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ABC, VED and FSN Analysis with a Twist: Can They Tango Together to Entertain Inventory Managers?

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Key words: ABC, VED, FSN, selective control, inventory

Abstract

Inventory control plays very important role in the overall cost of operations and supply chain of any business big or small. The topic of inventory management has been widely taught, discussed, researched, and reported in many journals. Keeping its importance for business studies in mind, this paper has investigated into some aspects of inventory management systems of an SME in Hawke's Bay region of New Zealand. The paper deals with the existing organisational structure of the company, its supply chain, and its existing classification of items in stores. The company has been using unscientific inventory control and storage methods where pallets are kept on top of one another vertically in the open storage room or stacking them in containers, causing damage to products, and making it difficult to find a particular product when needed. Based on observations, discussion, and data collected, the paper suggests some selective control techniques (viz. ABC, FSN and VED) which can jointly enable the company under focus to manage their inventory in a very cost effective and efficient manner. Some suggestions have also been made for better display and storage of items in the stores for enhanced visibility to customers.

Introduction

Inventory management is defined as the systematic control and regulation of purchase, storage and usage of materials in order to maintain an even flow of production and at the same time avoiding excessive investment in inventories. '*The objective of inventory management is to strike a balance between inventory investment and customer service'* (*Heizer & Render, 2008*). In every kind of business, inventory management consists of a

range of functions such as negotiating with suppliers, ordering, tracking, handling, transporting, storing of goods and materials. An effective inventory management will always give a competitive advantage to the business over its competitors. In addition to reduced operating costs, good inventory control will also result in increased customer retention rate for more businesses in the future.

Research Objectives

The key objective of this paper is to apply selective control techniques (viz. ABC, FSN, and VED) to classify a considerably large number of items in the store of an SME into some logical groups based on *annual value*, *rate of consumption*, and *criticality* of items for the business. The goal behind this approach is to identify the *vital few* items in the business (A class) than the *trivial many* (C class), so that materials manager can keep differential control over them. Literature review has been carried out to highlight the popularity of selective *control techniques* in inventory management.

Literature Review

Selective control techniques are very much on the line of 80/20 rule which has been discussed by researchers in various contexts. Kelly, for example, believes that 80/20 rule is one of the most powerful ideas to be used in many aspects of business (*Kelly, Pareto's 80/20 rule*). Kelly quotes a book '*The Four Hour Work Week'*, in which Tim Ferriss suggests that one should focus one's attention on 20 % of the projects that contribute 80 % of the income. This rule also appears in the book *Tipping Point*, where Malcolm Gladwell calls it '*The Law of the Few'* (*Kelly, Pareto's 80/20 Rule*). Pareto principle states that *for many events, roughly 80 % of the effects come from 20 % of the causes*. Management consultant Joseph Juran named this principle after Italian economist Vilfredo Pareto, who observed in 1906 that 80 %

of the land in Italy was owned by 20 % of the population. He also observed that 20 % of the pea pods in his garden contained 80 % of the peas.

Encounters with 80/20 rules

Yaro compiled a set of examples for the 80/20 rule, viz. 20 % of employees are responsible for 80 % of a company's output; 20 % of customers responsible for 80 % of the revenues (*these are not hard rules, not every company will be like this and the ratio won't be exactly 80/20, but chances are for many key metrics in a business there is definitely a minority creating a majority*); most of our phone calls are directed to a very small number of the people; a large chunk of our money is spent on few things (e.g., rent, mortgage or food); we spend most of our time with only a few people from a big pool of people we know *(Yaro, What is the 80/20 rule and why it will change your life).* Kelly reported other examples viz. 80 % of the money raised for starting a business came from 20 % of investors; 20 % of the advertising campaigns generated 80% of the web traffic for a business; 1 in 7 (over 14 %) venture capital investments is a major success; 80 % of profit comes from 20 % of products; and 95 % of sales in a business came from 20 % of sales team (*Kelly, Pareto's 80/20 rule*).

There is a profound imbalance between what is created and how much time is taken to create it. Koch observes that 80 % of achievement is attained in 20 % of the time; 80 % of happiness is experienced in 20 % of life; and 80 % of time only contributes 20 % of happiness. Koch, however, cautions that these are hypotheses to be tested against individuals experience (*Koch, Applying the secrets of the 80/20 rule*).

So why is 80/20 rule important?

The 80/20 rule is important as it helps us realize that the majority of results come from a minority of inputs. So, if we know that 20 % of workers contribute 80 % of results, then we need to focus on rewarding them; 20 % of bugs contribute 80 % of computer crashes, then we

need focus on fixing these bugs first; and so on. However, one needs to be cautious. The rule does not say one should do only 80 % of the work needed. For example, 80 % of a bridge is built in the first 20 % of the time, but we still need the rest of the bridge.

Selective control in inventory management

Researchers (*Roy & Guin, 1999*) have reported use of selective control techniques (viz. ABC, VED, and FSN) in the inventory management of spare parts and other items of a large steel plant. They concluded that out of about 80,000 different types of items and spare parts used by the steel plant, only 10 % of them were A-Class, and 70 % were C-Class items, and this was a very crucial input for the Company in setting the priority rule for their inventory control. Other researchers have suggested another type of classifications. For example, Patil (n.d.) reported two classifications: SDE (*scarce, difficult, easy*), and HML (*high, medium, low*). VED (*vital, essential, desirable*) classification is applicable to spare parts and is based on factors like criticality, price, availability, etc. While for V items, a reasonably large volume of stocks might be necessary; for D items virtually no stocks needed *(Patil, Selective inventory control method).*

ABC analysis is an inventory control approach, which classifies inventory items, or stock-keeping units (SKUs), based on their *annual dollar value*. However, Flores & Whybark (as in Teunter et al., 2010) have suggested that criteria such as criticality and lead-time can also be combined with ABC analysis to make this selective control technique more realistic. Similarly, Chen et al. (2008) suggested a *dominance-based rough set approach* to multiple criteria ABC analysis which can provide more managerial flexibility by using criteria viz. *lead time* and *criticality*. The most important reason behind using ABC classification is the fact that retailers have to deal with thousands of different items or SKUs in their stores. The service level in each class of SKU is generally kept the same for the sake of convenience

(Teunter et al., 2010), although that is not pragmatic. These assumptions are also true for the case study discussed in the next section.

Apart from unit price and usage, many other criteria like lead-time, number of hits, average per hit, ordering cost, scarcity, durability, substitutability, reparability, commonality, criticality etc. have been taken into consideration. Jamshidi and Jain (2008), for example, introduced an approach based on multiple criteria of annual dollar usage, number of hits, and average per hit. They chose annual dollar usage as the prime criterion due to its popularity in almost all the past studies. The weight for each criterion was based on exponential smoothing method. Similarly, Vencheh (2010) presented a model that incorporates the multiple criteria for ABC classification and also considers the effects of weights in the final solution. Researcher did not confine their studies to multiple criteria but went further. For example, Ernest et al. (1990) as (*cited in Jamshidi & Jain, 2008*) proposed a statistical clustering method, which utilizes a full range of operationally significant attributes. However, this method requires substantial data, the use of factor analysis, and a clustering procedure, which may render it impractical in typical stockroom environment. Similarly, Chu et. al. (2008) proposed ABC-fuzzy classification (ABC-FC), which can handle variables with either nominal or non-nominal attribute, can incorporate manager's experience and judgment into inventory classification, and can be implemented easily. This approach implemented in a sea-port environment showed more accuracy in inventory control than simple ABC classification.

The area of inventory management offers managers an opportunity to introduce new ideas and technology to reduce costs and improve the production processes. Through a case study of an offshore vessel company, Regan, Lee and Kozman (2011) evaluated the inventory policy. Their study showed that the company with a very large inventory could effectively reduce its size by focusing on key parts. This method helped in classifying the parts

according to the *lead time* from supplier and the *cost of downtime* failure. Integrated with a preventive maintenance program and the standardization of parts, the method helped to better estimate the number of parts needed in the inventory. The solution developed concentrated on knowing what parts are critical to inventory and what parts do not need to be inventoried (sort of VED analysis).

All the papers included in the literature survey suggest that *selective control techniques* come in various shades and are very useful in the inventory management of small, medium or large enterprises. These techniques can use different criteria for inventory classifications but the method used will ultimately depend on the availability of data, and the complexity an enterprise can handle while implementing the proposed model. In the present study, the researcher had limited access to information about the company which gives top priority to its privacy of operations. Keeping the constraints in mind, and the simplicity expected by the company, the inventory classification was based on limited variables approach.

Case Study

This project has been taken up with a company called PE Ltd with a view to analyse some aspects of its supply chain, inventory control, and display of items. PEL is a family owned business which started its liquor stores in different parts of New Zealand as shown (Figure 1). PEL has been operating a warehousing facility at Ahuriri which also provides the transportation facility to deliver the products to every store. Palmerston North has big storage facility as compared with the one at Ahuriri. The organisational structure of PEL is very flat and consists of about 20 employees. Every store has 3 to 5 employees: one duty manager and others for stacking and filling the fridges and chillers or for assisting the duty manager to serve customers at the busy times.

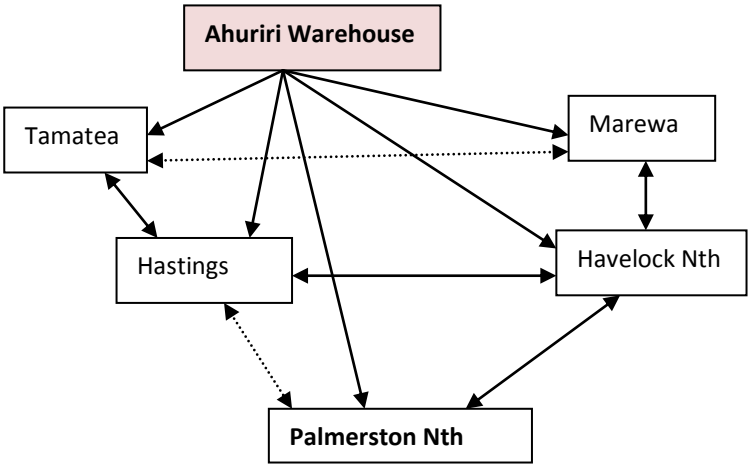


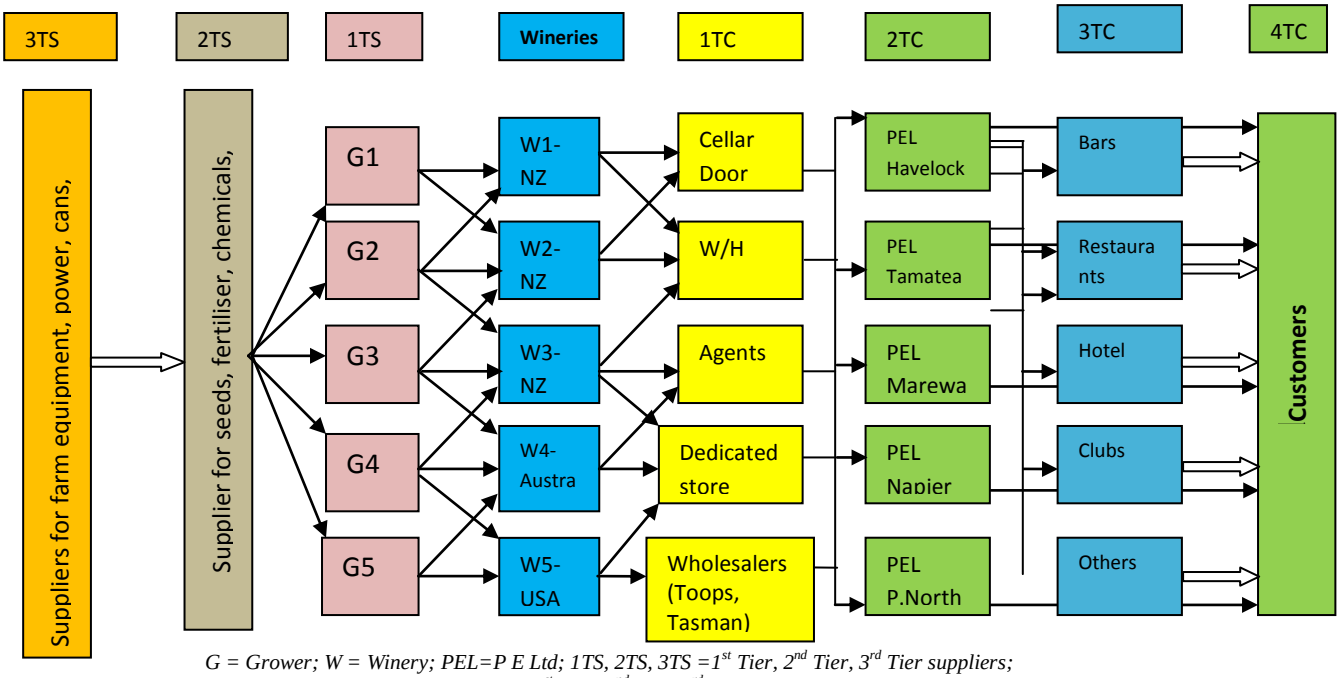
Figure 1: PEL Chain of liquor stores

Existing supply chain of PEL

As seen in Figure 2, PEL gets some of its items directly from the suppliers. Sometimes, PEL purchases its products in bulk in order to get discounts from suppliers and the low price benefits. The palletised items are sent to the warehouse from where the items are brought to the stores when needed. Some of the *key suppliers* of PEL are: British Tobacco, Coca cola (energy drinks), Dominion Breweries Limited, Equation Services Corp, Euro Wines Ltd, Fosters Group Limited, Lion Nathan Liquor, Montana Wines Limited, Red Bull, Tasman, and Toops. Spirits are purchased from wholesalers like Toops and Tasman.

PEL supplies liquor to bars, hotels, restaurants and clubs, but most of the customers get liquor directly from their stores at different locations. PEL has been using *point of sale perfect software (POSPS*) which is a very useful in managing the inventory and is very easy to operate. When a product is purchased and brought to the store; it is updated in the POSPS. If there is a need to know how much stock of any particular product is left, then *F3 button* is pressed which displays a screen where one can type the name of any product and get the information about the quantity of that product in the store. If an item is sold out then it is automatically reduced from the stock information by the software. For example, if there are 20 bottles of Jim Beam in the store and 1 bottle is sold out, then the figure will be automatically reduced in the system and next time, the system will show only 19 bottles. PEL

has been using minimum order quantity level for some of the products with stable demand. For example, there is regular customer of Huntaway Chardonnay at Tamatea store, who purchases one or two bottles every day and overall 15 bottles are sold per week. If there are 24 bottles (or 2 cases) in the store, which is the minimum ordered quantity level (*reorder point*); the software will automatically report that the *minimum* ordered quantity level has been reached and that there is a need to place order for it. The same is true for cigarettes or other products that have stable sales or demand. Table 2 shows the existing classification of items in the PEL stores which are not appropriate from inventory control point of view.



G = Grower; W = Winery; PEL=P E Ltd; 1TS, 2TS, 3TS =1st Tier, 2nd Tier, 3rd Tier suppliers; 1TC, 2TC, 3TC = 1st Tier, 2nd Tier, 3rd Tier customers.

Figure 2: Supplier Network Diagram

Table 2: Existing classification of products in PEL stores

White Wines	Sauvignon Blanc, Chardonnay, Riesling, Pinot Gris, Rose, Dessert wines supplied by Mission Estate Winery, Montana and Hardy's are sweet and specially served after lunch or dinner. They are also known as *still wines* because they are filled into bottles without any pressure. *Sparkling wines* (Lindaour, Aquila and Chardonnay) and champagne are also known as *bubbly* wines because they are filled into bottles with pressure of CO_2.
Red Wines	Merlot, Cab Merlot, Cab Sauvignon Merlot, Pinot Noir, Syrah NZ, Shiraz (Australia), Ports, Sherries. Red wine generally preferred by customers in winter.
Fortified Wines	Ports, Sherries (medium, dry, sweet).
Spirit	*Whiskey*: Irish whiskey, Scotch whiskey, single malt whiskey, Canadian whiskey. *Rum*: Black Rum (Captain Morgan), White Rum (Bacardi), Gold (Coruba). *Vodka*: 42 below vodka, Still vodka.

	Gin: Seagers, Gordans, Partings. *Cognac*: Champagne, Brandy, Fruit flavour mixes. *Sambuca*: Galliano black, vanilla, white. *Liqueurs*: Everglade, Continental. *Tequila*: Dos Gusanos, Pepe lopez. *Canterbury Cream*: contains milk products, chocolate and caramel flavour and expires after a particular period of time. *Low alcohol spirit*: Kristov Vodka, Kentucky Blue, Carthew Gin and Mad jacks.
RTDs	They are '*ready to drink'* and come in packs of 4, 6, 10, 12, 15, 18, 24. Some examples of RTDs are: *Bourbon*: Jim Beam and cola, Jim Beam and dry, Jim Beam and ginger beer, etc. *Canadian whiskey*: Canadian club and cola, Canadian club and ginger beer. *Scotch*: Highland scotch and cola. *Black Rum*: Blackheart and cola, blackheart Rum and cola 8% 12 pack *White Rum*: Bacardi (raspberry, watermelon, lemon, pineapple). *Vodka*: Smirnoff ice 7%, Smirnoff ice 5%. *Mudshake*: They expire after a particular time because they contain milk products.
Beer	Tui, Crown Lager, Grolsch, Carlsberg, Tuborg, Stella, Victoria bitter, Becks, Carlton cold, Steinlager, Pure blonde, Kingfisher, Monteith, Radler, Haagen, Lion red, Speights, Waikato, Ice lager, Diesel, New Zealand lager, Reineck, etc.
Premixes	Cruiser, Dakota, Woodstock, Smirnoff, Blackheart, Coruba, Export gold, etc.

Proposed Selective Control Techniques for PEL

From inventory control point of view and for the sake of easy implementation, all the items in the PEL stores have been classified as: ABC, FSN, and VED on the basis of different criteria as discussed below:

1. ABC grouping is based on the annual dollar value. Thus, **A-class** consists of less number of items but more $ value; **B-class** items are in moderate number with moderate values, and the **C-class** items are in large number but very small value. A class items are monitored with top priority and attention in order to control the cost. From Tables 3 & 4 and Figure 3, it is obvious that about 20.3 % of items in PEL stores make 66.2 % of dollar contribution (A class), 29.3 % of items contribute 24.3 % of dollar value (B class), and lastly 50.4 % of items contribute just 9.6 % dollar value (C class). Following ***heuristics*** has been proposed for the ABC classification of all the items in the PEL stores as given in Table 3. Let p_i = price per unit of i^{th} item ($), and x_i = no. of units of i^{th} items, then

the $ value of i^{th} items = $(p_i x_i)$ .....(i)

Total $ value of all the items in the store = $\sum p_i x_i$ .....(ii)

% age $ contribution by i^{th} items = $(p_i x_i)/\sum p_i x_i$.....(iii)

MS-Excel has been used to record, organise, and chart the data for the PEL which have 1,489 items in their stores. Their existing classification and the ABC classification are shown in Table 2 and Table 3 respectively.

Table 4: Summary of items and their contribution

Items	% of items	% $ contribution	Cum % $ contribution	Class
First 25 items	20.3	66.2	66.2	A
Next 36 items	29.3	24.3	90.5	B
Last 62 items	50.4	9.6	100	C
Total items = 123				

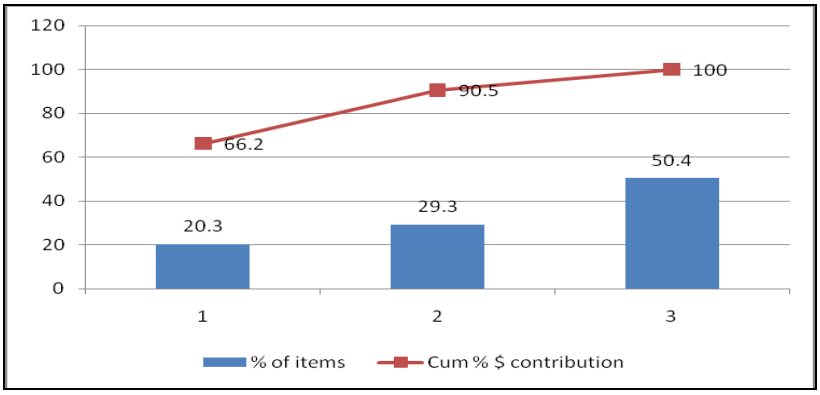


Figure 3: ABC analysis based on % of items and their % $ contribution

Purchase and sale of *A class items* should be monitored by PEL with great care to avoid overstocking or shortages. It would be wise to do demand or sales forecasting (taking into account the seasonality, trend and randomness in consumption) based on past data available in the stores for an accurate purchase of A class items.

2. FSN grouping is based on the movement of items or its rate of consumption. FSN stands for *Fast, Slow, and Non- moving* items. Items in PEL stores have been classified based on their movement or sale for a specified period of time (monthly basis). So, higher the stay of item in the store, the slower would be its movement. Based on salesmen observations, the fast moving items are: *Beers & the premixes, RTD (ready to drink), Gin, Rum, etc*. as shown in

Table 5 with some typical examples in each category. Similarly, the slow moving items are: whiskey, RTDs, premixes, etc.

Table 5: FSN classification of items

Fast moving items *Beers & premixes*: These are products that are kept in the chillers to be consumed (viz. Tui, Steinlager, Corona, KGBs, Cruisers, Woodstock, Smirnoff, Coruba, Blackheart, NZ lager, Victoria bitter. *RTDs:* Woodstock, Barrel, Cruiser, Coruba, Envy, Cody's, Pulse, Canadian club. *Gin*: Seagers, Partings, Gordon's. *Rum*: Coruba, Bacardi. *Others*: Ivanov vodka, Canterbury cream, Kristov red label (vodka), Casks (country, chasseur).
Slow moving items *Whiskey*: Jack Daniels, Jim beam, Canadian club, Grants, Old Taylor, Jamson, Glen Nevis. *RTDs*: Purple goanna, Tattoo, Bacardi, Chactus, Mck. *Premixes*: Purple goanna, Dakota, Vodka fuse, Vault, Export gold, Speight's, Lion red, Jack Daniels, Wild bull, Guinness. *Others*: Martineau brandy, St. Adette brandy, Smirnoff vodka, Greenall's Gin, Malibu Rum, Glenlivet
Non moving items*:* Remaining items (about 80%) are either *very slow* or *non-moving*.

F type items can be purchased in bulk and stored in the warehouse which can be brought from time to time in the stores when needed. This will help PEL in two ways: (a) it will have the advantage of purchasing the items in bulk with some discounts from the suppliers; and (b) as the items are fast moving, they can be sold quickly so there will be no need to keep them in storage for long time and pay storage charges. On the other hand, S and N type items can be brought straight to the stores because they move very slowly and PEL has to pay extra storage costs for them. About 80% of the items are estimated to be either very slow or non-moving types.

3. VED grouping: Items can also be grouped on the basis of *criticality* (the kind of impact the item has on the overall customers' requirements). VED stands for v*ital, essential and desirable*. Maximum attention is paid to the *vital few* items because if they go out of stock then the business will suffer the most. Here *vital* does not mean something like a life saving drug, but rather how important a particular item is for the social party, occasion, celebration, status, etc. Some examples of vital items could be champagne, however, which items are vital or essential will depend on the customers' perspectives, and their needs.

4. Combined Classification: In addition to the above, it is also possible to have a classification of items based on a combination of ABC, VED and FSN as in Tables 1a & 1b and Figure 3. The estimated % values of items (after discussion with PEL) in various categories are shown in Figure 3.

Table 1a: Groups of items when ABC and VED are combined

	V 1%	E 3%	D 96%	Comments
A 20%	AV	AE	AD	Items in the AV, BV & AE groups should be monitored regularly and carefully by the materials managers of the PEL stores.
B 29%	BV	BE	BD	
C 51%	CV	CE	CD	

Table 1b: Groups of items when ABC, VED and FSN are combined

	F	S	N	Comments
AV	AVF 2%	**AVS 9%**	**AVN**	Items in the AVF, AEF & AVS groups should be monitored very regularly and carefully by the materials managers of the PEL stores.
AE	AEF 3%	**AES**	**AEN**	
BV	BVF 5%	**BVS**	**BVN**	

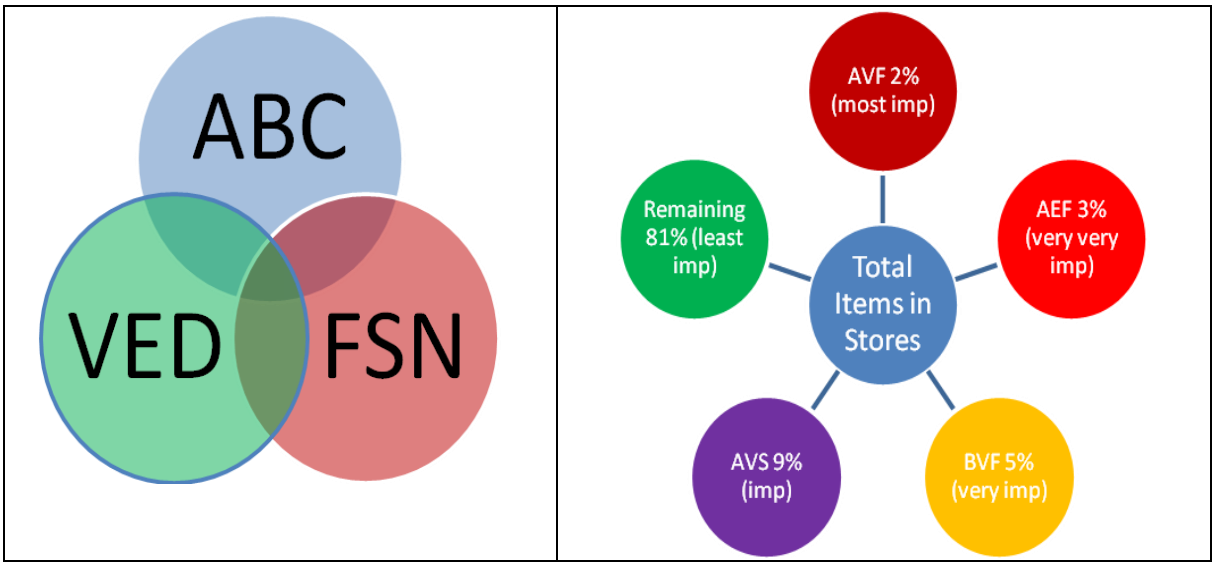


Figure 3: Estimated % values of items in the stores within various combined categories

Conclusions and Recommendations

Based on observations, estimation and data analysis, the paper draws the following *conclusions* and suggests some useful *recommendations* for inventory control, storage, and display which PEL may use to their advantage.

(i) Inventory control: It is recommended that PEL should monitor the purchase and sale of items in *AVF, AEF, BVF and AVS classes* with great care and more frequently to avoid overstocking or shortages. Items in these categories constitute 19% but they are very high value, vital, essential and fast moving items. It would be wise to do demand forecasting (taking into account seasonality, trend and randomness in sales) based on past data available in the stores for an accurate purchase of items.

It is also advisable that *F type* items (Table 4) be purchased in bulk and stored in the warehouse and be brought from time to time in the sales stores when needed. This will help PEL in two ways: (a) it will have the advantage of purchasing the items in bulk with some discounts from the suppliers; and (b) as the items are fast moving, they can be sold quickly so there will be no need to keep them in the warehouse for long time and pay storage charges. Besides, *S and N type* items can be brought straight to the sales stores in limited quantity because they move very slowly. About 80% of the items in stores are estimated to be either very slow or non-moving.

ii) Storage: Presently, only the store in Palmerston North has shelf-storage facility that is very effective. There is a separate section for each category (viz. RTDs, Spirits, Beers, etc) so the customers find the items of their choice very easily. However, the rest of the stores have only open containers or open rooms where pallets are kept on top of one another vertically using a fork lift or manually which is very risky and time consuming. This method of storage has been the cause of damages to some products in PEL. It is also hard to get the products from PEL's storage system when needed. Therefore, PEL needs to modify its storage systems.

For example, PEL could follow the storage system used by some of the renowned stores in New Zealand such as Foodstuff, New World or Pak n' Save where each section of shelves

can have unique code number to enable staff to find the products easily. PEL could use shelves on one side of the storage facility for *F type*, and other sections for S type items. PEL can also go for RFID tags (like the one used by The Wal-Mart, FedEx, and UPS) for some of their high value products (**A** and **F** type of items) for an accurate tracking and control.

(iii) Display: PEL has been using a display strategy which is not very effective. For example, boxes of spirits are put on top of one another in the vertical direction and the top box is cut away to show the bottles. This is not very effective because it takes up more space and does not look aesthetically attractive. It is also sometimes confusing for the customers.

Therefore, it is recommended that there should be proper sections for *regular items* and *specials* of the week for each class of liquors (viz. whiskey, brandy, rum, vodka, gin, cream, etc). PEL may also create a website for the products in their stores where specials, discounts, new arrivals, and other related information could be posted for the IT friendly customers.

Future Direction of Research: Other techniques which can be explored in the context of inventory management of an SME are: vendor managed inventory (VMI), two bin system (S, s), and JIT. VMI, for example, could be especially suitable for local winery products, and JIT could be very appropriate for local producers of items with relatively stable demands, low transport cost, and predictable lead-times.

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Appendix

Table 3: ABC Analysis of items in PEL stores

Items description	Price per unit of i^{th} item, p_i ($)	No. of units in the i^{th} item, x_i	\$ value of i^{th} items = p_i*x_i	% contribution by i^{th} item = $(p_i*x_i)/\sum(p_i*x_i)$	Cum % contribution	Class
DB Draught 15 pk Btls 330 ml	20.00	158	3160.0	5.93	5.93	A
Hopper Peach 6 X 4 Pk (24)	30.00	101	3030.0	5.68	11.61	A
Captain Morgan 5% n Cola 24pk	60.00	47	2820.0	5.29	16.90	A
Barrel No 51 4x6pk 440 ml cans	50.00	52	2600.0	4.88	21.77	A
DB Export Gold 6X4 440 ml cans	40.00	63	2520.0	4.73	26.50	A

KGB Raspberry 4x6pk Btls	45.00	37	1665.0	3.12	29.62	A
Monteiths Golden 12pk Btls	21.99	71	1561.3	2.93	32.55	A
Orange Ruffy 5% 6x4pk 330 ml	48.00	31	1488.0	2.79	35.34	A
DB Tui Bottles 4x6x330 ml	34.99	42	1469.6	2.76	38.09	A
Monteiths Pilsner 6X4X330 ml	55.00	24	1320.0	2.48	40.57	A
Grolsch Keg 2 x 5 L Imported	80.00	16	1280.0	2.40	42.97	A
Heineken 12X650 ml Btl	70.00	18	1260.0	2.36	45.33	A
Mangatainoka DRK Swappa Crate	17.99	70	1259.3	2.36	47.69	A
Isle of Jura Superstition 750 ml	89.99	13	1169.9	2.19	49.89	A
Corona Bottles 2x12x330 ml	54.00	19	1026.0	1.92	51.81	A
DB Draught 12pk Btls 330 ml	14.99	66	989.3	1.86	53.67	A
Sol 12x330 ml btls	24.99	38	949.6	1.78	55.45	A
Bernheim Orig Wheat Whisky 750	110.00	8	880.0	1.65	57.10	A
Jack Daniels 4x6 Cans 375 ml	84.99	9	764.9	1.43	58.53	A
B52 12x6pk Shots	120.00	6	720.0	1.35	59.88	A
Seagers Gin n Tonic 6x4pk 330 ml	65.00	11	715.0	1.34	61.22	A
Baileys Glide 4x6 200ml box	75.00	9	675.0	1.27	62.49	A
Db Draught 16pk bottles	16.99	39	662.6	1.24	63.73	A
Harvest Cider Keg 50 L	220.00	3	660.0	1.24	64.97	A
Halo Sparkling Cider 6x4pk btl	32.00	20	640.0	1.20	66.17	A
Stonecroft HB Syrah 750 ml	36.99	16	591.8	1.11	67.28	B
Glenmorangie Quinta Ruban 750 ml	95.00	6	570.0	1.07	68.35	B
MCK Brbn Energy 6x4pk Cans	57.00	10	570.0	1.07	69.42	B
DB Draught Bottles 24x330 ml	26.99	20	539.8	1.01	70.43	B
Murphys Black Keg 30 L	175.00	3	525.0	0.98	71.41	B
Sherry full Cream bulk 20 L	170.00	3	510.0	0.96	72.37	B
Longridge HB Merlot Cab 750 ml	13.00	39	507.0	0.95	73.32	B
Jagermeister Mega 1750 ml	99.99	5	500.0	0.94	74.26	B
RattleSnake Tequila Lime 6*24p	240.00	2	480.0	0.90	75.16	B
DB Amstel Light 8pk Cans 330 ml	9.99	47	469.5	0.88	76.04	B
Gladstones Ginger Beer 6x4pk	24.00	19	456.0	0.86	76.89	B
Jack Daniel & Cola 6x4 pk btls	84.00	5	420.0	0.79	77.68	B
Glenfiddich Res 30 YO 700 ml	400.00	1	400.0	0.75	78.43	B
xxxmonteiths black 1x6x330 ml	11.99	33	395.7	0.74	79.17	B
DB Export Dry Bottles 4x6x330 ml	37.99	10	379.9	0.71	79.88	B
DB Tui Can 4X6X330 ml	32.99	11	362.9	0.68	80.57	B
Taylors 20 Year Old Port	119.99	3	360.0	0.68	81.24	B
Jack Daniels 3 L	330.00	1	330.0	0.62	81.86	B
Johnnie Walker Blue Label 750 ml	325.00	1	325.0	0.61	82.47	B
Pure Blonde Low Carbs 2x12pk	42.00	7	294.0	0.55	83.02	B
Johnnie Walker Red Label 4.5 L	290.00	1	290.0	0.54	83.56	B
Dom Perignon Cuvee 99	289.99	1	290.0	0.54	84.11	B
Guinness Draught 50ltr Keg	275.00	1	275.0	0.52	84.62	B
Krug Grande C Champ750 ml	269.99	1	270.0	0.51	85.13	B

Glenfiddich Res 18yr 700 ml	129.99	2	260.0	0.49	85.62	B
DB Draught Cans 4x6x330 ml	27.99	9	251.9	0.47	86.09	B
Jack Daniels 1750ml + Cradle	250.00	1	250.0	0.47	86.56	B
Monteiths Radler 30 L Keg	125.00	2	250.0	0.47	87.03	B
Bruichladdich Blacker Still 86	249.99	1	250.0	0.47	87.50	B
Hoegarden Giftpk 6x4pk Btls	78.00	3	234.0	0.44	87.93	B
Steinlager 50 L Keg	230.00	1	230.0	0.43	88.37	B
Speights Gold Keg 50 L	229.00	1	229.0	0.43	88.80	B
Lion Brown Keg 50 L	224.99	1	225.0	0.42	89.22	B
DB Flame Bottles 12x330 ml	15.99	14	223.9	0.42	89.64	B
Crown Lager 2x12pk 375 ml	44.00	5	220.0	0.41	90.05	B
Mac's Gold Keg 50 L	210.00	1	210.0	0.39	90.44	B
db Tui 16 pack	18.99	11	208.9	0.39	90.84	C
Valente Bellini 4x6 pk	26.00	8	208.0	0.39	91.23	C
Saint Brendans Irish Cream 700 ml	22.99	9	206.9	0.39	91.61	C
Lion Red Keg 50l	199.99	1	200.0	0.38	91.99	C
Glenmorangie Nector Dor 700 ml	95.00	2	190.0	0.36	92.34	C
Barrel No 51 6x4pk 330 ml btls	46.99	4	188.0	0.35	92.70	C
Lindemans Bin 65 Chardonnay	8.99	17	152.8	0.29	92.98	C
Maglieri Sparkling Bianco 750 ml	7.99	19	151.8	0.28	93.27	C
Bruichladdich 18YO Single Malt	150.00	1	150.0	0.28	93.55	C
Bruichladdich Port Charlotte	149.99	1	150.0	0.28	93.83	C
DB Flame Cans 12x440 ml	13.99	10	139.9	0.26	94.09	C
Mac's Sun Dance 4x6x335 ml Btls	46.00	3	138.0	0.26	94.35	C
DB Export Gold Bottles 6x4pk	42.99	3	129.0	0.24	94.59	C
Mangatainoka Dark Keg 30 L	124.99	1	125.0	0.23	94.83	C
Cascade Lager 4X6X375ml	55.99	2	112.0	0.21	95.04	C
Steinlager 25 ltr Keg	111.00	1	111.0	0.21	95.25	C
Kristov Vodka+Orange 6x3 L	108.00	1	108.0	0.20	95.45	C
Kristov Trop Punch Cask 6x3 L	108.00	1	108.0	0.20	95.65	C
Tiger Beer Tall 12x640ml Btls	36.00	3	108.0	0.20	95.85	C
Crazy Mexican 6x4pk Btls 330ml	52.99	2	106.0	0.20	96.05	C
Jack Daniels 50ml	5.00	20	100.0	0.19	96.24	C
Big Foot Bourbon 8% 12pk 1.25 L	96.00	1	96.0	0.18	96.42	C
Heineken 6*1.5 L Magnums	87.99	1	88.0	0.17	96.59	C
DB Export Gold 8pk 330ml Cans	10.99	8	87.9	0.16	96.75	C
Unison HB Cab Sav/Syrah 750ml	28.99	3	87.0	0.16	96.91	C
Balvenie Double Wood Single	80.99	1	81.0	0.15	97.06	C
Opal Nera 50ml	7.00	11	77.0	0.14	97.21	C
Coruba & Cola 7% 6*4 330 ml	76.00	1	76.0	0.14	97.35	C
Coruba n Cola 5% 4x6pk Btls	71.99	1	72.0	0.13	97.49	C
Carlsberg Elephant 8% 4x6 pk	67.99	1	68.0	0.13	97.61	C
Cockburn 10yr Tawny Port 700 ml	67.99	1	68.0	0.13	97.74	C
Opal Nera & Glasses	33.99	2	68.0	0.13	97.87	C

Asahi Super Dry 6x4pk 330 ml	66.10	1	66.1	0.12	97.99	C
Smirnoff Red 5% 4x6pk 330 ml	66.00	1	66.0	0.12	98.12	C
42 Below Vodka Feijoa 50 ml	6.00	11	66.0	0.12	98.24	C
Kronenbourg 1664 6x4pk	65.00	1	65.0	0.12	98.36	C
Grey Goose Vodka 700 ml	61.99	1	62.0	0.12	98.48	C
Grey Goose Vodka Orange 700 ml	61.99	1	62.0	0.12	98.60	C
Southern Comfort Dry 6x4 pk	58.99	1	59.0	0.11	98.71	C
Corona Bottles 4x6x330 ml	58.99	1	59.0	0.11	98.82	C
Jack Daniels & Cola 6x4pk Cans	57.99	1	58.0	0.11	98.93	C
Woodford Reserve Bourbon 750 ml	57.99	1	58.0	0.11	99.03	C
Mudshake Ex Banana 24X275 ml	57.99	1	58.0	0.11	99.14	C
Mudshake Ex Fraise 24X275 ml	57.99	1	58.0	0.11	99.25	C
Mudshake Vanilla 24X275 ml	57.99	1	58.0	0.11	99.36	C
KGB Black 7% 24 pk	52.80	1	52.8	0.10	99.46	C
Francoli Grappa DI Moscato 700	51.99	1	52.0	0.10	99.56	C
Tasman Bitter 12X330 ml Bottles	9.50	5	47.5	0.09	99.65	C
Tui Pies Range 24	4.00	10	40.0	0.08	99.72	C
Frescobaldi Cast Chianti 750 ml	20.99	1	21.0	0.04	99.76	C
Black Heart & Cola Bottle each	2.50	8	20.0	0.04	99.80	C
South Pacific Water 1 L	2.00	10	20.0	0.04	99.84	C
Jagermeister Miniature 21 ml	3.00	5	15.0	0.03	99.86	C
Carling Cans 330ml 12pk	13.50	1	13.5	0.03	99.89	C
Jose Cuervo Margarita Mix 1L	11.81	1	11.8	0.02	99.91	C
Camo Shots 6 pk	11.75	1	11.8	0.02	99.93	C
ETA Dry Roasted Nuts 225gm	3.50	3	10.5	0.02	99.95	C
Twistee Shot Baby Irish 6 pk	10.00	1	10.0	0.02	99.97	C
Kristov Vodka & Guava 330ml	2.20	4	8.8	0.02	99.99	C
Juel P fruit & Orange 1 X 275ml	1.25	3	3.8	0.01	99.99	C
Platinum Vanila & Vodka 1*330 ml	1.50	1	1.5	0.00	100.00	C
Seagers Strawberry Bottle each	1.00	1	1.0	0.00	100.00	C
Total		$\sum x_i$ = 1,489	$\sum p_i x_i$ = 53,327			