Integrating ABC & TOC to improve internal reporting: a case study: Isle of Arran Distillers

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- a Case Study –

ISLE of ARRAN DISTILLERS

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Company Profile: History of Scotland's Newest Malt Whisky

Isle of Arran Distillers is a dynamic new force in the Scotch Whisky market, and is one of the few independent distillers in the industry. The distillers are based at Lochranza on the Isle of Arran, one of the most beautiful and famous in Scotland, which lies off the West Coast between Ayrshire and Kintyre. The company is independent, having been set up by Harold Currie, who was previously Managing Director of Chivas (Seagrams) and House of Campbell (Pernod Ricard).

Arran is considered a unique island also known as 'Scotland in Miniature', for it has all of the scenery of Scotland, with mountains and lowlands, glens, lochs and royal castles (including one at Lochranza). Early in the 19th century there were more than 50 whisky distilleries on Arran, most of them illegal and carefully hidden from the eyes of the taxmen. The malt was acclaimed at the time as the best in Scotland, only rivalled by those from the 'Glen of Livet'. But economic problems, with the high cost of transporting the whisky to the mainland, forced them to close.

In 1995, The Isle of Arran Distillers Company opened a new distillery on Arran. They use only the traditional methods of distilling, with wooden "wash-backs"[1] and copper "stills"[2] designed to exact specification. The location offers perfect water for whisky production, cleansed by granite rock and softened by peat[3] as it comes down from the mountain above. The atmosphere of sea breezes and clear mountain air matures the Arran Malt to perfection in earth-floored warehouses in a manner unique to Arran.

In 1997, the company opened an award winning "Visitor Centre", which was officially opened by H.M. The Queen as she took her last voyage on the Royal Yacht Britannia. This has achieved the 'Highly Commended' category from the Scottish Tourist Board, marking it as one of the country's top attractions[4]. The company has won many awards, including 'Scottish Exporter of the Year' in 1998, 'Scottish Television's Best Young Company in Scotland' in 1997 and 'Scottish Marketing Awards Winner' in 1996.

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[1] A large vessel made form pine wood in which the "wort" is run (see appendix A: The Distillery Process)
[2] Apparatus used in distillation comprising the chamber in which the vaporisation is carried out (see appendix A).
[3] Turf; various plants that are partially carbonised by nature by decomposition in water (see appendix A).
[4] The company's restaurant has been named as one of the 'top 100 in Scotland', is listed in 'Taste of Scotland' and has been awarded an AA rosette.

They are now developing sales of their brands, in particular the Arran Malt, Loch Ranza and Holy Isle Cream Liqueur, across the world in Europe, Asia and the Americas. "Every one a temptress..." so says whisky writer Jim Murray.

When the only Arran Malt available was made in illicit stills dotted in the glens, supplies were pretty scarce. The new Arran Malt is still relatively rare, only few casks in the warehouse, only few casks put into bottle, only few connoisseurs will find it, but for those that do, the company claims to "…promise an exciting malt which lives up to its glorious heritage".

Main Products

Arran Malt

The first single malt whisky to be produced on the Isle of Arran for over 150 years. The distillery was built with additional plant, including wooden "wash-backs"and coppper stills, to produce a whisky of the finest quality, according to Scottish standards. The company has chosen to launch limited quantities of this new malt whisky which has matured at an exceptional rate in a wooden cask or case (in a wooden "hogshead"[5] to be more specific).

Loch Ranza

This rare "old blended" whisky bears the name of the home of the Isle of Arran Distillers company, which lies at the north end of the island. Loch Ranza is in a glen (valley) with a stream and towering hills all around. This blend (mix) is, according to connoisseurs "…very smooth with a relatively sweet taste – a marvellous "dram" for every occasion" and matures in "butts"[6].

Holy Isle

Holy Isle is e cream liquor, and therefore a union between Scottish and Irish traditions. The Arran Malt is combined with Ireland's "grain spirit" and smooth cream in order to create a traditional "Celtic" cream liquor. Either hogsheads or butts are used for the maturation of this liquor.

[5] A wooden cask containing approximately 250 liters.
[6] A butt is a wooden case, twice the size of a hogshead, i.e. a butt contains app. 500 liters..

The Existing Internal Reporting System

The existing internal reporting system provides a traditional absorption income statement (see exhibit A) where overhead is applied to production based on material consumption. Although direct labour is traced directly to the three products, management realises that this tracing can be inaccurate due to the shifting of workers among the three products and the utilisation of common facilities. The products are marketed mainly through wholesale distributors, although an on-line order placement facility [7] and a visitors' centre annex shop exist. The products are marketed via a sales force that works totally on a 5% commission basis. The remaining selling (marketing) and administrative costs are allocated to the products based on sales pounds (£). The company's limited inventory does not vary significantly from year to year, that is to say, the inventory of bottled and labelled whisky ready to be sold and shipped is not important.

The problem with the traditional income statement (exhibit A) is that one is not quite certain what the results indicate. It is indeed questionable to spread the overhead over the products employing the material costs because material consumption may not indicate the overhead resources being consumed by the products, as activity-based costing (ABC) theory often claims. Furthermore, it is spurious to allocate the other marketing and administrative costs based on sales £'s.

The theory of constraints (TOC) contends that it is indeed meaningless to allocate any fixed costs to individual products. ABC-purists, on the other hand, demand activities and drivers in order to rationally "drive all costs to the cost objects including facility-level activities".

Theory of Constraints (TOC) and Activity-based Costing (ABC)

The standard TOC approach allegedly captures a phenomenon that is often misunderstood. When costs are fixed, allocation to individual products can be extremely misleading because it implies that changing product volumes will result in changing costs. Goldratt's TOC[8,9] handles this problem by ignoring allocated costs and concentrating on global measures. Under

[7] More information on on-line product ordering or this visiting centre can be found on the company's website www.arranwhisky.com.

[8] Goldratt, E.M. & R. Fox, 1989, Chapter 4, "The Importance of a Systems Constraint", The Theory of Constraints Journal, Vol.1, February 1989, pp. 5-7.

[9] Noreen, E. , D. Smith & J.T. Mackey, 1995, The Theory of Constraints and Its Implications for Management Accounting, The North River Press, Great Barrington (MA), p. 24

the standard TOC approach of managerial reporting, direct material is treated as variable cost and all other manufacturing costs are assumed fixed. Specifically, Goldratt seeks to maximise throughput subject to marketing or production constraints while minimizing inventories and other costs. He uses the throughput margin per unit of constraining resource to guide product pricing and investment decisions, arguing that the selling price for a product should be determined from the market, not from marking up an arbitrarily allocated product cost. To increase throughput, however, the price charged should at least cover all out-of-pocket variable expenses plus the opportunity cost for using constraint resources. When materials are the only variable costs and there is no real internal constraint, any sale in which revenue exceeds the material cost will increase throughput (and hence short-term profit) of the company. An important consequence is that pricing decisions based on throughput arguments is to reserved for special orders only.

Because TOC assumes that material is the only (short-term) variable cost, TOC systems can be much simpler and easier to implement than ABC. In ABC, a serious work is to be done to record all material, labour and overhead expenses and to trace and allocate these costs to individual products. In other words, the ABC approach assigns – in contrast to TOC – all costs, fixed and variable, to specific products. It is, therefore, a rather complex and difficult process entailing describing what a company does as opposed to "a functional classification by departments". ABC means recasting a company's general ledger accounts into activities. Once this first recasting stage is accomplished, the assignment of "activity" costs to cost "objects" is relatively simple by using "activity" drivers. These "drivers" are typically categorised as (i) unit-level activities, (ii) batch-level activities and (iii) individual-product-level activities. Facility-level activities (such as depreciation, warehousing,…) normally require or necessitate an arbitrary driver for allocating these costs (or no allocation at all).
In the distillery, the following activities and their drivers could be employed to drive the labour and overhead (see exhibit B and also appendix A).

In ABC analysis, the normal outcome is that high-volume products and customers appear more profitable while the lower volume products appear less profitable as a result of true demand placed on company activities. This is manifestly the case in the whisky business when one switches from the allocation of overhead by material consumption and no longer traces the direct labour costs. In material procurement, e.g., larger orders of malt are made on one purchase order, which reduces relatively the material procurement costs charged to the

Loch Ranza blended whisky. Similarly, larger quantities of Loch Ranza are produced with each set-up, reducing the making costs charged to this product. A similar analysis applies for the shipping activity because, again, larger quantities the blended whisky are shipped with each order than with the Holy Isle cream liquor or with the premium Arran single malt. Finally, in an ABC analysis, the facility-level costs are to be divided equally rather than on the basis of material consumption.

The net result of these activities, is that ABC is expected to attribute a higher operating income to the Loch Ranza blended whisky compared to the traditional absorption costing system, while both the Arran Malt and the Holy Isle liquor are expected to look less profitable.

The Isle of Arran Distillers Company plans to use activity-based costing in the manufacturing area only and not in marketing, engineering or other areas. While there is no logic rationale for this emphasis, manufacturing is where most of he ABC implementation has taken place, mainly due to the complexity of broadening the scope to other business functions. A cost-benefit analysis of an ABC implementation is never far off. The company does expect important improvements in management information, even when non-manufacturing areas such as marketing and engineering are to be ignored.

One of the reasons for the company to introduce ABC, is that Mr. Tom Pearson, the manager of the visitors' centre has often been heard saying that the "… the market for the Loch Ranza blended Whisky is beginning to lose relative market share in the whisky business, mostly in favour of the premium quality of the single malt (Arran Malt). That is why we should consider permitting an individual to order several cases at a extra price with the individual's name on it. It would make a very special souvenir – especially for the Americans and Japanese customers – to have their bottles labelled 'Bottled exclusively for Joe Doe' and shipped to their countries."

The company realises that the existing internal reporting and cost calculating system would not adequately capture the ordering, labelling and collection costs for these special orders. If Mr. Pearson turns out to be right in his analysis that this is something that customers really want, the company will be routinely confronted with such requests and an ABC-implementation would be provided with a strong rationale indeed.

Furthermore, a closer look at the advertising and other marketing costs shows that £1.180.000 is spent in total on direct product advertisement. Another £1.790.000 is spent on other marketing activities such as the company's news letter, flyers and brochures, etc…, all activities that are categorised as being generic advertising and marketing activities. Exhibit C gives more detailed information on the funds used to promote the three products. The company's News Letter is mainly used to announce events such as "connoisseur" meetings (meetings organised to gather a panel of famous whisky writers and whisky clubs), tourist events (hiking arrangements, guided tours, special "degustation" weekends, …) as well as to give customers a forum to ventilate their opinions or feelings concerning the company's products. As such, the letter fulfils an important role in the customer satisfaction strategy of the company. The News Letter makes up for 40% of total "generic" marketing expenses, although it has to be said that the promotion of the company's "flag product", the Isle of Arran single malt get the major part of attention in this news letter. As Mr. Pearson states: "The reputation of the company in the whisky business stands or falls with the quality of its purest product, the single malt which has to be a work of Scottish art and has to be appreciated as such by the connoisseurs. Letting the whisky loving an drinking world know what famous whisky writers and connoisseurs think of our single malt, justifies the decision to allow at least half of the news letter to draw on this."

A second important set of instruments concerns the flyers and brochures announcing new or "special" prices for e.g. Christmas offers, Isle of Arran special packages, new products to be purchased in the visitors' centre or on-line (e.g. bath towels, tankards, hampers, golf equipment embossed with the company logo, …), totalling roughly 30% of other marketing expenses. The website and the updating of the personal mailing list, together with personal mails, complete the list of other marketing expenses.

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Exhibits

Exhibit A
Isle of Arran Distillers
Income statement under traditional absorption costing

(x 1.000)	Arran Malt		Loch Ranza		Holy Isle	
Sales (£)	7.800		21.000		7.200	
Materials (£)		2.200		6.300		2.350
Labour (£)		720		2.200		610
Production overhead (£)		2.640		7.560		2.820
Cost of sales (£)	5.560		16.060		5.780	
Gross margin (£)	**2.240**		**4.940**		**1.420**	
Commissions[10] (£)		390		1.050		360
Advertising & other marketing (£)		644		1.732		594
Administrative (£)		539		1.453		498
Total expenses (£)	1.573		4.235		1.452	
Operating income (£)	**667**		**705**		**(- 32)**	
Total liters	11.355		22.710		10.600	

Exhibit B
Isle of Arran Distillers
Activity & Activity Drivers

Activity	% production overhead[11]	Activity Driver
Material procurement	16%	number of purchase orders
Making (Mash, Tun & Still House)	29%	number of set-ups/liters produced
Bottling (Spirit House)	18%	number of casks per set-up
Facility activities (joint costs)	15%	no real driver found (liters produced?)
Shipping	22%	orders shipped

Exhibit C
Isle of Arran Distillers
Advertising and Other Marketing Expenses

(in thousands)	Arran Malt		Loch Ranza		Holy Isle		Total
Product Advertisements (£)	300		600		280	**1.180**	
Magazines		54		312		186	552
Connoisseurs meetings		148		142		-	290
Free samples		98		146		94	338
Other Marketing (£)						**1.790**	
News Letter (quarterly)							537
Flyers & brochures							716
Website							179
Personal mailings							358
Total Advertising & Other Marketing (£)						**2.970**	

[10] 5% of £-sales.
[11] Rough estimates, excluding labour.

Requirements

1. Calculate throughput based on the standard TOC and carefully comment on your findings. Explain why pricing discretion based on throughput arguments is to be reserved for special (short-term decision) orders only.

2. Calculate the ABC production-only cost per liter for each of the three products Arran Malt, Loch Ranza and Holy Isle.

3. Integrate the full ABC and TOC analysis into a cost system that provides you with the following information:

- net throughput per liter;
- variable cost per gallon;
- (integrated) ABC cost per gallon.

4. Comment on your findings concerning the decision whether or not to drop products under:

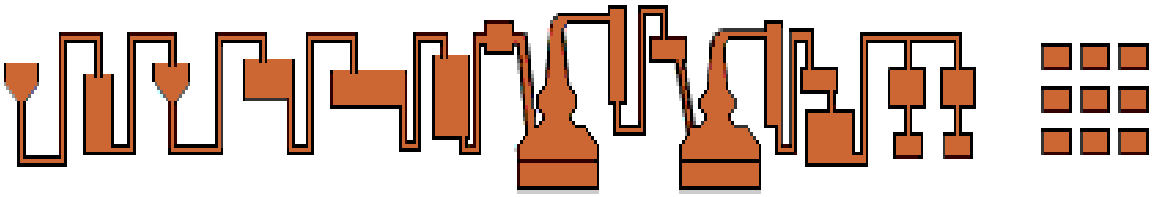
- the traditional absorption approach;
- the TOC approach;
- the ABC approach and the
- integrated or combined TOC & ABC approach.

Appendix A: The Distillery Process

"Sea water can be rendered potable by distillation. Wine and other liquids can be subjected to the same process. After they have been converted into humid vapours they return to liquids."

***Aristotle** (350 BC)*

Figure: The Distillery Process



Malt store Mash house Tun room Still house Spirit store Warehouse

The Malt Store

Whisky is made of barley. The barley is soaked in water for two to three days, then spread over the floor of the maltings where it starts to germinate. The rate of germination is carefully controlled by turning the barley at regular intervals, as the germination must be stopped after it has developed far enough, i.e. after about five days. This is done by taking the barley or green malt as it is now called and putting it in a kiln to dry out. The floor of the kiln on which the green malt is spread has perforations, so allowing the hot air and smoke from a peat furnace underneath to percolate upwards through the grain. It is the peat smoke that imparts to the malt its characteristic flavour, which can later be discerned in the whisky. Sacks of malted barley are fed into the malt feeder and into the mill where it is ground between two pairs of steel rollers into grist which resembles coarse flour. From the mill the grist is conveyed into the grist hopper. As the Arran Malt is a single malt premium whisky, its barley has to be selected and treated with the utmost care. This typically results in smaller purchase orders and more time for treatment (malting) and the subsequent quality control. Material procurement and malting costs for the Arran Malt therefore equal the costs for the Loch Ranza barley procurement and malting, although almost twice as much barley is purchased for the Loch Ranza production[12].

[12] Purchase order size and malting costs per order for the Holy Isle Liquor are identical to the Loch Ranza order and malting costs.

The Mash House

The grist is then mixed with hot water in the mash "tun", a large circular vessel. Three different quantities of hot water at approximately 70°C are passed through the grist. The first water mixes with the grist as the grist comes out of the grist hopper into the mash tun. After about one hour, the first water has broken down the fermentable sugars and the water is drained off slowly, taking about an hour. The second water is then added, slightly hotter, and this immediately drains through the grist, not being allowed to settle. The third water that is hotter again, is kept as part of the first water of the next mash. The resulting sugary liquid is called "wort", and is collected in the worts receiver. Next the wort is cooled, and then flows to the tun room where it is fermented.

The Tun House

The wort is run into large vessels called "wash backs", which are made from pine. A measured amount of yeast is added; the resulting reaction causes the wort to bubble and froth. The froth is known as barm. After about 48 hours the fermentation has turned the wort into a weak form of alcohol, similar to beer, which is known as wash, and it is from this wash that the distiller ultimately produces the spirit which is to become malt whisky.

The Still House

From the wash backs the wash is pumped into the wash charger, a pre-heating vessel. The wash then flows into the wash still - a traditional pot still made from copper, the shape of which has remained unchanged since Scotch whisky was first made. The wash is heated to the point at which it becomes vapour. The vapour then rises up the still and is then cooled so it condenses. This allows the alcohol to be separated from the water and waste products in the wash. The resulting distillation of alcohol is known as low wines and is collected in the low wines receiver. It is then run from the low wines receiver into the spirit still.

The low wines are heated again to the point of evaporation and then condensed, where-upon the spirit is run off. All the low wines and spirit run through the spirit sample safe which the stillman operates.

All spirit running from the stills must be kept under lock and key as it is dutiable. The spirit sample safe allows the stillman to test the spirit as it flows from each of the stills. The low wines from the wash still run through quickly - the stillman testing the temperature and

specific gravity (strength) by using a hydrometer which floats in a testing jar within the safe, which is securely locked by Custom and Excise Crown Locks.
The spirit from the spirit still (the second distillation) is split into three parts. It is only the 'Middle Cut' or the 'Heart of the Run' as it is termed, which is of the required strength and quality for malt whisky. This represents a very small proportion of the run; the first and final parts of the run, known as “foreshots” and “feints”, are fed back into the low wines vessel for re-distillation.
The Middle Cut is run into the intermediate spirit receiver, an oak vessel which holds the spirit for a few hours until full, when it is then pumped to the spirit store to the filling vats.

As the whole process from Mash House over Tun House to Still House takes on about three days, at maximum twice a week a set-up and production run can be carried out.
A typical production run leads to 500 liters of “spirit-to-become-whisky”. Apart from the premium quality of the spirit produced, a production run of Arran Malt does not differ in much from a run to produce Loch Ranza or Holy Isle Liquor.

The Spirit Store

The colour of the spirit at this stage is clear, and the strength around 75% vol. al. (130° proof). It is reduced at this stage by the addition of water, the same water that is used for mashing. The spirit is then reduced to 64% vol. al. (111° proof).
The cask is stencilled with the year and cask number. The number of litres is stencilled on each end after filling. The size of cask (or case) used for the Arran Malt is a hogshead (250 liters). The Loch Ranza typically matures in a butt. Butts are twice the size of the hogshead - 500 litres. The whisky or “dram” used for the production of the liquor matures in either hogsheads or butts. All casks are made from high quality oak, and it is from the wood that the whisky is given its colour.

The Warehouse

The last strange eventful process is that of maturation, the most fascinating process of all. The cask is stowed in the warehouse and left undisturbed for a minimum period of three years - legally. It may be removed after three years and used for a blend. Excellent whisky, such as the Arran single malt, is matured for a minimum of twelve years, but also fifteen, eighteen, twenty-one and twenty-five years old.

Shipping

Shipping costs heavily depend on customer order sizes. Not surprisingly, the average order size of the Arran Malt premium whisky is smaller than that of the Loch Ranza: "connoisseurs" are indeed outnumbered by whisky drinkers. Average order sizes are given in the following exhibit (exhibit App. A).

Exhibit App.A
Isle of Arran Distillers
Average Customer Order Size

	Bottles	Liters
Arran Malt	8,14	6,10
Loch Ranza	27,16	20,37
Holy Isle Liquor	5,60	4,20