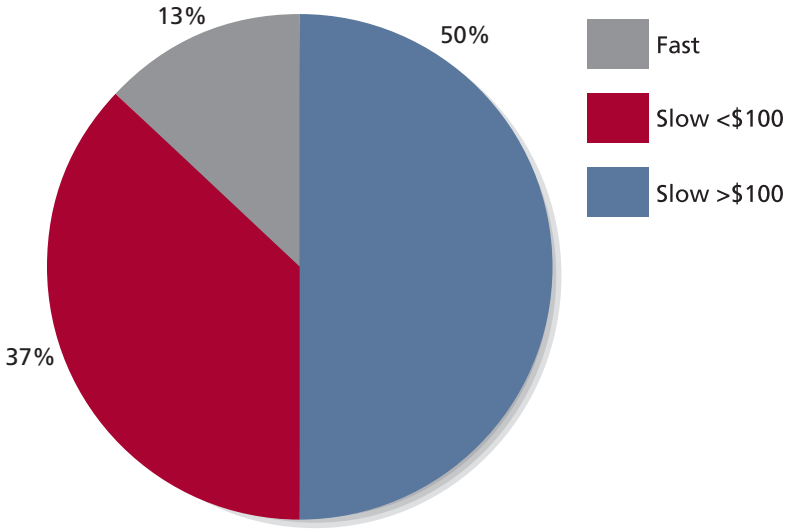


Figure 3 – Inventory composition – fast and slow items

operate on Australian roads. In order to support this number of vehicles, an inventory of approximately 20,500 different parts was required and through analysis, nearly 85 percent of these parts were considered slow moving (refer Figure 2).

Approximately 13,000 parts had a value of less than $100[4] and had been in the inventory for a sufficient period- (refer Figure 3). A summary of the results is shown in Figure 4. As highlighted, approximately 1,300 items were understocked and could impact customer service levels, over 5,300 items were appropriately stocked and over 6,300 items were considered to be over-stocked. More importantly, approximately 3,000 of the overstocked parts were considered obsolete. Therefore it was found that in reality instead of 20,500 different stock items, only 17,500 were actually needed.

To rectify the situation, an investment of approximately $75,000 was needed to address the understocked items. The overstocked component represented approximately $470,000. Our review showed that existing practices were borrowed from those applied to fast moving items, and were therefore insufficient to meet requirements in the SMI area. The truck retailer responded with new policies, practices and algorithms. This response included segmenting the inventory and determining appropriate service levels for each segment, documenting procedures for the

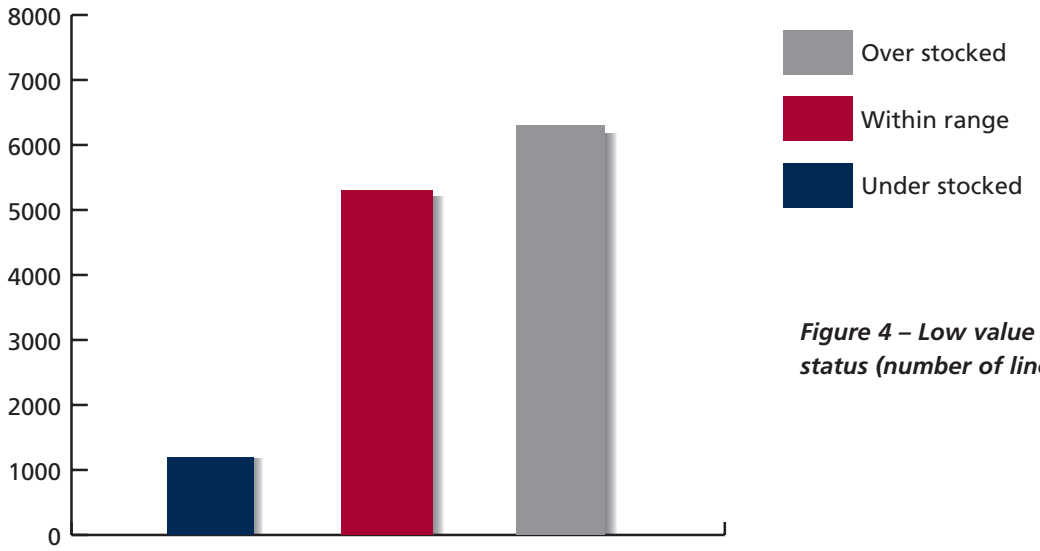


Figure 4 – Low value SMI status (number of lines)

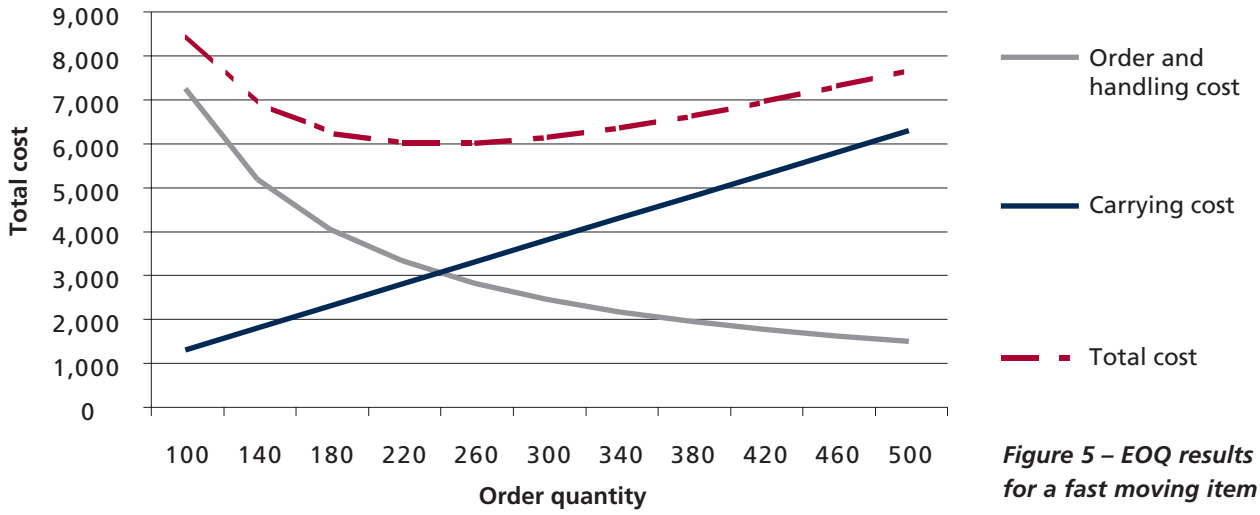


Figure 5 – EOQ results for a fast moving item

introduction of new items into the inventory, which included order quantity calculation variables and calculating more appropriate replenishment variables (re-order point and re-order quantity) for the slow moving. In total, this exercise took about 12 weeks to complete and provided significant cost savings to the client.

Rethinking Existing Practices

Generally, organisations have developed strong forecasting and inventory management procedures that lead to consistent availability for the inventory that 'mattered' (typically fast moving items) and not for slow moving items. The resulting mistakes of this approach tend to be costly because low levels of demand make it difficult to rectify the problem quickly. Our experience with clients has shown that inventory management practices need to take slow moving items into account. Four areas of regular concern are discussed below.

Use of Economic Order Quantity (EOQ) model

The EOQ model is orientated around minimising the costs associated with introducing (or ordering) an item into inventory versus holding an item within the inventory. Taking ordering, handling and carrying costs into account, the model finds the optimal order quantity that potentially provides the best long-term value. Figure 5 illustrates the application of EOQ for a 'fast' moving item[5]. In this instance, the least cost option involves using order quantities of 260 units.

While the EOQ model is simple and often does the job, there are limitations.

One 'shortcut' widely used is that 'broadly' acceptable variables like order handling costs, carrying costs and transport costs will suffice. Lambert and Stock (1993) highlight the folly of using representative industry values. In the case of Air Force's parts inventory, analysis revealed that using more representative variables in the EOQ equation offered a one off saving of approximately $20M.

Another belief is that the results of EOQ provide the best long-term value. While EOQ definitely offers benefits, what is sometimes ignored is the impact of obsolescence – a situation that tends to occur with SMI this cost is often ignored at the time of ordering.

While EOQ is simple and often does the job, there are limitations

Figure 6 illustrates the application of EOQ to a 'slow' moving low cost item[6]. The normal EOQ trade-off between introducing and holding results in an order quantity of 60 being recommended. Such a result is not uncommon for low value items. Based on recent annual demand of 12 items, this quantity represents the equivalent of five years worth of stock. However, factors such as warranty and the item's life cycle mean that only 20 of the item are ever demanded. In effect, forty items have to be thrown out.

In addition to the normal inventory carrying costs[7] and the associated total cost, Figure 6 shows the inclusion of 'obsolescence' costs as part of inventory carrying[8,9]. The inclusion of costs for stock obsolescence results in a

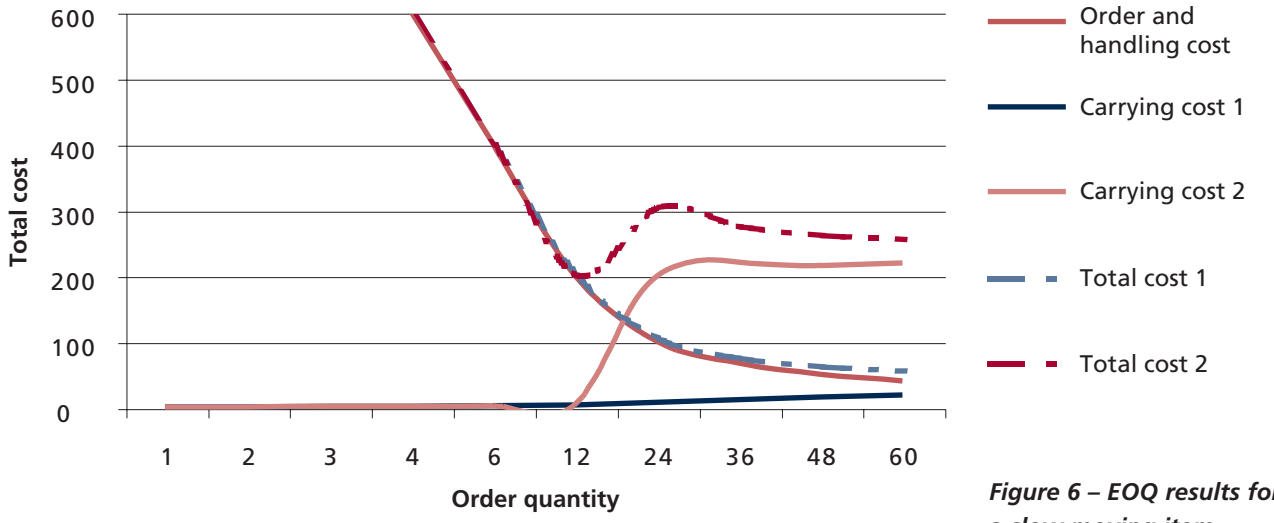


Figure 6 – EOQ results for a slow moving item

different ordering recommendation. The normal approach results in a recommendation to hold the equivalent of five years of stock (60 items) whereas the alternative approach results in a recommendation to hold only 12 months of stock (12 items).

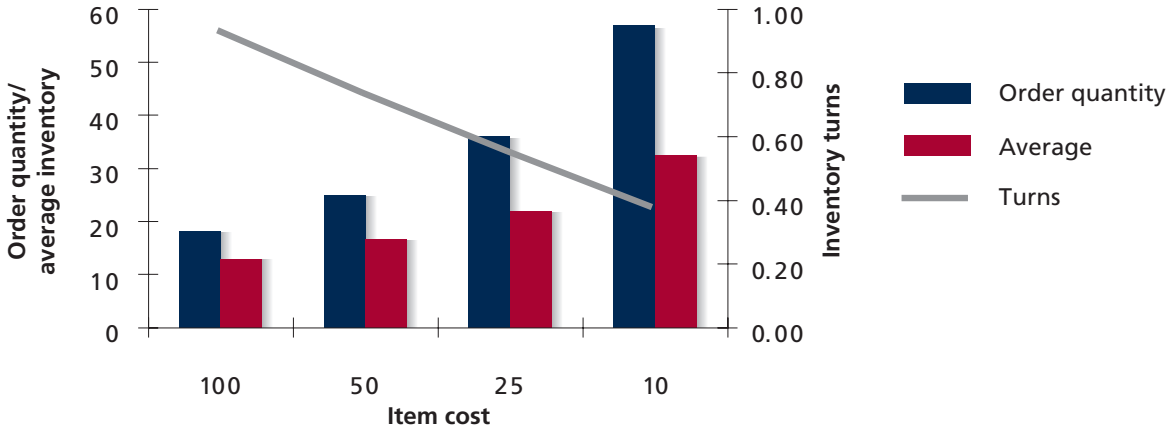
Generally, our suggested policy is to limit the order quantity, say to the equivalent of 12 months usage, until a demand profile can be established. Only when the demand profile; which tends to be a function of the item's life cycle; has stabilised, will demand information allow the determination of the optimal quantity. Limiting the EOQ will assist with identifying the various demand profiles. More importantly, the iterative step to 'order quantity determination' will assist with minimising obsolescence.

Emphasis on Stock Turns

Stock turns are regularly used as a measure of inventory performance (refer Figure 7) Generally, the higher the stock turn ratio, the better the performance. While the axiom of stock turns holds true, the level of acceptable performance often ignores other inventory optimisation techniques, in particular the order quantity determination.

Figure 7 demonstrates the impact on inventory turns of different order quantities[10,11]. As can be seen, as item cost decreases, the order quantity increases and as a result the inventory turns decrease. For those over emphasizing stock turns as a primary KPI, the temptation is to ignore the EOQ functionality and arbitrarily reduce order quantity, which will likely increase total

Figure 7 – Order quantity and inventory turns



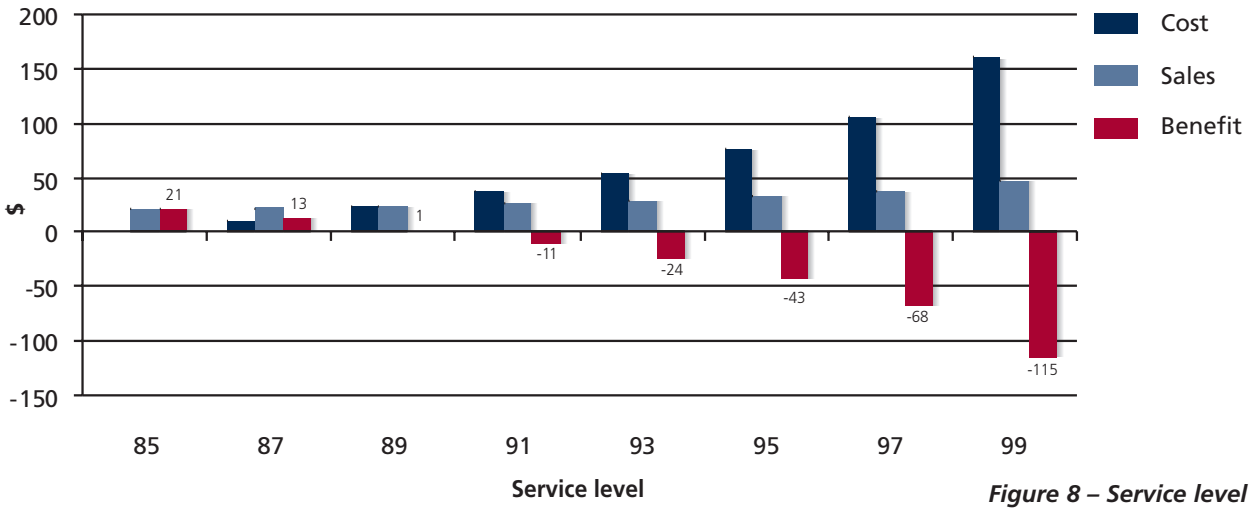


Figure 8 – Service level cost tradeoff

costs beyond optimal levels. Essentially, in the slow moving environment, it is unrealistic to expect high inventory turns for those items that are relatively inexpensive. Several opportunities present themselves. Firstly, stock turns should not be used as a KPI for slow movers. Secondly, staff and management should be educated in stock turns and how it relates to slow moving items, in particular the implications of EOQ.

Tools and Skills Development

With the focus on ensuring that fast moving items are well managed, millions have been spent on improving systems and process and skill development. For instance, ensuring that the Y2K bug did not bite resulted in significant upgrades to enterprise resource planning (ERP) systems. At about the same rate that logistics professionals climbed the learning curve on fast movers, they have fallen behind in the systems, processes and skills required to manage slow movers. Few of the system upgrades dealt with SMI with any power or sophistication. Fewer logistics professionals understand how to make use of or improve on appropriate algorithms such as Croston's method or the Laplace and Poisson based techniques.

Management and staff involved with inventory management typically do not recognise the cost implications of service level decisions

As a result, experience indicates that a large proportion of staff involved in the determination of what and how much inventory to introduce, operate with minimal guidance. Management only interrupt when there is insufficient stock to satisfy a demand. A conservative response is triggered: avoid stock-outs. Allowed to continue, the dominating culture becomes one of avoiding stock-outs at all costs.

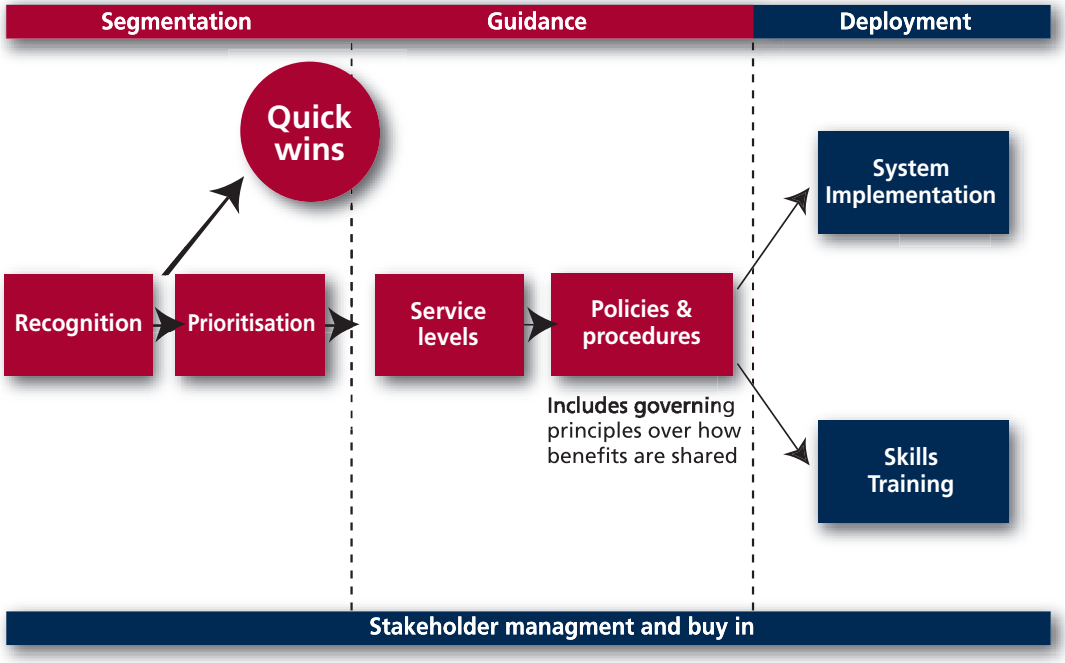
Probability suggests that a 100 percent service level is impossible to obtain. While this is so, very few understand the cost and service implications of the reduced service levels such as the difference of a 95 versus a 99 percent service level. Figure 8[12,13] provides an example of the service level cost analysis. In this instance, an 89 percent service level provides the cost optimal solution[14]. Higher service levels would only add to costs whereas lower service levels would result in lost profit.

Management and staff involved with inventory management typically do not recognise the cost implications of service level decisions. Accordingly developing and using appropriate policies and procedures assists with overcoming this problem.

Policy and procedure development commitment constitutes a critical step in determining the most appropriate service level. Notwithstanding, appropriate tools/techniques for calculating the most appropriate service level are typically required. These tools should answer questions on the implications and costs of various service levels.

Tools are not only required for service level measurement, they are required for to determine the ongoing requirements of the organisation. In effect, there needs to be some way of running the Croston[15],

Figure 9 – Managing slow moving items



Laplace[16] or Poisson[17] calculations, or other appropriate models to produce stock replenishment values. In some instances, it may be appropriate to incorporate some or all of these techniques into the organisation's inventory management system. Alternatively, the values may be calculated externally and used to update the inventory management systems' replenishment values (reorder point and reorder quantity).

The need for policy, procedures, skills training and system support is critical for slow moving items. A lack of demand means that overstocking can take years to resolve- if indeed ever. When inventory managers have the tools, policies and procedures, and these are supported by appropriate training, the prospect of optimal inventory is greatly enhanced.

Insurance items

Insurance items regularly comprise a proportion of the SMI. What constitutes an insurance item and the role that insurance items play will vary significantly. However, what seems to be constant is an extremely conservative approach to the quantity of insurance items held.

Insurance items are typically those items that are not available because they are no longer in production or the timeframe for delivery does not align with customer requirements. For example, a special production run needs to be set up and run or the item is supplied from an overseas supplier either of which would result in an excessively long supply timeframes.

Apart from being known as insurance items, they may be referred to as life-of-type (LOT) and all-time-buy (ATB) items. Insurance items sometimes constitute the higher assemblies. For instance, a gearbox may be held instead of the lower level items.

Experience suggests that whenever insurance requirements are calculated, worst case anecdotal evidence prevails. "I remember when we needed one of them" and "Do you recall the problem caused when we could not supply ..." are typical of the comments heard and used when determining insurance item quantities. In response, the quantity deemed to be needed is usually conservative.

While the need to rely upon professional judgement always exists, the default for insurance items should be calculated rather than guessed. It may mean that the demand data for a similar item needs to be used. Alternatively, it may require that probability/risk analysis needs to be performed in determining requirements.

Insurance items tend to represent the 'hollow log' of inventory management. Items get 'hidden' in the insurance category because the need (and quantity) is rarely questioned. Therefore, lack of policy, procedures and tools in relation to SMI will only foster this approach.

Maintaining the focus

SMI requires focused management effort. Not only is care required during the introduction phase, on-going effort is required. The fact that life cycle changes mean that some fast moving items become slow moving items only serves to complicate the situation. Analysis of a European vehicle importer provides supporting evidence.

The vehicle importer was in the process of releasing a new model onto the market. Part of the marketing and promotion substantiation for this new vehicle was 'excellent support'. In response, the inventory managers were encouraged to ensure that 'all' demands for parts could be met from the local inventory. Without the necessary guidance and tools, the inventory managers did their best. In hindsight, however, analysis reveals that they introduced over 1600 lines that were never needed. These items have a cost value of over $635,000, which will ultimately have to be written off. While it is improbable that you'll be able to get it right every time, you could do a lot better.

This situation highlights the need to for tools and policies. Collectively, this could have assisted with determining more accurately which items to introduce and how many.

All is not lost. The information associated with the 'unusable' items constitutes a valuable resource. It tells the organisation what not to order next time. On this basis, the information shouldn't be thrown away when the parts are written off. Instead, it should be used a reference for new introductions.

Introduction is one thing, on-going inventory management is another. In some instances, demand can go away. Customers are finding alternative sources of supply. In response, prices may also need to be reviewed. Where the demand has reduced, it may be possible to return some of the items to the supplier rather than allow the items to stagnate in the inventory until they can no longer be used. Again, tools and policies will help.

This situation means that on-going management can provide real value to the organisation. Moreover, unless there is ongoing management, in particular the review of slow moving items, then the obsolete inventory write-off is likely to be higher than is needed.

Tackling Slow Movers

Given the peculiarities in demand patterns and the lack of data to support time-series forecasting, SMI needs to be tackled in a different way. Different policies, procedures, systems and skills need to be formulated and deployed for you to grab any opportunities available within your own operations. In our recent experience within Australia, we have found that opportunities for cost savings within operating and inventory are there to be realised. Therefore Dawson Consulting has developed a structured approach that helps organisations quickly achieve this prize. It involves three simple steps diagrammed in Figure 9: '***Detailed as Segmentation, Guidance and Deployment***'.

Segmentation

Inventory composition and inventory purpose influence inventory management techniques. What is 'slow' moving inventory for one organisation may not be so for another as discussed earlier. Similarly, the need to hold SMI will vary from one organisation to another. Accordingly, the initial step involves determining the amount of SMI. Details such as how the SMI should be segmented, for instance, critical and non-critical and where critical items need to be available 'immediately' (service level).

Experience suggests that whenever insurance requirements are calculated, worst case anecdotal evidence prevails

In general terms, slow moving items are those with less than six months of demand in the previous 12 months. This criteria stems from forecasting functionality. Essentially, different forecasting techniques are required for determining the service level and replenishment requirements for slow moving items.

Once the 'optimal' slow moving item requirements have been determined, the real issue then becomes 'what to do'. Within some organisations, for example retail, it may be appropriate to achieve quick-wins like the immediate removal of any SMI from the inventory. The revenue that these items generate compared to the expense of holding and managing them does not

warrant maintaining them. There will be organisations where slow moving items represent a considerable proportion of the inventory and it is inappropriate to consider purging these items altogether.

Guidance

Where SMI is necessary, as previously mentioned, it needs to be supported with policy and procedures. Specific policy requirements include:

- **Segmentation**. Grouping inventory into logical lots. Included with each segment are details on the segment, why it exists and how it should be managed.
- **Service level**. Details on the service levels that are to be applied to various slow moving segments, for instance, 95 per cent for critical items and 85 per cent to the non-critical items.
- **Introduction**. Guidelines for the introduction of new items into the inventory. What order quantities are to be used or how the order quantity parameters need to be configured.
- **Review**. Guidelines on the need and purpose of inventory reviews. Review of activities may include the need to investigate price, segmentation and service level.
- **Performance**. What indicators are to be used to measure inventory performance, why and what benchmarks are to be used in determining acceptable performance.

A significant proportion of obsolescence occurs because the inventory manager did not have any guidance. 'Guessing' or using the quantity of stock on hand of a similar item may not provide an appropriate solution as there was not any rigour in its stocking recommendation. Instead, using the demand of a similar item, calculating requirements through the use of Poisson, Laplace or Croston based algorithms and associated policy guidance then using the results as the basis of stocking recommendations offers a more appropriate solution.

In addition to how, the procedures need to contain the associated reasoning. For example, how service levels are calculated and why a particular approach is pursued. Unless this supporting information is available, inventory managers may not be able to convince themselves that the procedures will align with policy requirements and may end up doing their own thing.

Deployment

Policy and procedures will definitely help to optimise inventory performance. However, system support is required too. Determining the number of slow moving items, especially when the demand quantity fluctuates significantly can present difficulties. Unless the inventory manager has system support, an overly conservative response usually results, which in turn fosters excessively overstocked SMI.

The sophistication of the slow moving forecasting support will vary from organisation to organisation. Again, the amount of SMI will influence the response. Multi-million dollar slow moving inventories may warrant the implementation or upgrade of distribution resource planning (DRP) functionality. Alternatively, a system, which may constitute a spreadsheet or database that incorporates an appropriate technique, that back loads replenishment information back into the organisation's inventory management system may be appropriate.

The sophistication of the slow moving forecasting support will vary from organisation to organisation

Perhaps the 'glue' in sustaining a strong management of SMI is the development and maintenance of skills. Without working in harmony and at par with policy and tools, your staff at all levels will soon resort to old habits. Logistics professionals need to understand the use of algorithms, including key variables to consider, and how to get peak performance out of their systems. Staff directly involved with ordering need to understand the appropriate performance measures for slow movers and be trained in tactical procedures influencing order and inventory carrying costs. We therefore see the need for at least 20-30 hours annually per staff member. Hardly a large investment to keep SMI at optimum levels.

Next Steps

SMI typically attracts less attention than other classes of inventory except when it comes to cost analysis. "Why is there so much SMI?", constitutes a common response. Why are stock turns so low?

Without the requisite policy, procedures and functionality, inventory managers operate in an uncertain environment. Therefore the conservative response typically

prevails. Essentially, inventory accumulates wherever uncertainty exists. As the examples have highlighted, taking the requisite action offers significant benefits. Not only did the Australian truck retailer identify significant excess inventory, but we also uncovered situations where there was insufficient inventory to meet client requirements.

We invite you to contact us on the addresses overleaf to learn more about our approach and provide a view on what may be possible in managing your company's SMI.

[1] Source: Performance Measurement Group, LLC, January 2000, US Statistics

[2] Best in class is less than 40 days

[3] Number of days between paying for raw materials and getting paid for the product

[4] A two-phased approach was considered in analysing the SMI. Where the value of the part was less than $100, a spot review of recommended inventory values was performed. Where the value was greater that $100, the inventory values for each item were subject to review.

[5] Item and calculation information: annual sales of 3,600, item cost of $100, order and handling cost $200 and an inventory carrying cost equal to 25 percent of item value.

[6] Item and calculation information: annual sales of 12, item cost of $2.50, order and handling cost $200 and an inventory carrying cost equal to 25 percent of item value.

[7] Figure 6 -Carrying cost 1

[8] Figure 6 – Carrying cost 2

[9] Obsolescence costs are $200. Essentially, it costs the same to remove an obsolete item as it does to introduce it.

[10] Item and calculation information: annual sales of 12, order and handling cost $200, an inventory carrying cost equal to 15 percent of item value and a safety stock of 4 items.

[11] In this example, the average stock is equivalent to safety stock plus half of the order quantity.

[12] The Figure 8 information was derived using the following variables: item cost $100, average daily demand 100, standard deviation in demand 20, lead time 10 days, 10% sales margin, 20% capital utilisation charge.

[13] The values for Figure 8 do not represent a slow moving item. Values for a fast moving item have been used for highlight the impact. Note, experience indicates that where a large number of 'cheap' slow moving items are in the inventory, the need for an appropriate service level is critical.

[14] Note, Figure 8 represents the analysis of a particular item. A service level of 89 per cent will not be the optimal level for each item.

Algorithms and Techniques

[15] Croston refers to a technique for determining slow moving requirements. This technique revolves around using an exponential weighted moving average of non-zero demands.

[16] Laplace refers to a probability distribution that is defined by the mean and the standard deviation. Using the average demand and the demand standard deviation, the cumulative probability density function of this distribution allows the number of items associated with a particular probability to be determined. The probability that is used for item selection corresponds to the service level.

[17] Poisson refers to a probability distribution that is defined by the mean. The standard deviation of the Poisson distribution is equal to the square root of the mean. An advantage of the Poisson distribution is that it only requires the mean for it to be able to be used. This fact is also a limitation. Where the standard deviation of demand does not closely align to the square root of the mean, then the Poisson technique is not appropriate. In most instances, Laplace may be used where Poisson is unable to be used. Using the average demand and the demand standard deviation, the cumulative probability density function of this distribution allows the number of items associated with a particular probability to be determined. The probability that is used for item selection corresponds to the service level.

DIALOGUE

Dawson Dialogue

About
Dawson Consulting

Dawson Consulting, part of the Dawson Group of companies, is Australia's largest management consultancy specialising in logistics, supply chain management, and the application of Supply Chain technologies.

With a strong bias towards implementation, Dawson Consulting provides practical, sustainable solutions for modern supply chains. Consistently driving towards measurable outcomes, we generate a rapid return on investment for our clients.

For more information, please visit our website.

Melbourne
1/21 Bedford Street
North Melbourne
Victoria Australia 3051
Ph: +61 3 9326 7577
Fax: +61 3 9326 7588

Sydney
5/153 Walker Street
North Sydney
NSW Australia 2060
Ph: +61 2 9964 9566
Ph: +61 2 9964 9588

www.dawsonconsulting.com.au
info@dawsonconsulting.com.au

DAWSON CONSULTING
a Dawson Group company