DEVELOPING A PERFORMANCE MEASUREMENT FRAMEWORK FOR THE SOUTH AFRICAN WINE SUPPLY CHAIN: A FOCUS ON THE BULK EXPORT SEGMENT

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Declaration

I, the undersigned, hereby declare that the work contained in this final year project is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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Abstract

The purpose of this study was to develop a performance measuring framework for the South African (SA) wine supply chain, focusing on the bulk export segment. Cellars lack supply chain knowledge, and, as a result, under-perform from a supply chain perspective. The framework will enable cellars to measure relevant processes whereby logistical performance can be improved and, in the process, advance the SA wine industry as a whole. In addition, this framework will enable cellars to benchmark quantitative supply chain data and compare it to other cellars or in future, to other countries competing in the same market.

The performance measuring framework was developed using an emergent multi-phased exploratory approach. This thesis presents the exploratory approach as two distinct interactive phases, qualitative data collection to be the first approach and then quantitative. The explanatory approach was conducted in concurrent strands over a period of time that constituted a multi-phased approach. Multiple semi-structured and unstructured interviews were scheduled with cellars, freight forwarders and the department of agriculture, forestry and fisheries. In addition, projects were conducted by final year undergraduates, surveys were sent out and workshops were scheduled, each contributing to the quantitative and qualitative data comprising this thesis. For this thesis, the cellars represented 29.2 % of SA's bulk export segment and the representative freight forwarders were responsible for roughly 77.5% of SA's bulk exports. These samples were deemed sufficient in size to represent the knowledge of the segment.

Findings revealed that cellars use insufficient supply chain segmentations. Their systems are not configured to record data in segments, which made it

difficult to collect the required quantitative data. Moreover, cellars are generally unaware of activities occurring further down the supply chain and, as a result, freight forwarders were approached to obtain quantitative data. In spite of this complication, an ideal framework was developed using primarily qualitative data. The ideal framework includes metrics that differentiates the various cellars focusing on bulk exports from one another.

In conclusion, cellars should firstly, reconfigure their systems to record data in the segments proposed by this study. This will enable cellars to calculate the metrics in a segmented manner, thereby enabling them to compare different supply chains with one another. Secondly, cellars should ascertain which of their attributes demand the most attention or improvement, or alternatively, which attribute is best aligned with their strategy. The selected attribute should be implemented first in order to provide a platform on which other attributes should be implemented to avoid making unnecessary errors again. Finally, once all attributes have been implemented correctly at each cellar, benchmarking can commence. This will enable cellars to compare processes with one another, identify gaps in their processes, improve logistical operations and advance the industry as a whole.

Opsomming

Die doel van hierdie studie was om 'n prestasiemeting raamwerk vir die SA wyn industrie se voorsieningsketting te ontwikkel, met die fokus op die stortmaat uitvoer segment. Kelders het 'n gebrek aan voorsieningsketting konsepte en relevante kennis, en as 'n gevolg onder presteer met 'n voorsieningsketting perspektief. Die raamwerk stel kelders in staat om relevante prosesse te meet waardeur logistieke prestasie verbeter kan word en in die proses die SA wynbedryf as 'n geheel te bevorder. Hierdie raamwerk stel die kelders in staat om kwantitatiewe data te vergelyk teen ander kelders of in die toekoms teen ander lande te vergelyk wat in die selfde mark kompeteer.

Die raamwerk is ontwikkel deur gebruik te maak van 'n ontluikende multifasige ondersoekende benadering. Navorsing toon die verduidelikende benadering as twee afsonderlike interaktiewe fases, kwalitatiewe data-insameling as die eerste benadering en dan kwantitatiewe as die tweede. Die ondersoekende benadering is in gelyklopende dele oor 'n gegewe tydperk uitgeofen sodat 'n multi-gefaseerde benadering saamgestel moet word. Verskeie semi-struktuur en ongestruktureerde onderhoude is geskeduleer met kelders, expediteurs en die departement van landbou, bosbou en visserye. Daarby is finale jaar projekte uitgevoer, opnames was uitgestuur en werkswinkels was geskeduleer wat alles bygedra het tot die kwantitatiewe en kwalitatiewe data vir hierdie tesis. Vir hierdie tesis, het kelders 29,2 % verteenwoordig van die SA stortmaat uitvoer segment en die verteenwoordigende expediteurs is verantwoordelik vir ongeveer 77,5 % van die stortmaat uitvoer van SA. Die steekproef is voldoende in grootte tot die kennis van die verteenwoordigde segment.

Daar is gevind dat kelders onvoldoende voorsieningsketting segmentering het. Hul stelsels is nie ingestel om data in segmente aan te teken nie en het dit dus moeilik gemaak om die kwantitatiewe data wat vereis was in te samel. Ten spyte van hierdie komplikasie, was 'n ideale raamwerk hoofsaaklik ontwikkel deur gebruik te maak van kwalitatiewe data. Die ideale raamwerk sluit metrieke in wat kelders, wat 'n fokus op stortmaat uitvoer het, van mekaar sal onderskei.

Ten slotte, kelders moet eerstens hul stelsels instel om data op te neem in die form van die geselekteerde segmente vir hierdie studie. Dit sal kelders in staat stel om metrieke te bereken in 'n gesegmenteerde wyse en in die proses verskillende voorsieningskettings met mekaar kan vergelyk. Tweedens moet kelders vasstel watter attribuut meeste aandag of verbetering nodig het of wat hoofsaaklik in lyn is met hul strategie. Hierdie attribuut se metrieke moet eerste gemplementeer word en sal 'n platform skep waarme ander attribute geimplementerr kan word sonder dat onnodige foute weer gemaak word. Laastens, na al die attribute korrek gemplementeer is sal kelder hulle prosesse kan begin maatstaaf. Dit stel kelders in staat om prosesse met mekaar te vergelyk, gapings te identifiseer in hul prosesse, logistieke bedrywighede te verbeter en wat dan as gevolg die bedryf as geheel sal bevorder.

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Nomenclature

Superscripts

ATA	Actual Time of Arrival
ATD	Actual Time of Departure
BSC	Balanced Score Card
Busco	Wine Industry Business Support Company
COLS	Corrected Ordinary Least Squares
DAFF	Department of Agriculture, Forestry and Fisheries
Devco	Wine Industry Development Company
DPO	Days Payable Outstanding
DSO	Days Sales Outstanding
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FOB	Free on Board
GDP	Gross Domestic Profit
IDOS	Inventory Days of Supply
KWV	Kooperative Wijnbouwers Vereniging van Zuid Afrika
MSC	Mediterranean Shipping Company

OLS	Ordinary Least Squares
PDSA	Plan-Do-Study-Act
POD	Port of Destination
QA	Quality Assurance
QC	Quality Control
SA	South Africa
SAWB	South African Wine & Brandy
SAWIS	SA Wine Industry Information & Systems
SCC	Supply Chain Council
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference
SCPM	Supply Chain Performance Measurements
SFA	Stochastic Frontier Analysis
SU	Stellenbosch University
TQM	Total quality management
WIP	Work In Progress
WOSA	Wines of South Africa

Chapter 1

Introduction

Contents

SA's wine has a rich history dating back to 1659. The SA wine industry has experienced substantial growth since its origin and provided growth for the economy. For example, it contributed R36.1 billion to the gross domestic product (GDP) in 2013 (SAWIS, 2015). SA's wine industry still manages its supply chain with low supply chain maturity, therefore, SA's wine supply chain remains underdeveloped and lacking in the knowledge to advance it. This issue presented an opportunity to conduct further research in this industry regarding the SA wine supply chain. In this section, a brief viticultural history of SA's wine industry and its development is presented. In order

to comprehend the problem statement defined in this thesis, literature was reviewed regarding the current state of the SA wine industry, the segmentation split of the industry, as well as the segmentation focus of this thesis, namely bulk exports. This section will also provide the rational of the research and the problem statement on which the study centres. Finally, the objective and scope for the thesis is detailed here. Notably, for the purpose of this thesis, when referring to natural wine or wine, it only includes white, red and Blanc de noir/rosé wines. Distilling wine, sparkling wines, dessert wines and fortified wines are excluded from the term "natural wine". (WOSA, 2014)

1.1 History of SA wine industry

SA's first wine was made on 2 February 1659 and was recorded in Jan van Riebeeck's diary (Goode, 2013). Thereafter, vineyards gradually increased and wine was exported to Europe and sold to ships passing through the Cape. This became a great business opportunity and farmers invested more time and money into wine making. Due to hungry birds that needed to feed, farmers were forced to pick grapes earlier than deemed ripe. This resulted in the wine being highly acidic and was therefore poor in taste. Jan van Riebeeck and his accomplices, the Free Burghers who were servants of the Dutch East India Company (also known as Vereenigde Oostindische Compagnie), had little viticultural knowledge. Later, governor Simon van der Stel demonstrated that palatable wine could be produced (van Wyk, 1989). After Simon van der Stel introduced palatable wine, numerous farmers begun planting vineyards to enter into this market, resulting in competition. This ultimately lead to enriching the knowledge of the wine production process and as such, better quality wine was produced. By then (e.g.,1825) wine exports accounted for half of SA's exports, although it did not continue with the same trend. Some problems arose that prevented the wine industry from maintaining the growth it had been experiencing. These problems included over planting of vineyards and plagues, namely the phylloxero, which made wine production a challenge. (Goode, 2013)

In 1918 the co-operative company, Kooperative Wijnbouwers Vereniging van Zuid Afrika, more commonly known as KWV, was registered (KWV, 2013). The main thrust

behind KWV's formation was to avoid continuous problems such as overproduction and price collapses. KWV purchased the grapes from the grape growers, at a fixed price per ton, and produced and marketed the wine. KWV also focused on infiltrating the local and international markets. One of the main goals of grape growers was to maximise grape production, regardless of quality, and in essence, make more money (Goode, 2013). This business model was appealing to the grape growers and KWV grew steadily in power. However, this also led to problems, since some grape growers cultivated a higher quality of grapes and did not receive the added benefits. Thereafter, price segments for different qualities of grapes were established. KWV regulated SA's wine industry for 19 years (1978 - 1997) and subsequently converted into a private company in 1997, which was the settlement of the free trade agreement. KWV operated as a private company, but in light of the settlement, agreed to fund an industry trust that would support transformation and provide services to the industry (Ponte & Ewert, 2007).

The free trade agreement in 1997 allowed cellars to register as private companies and market and produce their own selection of wines. This period was especially difficult for privately owned cellars since they had little experience with regards to wine making and marketing. A further challenge arose in that KWV was now a competitor and no longer the regulator of the wine market. This created an opportunity for organisations to take responsibility for different sectors and areas of the spirit industry, and to represent them. The SA Wine Industry Trust (SAWIT), established in 1999, was divided into two non-profit organisations, namely Wine Industry Business Support Company (Busco) and Wine Industry Development Company (Devco); (Ponte & Ewert, 2007). The funds sponsored by KWV were transferred into these two organisations to support both of their objectives. Busco's objective was to support the industry representatives, namely SA Wine Industry Information & Systems (SAWIS), Wines of South Africa (WOSA) and Winetech. In short, SAWIS is a statistical research group, WOSA focuses on generic promotions and Winetech is a human support and technology transfer research institution (van der Merwe, 2009). The objective of Devco was to support new entrants into the industry and help with marketing, farm worker agreements, and to offer access to extension services. See Appendix A for additional formal institutions

and organisations in the SA wine industry.

Over the years, wine making process evolved, leading to more efficient wine making practices whilst enriching the industry's knowledge. This enabled the wine makers to produce larger quantities of better quality wine, using the same volume of grapes, at lower costs. Procedures were further improved in 1994 when more advanced technology was introduced, using automated machines that radically increased the output and quality of wine (Biophile Magazine, 2011). Since then the wine industry has grown steadily and become more specialised. The total wine production grew with 67.2 % from 2003 to 2013 WOSA (2014). This growth trend forced cellars to outsource activities that occupied unnecessary time spent on non-value added procedures. For example, the wine industry now uses distributors to deliver their wine, allowing wine producers to focus on wine production and marketing, rather than keeping track of logistics.

To summarise, SA's wine industry has a rich historical background, but remains classified as a new world wine country. The wine industry still encounters some challenges faced in the past and has yet to develop solutions to manage them. KWV diminished the surplus of wine in SA and sold it as table wine. It was a business model that was not sustainable, and had to change. Although SA's wine industry structure changed three times, the industry proved to be stable and well managed by the executive office of the wine industry council. Shortly after the KWV registered as a private company, cellars started producing wine at their own facilities and could produce wine they deemed adequate for the different markets. These markets included local, export, high-,medium-, and low-class income groups, among others. Over the years, cellars developed different strategies for the different markets, best suited for their needs. To this end, cellars devoted their attention to producing wine to fit their needs , but neglected the rest of the partners in the supply chain.

1.2 SA wine industry

The SA wine industry is complex, yet its supply chain activities are underdeveloped. In order to understand this better, this section provides a short overview of SA's wine industry, which includes statistical information to explain SA's challenges and position

with reference to international competitors. This section further provides a review of SA's wine industry and segments in the wine industry with a focus on bulk exports.

1.2.1 Overview of SA's wine industry

Currently, more than 3,300 farmers grow and maintain 99,463 hectares of land under vines according to WOSA (2015). In 2014, the annual harvest amounted to 1, 519, 708 tons, 81% of which was used to produce natural wine. The other 19% included distilling wine, rebate wine, juice and grape concentrate. SA's wine industry currently hosts 564 wine cellars which are divided into three categories, namely *producer cellars*, *private cellars* and *producing wholesalers* (See Table 1.1) with producing wholesalers contributing the largest volume of wine (SAWIS, 2014a). The wine cellars are scattered over SA, but viticulture is mainly situated at the North-Western and South-Western regions, where the Mediterranean climate is suitable for growing grapes (See Figure 1.1). The Western Cape contributes both the largest volume and variety of wine in SA, with a slightly cooler climate than what the latitude suggests (Ponte & Ewert, 2007). The list of districts are better detailed in Figure 1.2.

Table 1.1: Number of wine cellars that crush grapes (WOSA, 2014)

Wine cellar type	**Number of cellars**
Producer cellars	50
Private cellars	493
Producing wholesalers	21
Total	**564**

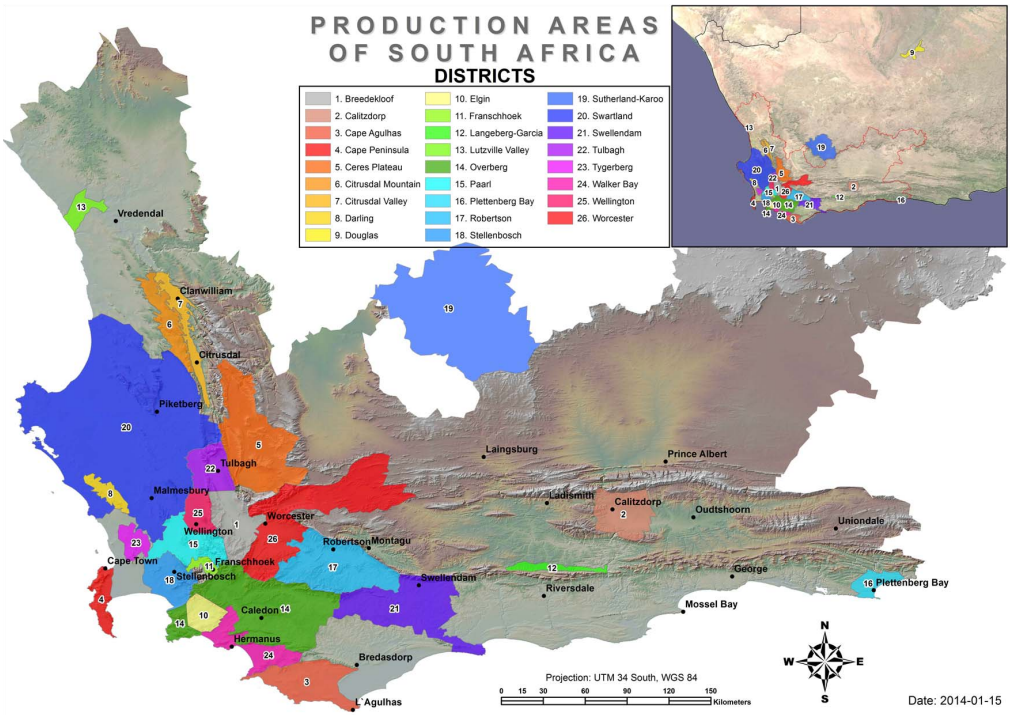

Figure 1.1: Wine production areas of South Africa SAWIS (2014b)

Figure 1.2: List of the districts SAWIS (2014b)

SA is the ninth largest wine exporter in the world and contributes 3.9 % of the world's wine production (SAWIS, 2014a). According to OIV (2014), the global wine production for 2014 excluding must and juice, decreased with 6% compared to 2013. Furthermore, it should be noted that in 2013, the global wine production reached the second largest volume it has seen in 14 years. Therefore, 2014 is considered to be a

normal year in terms of global wine production. Also, 2013 global wine production was similar to 2006, but using 300 000 hectares less vineyard area (OIV, 2014), indicating that wine cellars are operating far more effectively and efficiently, with better methods and technology having been introduced.

France and Italy are generally regarded as the world's largest wine producers, with France producing the most in 2013 (SAWIS, 2013). See Figure 1.3 for the top ten countries producing 80% of the global wine production. SA exports its wine to Germany, United Kingdom, Russia, France and Denmark, among many others. These countries also have the option to import wine from neighbouring countries in the northern hemisphere. A great benefit for these countries is a shorter lead time and as such, SA is at a geographical disadvantage. Countries with the same challenges as SA include Argentina, Australia and Chile, which collectively produce 13.2 % of the world's wine (IWC (2014); Transo (2013)). SA has definite disadvantages against the northern hemisphere countries, but faces major competition against the Southern countries. Specifically, SA has a continuous challenge to compete on price and lead time against the Southern exporting countries. According to SAWIS (2013), other challenges facing SA's export wine market experience include:

- From 1994 SA's exported almost half of its wine to the UK, Sweden and Germany, but thereafter it stagnated. Therefore, SA has to gain new export markets.
- SA has not succeeded in broadening the exporting markets, including the African countries.
- There are hundreds of exporting brands in SA, which means there is insufficient marketing spending and economies of scale to market these brands.
- When emerging into new markets, information regarding the macro economy, marketing, markets, and competitors are deemed as prerequisite requirements.

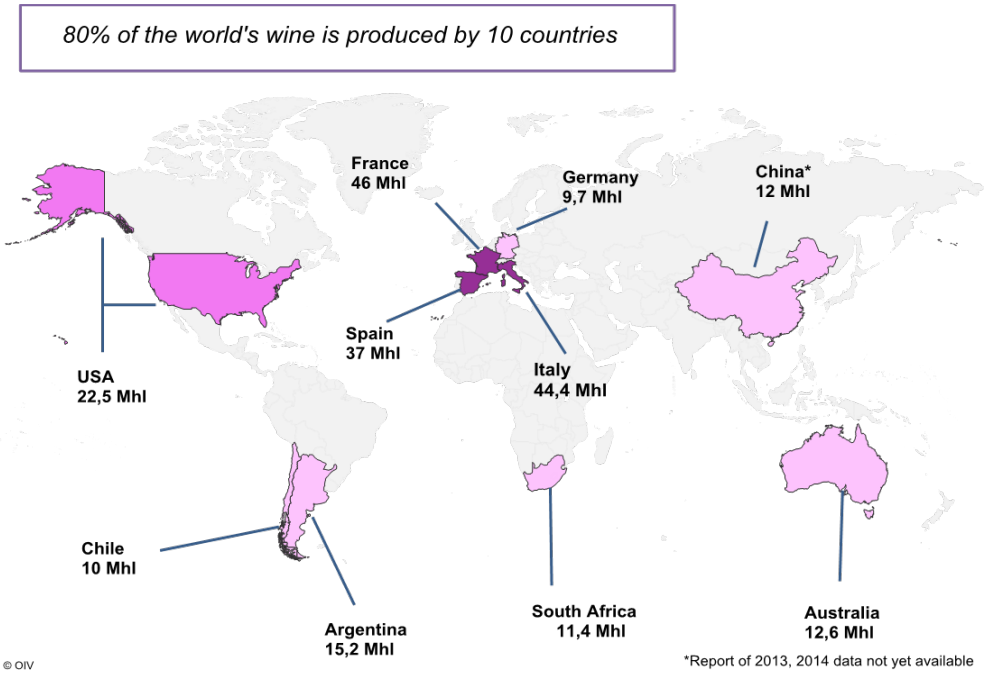

Figure 1.3: Top ten countries producing 80% of global wine production OIV (2014)

Exporting wine is therefore not a simple task and requires visibility further down the supply chain to manage those factors that the cellar has little control over. In this context, SA's government is responsible for providing more support in order for wine exports to increase, which will ultimately enhance economic growth and allocate resources more efficiently. In addition, and according to PwC (2014), the major concern for the next 12 to 36 months, pertains to the increase in price for water and electricity. Other price increases, namely chemicals, cleaning, filtration, bottling and packaging are also a major concern for the future. Furthermore, according to SAWIS (2013), the total unsold stock of wine in SA, shows an increase of 28.5% (37.9 million litres) in red wine, and 2.9% (10.4 million litres) in white wine from 2009 to 2013. National and international competitors are becoming fiercer and as such, adequately managing the wine industry is becoming a greater a necessity than before.

1.2.2 Segmentation

The SA wine industry has different processes, products and markets, making it a challenge to integrate all the activities into one supply chain. Depending on the process

followed or the market focus, each product has its own price segment and may be sold in packaged or bulk format (see Appendix B for bulk wine's most current price segments). It is clear that there are multiple factors to take into consideration when analysing the product range of a cellar. Therefore, a single supply chain cannot be used to manage all products and flows in this cellar. Products have to be treated differently in that they follow different streams after an order has been assigned. Consider the following two case studies to recognise the need for more than one supply chain.

Case 1:
Cellar A sells wine in packaged format which is sold locally and is exported. The variety of wine sold has a price range from table wine to premium wine. This cellar invested in equipment and has its own bottling and labelling machinery. Furthermore, the cellar exports its wine only to Germany and sells the rest locally.

Case 2:
Cellar B sells wine in bulk and packaged format which is only exported. This cellar only sells table wine in both packaged and bulk format. Cellar B does not have bottling or labelling equipment and outsources both processes. Furthermore, the cellar sells the majority of wine to the top 5 importing countries and has mature relationships with the majority.

Currently, SA's wine industry functions as if there is only one supply chain. Looking at both the above cases, it is clear that SA's wine industry has more than one supply chain. In the event where an order is placed for cellar A and B to export wine in packaged format, each will follow different process, although both export packaged wine. Cellar A would bottle and label at the cellar and would therefore have a fast response time after the initial order was placed. Cellar B, however, first needs to inform the bottling and labelling company to get the order ready. Since cellar B must fit into the schedule of the bottling and labelling company, they would likely work on a make-to-stock principal to save time. This way they are able to compete against Cellar A with responsiveness. Moreover, Cellar A has continuous control over the quality of bottling and labelling, whereas Cellar B must rely on the guarantee of the outsourcing company.

There is also the possibility of not selling the pre-packed wine which could lead to high inventory cost. Therefore, the two cellars with different strategies cannot function in the same supply chain. To illustrate the point further, consider the event where cellar A receives an order to sell table wine locally and cellar B gets an order to export table wine in bulk. The wine production process are similar, but are vastly different after an order is placed. Since almost no process overlaps when selling packaged locally and exporting bulk, one can conclude that there is more than one supply chain in the wine industry. Van Eeden, Louw, Goedhals-Gerber & van Dyk (2012) conducted a study to increase the wine industry's supply chain knowledge and identified six supply chains, namely Local Bulk, Local Basic, Local Premium, Export Bulk, Export Basic, and Export Premium. The selection of supply chains proved to be a challenge, in that the segmentation of price would complicate the study further. For the purpose of this study, SA's wine supply chain was divided into four basic segments, namely *Bulk Export*, *Bulk Local*, *Packaged Export* and *Packaged Local* (See Figure 1.4).

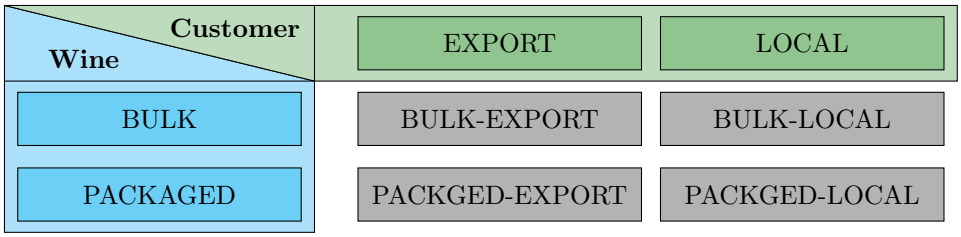

Figure 1.4: The four segments selected for SA wine supply chain

1.2.3 Bulk exports

The four supply chains illustrated in Figure 1.4 were selected on the basis that they include various operations and information flows regarding all activities required to produce and supply wine. Each supply chain follows similar activities prior to transporting the wine, after which they become unique and face distinctive difficulties. This section describes the flow of products and information, as well as challenges within the bulk export supply chain.

In 2014, SA produced a total of 956,6 million litres of wine, of which 57.4% was exported (WOSA, 2014). Of the total wine produced, 37.3% was exported in bulk, making bulk export the largest segment in the wine industry (see Figure 1.5). The remaining wine was exported in packaged format or sold locally as packaged or bulk (WOSA, 2014). Figure 1.5 exhibits the split of SA's wine production regarding the segments mentioned above (VinPro, 2014). Undertaking both bulk and packaged wine is a costly exercise, especially for producing cellars, since they do not have the capital to hold packaging material and dry goods for long periods of time (Bezuidenhout, 2014). Packaged wine thus has a much longer turnaround time than bulk wine. However, bulk wine is sold in large volumes, which would provide a beneficial cash flow structure; in other words a higher cash-to-cash ratio than that of packaged wine. Therefore the bulk export market is, in most cases, the more popular market to venture into and would accordingly be the largest market.

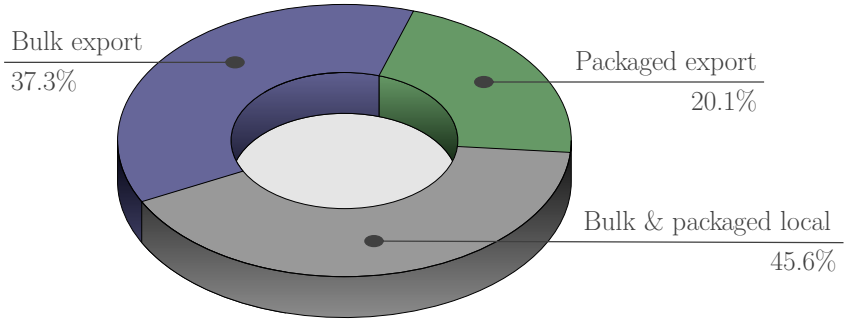

Figure 1.5: Wine production split between the segments

Pool systems originated with the establishment of the KWV where all the grapes were priced the same irrespective of quality. This was later changed to accommodate different quality pools. After the KWV registered as a privately owned company, the industry continued with the pool system. A pool system exists when cellars pay grape growers for the grapes delivered at the cellar. The grapes delivered are categorised in quality groups and "pooled" accordingly. The grape growers are then compensated according to the quantity and quality of their grapes. This system provides security for the grape growers and cellars are able to build relationships with the grape growers and

work together towards the same goal, essentially advancing their supply chain maturity level. A problem with the pool system is that grape growers only get imbursed after the wine is sold and as such, many cellars would enter into the bulk market.

Furthermore, from 2009 the total natural wine exports dropped with an average of 5% for three years and in 2012 exports increased with 16.7% from the previous year and a further 26.5% from 2012 (SAWIS, 2014a);(see Figure 1.6). SA exports the majority of its bulk wine to the northern hemisphere (See Table 1.2). Table 1.3 displays the growth of the top nine countries regarding SA's bulk exporting market. It is noteworthy that from 2008 to 2014, SA experienced growth with most countries, although 2014 is considered a poor year compared to 2013. In 2012, Italy and Spain experienced drought and were not able to produce the quantities of wine they usually experience (Hall, 2012). New world countries such as SA, Australia, Argentina and Chile took advantage of this opportunity and exported bulk wine to all major importing countries. In 2013, the drought experienced in 2012 resulted in a dramatic increase in the volume of wine exported from SA. The 2013 exports provided an exceptional year; considered to be an outlier, while 2014 is considered to be a normal year.

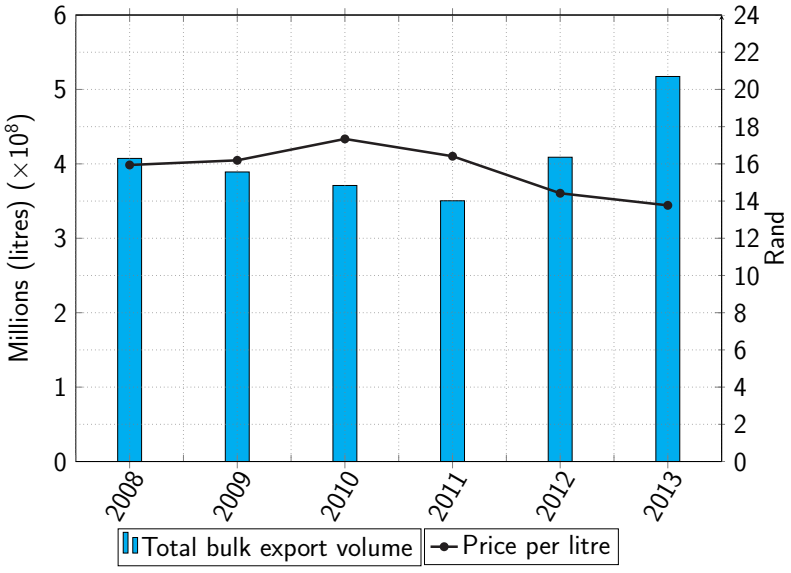

Figure 1.6: Total bulk wine export volume and value (Price per litre): 2008 - 2013 (SAWIS, 2014a)

Table 1.2: Total SA bulk exports to top 9 bulk importing countries (SAWIS, 2014a)

Country	2010	2011	2012	2013	2014
Germany	51 764 395	54 811 939	63 486 633	77 656 702	62 985 326
UK	24 565 807	37 785 571	42 001 377	71 060 122	68 076 583
Russia	17 091 075	6 461 002	6 847 278	35 428 068	25 418 866
France	7 566 206	6 607 564	8 265 912	33 827 968	23 857 314
U.S.A.	8 152 292	3 658 030	3 774 671	21 625 827	1 602 344
Canada	5 954 901	5 300 962	6 670 158	14 391 812	10 307 654
Denmark	3 935 227	5 900 100	10 507 970	12 592 591	11 516 288
Sweden	1 008 710	6 319 211	10 609 157	11 872 538	6 508 933
Switzerland	4 434 806	2 505 081	9 462 066	9 462 066	4 967 347
Total (ℓ)	124 473 419	129 349 460	161 625 222	287 917 694	215 240 655

Table 1.3: Bulk export growth per year from 2009 - 2014 (SAWIS, 2014a)

Country	2009	2010	2011	2012	2013	2014
Germany	7%	-6%	6%	16%	22%	-19%
UK	23%	-19%	54%	11%	69%	-4%
Russia	-65%	190%	-62%	6%	417%	-28%
France	5%	-5%	-13%	25%	309%	-29%
U.S.A.	-36%	56%	-55%	3%	473%	-93%
Canada	-48%	93%	-11%	26%	116%	-28%
Denmark	26%	-21%	50%	78%	20%	-9%
Sweden	400%	-80%	526%	68%	12%	-45%
Switzerland	-28%	39%	-44%	278%	0%	-48%
Total (ℓ)	-3%	3%	4%	25%	78%	-25%

1.2.4 Conclusion

This section provided the reader with background of the SA wine industry, specifically, the history of wine making and the evolution of the SA wine industry structure. In addition, the section presented the current state of the SA wine industry with reference to statistical data. This section further included an outline of segmentation within the

wine supply chain and background regarding a particular segment, namely bulk export.

1.3 Rationale of the research

A preliminary study was conducted in 2012 to identify the gaps, opportunities and information available in SA's wine industry. The research indicated that SA's wine industry lacks necessary knowledge of the supply chain and as a result, has been underperforming (Van Eeden *et al.*, 2012). Currently, there are no performance indicators for cellars to measure themselves with (PwC, 2014). Therefore, enriching the knowledge of supply chain principles may help the wine industry to improve the current supply chain performance, resulting in well-established long-term relations with both customers and industry players.

An opportunity was presented to Stellenbosch University to establish a performance measuring framework in order to benchmark the current state of SA's wine supply chain. Firstly, performance indicators should be identified that will have an effect on the performance of the supply chain. Secondly, the data should be gathered for the selected performance indicator and thirdly, the data should be presented to the cellars in order for them to interpret it and improve their supply chain performance. This will enable other industry players in the supply chain to view their performance relative to the sample or industry average, and to improve their processes whilst contributing to the industry's performance as a whole. SA's wine is sold on the global market and competes against countries such as France, USA, China, Australia and Chile, among others, for market share SAWIS (2013). To improve current global trading, change has to occur. Changing the current structure, logistics, or the way organisations are managed, remains challenging. Many organisations are resisting change because the current management meets their basic requirements.

The purpose of this study is to develop a performance measuring framework for the SA wine supply chain, focusing on the bulk export segment. The framework should be developed to enable cellars to benchmark quantitative supply chain information. This will permit them to compare supply chain processes to the sample or industry average, which will ultimately construct a platform for the SA wine industry to improve as a

whole.The performance measuring framework can be used to benchmark the SA's wine industry performance indicators. Cellars can use the benchmark results to evaluate where specific performance attributes of their supply chain are, relative to the sample or industry average. After evaluating their position, action can be taken to improve the gaps in their supply chains. This will ultimately benefit all wine producers and advance the industry as a whole.

1.4 Problem statement

A preliminary study was conducted in 2012 indicating that SA's wine industry lacks the relevant knowledge of the supply chain concepts, and as a result, the industry generally under-performs. The purpose of this study is to develop the first performance measuring framework for the SA supply chain by using quantitative and quantitative supply chain information, focusing on one segment in the wine industry, namely bulk export. This will provide a platform from which to advance the SA wine industry. Questions that have to be addressed in this thesis are listed below:

- What processes are conducted to export wine in bulk format?
- What level of data is available that can be used to develop and validate a framework?
- Which performance indicators would distinguish cellars from one-another and provide distinctive benchmarking results?

1.5 Scope and objectives

The following two sections will provide the scope and objectives that comprise this thesis. The scope is briefly discussed to provide an overview of the field that is under study. More detail regarding the scope of this study is provided in Chapter 3.

1.5.1 Scope

This thesis addressed the first two years of the three-year project. For the purpose of this study, the SA wine industry is divided into four segments. These segments are listed below:

- Bulk Export
- Packaged Export
- Bulk Local
- Packaged Local

The project research team consists of three masters students, each developing a performance measuring framework for a selected segment. This thesis was conducted on the SA bulk wine supply chain, specifically, the section in the supply chain after the wine has been produced, to the delivery at port of discharge (POD);(See blue highlighted entities in Figure 1.7). The other two students focused on packaged export and packaged local segments. The bulk local segment was not accounted for, since the wine is included in any of the other segments. In other words, the bulk local wine will be sold to an individual who will then sell it again, but in any of the other segments.

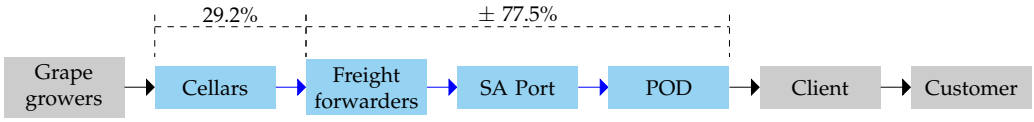

Figure 1.7: High-level representation of SA export supply chain

The focus of this thesis was on the bulk export segment that consisted of 16 cellars representing 29.2% of the bulk export segment (see Figure 1.7). SA's wine industry is large and comprises nearly 600 cellars. To include all cellars in the sample was beyond the scope of this study, since this would have resulted in an overload of information, which could not be evaluated. As such, the 29.2% representation was deemed sufficient for the bulk export segment. The participating cellars represented a variety of producer cellars, wholesalers and private cellars that were beneficial since it involved all three cellar types that are present in the industry. The three cellar types include producer cellars, private cellars and wholesalers.

Four freight forwarders were approached in the second year of the study that mange roughly 77.5% of the SA wine exports (see Figure 1.7). Semi-structured and unstructured interviews were conducted to collect quantitative and qualitative data. In addition, PwC, an auditing firm, was approached to comprehend the financial side of the

cellars. An entity that was not approached in the supply chain was the Cape Town port, seeing that wine is a small part of the ports' exports comparing it to deciduous fruit, steel, and chemicals among many others.

1.5.2 Objectives

Quantitative and qualitative information was gathered from semi-structured and unstructured interviews, visits to wine farms, appointments with freight forwarders and an auditing firm, a survey and multiple research projects. This enabled the student to develop a performance measuring framework for the bulk export segment. Advantages from other established frameworks were also used as guidance in developing the framework. The performance measuring framework developed in this thesis can be used to benchmark processes in the bulk wine supply chain. Wine producers can compare their supply chain's quantitative information against industry standards and identify gaps within their supply chain. Key objectives for the study in the bulk export segment included the following:

- To understand SA's wine industry supply chain and its processes regarding bulk export.
- To assess the maturity and determine the level of information available in the supply chain.
- To identify performance indicators of the wine supply chain that can be used as a benchmark metric that will help improve SA's wine industry as a whole.
- To create a framework to measure performance indicators using a established framework and analyse it after data is collected.
- To identify gaps in the framework and develop an ideal framework.

1.6 Conclusion

SA's wine industry in under-performing and under pressure. The research team believes that enriching the knowledge of SCM can improve the ability to make better business decisions, which could improve logistical performance and ease the pressure

on wine producers. Quantitative and qualitative information was gathered primarily through semi-structured and unstructured interviews, a survey and multiple research projects. The information obtained was used to develop a performance measurement framework for the bulk export segment in order to benchmark SA's wine cellars supply chain processes. The thesis aims to provide the wine industry with a way to improve business decisions, logistical performance, and customer satisfaction within the wine supply chain to achieve world class standards. This will benefit the industry in competing in the global market.

Chapter 2

Theory and literature analysis

Contents

The purpose of this chapter is to provide the reader with the necessary literature that has been reviewed. This chapter commences with the important aspects of SCM and total quality management (TQM) as well as the benefits it holds. The chapter further discusses different categories of benchmarking and a method to implement a benchmarking study, followed by reviews on different performance measuring frameworks with a focus on the SCOR framework. Finally, this chapter includes the benefits of having a mature supply chain and the effects of implementing a performance measuring framework. This chapter aims to provide the reader with a clear conceptual knowledge of SCM, benchmarking and the importance of performance measuring frameworks.

2.1 Supply chain management overview

This section will present an overview of SCM and TQM. Both knowledge of SCM and TQM are becoming increasingly important for industries as they experience growth. With regards to the wine industry, it is growing and more wine is being produced every year. As such, more international markets are entered by cellars and as a result, the logistical activities are becoming complex. It is important to manage these activities efficiently and effectively. A further look at TQM approaches, namely the plan-do-act cycle and benchmarking will also be discussed.

2.1.1 Short history of SCM

In 1908, Henry Ford installed the first assembly line of an entire auto-mobile. In 1913, the demand for cars required Henry not only to manage the assembly line, but to observe the entire supply chain as a whole (Glueck, Koudal & Vaessen, 2006). Managing a supply chain was a new and innovative way of managing an organisation. In spite of courses explaining SCM already existing in the United States education system in 1919, it was only considered to be a strategic function from the 1950s. The transformation period started after the 1950s, when companies recognised SCM as a separate organizational function (Habib, 2011). Only in the 1980s, did SCM form part of manager's

strategic decision making process.

SCM became a popular trend, and various business magazines published multiple articles on SCM and relevant topics. The SCM wave continued through the 1990s and became more complex as personal computers and internet became established in the world of technology. Globalisation of products and services stared becoming a new strategy for industries and changed the way supply chains were managed. Thereafter, companies such as Dell, Procter & Gamble, Toyota, Walmart ect. recognised SCM as a primary process to manage a company in all its aspects (SCC, 2013).

In 1996, a non-profit organisation, namely the Supply Chain Council (SCC), was formed. Their primary goal was to provide tools to help *"organizations make dramatic, rapid, and sustainable improvements in supply chain performance"* (SCC, 2013). Supply Chain Operations Reference (SCOR) is one of the current tools developed by the SCC and is used in industries to improve logistical performance.

2.1.2 Supply chain management

"Supply chain" is a general term used in service and manufacturing industries, the primary purpose of which is to satisfy customer needs while generating profits for the organisation (Chopra & Meindl, 2001). In this section, a conceptual understanding of supply chain is provided as well as the importance of managing it.

Supply chains comprise of all activities, beginning from raw material to the end consumer. These activities include sourcing, manufacturing, documentation and transportation among many others. All activities form part of functions within the supply chain and operate as cross-functional operations where information, funds and physical products flow. Each function interacts with other functions and operates differently. Importantly, all functions operate as one to satisfy customers needs. One way to measure supply chains are by calculating their value generated, which is a financial measurement to compare most supply chains with one another. According to Chopra & Meindl (2001), the objective of a supply chain is to maximise the overall value generated. The value of a supply chain is the difference between inputs and outputs. In

other words, it is the difference between the effort that went into producing the final product and what the customer values the final product for. Another method to compare supply chains with one-another is to calculate the supply chain's profitability, which includes all profits shared across the supply chain functions. The objective of a supply chain is to maximise the value generated and operations that contribute to the value of a supply chain, such as funds, information, and physical products should carefully be managed. In addition, a supply chain consists of functions where decisions are made daily in order to optimise the integration between information, funds and the flow of products. As a result of the latter, the term "supply chain management" was established and is now recognised as a strategic function in most organisation (Habib, 2011). Michigan State University (2014) defines SCM as follows:

> *SCM is an integrated approach to planning, implementing and controlling the flow of information, materials and services from raw material and component suppliers through the manufacturing of the finished product for ultimate distribution to the end customer (See Figure 2.1).*

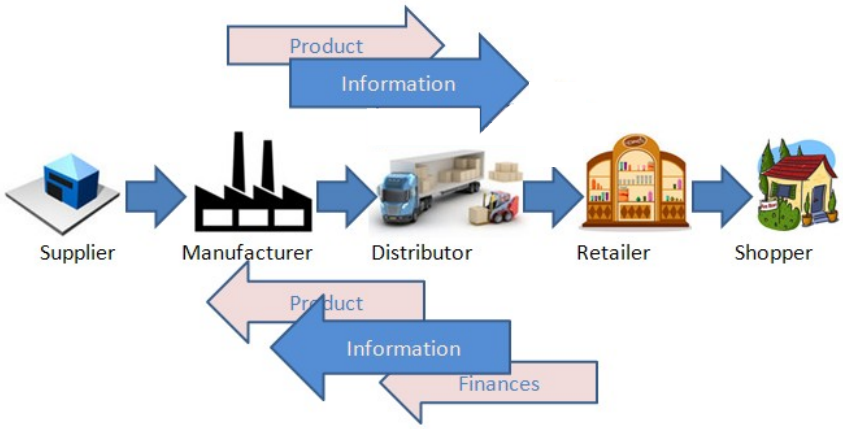

Figure 2.1: SCM representation (Cheng, 2014)

Consumers constantly require more advanced products, services, customer care and faster delivery at a lower cost. Companies are challenged to meet these needs and to operate as a profitable organisation. However, consumers' needs are not the only challenges companies face, as global competition and market uncertainty are other challenges to take into consideration. One way to manage these challenges is to manage

the variety of supply chains within an organisation. According to Roberts (2014), SCM provides many advantages, namely *reduced cost*, *increased efficiency*, *increased output* and *profits*. Other advantages, namely shorter lead times, forecasting and improved planning are also possible. Therefore, SCM is becoming a key factor to help organisations overcome the variety of challenges mentioned above.

To ensure well-coordinated supply chain, all parties within the supply chain should work towards the same goal. However, numerous dilemmas can prevent the supply chain from flowing efficiently; causing mayhem up and down the supply chain. One such dilemma is known as the *bullwhip effect*. The bullwhip effect occurs when demand fluctuates and amplifies up the supply chain from customer to supplier. According to Nienhaus, Ziegenbein & Duijts (2011), the bullwhip effect affects three aspects of the supply chain, namely *dimensioning of capacities*, *variation in inventory level* and *high level of safety stock*. These effects have a great impact on finances and information flowing through the supply chain and no party within the supply chain will benefit from it at any point. A well-coordinated supply chain will, however, prevent distortion and diminish the bullwhip effect. Also, it will balance supply and demand, allowing the supply chain parties to have a healthier risk-managing system.

Companies such as IBM, Apple, Dell and many others are considered among the world's leading companies. A system that all these companies have in common is well-structured supply chain. The above mentioned companies are listed in the top 25 Gartner supply chain for 2015 (Rivera (2015); see Appendix C), of which 15 are listed in the Forbes 200 largest public companies (Forbes, 2015). These companies mastered supply chain management and realised that a supply chain is a bi-directional flow process, where products and information flow from raw material to consumer and *vice versa* (See Figure 2.1).

To summarise, SCM is a key factor in all industries, which will not only benefit the organisation itself, but all parties involved the supply chain. As such, organisations should adopt this concept and continuously improve the flow of products, information and finances in order to create a sustainable supply chain.

2.1.3 Supply chain visibility

One manner in which a supply chain can be effectively managed is with information flowing bi-directionally; from raw materials to the consumer. This enables the company

to use the information to create visibility in the supply chain. The visibility will provide clarity regarding the limits, performance and opportunities of the supply chain. In this context, supply chain visibility is key to the success of a supply chain. Moreover, the maturity of a supply chain is greatly affected by its visibility, and will be discussed in the following section.

Collecting data within organisational systems is becoming more important, since the information can give an indication as to where problems lie and whether an organisation is experiencing growth. The information is not only beneficial for the organisation itself, but for other supply chain partners who collaborate with them. Therefore, supply chain visibility is important and provides a clear view regarding operations such as, in-transit visibility, production visibility, on-hand visibility and cost visibility. Visibility affects the entire performance (Carid, Moretto, Perego & Tumino, 2014) and strategic performance (Wei & Wang, 2010) of a supply chain and is therefore a key issue that should be addressed. Data visibility within the supply chain is relevant for all organisations and includes the sharing of real time data of critical information that is required to manage the flow of products/services, and information between customers and suppliers (Handfield & Nichols, 2002). According to Handfield & Nichols (2002), having supply chain visibility can include benefits such as *reduced lead times*, *better decision making*, *improve constraint management*, *increased profits and lower costs*, and numerous others, which will effectively decrease supply chain problems. Not only will these benefits diminish problems, they will also enable supply chain partners to prevent future problems form occurring. These anticipated problems can then be identified early, and appropriate action can be taken.

Handfield & Nichols (2002) conducted a study asking numerous companies to rank which information should be shared in a supply chain. Companies were given a list of criteria which they had to rank on a scale from 1 to 5, with 5 being the most important. The average results of the feedback received are displayed in Table 2.1. Only the top 8 out of 34 criterions are displayed in this table.

Table 2.1: Ranking of shared content information

Criteria	Average
Material releases	5
Material requirements	4.8
Inventory	4.7
Order status	4.3
Advanced shipping notice	4.3
Sales forecast	4.3
Quality specification	4.3
Rejection of order	4.3

Furthermore, visibility has a direct impact on the maturity of the supply chain. The maturity of a supply chain can be divided into five levels (See Table 2.2); (McCormack, Johnson & Walker, 2003). This supply chain maturity model was developed over a period of two decades by researches who concluded that it has a life cycle, depending on the extent to which the organisation defines its processes and their ability to manage, measure and control them. The purpose of this model is to asses at which stage an organisation's supply chain is situated. *Level 1* of the maturity model is where an organisation's supply chain is unstructured and internally focussed. This results in high SCM costs and an unpredictable process performance (McCormack *et al.*, 2003). Also, if targets are set, they are often missed as a result of low visibility up and down the supply chain. This may cause low customer satisfaction and the outcome presents frustration and burnout in an organisation. *Level 2* is an organisation's supply chain with basic processes in place, which are defined and documented. The organisation remains internally focused where representative from sales, transport, and manufacturing meet regularly to coordinate with each other (McCormack *et al.*, 2003). Theses representatives have a basic understanding of SCM aspects and work primarily in functional silos. The SCM costs remains high and process performance is more predictable, but the organisation still misses targets due to low visibility. Levels 1 and 2 are internally focused, since operational excellence and functional improvements remain the core focus of internal operations (Poirier & Walker, 2005).

Table 2.2: The 5 levels of supply chain maturity (McCormack *et al.*, 2003)

Levels	Process maturity	Short description
Level 1	Ad Hoc	Processes are unstructured and internally focussed.
Level 2	Defined	Basic processes are defined and documented, and also internally focused.
Level 3	Linked	Basic collaboration between customers with structures with strategic intent is put in place.
Level 4	Integrated	The company, its suppliers and vendors are working collaboratively. There is high visibility throughout the supply chain.
Level 5	Extended	A horizontal, customer focused, collaborative culture is firmly in place.

Level 3 represents the breakthrough level (McCormack *et al.*, 2003). At this level organisations have a SCM team and generally have a supply chain manager. The team puts structures into place above that of traditional functions. The organisation shares high-level information, as well as common goals and measures, which will stretch horizontally across the supply chain. At this level, SCM cost decreases, root cause analyses are conducted and performance processes become more predictable. More importantly, at this level, customers are included into decision making and process improvements. At *Level 4*, the traditional functions disappear, as SCM procedures take over. A joint venture is undertaken by supply chain partners in order to collaborate on planning and forecasting, which dramatically reduces the SCM cost whilst increasing customer satisfaction. *Level 5* is where a horizontal, customer focused, collaborative culture is firmly established. All supply chain parters are integrated and all have high visibility of the supply chain. This level indicates complete network connectivity and prove to have high processing capabilities.

A higher level of supply chain maturity may require costly infrastructure and not all organisations have the need to operate at level 5. Therefore, it is important to understand the industry with which the organisation is situated in order to determine the level of supply chain maturity that is required for that industry. Also, an organisation might operate at level 2 supply chain maturity, but in order to permeate new markets, the organisation has to shift to level 4, which will ease the process of invading unknown

territory. Therefore, organisations not only need to operate at the current level of maturity, but should identify the level of maturity other possible markets are operating with.

To summarise, with greater supply chain visibility the organisations are able to have a lean supply chain, identify problems early on and eliminate them, improve customer satisfaction and increase profits. It also directly affects the maturity of the supply chain and organisations, therefore, have to determine the supply chain visibility required for their industry on order to optimise supply chain costs.

2.1.4 Total quality management

Organisations strive for world class performance; adding maximum value to their services or goods with minimal input. One approach to controlling these inputs and outputs is total quality management (TQM). Reid & Sanders (2013) define TQM as "*an integrated effort designed to improve quality performance at every level of the organisation*". In addition, Dahlgaard, Kristensen & Kanji (1998) developed a pyramid, which was adapted from Kanji & Asher (1996), with five principles forming the core of TQM. The five pillars are:

1. Leadership
2. Customer focus
3. Everyone's participation
4. Focus on facts
5. Continuous improvement

These principles are fundamental pillars in the TQM pyramid, but continuous improvement will be the focus of this section. This section will also discuss implementing a benchmarking study, which is one of many continuous improvement methods.

2.1.4.1 Continuous improvement

Many organisations strive to implement a quality focused culture within their company. The benefits of the latter are increasing competitiveness, enabling change, and increasing co-operation, among many others (Harvey, 2006). The concept of "quality" has been around for many years, yet its meaning and focus has changed from inspection, to customer driven quality. The transformation process from old and new quality

concepts are detailed in Figure 2.2.

Date	**1900s**	**1940s**	**1960s**	**1980s - To date**
Focus	Inspection	Statistical sampling	Organisational quality focus	Customer driven quality
Description	Old Concept of Quality: Inspect for quality after production.			New Concept of Quality: Build quality into the process. Identify and correct causes of quality problems.

Figure 2.2: Time-line showing the evolution of quality concepts (Reid & Sanders, 2013)

Even though the meaning of quality and its focus has evolved, the cost of poor quality is always a burden and can lead to loss of business. Consequently, companies still have major issues in this regard and constantly apply different techniques to solve quality related problems. One philosophy, which has earned its credibility, is *continuous improvement*, also known in Japanese as *kaizen* (Reid & Sanders, 2013). Continuous improvement has many methods to help companies implement it. One such method, which will be discussed below, is *benchmarking*. A short description follows:

Benchmarking:
The procedure that entails comparing process measurements of operation, products, services and practises, is referred to as benchmarking. Benchmarking is an important tool for virtually any industry, and by implementing it, industries can achieve realistic goals and sustain them. According to Howard (1992), no business is too small to take part in benchmarking. In fact, smaller companies can integrate new processes and ideas more easily than larger companies that are constrained in their systems or government. Indeed, study conducted by Taylora & Wrightb (2006) found that the success of TQM was not associated with the size of the company. Their results further suggested that in order to attain the highest level of TQM success, companies should measure benchmarking and self-assessment practices, provided they establish an appropriate measuring framework before measuring these practices. In addition, benchmarking should be a replicable process and should, therefore, be managed as one.

A simple method to apply is the plan-do-study-act (PDSA) cycle, which was developed by Deming (Dahlgaard *et al.*, 1998). PDSA cycle is a straightforward approach that is detailed in Figure 2.3. For each phase in the cycle, it is important to document the problems as well as the procedures that were followed to find the solutions. Future problems can be traced back to the documents with logged solutions in order to apply the same solution or improve it. Not only should the problems be documented, but data should also be gathered to compare processes before and after implementing the solutions to examine whether or not the process has improved. The procedure of each phase is described below:

- **Plan:** The cycle starts with identifying the problems and planning to solve each one.
- **Do:** The second phase consists of implementing the plan. It is preferable to conduct a pilot study. One reason for this is to examine whether or not the plan is economically viable and effective.
- **Study:** In the third phase the managers should gather and examine the data obtained in the previous two steps to determine whether or not the process has improved and if it is cost effective. Otherwise the plan should be re-evaluated.
- **Act:** The final phase consists of integrating the information of the previous three phases and taking action, whether the results are positive or negative. This phase is most effective when communicating with other employees as soon as changes occur.

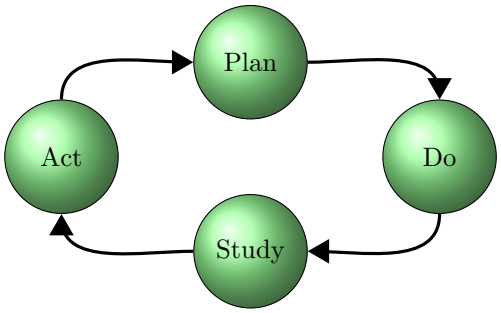

Figure 2.3: Plan-Do-Study-Act cycle (Reid & Sanders, 2013)

Organisations cannot expect to develop the ideal framework for benchmarking after the first, or only one attempt. It is a process that gains value over time. Therefore, the PDSA cycle is an ideal cycle to manage the benchmarking process.

2.1.4.2 Categories of benchmarking

As stated in Section 2.1.4, benchmarking is a proven philosophy of continuous improvement to support organisations in achieving their goals and sustaining them. Although benchmarking alone will not guarantee that the companies achieve all of their goals, this process can assist an organisation insofar as to identify which actions should be taken to achieve best in class. Therefore, a strong correlation between the analysis of information obtained through benchmarking and the implementation of results should be apparent. Benchmarking is a systematic process which should be implemented on a continuous basis to obtain the best results. There are four categories of benchmarking, namely *internal*, *external*, *functional* and *generic* benchmarking (Karlöf & Östblom (1994); Zairi (1992)). Each benchmark serves different functions, depending on the outcome one wants to achieve. A description of each benchmarking category is provided below.

Internal benchmarking:
Organisations have certain structural processes in place that fit their strategy the best. Some of these processes differ vastly inside an organisation, but others are similar and relatively comparable. Comparing the similar processes within the organisation against one-another is known as internal benchmarking (Zairi, 1992). For example, an organisation consisting of several franchises can compare their processes with one-another and implement the best practices. This presents an opportunity to be innovative with new processes and as a result, the organisation can benefit as a whole. Benchmarking is a timely and continuous process, which allows organisations to become acquainted with the process of benchmarking and sharpen their focus on the operative content of their work (Karlöf & Östblom, 1994). One advantage of internal benchmarking is that the organisation retains full control over the data and do not have to collect the data from various sources to obtain accurate results. However, the organisation is restricted by its own boundaries, and can access only limited data. Whereas external and functional benchmarking on the other hand, have access to more data and as such are more likely to achieve world class performance.

Many organisations start with internal benchmarking and use it as the groundwork before tacking on external benchmarking. This is done in order to get the most value out of external benchmarking. Importantly, internal benchmarking is not a substitute for external benchmarking, but rather a starting point for this method (Karlöf & Östblom, 1994).

External benchmarking:
External benchmarking is the process of comparing the activities of one's own organisation to other leading competitors by measuring the actual processes. This benchmarking category does not limit the organisation to compare its activities within the same industry, but encourages its comparison with various other industries (Jacobs, Chase & Lummus, 2011). However, there are some risks involved in external benchmarking. One such risk is that organisations tend to focus more on competitive factors instead of identifying the value it can add to effective performance. It is not natural, as Karlöf & Östblom (1994) defines it, "to dance with the enemy". Many organisations that undertake benchmarking are competing for market share and are unaccustomed to share important information regarding processes and financial data. This is problematic since companies will benefit most when organisations supply all relevant data. Individuals can then calculate the benchmarks and find world class performance indicators proficiently and accurately.

Functional benchmarking & Generic benchmarking:
Functional benchmarking is similar to external benchmarking, but its scope is restricted to comparing production operations or processes within the same industry. It focuses on products, services and specific processes, functions and product development. Finally, generic benchmarking is similar to functional benchmarking, but compares production operations or processes across non-relating industries. The methods discussed here is the area where an organisation can benefit most from using benchmarking, since its scope includes related and unrelated industries (Zairi, 1992). Also, the focus is narrowed down to only production operations and distinctive processes, which allow the organisation to focus on specific problems.

2.1.5 Conclusion

To summarise, benchmarking is not always the optimal solution, but it can clarify which questions should be asked to improve the logistical processes at hand. Also, internal benchmarking is not a substitute for external, generic or functional benchmarking, but is merely a starting point. External and internal benchmarking holds potential for sustainable growth, though functional and generic benchmarking hold the most potential for growth. The benchmarking category selected for this study was functional benchmarking. The industry lacks supply chain knowledge and is not equipped with meaningful research to contribute to external and generic benchmarking. Also, the

industry is not embodied with franchises, suggesting that internal benchmarking was not an option for this study. In addition, since benchmarking is a process that should be replicable, the PDSA cycle method can be used to regulate the benchmarking process.

2.2 Implement benchmarking as a strategy

The content of this section consists mainly of the implementation process of benchmarking. It commences with a description of a *hypothesis benchmarking process*, as developed by Karlöf & Östblom (1994), and continuous with the implementation process. The implementation process is an integration of methods used by Watson (1992) and Karlöf & Östblom (1994).

2.2.1 Hypothesis benchmarking process

Before benchmarking, an organisation can first implement a hypothetical approach in order to see if this process can add value for the time invested. This will provide the organisation with a good indication of the result that a benchmarking study can obtain. By conducting a hypothesis benchmarking test, organisations can ascertain whether or not the benchmarking study would be worth their effort. The hypothesis approach consists of five steps (Karlöf & Östblom, 1994). These steps are detailed below:

1. *Surveying the structure of the business*
   This step is conducted to understand the environment that the hypothesis benchmarking process should operate in. The environment is a macro overview that includes financial strength, growth and dynamics, competition, efficiency and the organisational structure of the company.

2. *Identifying difficulties and constraints*
   It is important to identify difficulties and constraints at an early stage in order to avoid problems later on.

3. *Identifying critical questions*
   Questions should be asked to indicate precisely what the study is intended to answer.

4. *Setting up hypothetical solutions*
   The hypothetical solutions are answers to the critical questions, indicating which solutions are plausible with the questions raised.

5. *Testing the truth of the hypothesis*
   At this point, the solutions obtained in the previous step are evaluated. A "logic tree" is proposed to determine the steps towards each solution. If a hypothesis proves false, one should refer back to the logic tree and identify a different path to obtain a true hypothesis.

The hypothesis approach provides a quick solution to problems and broadens one's knowledge of the organisation. The drawbacks are that this approach cannot solve complex problems and the solutions obtained are merely an indication of what may occur. Despite the disadvantages, this approach is beneficial for all organisations and is generally shown to have an overall positive outcome (Karlöf & Östblom, 1994). If the hypothesis approach proves to be beneficial for the organisation, the organisation can fully implement a benchmarking study.

2.2.2 Eight stage benchmarking implementation

The implementation of benchmarking is an eight stage process, adapted from Watson (1992) and Karlöf & Östblom (1994), and if carried out correctly, can minimise error and provide relevant data. This procedure requires preliminary activities to be completed before implementing benchmarking. According to Watson (1992), implementing a benchmarking study is similar to conducting a research project. The benchmarking method is divided into two sections, each consisting of four stages. The first section's stages include *understanding the business model*, *deciding on activities to be benchmarked*, *breaking activities down*, *developing business model* (See Figure 2.4). After *Section 1* has been completed, *Section 2* commences with the following stages, namely *finding benchmarking partners*, *gathering information*, *analysis* and *implementation* (See Figure 2.4). Therefore, *Section 1* consists of the preliminary processes and *Section 2* is the actual implementation of benchmarking.

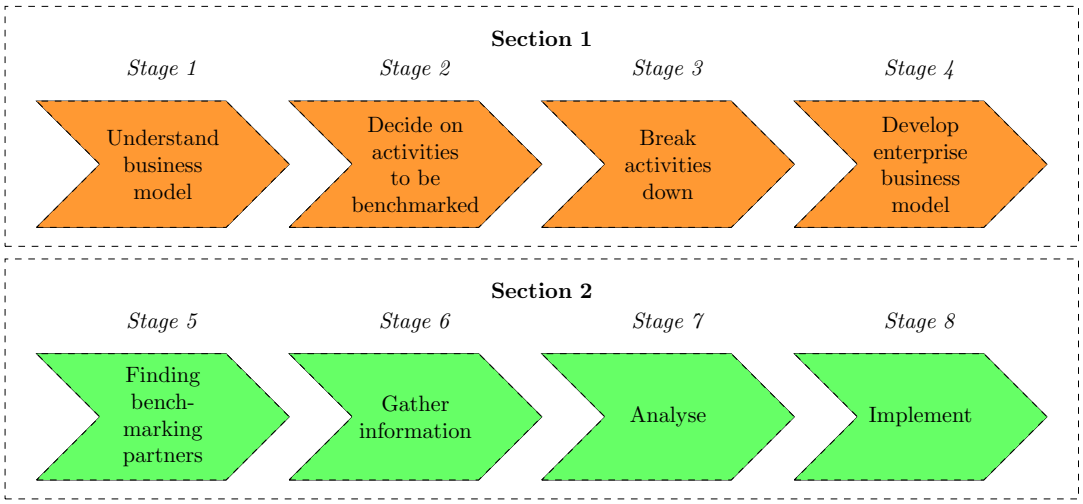

Figure 2.4: Eight stage benchmarking implementation

Stage 1 of *Section 1* is a comprehensive study necessary in order to understand the business or industry of the organisation, as well as to establish whether an external or internal benchmarking study should be conducted. This stage is the starting point that allows the individual who is implementing the benchmarking study to understand the operations behind the business and to identify the mission and vision of the business. In *Stage 2*, key business processes and problem areas should be identified to establish which activities should be benchmarked. Clearly, more than one activity should be identified, since some activities are trade-offs of one-another. For instance, an organisation may perform best in lead times to deliver products to customers, which would indicate that the products are make-to-stock. As a result, the trade-off is higher storage cost for the organisation. Identifying these activities can be achieved through ABC analysis, among other methods, in order to distinguish whether or not the organisation should undertake an internal, external, functional or generic benchmarking study. Moreover, it is important to take customers and suppliers into account when identifying key business processes and problem areas in a supply chain.

At *Stage 3*, the organisation should break the key business processes and problem areas down into detailed segment in order to discover how the processes work and how they can be measured. This provides the organisation with sufficient information to search for other business processes and problem areas similar to theirs. One disadvantage with breaking down these processes, is that it is expensive and time-consuming. In

spite of this, it tends to generate the most accurate solutions. Upon completion of these stages, the organisation will have the information needed to develop a business enterprise model (*Stage 4*) appropriate for their organisation (Watson, 1992). This model should illustrate the integration between internal services, key business processes and market segments. In addition, the business environment should be described through material, information, resources and control flows. Once the organisation has developed their enterprise business model and has identified the benchmarking activities, they should search for benchmarking partners.

Stage 5 of *Section 2* consists of finding benchmarking partners. Ideal benchmarking partners are the leaders in the industry who are willing to disclose information regarding their financial records and processes. Moreover, a trade-off between the leaders in the industry and those who are willing to disclose information should be determined in order to find ideal benchmarking partners. An ideal benchmarking parter would supply sufficient data and cooperate to benefit all parties participating in the benchmarking study. *Stage 6* involves collecting data with reference to the activities that were selected during *Stage 2* of *Section 1*. In *Stage 7*, the data is analysed in order to view the positions of all organisations. The average of the various organisations represents the sample's benchmark. Importantly, it would be best if the sample of participants represents a sufficient portion of the market in order to achieve an accurate benchmark average. Once each organisation has been benchmarked, they will be able to identify where they are positioned relative to the sample average. The organisation is now able to identify the activities in which they are lacking (*Stage 8*). The organisation can then review the best practises in order to improve their activities and be more competitive. (Karlöf & Östblom, 1994)

In conclusion, benchmarking is a process of continuous improvement and should be replicable by using the PDSA cycle. *Section 1* is a preliminary study and should only be conducted if the organisation's business model has not changed, whereas *Section 2* is continuous and should be repeated to obtain better results. This would allow the organisation to systematically improve key aspects of their processes to become a world class performer.

2.2.3 Data quality assurance

Data quality is a significant part of data collection and should, therefore, be part of the process from the beginning. This course of action is more commonly known as data

quality assurance (QA). Data QA is a system that is designed to ensure that the data meets the quality control's (QC) objectives. Usually data QA is conducted before data QC to implement the data capturing effectively. The data QA should conform to the following data quality objectives to guide the implementation of QC (see Table 2.3).

Table 2.3: Data quality objectives (CDM, 2015)

Objectives	Description
Relevance:	Is the data relevant and applicable to achieve objectives.
Completeness:	This includes procedures to handle, avoid and identify missing data.
Consistency	Will the data be reproducible if asked again or asked from others.
Credibility:	Is the reference to their sources and information/data provided.
Currentness:	Apply the most recent data available to reflect the current practices. Also, this relates the frequency the data is updated.
Accuracy:	The steps should be designed to minimise uncertainties and errors when collecting data.
Objectivity:	Avoid prejudiced, partial and biased information.
Conservativeness:	Any division in the objectives should be addressed and a conservative approach should be adapted for incomplete, incorrect, missing, old or invalid data.
Security:	Enforce a procedure to restrict access to the database.
Transparency:	Acknowledge processes and appropriate data to provide clarity.
Traceability:	The data should be traceable and documented such that a third party will be able to continue with the data collection.

All data quality objectives are important to meet, but some will receive more focus for this thesis since these are lacking in the SA wine industry. These objectives include completeness, consistency, accuracy, security, transparency and traceability. This will provide a stable platform for further research with particular reference to the development of a framework for SA's wine industry.

2.2.4 Blue and red ocean strategy

Benchmarking is an effective method to use and allows organisations to reach world class performance. According to Parast & Adams (2012), organisations should implement industry best practices to compete and challenge competitors. Therefore, the organisations should carefully monitor changes within their environment, as well as evaluate new technologies and best practices in their and other industries. Technologies and development of new information systems contribute to the world of information and organisations have more tools at their disposal to monitor changes in the industry. Matthew & Julian (2010) state that benchmarking creates a competitive environment for all organisations within an industry. Consequentially, organisations are starting to reach the *ceiling*. In other words, the major competitors in a market are implementing all relevant best practices and optimising each one. In this context, the blue and red ocean philosophy is relevant, and is as described below.

Chan & Mauborgne (2004) conducted a study to ascertain the distinction between those companies that became successful, where others have failed. Chan and Mauborgne identified two strategies, namely the blue and red ocean strategies. The blue ocean strategy involves organisations who are innovative and creates demand, rather than competing for it. The red ocean strategy represents all known markets where competition for market share is fierce, such as the fast moving consumer goods market, including many of the wine industry products. The differences between these two strategies are outlined in Table 2.4. Moreover, Chan and Matalobos found that those who created blue oceans, usually create them within their core business. In other words, they created blue oceans from red oceans by observing and studying the market to find where new demand can be created.

Table 2.4: Red ocean vs. blue ocean strategy (Chan & Mauborgne, 2004)

Red ocean strategy	Blue ocean strategy
- Compete in existing market space.	- Create uncontested market space
- Beat the competition.	- Make the competition irrelevant.
- Exploit existing market.	- Create and capture new demand.
- Make the value/cost trade-off	- Break value/cost trade-off
- Align the whole system of a company's activities with its strategic choice of differentiation *or* low cost.	- Align the whole system of a company's activities in pursuit of differentiation *and* low cost.

In essence, organisations need extensive knowledge of their industry to be able to create blue oceans. Thus, benchmarking an industry will not only enrich organisations' knowledge, but will allow them to move from red to blue oceans.

2.2.5 Conclusion

To summarise, benchmarking was discussed as an eight stage implementation process. Prior to the implementation process, a hypothesis benchmarking study can be conducted in order to determine whether or not the study will benefit the organisation to the extent that the study is economically viable. Furthermore, the red and blue ocean strategies were discussed in order to understand that benchmarking is not an optimal answer to solve problems. Organisations have to remain innovative in order to lead an industry and to target new markets. Benchmarking is a tool that can be used to create visibility within an industry and that will challenge organisations to improve those areas where they lack most. By implementing such strategies, all parties in the industry will be able to compare their performances and improve where necessary, thereby advancing the industry as a whole.

2.3 Performance measuring frameworks review

Firstly, this section provides the reader with the knowledge to develop a well-designed framework. Secondly, a few frameworks are discussed to provide a background that is beneficial for this study. The section concludes with a discussion as to why some frameworks are not suitable for this study and suggests the most appropriate one.

2.3.1 Relevant performance measurement requirements

In this section, different studies regarding performance measurement, are evaluated. Only the requirements that will improve the design for a performance measuring framework for this paper are discussed. Though the requirements discussed are mostly good quality frameworks, problem areas are also reviewed since they are downfalls that should not be repeated.

When analysing or benchmarking a supply chain's performance, quantitative analyses are preferred over qualitative analyses. Quantitative information is easy to process and concrete results can be obtained. Beamon (1999) supports this claim and states that qualitative information is vague and difficult to utilise in any way. Shao & Wang (2010) argue that a combined method is far more accurate, since qualitative information leads to quantitative results. Therefore, in order for companies to excel in their industry, it is necessary to identify supply chain performance measures using both quantitative and qualitative information.

Furthermore, supply chains are complex systems as discussed in Section 2.1.2. As such, it is difficult to identify exact measurements for a particular supply chain. In order to identify suitable measurements, quantitative and qualitative information should be gathered to fully understand the supply chain. Since each supply chain consist of its own distinctive processes, different performances can be measured within each supply chain. The supply chain's performances are affected by a diverse set of external variables such as, supply chain management and planning decisions, as well as supply chain design decisions (Pero, Rossi, Noé & Sianesi, 2010). According to Estampe, Lamouri, Paris & Brahim-Djelloul (2010), the performance of a supply chain can be measured in terms of both customers' level of satisfaction and the cost incurred. Also, Camerinelli (2009) reviewed a survey that asked a large number of European companies to list the three most common metrics they use to measure the performance of their supply chains. These included delivery performance and customer service level, cost reduction, and efficiency. However, since customer satisfaction is the main priority, it should be the focus of measurement. In other words, the functions which are measured should add value to the customer's perspective, not only to the company itself.

Gunasekaran, Patel & McGaughey (2004) developed a framework for supply chain performance measurements (SCPM), but argue that it is only a starting point for an assessment of the need for SCPM. Gunasekaran *et al.* (2004) also states that their

framework is compiled from a small sample and if an organisation desires to develop a framework they should reflect on their own needs and prioritise the measurements to fit their strategy. However, Gunasekaran *et al.* (2004) framework provides some benefits for this paper in terms of developing a framework for the wine industry. Gunasekaran *et al.* (2004) divided an organisation's supply chain activities into four areas, namely plan, source, make and deliver where each activity has a strategic, tactical and operational level. The strategic level includes high level decision-making where long-, medium- and short-term goals are decided. The tactical level includes calculated decisions to ensure the strategic level goals are met. And lastly, the operational level involves day-to-day decisions made by front-line or low-level managers. By dividing the supply chain activities into different levels, it designates the responsibilities for each measurement. This will in turn, highlight the information streams within the organisation and where it is lacking. For example, "sourcing" at the tactical level, may affect "making" at operational level, thus leaving a gap in information streams since these two managers don not have a day-to-day communication stream.

Furthermore, Neely (2002) identified certain requirements the performance measurement should adhere to. These requirements are:

- There should be few measures, since too many will exceed cognitive limits to analyse data and information will be lost. Also, to attain more diverse data, the number of measures should be evenly spilt between financial and non-financial measures.
- The non-financial processes should reflect on the financial sheets afterwards, such that non-financial measures are seen as leading indicators, while financial measures are seen as lagging indicators.
- The measuring system should be stable and should create an awareness regarding long-term goals.

Neely (2002), however, states that these requirements can only be achieved in a world with perfect measurements. Since this is the case, this study viewed these requirements as rough guidelines rather that absolute standards when considering a measurement. On the basis of Neely (2002) argument, Akyuz & Erkan (2010) conducted a literature review on SCPM for the new supply chain era regarding the problem areas, requirements, and basic research methodologies followed. Although Akyuz & Erkan

(2010) an suggested that further research is required in the area of developing performance measurements, they found that SCPM is still a positive addition to most organisations. Some problem areas and requirements highlighted in the study, are used in this paper to avoid similar mistakes executed in the past. Problem areas identified in the study that should be avoided are:

- Failing to align the organisation's strategy with the measurements.
- Measuring a large number of metrics.

These problem areas should be avoided since the focus of performance measurements is to measure processes or operations within the organisation and allow it to compare performance with itself and similar organisations. When the strategy is not aligned with the measurements, it steers the organisation's focus in the wrong direction, making them invest time and money in processes and people, all the while adding no value to their organisation. As such, an important step towards developing a suitable performance measurement is to understand the organisation's business model and to afterwards, establish short- and long-term strategies for the organisation. Not only should the right metrics be selected, but the correct quantity as well. Selecting too many metrics may lead to an overload of information that creates turmoil. This may shift the manager's focus to deal with irrelevant problems with the after-effect leading to investing resources in the wrong areas.

Furthermore, Akyuz & Erkan (2010) also argue that new era performance measurement metrics should include a list of requirements. Some requirements are recommended for this paper:

- Base the performance measurements on the industry's strategies and objectives.
- Balance non-financial and financial measures according to the industry's strategies.
- Be comparable to other performance measures used by similar industries (Akyuz & Erkan, 2010).
- Define and standardise data collection and calculation methods.
- Use performance measurement results for strategic, tactical and operational decision making.

- Prioritise metrics.

It is noteworthy that the requirements stipulated by Gunasekaran *et al.* (2004), Neely (2002) and Akyuz & Erkan (2010) are similar in some areas. Since each have valuable requirements for developing a framework, these requirements should be seen as a primary focus when determining the measurements. One aspect the above mentioned authors did not consider, is the relationship between the measurements. In light of this, Beamon (1999) proposed a framework for performance measurements. Beamon divided the performance measurements into three types, namely *resource measures*, *flexibility measures* and *output measures*. Resource measures consist of inventory levels, equipment utilisation and energy usage, among others. Flexibility measures accommodate the volume fluctuations in a supply chain and output measures consist of customer responsiveness, quality and quantity of products. Each is a vital contribution to the performance measurement, since one performance measurement affects the others. For example, when measuring a single measure of the supply chain's performance, namely cost, it would change the company's focus to reduce cost and optimise that aspect of the company. Although cost is considered to be a high priority when measuring performance, the other measures may experience a downturn. While companies may reduce cost, it could result in poor customer response time, poor performance or lack of flexibility (Beamon, 1999). Therefore, measuring a single performance measure ignores the interactions between characteristics in a supply chain and is therefore generally inadequate (Beamon, 1999).

To conclude, developing a performance measuring framework is different for each industry, but there are some requirements that should be taken into consideration across all performance measuring frameworks. These requirements were highlighted in this section as well as the problem areas to be avoided. Briefly, the major requirements to take into consideration are *aligning the measurements with the business strategy*, *measuring financial and non-financial measurements*, and *performance measurements that should be indirectly proportional to one-another*.

2.3.2 Balanced score card

In 1992, the balanced score card (BSC) was developed by Dr. Robert Kaplan (Harvard Business School) and David Norton as a performance measurement framework that combined financial and non-financial metrics to give managers a "balanced" view of organisational performance (Balanced scorecard institute, 2015). Kaplan & Norton (1992)

viewed the use of financial measurements alone as inadequate, since it gives misleading signals that interferes with innovation and continuous improvement. The financial measurement will indicate the after-effect of innovation and continuous improvement, but will not initiate them. In order to fully analyse organisational performance, it is necessary to measure both financial and non-financial metrics. Consequently, Kaplan & Norton (1992) developed the BSC. The BSC views the organisation from four perspectives, namely the *Learning and Growth Perspective*, *Business Process Perspective*, *Customer Perspective* and *Financial Perspective*. These perspectives minimise the information overload, giving managers four areas to focus on, form which to measure their performance. It delivers results in a single report allowing managers to see whether one area has improved at the expense of another (Kaplan & Norton, 1992). The following section will provide a short description of each perspective.

Learning and growth perspective

Innovation and continuous improvement plays a large role in an organisation's success. This enables them to remain competitive or even lead innovation. In order for this to take place, employees should be exposed to new techniques and technologies. Kaplan & Norton (1992) state that "a company's ability to innovate, improve and learn ties directly to the company's value"(Kaplan & Norton, 1992). Therefore, this perspective includes the learning and training of all individuals working for an organisation.

Customer perspective

Customers are an essential part of any organisation, especially in a competitive environment where it is easy for a customer to change suppliers when they are not satisfied. Therefore, customers are one of the key metrics that should be measured. Kaplan & Norton (1992) identified four categories by which customers can be measured, namely quality, cost, service and performance (Kaplan & Norton, 1992). Categorising and measuring the customers in this way would allow the organisation to view their performance from the customer's perspective.

Business process perspective

This perspective provides companies with internal business processes enabling them to satisfy customer needs and maintain a profitable organisation. Measurements should be aligned with an organisational strategy to provide sufficient information leading to better decision-making. Kaplan & Norton (1992) state that these measurements are unique to the organisation's mission and should therefore not be developed by outside

consultants, but by the managers themselves.

Financial perspective:
Financial measurements typically include net profit, shareholder profit, asset turnover, and return on capital, among many others. These measurements should not be neglected, since they show concrete results which make it easy for managers to make financial decisions. Also, it shows logical results for the other measurements enabling managers to see whether their decision was favourable for the organisation.

To summarise, the balanced score card is a well-researched method and has earned its credibility in the industry. Therefore, some aspects that were mentioned in this section will be used as guidelines to develop a framework for the SA bulk wine. These aspects are generally used to view the organisation as a balanced entity where financial and non-financial metrics are trade-offs of one another. Finally, it is imperative to incorporate the customer's perspective in most decisions, seeing that they are an essential part of any organisation.

2.3.3 Overview of SCOR

Organisations in general, have many supply chains to identify and prioritise. Without knowing which supply chains are essential, management might invest time and money in the wrong areas within their organisation. SCOR is a framework used to identify, measure, evaluate, and describe supply chain configurations within the organisation and also helps to prioritise them. SCOR consists of a hierarchy of four levels, where the first three levels are applicable across all industries and level four is industry specific (See Figure 2.5); (SCC, 2013).

Level 1 provides a high level overview of the organisation and consists of *six* processes, namely Plan, Source, Make, Deliver, Return and Enable. These processes define the content and scope of the SCOR model and differentiate businesses from one another. A combination of these processes will indicate the efficiency of several processes within the company (Garcia, Marchetta, Camargo, Morel & Forradellas, 2011). Each of Level 1's processes are sub-divided into more detailed processes with reference to the business strategy. These detailed processes are labelled as *Level 2* and consists of 24 processes. Organisations use at least one or more of these processes, since an organisation that uses supply chains require, for example, a planning section, and a Level 2 process would thus be mandatory for the organisation. *Level 3* is more detailed than

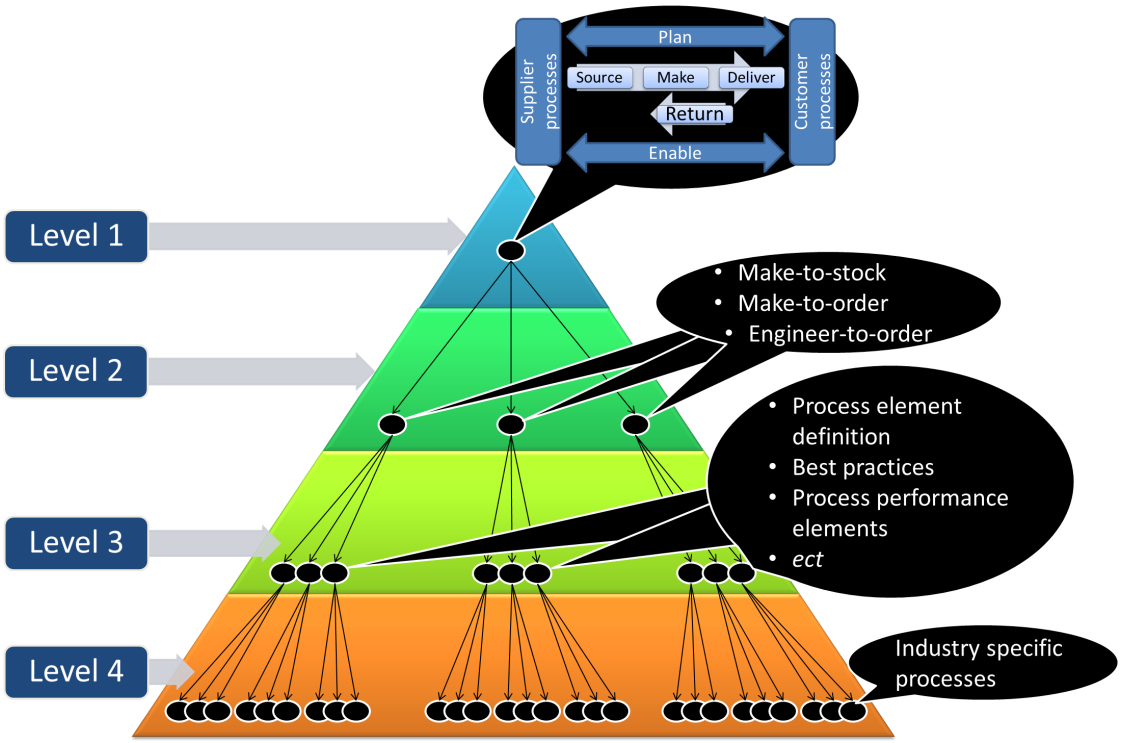

Figure 2.5: SCOR hierarchy consisting of 4 levels

the previous two levels, as it measures an organisation's everyday operations. This level defines an organisation's ability to successfully compete within its market and identifies gaps within their strategy (SCC, 2013). Lastly, *Level 4* is industry specific and is not therefore not within the scope of the SCOR framework.

In addition to the SCOR framework, the SCC provides a roadmap to implementing the framework, which consists of 6 phases (See Figure 2.6). In *phase 0*, the sponsors are identified. These sponsors are individuals who are committed and help to construct the project. The next phase, *phase 1*, the supply chains are identified and re-evaluated to determine only the essential supply chains. Some organisations may have multiple supply chains that they can incorporate into one. According to Gilmore (2011), an organisation only needs 4 - 5 supply chains, otherwise the analysis will become over-complicated. Supply chains are prioritised according to a rank given by organisations. This indicates which supply chains are of higher priority relative to other supply chains identified in phase 1. In addition, each supply chain consists of five performance at-

Phase	Name	Deliverable	Resolve
0	Organise	Organizational Support	Who is the sponsor?
1	Discover	Supply Chain Definition Supply Chain Priorities Project Charter	What will the program cover?
2	Analyse	Scorecard Benchmark Competitive Requirements	What are the strategic requirements of your supply chain?
3	Material	Geo Map Tread Diagram Disconnect Analysis	Initial Analysis - where are the problems
4	Work	Transaction Level 3, Level 4 Processes Best Practice Analysis	Final Analysis - where are the solutions?
5	Implement	Oppertunity Analysis Project Definition Deployment Organisation	How to deploy?

Figure 2.6: SCOR implementation roadmap (SCC, 2013)

tributes, namely *flexibility*, *reliability*, *responsiveness*, *cost* and *assets*, which would be categorised in *phase 2* (SCC, 2013). These attributes affect the major operations of an organisation and will provide feedback as to how well the performance attributes are performing in each supply chain. The performance attributes and supply chains are displayed in a strategy matrix (See Figure 2.7). To avoid confusion, it should be noted that Figure 2.7 uses the supply chain information collected from a sample of cellars. The performance attributes are categorised according to three different classifications, namely superior (S), advantage (A) and parity (P); (See Figure 2.7). These classifications allow the organisation to identify which performance attributes are of higher importance in each supply chain.

A superior classification is this instance, implies that the organisation requires a specific performance attribute to be in the 90th percentile. In a hypothetical scenario, for example, information is gathered by 100 organisations from which industry standards

	Supply Chain Strategy Matrix	Export Bulk	Export Packaged	Local Bulk	Local Packaged
External	Reliability	A	A	P	P
	Responsiveness	S	S	A	A
	Flexibility	P	P	A	A
Internal	Cost	A	A	S	S
	Assets	P	P	P	P

Figure 2.7: Supply chain strategy matrix

are determined. If an organisation's goal is to be superior in a certain performance attribute, it suggested that this performance attribute should be in the top 10 out of the 100. The other categories, namely advantage and parity are 70 and 50 percentiles respectively; meaning that advantage should be in the top 30 and parity in the top 50. A category is assigned to each attribute to highlight the organisation's strategies. Out of the five attributes, one should preferably be superior, two advantage and two parity, since it would not be possible for a company to be superior in all aspects of the organisation (See Figure 2.7). For example, if the organisation selects reliability as the performance attribute to be superior, it would affect cost or assets in a negative way. Therefore, some performance attributes' effects are trade-off's to one another and should be taken into consideration when categorising their attributes.

In phase 2, a benchmark study can be implemented to reveal gaps in the organisation's logistical processes. As discussed in Section 2.1.4, metrics that have the greatest effect on logistical performance should be selected for a benchmarking study. These will be used to compare processes against the other benchmarking partners. Gaps between your organisation and other benchmarking partners can be identified for the selected metrics. Formulated results for a benchmarking study of a hypothetical organisation is shown in Figure 2.8 in the column "*You*". The industry standards are shown in the next three columns, namely "*Parity*", "*Adv*" and "*Superior*". The difference between the organisation's metrics and industry standards are displayed in the "*Gap*" column. This method helps management to narrow their focus down to specific problem areas

within the organisation. Organisations are now able to invest money in the appropriate areas and identify best practises to achieve world class standards and compete globally.

Attribute	SAP	Metric (level 1)	You	Parity	Adv	Superior	Gap
Reliability	S	Perfect Order Fulfillment	97%	92%	95%	98%	1%
Response	A	Order Fulfilment Cycle Time	14 days	8 days	6 days	4 days	8 days
Flexibility	P	Ups. Supply Chain Flexibility	62 days	80 days	60 days	40 days	0 days
Cost	P	Supply Chain Mgmt Cost	12.2%	10.8%	10.4%	10.2%	1.4%
Assets	P	Cash-to-Cash Cycle Time	35 days	45 days	33 days	20 days	2 days

Figure 2.8: Illustration of data (Francis, 2009)

In *phase 3*, the supply chains that were prioritised in phase 1, are now analysed and initial problems are identified. The matrix in Figure 2.8 can identify those areas in which problems surface, since it is difficult for individuals to identify specific problems at a high level measurement. It is important to search for the problems that cause the organisation to perform poorly as compared with the rest of the industry. These include problems that prevent the company from being the best in class, or to perform as expected according to the industry. Problems can also be categorised from important to less important, delivering the highest reward with least input. The next phase, *Phase 4*, is the final analysis. In this phase, solutions for the problems identified in phase 3 are proposed. The solution will reduce recurring problems and improve the organisation's logistical activities. Importantly, the solutions should be sustainable; else the organisation will fall behind to the rest of the industry in years to come.

The first two phases are mostly theoretical and provide sufficient information to push for operational implementation. Phases 3 and 4 are highly analytical and lastly, in *Phase 5*, the team can prepare for an implementation plan. It is important that the whole team understands the implementation plan, how it should be executed, and how to sustain these new developments.

2.3.4 Review of relevant research

This section reviews a study conducted by Garcia *et al.* (2011) in the wine industry of Argentina. Garcia developed a framework to measure the performance of the wine

industry's supply chain. This method is similar to the SCOR framework in some areas and will be highlighted in this section. In addition, statistical techniques used to benchmark the performance of a supply chain are reviewed.

Over the past 15 years, a number of studies have been conducted to establish a benchmark for specific industries. These have included chemical (Keren, Harry, Mannan & Mannan, 2004), service (Simpson & Kondouli, 2000), tourism and hospitality (Perdue, 2004), as well as the manufacturing industries (Gordon & Shohal, 2001). However, little research has been done to benchmark the wine industry. One such study, which tackles the importance of performance measurements in the wine industry, was conducted by Garcia *et al.* (2011). Garcia *et al.* (2011) developed a framework to measure logistical performance in the wine industry. The research was conducted on six wineries in Mendoza, situated in West Argentina. The authors identified four performance attributes, namely quality, timeliness, logistics cost, and productivity and capacity; quite are similar to the five performance attributes of SCOR. SCOR's reliability is similar to quality identified by Garcia *et al.* (2011), as is responsiveness to timeliness, cost to logistical cost, and assets to productivity and capacity. The attributes of Garcia *et al.* (2011) function in a manner that is similar to SCOR's, where the performance attributes are further detailed in lower levels. The lower levels focus on specific areas where quantitative information are gathered to establish a benchmark for these indicators, however, SCOR's indicators are applicable across all industries whereas Garcia *et al.* (2011) model is focused specifically on the wine industry. Furthermore, Garcia *et al.* (2011) stated that the research is not a complete benchmarking study of the wine industry of Argentina, and that further research is required.

Expanding on Garcia *et al.* (2011) method, Dollet & Matalobos (2010) proposed a multi-level network orchestration of premium and super-premium wines, that encompasses a broader view of the entire supply chain. Multi-level network orchestration is a design that optimises all global networks and collaborations of the same product. In addition to Garcia *et al.* (2011) model, Dollet & Matalobos (2010) demonstrated that all entities within the supply chain should fall under one strategy, and this will probably be the most powerful member of the network.

Garcia *et al.* (2011) method was not based on statistical techniques, however, a number of other techniques should also be considered. These performance benchmarking techniques include the Ordinary Least Squares (OLS) technique, Corrected Ordinary

Least Squares (COLS) models, and Stochastic Frontier Analysis (SFA); (IBNET, 2005). These methods are statistical techniques that require sufficient data to formulate accurate conclusions. OLS can benchmark an individual organisation's performance against their average production or cost functions. This is done by comparing the actual output to predicted output which will provide a measure of relative performance. COLS models also compare the organisations average production and cost functions, but use the best performing company instead of expected performance, to compare results. SFA focuses on two frontiers, namely production and cost. In each frontier all inputs and outputs are calculated and the input with maximum possible outputs is regarded as optimal. For SFA techniques, sufficient data is required to achieve desirable solutions (IBNET, 2005). With the above mentioned statistical benchmarking techniques in mind, it should also be considered how to effectively provide benchmarking measurements to industry players, who can then improve their logistical processes in order to advance the industry as a whole. Hodge (2011) mentions a few important principles needed for an effective performance measuring framework. The primary principle refers to measuring the system according to the strategy of the organisation. Other key principles include measuring all processes comprised of financial and non-financial data, the measurement should be evaluated over a period of time, and lastly, measurements should be communicated and documented. The above mentioned statistical methods is considered to be important when developing a performance measuring framework for the SA wine industry.

2.3.5 Conclusion

In conclusion, two established performance frameworks have been discussed, namely BSC and SCOR. Both of these are similar on many aspects, since they divide metrics in financial and non-financial measurements. SCOR is better suited than BSC for this study, since it already incorporates supply chain activities between suppliers and provides measurements for them. Furthermore, Garcia *et al.* (2011) developed a performance measuring framework for the wine industry of Argentina and divided the segments according to the price and quality. This seems to be suitable framework to use, since it has already been applied to the wine industry. However, the division of segments within this thesis are different to that of Garcia *et al.* (2011) model, as SA's quality and price of wine are not comparable to one-another. In other words, there is no honest standard by which to categorise the wine in SA according to the price and quality. Therefore, segmenting the SA's wine industry according to price and quality will be problematic, since a standard first has to be developed, which is beyond the

scope of this project. After discussing BSC, SCOR and Garcia *et al.* (2011) framework, SCOR remains best suited for this thesis (See Table 2.5). Table 2.5 shows the criteria that was derived from Section 2.3.1 to select the best suited framework for this study. Although SCOR is the primary framework that will be used, the other frameworks have other benefits that, when used in conjunction with SCOR's existing framework, will enhance it.

Table 2.5: Summary of performance measuring frameworks

Performance framework criteria	BSC	Garcia	SCOR
Does the performance framework include financial and non-financial measurements	YES	NO	YES
Can the performance framework incorporate the cellars strategy	YES	PARTIALLY	YES
Does the performance framework have established measurements to choose from	NO	NO	YES
Can the performance framework show trade-off's between measurements	YES	PARTIALLY	YES
Does the performance framework provide best practise for measurements	NO	NO	YES
Is the performance framework fit for SA's current supply chain processes	YES	NO	YES

2.4 Chapter conclusion

This chapter provided an overview of SCM , which included basic SCM concepts, supply chain visibility and TQM. As discussed, all three concepts are becoming increasingly important as the wine industry of SA experiences growth. SA's wine industry still operates with little supply chain visibility and is affected negatively by it. Therefore, it would be beneficial for the industry to explore these concepts further. In addition, an eight stage implementation process was discussed, which will be used as a guideline when developing a performance measuring framework for SA's wine industry. This eight stage process was adapted from Watson (1992) and Karlöf & Östblom (1994), and will fulfil the objectives of a benchmarking methodology. Relevant performance measurement concepts and other frameworks were discussed, but the focus was directed to the SCOR framework, since the SA wine supply chain framework will be primarily

based on SCOR.

Chapter 3

Methodology

Contents

3.1 Methodology overview

The purpose of the following sections are to provide the methodology that was applied, as well as the scope of the thesis. Firstly, the research team is introduced and a high-level overview of the methodology is provided. This also includes the scope of the thesis. This section further provides the methodology, which is discussed in detail, and concludes with methods of interpretation regarding the quantitative and qualitative data.

3.1.1 Background and scope of project

The research team consisted of three Industrial Engineering masters students. The project was supervised by three individuals, namely a project leader from the department of Industrial Engineering (Stellenbosch University), a supervisor from the department of Logistics (SU) and lastly, a respective from the Council for Scientific and Industrial Research (CSIR) to provide specialised input for the project.

The overall project is a longitudinal study that spans over a three-year period (see Figure 3.1). This thesis addresses the outcome of the first two years of the project which is divided into three stages (see Section 3.1.2). The first stage comprised of two work-streams, which were conducted in parallel. *Work-stream A* took place during year 1 of the project, whereas *work-stream B* spanned over the first two years.

Work-stream A was supervised by the departments of Industrial Engineering and Logistics, where six honours students from Logistics and five final-year Industrial Engineering students conducted case studies for 16 cellars. Four students conducted a case study at more than one cellar, which was beneficial since they had access to a larger representation of the market. These case studies were conducted with the primary intention of gathering information from the representative cellars and to broaden the research team's knowledge of the wine industry.

Work-stream B consisted of the three masters students focusing on developing a supply chain measuring framework for three priority segments of the wine industry. These three segments are:

- Bulk export
- Packaged export
- Packaged local

Since *Bulk Local* is either exported in bulk or packaged, or sold locally in packaged format, it is included in either one of the three priority segments.

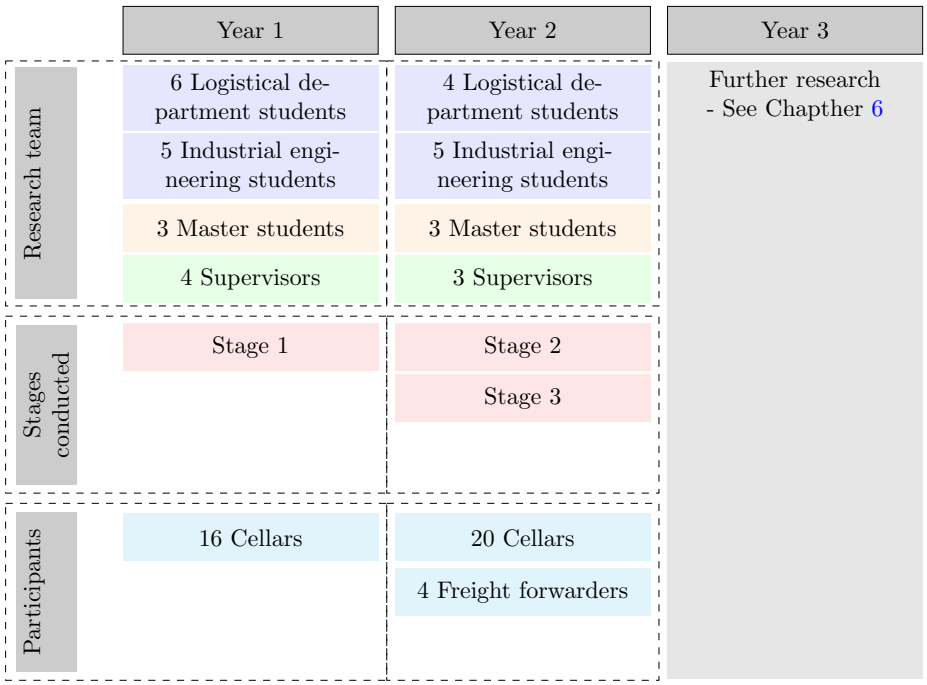

Figure 3.1: Research team and scope

The first year, which consisted of *Stage 1* (see Figure 3.1) of the project allowed the research team to gather information regarding the SA wine supply chain processes. This enabled them to identify problem areas in order to develop a preliminary supply chain measuring framework. In the second year, the research team revisited the participants (cellars) and the industry partners who were actively involved in the wine supply chain, to gather more information to validate and improve the preliminary supply chain measuring framework. In the second year, five final-year Industrial Engineering students and four Logistics students conducted case studies with reference to the problem areas identified during the first year of the project. This enabled the research team to focus on developing a new framework simultaneously while more information was being gathered regarding the wine supply chain processes. After the meetings, and subsequent changes to the preliminary framework and input from the wine industry, a new framework was developed. The metrics selected for the new framework were measured by collecting qualitative data from the cellars and the freight forwarders. These industry partners had to be approached since cellars do not keep a record of the type of information we required.

Before either of the work streams were undertaken, cellars were selected that would represent a large sample of SA's wine industry, thereby leading to sufficient data and contributing to the validity of the research. Since the SA wine industry in general is a large and complex industry as mentioned in Section 1.2, only a few of SA's wine cellars could be included. This ensured avoiding an overload of information that could not be processed within the scope of this project. Therefore, the scope of the study only comprises a representation of the SA wine industry. More specifically, the wine districts of Breedekloof, Stellenbosch, Robertson and Worcester were represented in this study. The advantages of selecting these districts, as highlighted by Van Eeden *et al.* (2012) in the preparatory study, were the sheer volume of wine produced and the variety of producer cellars, wholesalers and private cellars. According to WOSA (2014), there are 38 wineries in the Worcestor and Breedekloof regions.

The Worcestor region accounts for 20% of the national vineyards and produces 27% of Africa's total wine production volume. After evaluating the range of cellars in SA, 16 cellars were identified to participate in this study (see Table 3.1). The cellars were selected on the bases of the following:

- Volume
- Region
- Demographics
- Business models

The representative cellars account between 29.2% to 40% of SA's total natural wine production (Van Eeden, 2015). The reason for the representation range of 11.8%, is a result of the bulk local segment. Cellars sell bulk local to other cellars, who then sell it in any of the other three segments. The latter cellars combine the bulk they produced and bulk purchased from other cellars as their total production. This causes the total volume in bulk local segment to be inaccurate, seeing that the volume produced is added in the bulk local segment and in the other segments. Therefore, the participating cellars account for 40% of the industry in the event where all bulk local is sold to other cellars who then sell the wine in other segments. In the event where no bulk local is sold in the other segments, the participating cellars account for 29.2% of the industry. In addition, the cellars listed in Table 3.1 were selected with special interest in their different business models, as well as for the variety of districts they

represent and providing sufficient volumes in each segment.

Table 3.1: Representative cellar of SA wine industry

Cellar name	Cellar name
Botha cellar	Perdeberg cellar
Bonnievale cellar	Robertson cellar
Darling cellar	Roodezandt cellar
Du Toitskloof cellar	Rooiberg cellar
Koelenhof cellar	Stellenbosch Hills cellar
Lutzville Vineyards Ltd	Uniwines cellar
Montagu cellar	Van Loveren cellar
Namaqua cellar	Wellington Wines cellar

The 16 cellars participating in the study were divided amongst the three masters students, each focusing on different segments. The cellars were allocated to the masters students in accordance with the particular segmentation focus of the cellar. For example, a cellar that mainly produces bulk wine for export was assigned to the masters student focusing on bulk export who assumed responsibility for that cellar. The sample of cellars selected for the study focuses on one or more of these segments. This was determined through semi-structured interviews and workshops. See Figure 3.2 for the volume of litres represented for each segment by the sample of cellars and the percentage they contribute to the industry. For this thesis, the cellars represented 29.2% of the bulk export segment and included five of the top ten volume contributors in the bulk export segment. This sample was deemed sufficient in size to represent the knowledge of the segment, since the sample of cellars adheres to the four criteria's set out.

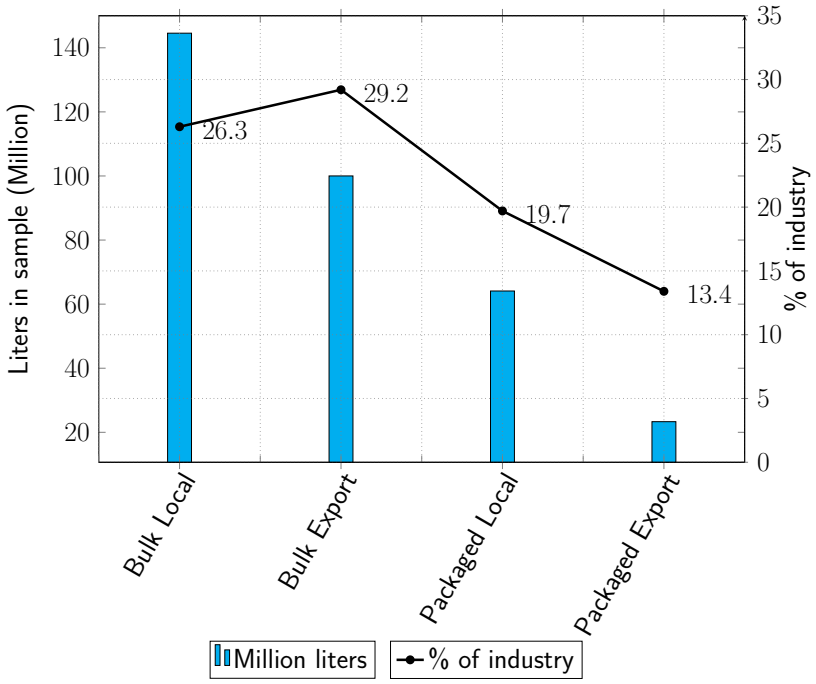

Figure 3.2: Segment representation in SA wine industry

This thesis concentrated on the SA wine supply chain with the focus pertaining to the bulk export segment. The study focused on a specific area of the SA bulk export supply chain: it covers the section of the bulk export supply chain from the production of wine to the delivery of it at the POD. See Figure 3.3 for the bulk export supply chain focus, which is indicated in red. Furthermore, as previously mentioned, quantitative data were requested from other freight forwarders and meetings were scheduled with each. These meetings were scheduled with four freight forwarders who handle roughly 77.5% of the bulk exports of SA (see Table 3.2).

Table 3.2: Representatives handling SA's wine industry exports (van Zyl, 2015)

Freight forwarder	Handle % of SA's exports
JF Hillebrand	40 - 50%
Inter-sped	20 - 30%
Gorgio Gori	5 - 10%
Outsource Logistics	< 2%

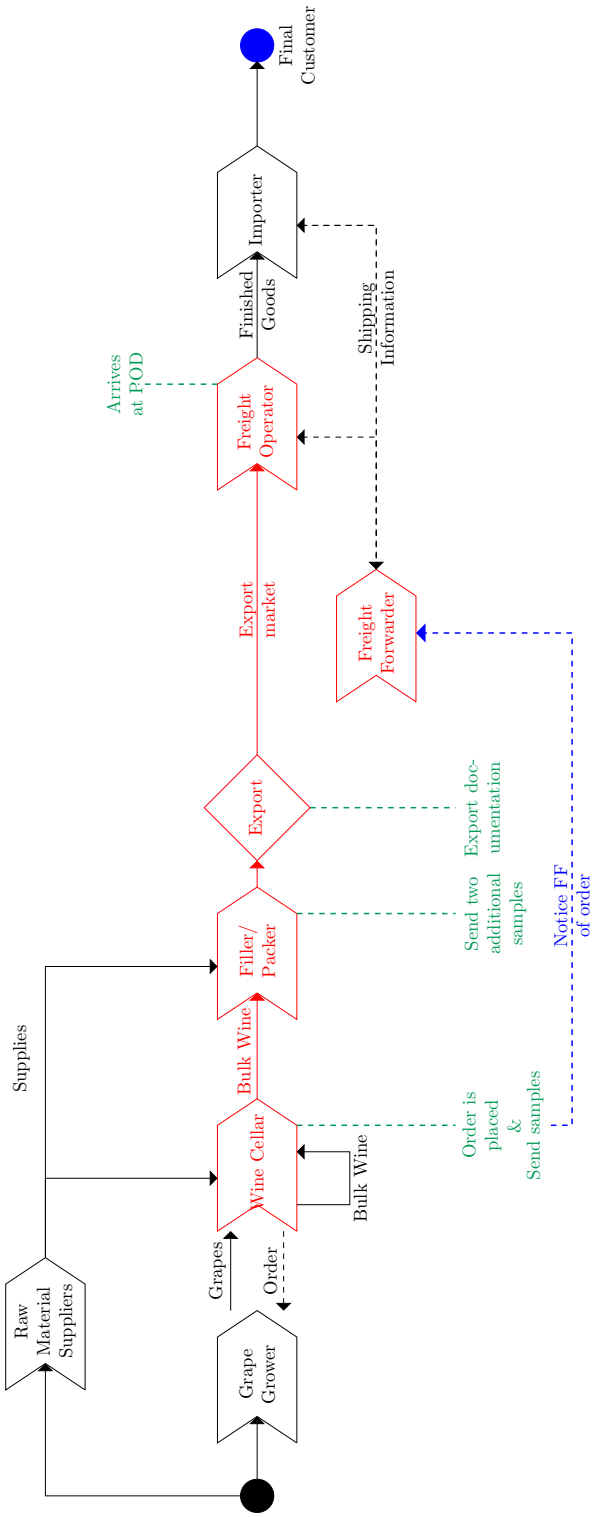

Figure 3.3: Export bulk wine supply chain (Adapted form Garcia *et al.* (2011))

3.1.2 Thesis methodology

The methodology process was divided into three stages (see Figure 3.4 for detailed steps). These stages are listed below:

Stage 1: Investigation of the SA wine industry and designing a preliminary framework.

Stage 2: Developing a new framework which was refined to the SA bulk export wine supply chain.

Stage 3: Developing an ideal framework.

Parallel to these three stages, literature was reviewed, semi-structured and unstructured interviews were conducted, and final-year projects were produced in order to obtain the most relevant information regarding the development of the framework. The framework was developed using an emergent multi-phased exploratory approach. This thesis presents the exploratory approach as two distinct interactive phases, qualitative data collection to be the first approach and then quantitative (Creswell & Clark, 2006). The exploratory approach was conducted in concurrent strands over a period of time that constituted a multi-phased approach.

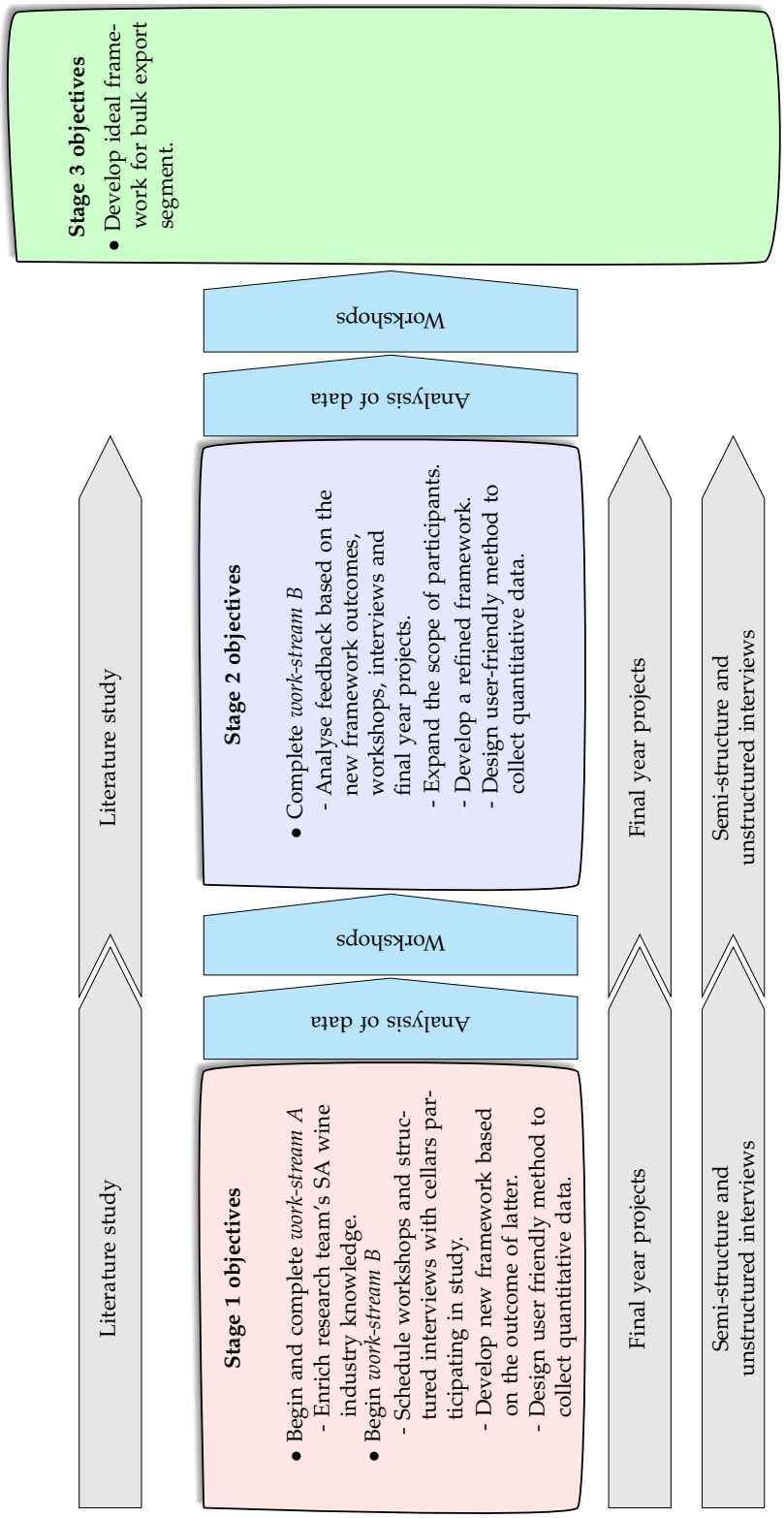

Figure 3.4: Methodology road map

The first stage was the starting point and the crucial element in both work streams. *Work stream A* was conducted by five final -year Industrial Engineering students and six Logistics students, as highlighted before. Each department's final-year projects had different objectives, in that the Logistics department's focus was mainly on research, whereas the Industrial Engineering department focused on problem-solving. Although the objectives were different, the overall objective, namely enriching the research team's and participants' knowledge regarding SA's wine supply chain, was achieved. *Work-stream B* was conducted in parallel to *work-stream A*.

In *Stage 1*, the research team became acquainted with the industry through scheduled workshops with all cellars participating in the study (See Appendix D for agenda). The workshop included the cellars' financial directors, marketing managers and chief executive officers. These workshops and semi-structured interviews steered the cellar management committees' thinking in the direction of supply chain concepts. The workshop's primary focus was to identify which two of the four segments the cellar focuses on, or wishes to focus on, and to identify which attributes are superior, advantage or parity for each selected segment (refer to Section 2.3.3 for the five attributes). In addition, the workshops and semi-structured interviews should indicate the quality of information and data available in the industry. This will enable the research team to understand the different business models used by cellars and to identify their challenges.

After the workshops and semi-structured interviews were completed, sufficient information had been gathered to develop a preliminary framework. This framework included metrics from each of the five attributes of SCOR, seeing that the attributes consisted of financial and non-financial metrics and are trade-offs of one-another. The objective of the preliminary framework was to determine the availability of the quantitative data, as discussed during the workshops. The metrics were designed on Microsoft Excel with a clear description of the metrics and how to calculate each one (See Appendix E). The Excel file was sent via email to all participating cellars who completed the Excel sheets in the two-week period allotted to them. The feedback was received via email, after which the analysis of the quantitative data commenced. The research team analysed each metric that had been measured. Conclusions were drawn for each metric, and workshops were arranged to share the feedback and present it to the cellars. The knowledge obtained from analysing the quantitative data, together with the feedback received from the workshops, formed the point of departure for *Stage 2*.

In *Stage 2*, the first objective was to investigate the feedback received from *Stage 1*'s measurements, workshops and the problems that surfaced during this stage. The next objective was to expand the scope of the project to include more cellars and other industry partners. During the refining process new metrics were selected for the new framework which were refined to SA's bulk export wine supply chain and its processes. The metrics were selected on the basis of the level of data that was available in the industry and the feedback received during *Stage 1*. There are many limitations regarding quantitative data availability in the SA wine industry and therefore, not all SCOR's attributes were measured for *Stage 2*. These limitations will be elaborated in Chapter 4. Moreover, each metric received demographics which would present the metrics in more detail. Similar to *Stage 1*, *Stage 2* metrics were selected and were designed in Microsoft Excel. The designed Excel sheets were converted into one survey to be more convenient for the cellars. The survey, designed on SurveyMonkey Inc. (2015), provided security and accuracy according to the QC objectives set out by CDM (2015). The data requested for *Stage 2* could not be collected at the cellars alone, seeing that they do not capture all the requested data on their systems. Data were also collected from other sources, namely JF Hillebrand, Outsource Logistics, Inter-Sped and Gorgio Gori. By including other industry partners and collecting the data directly, this ensured better security and increased the industry partners' willingness to participate.

During the final stage, *Stage 3*, an ideal framework was constructed for the bulk export segment. The ideal framework was developed using the results from *Stage 1* and *Stage 2*, the literature review, scheduled interviews, workshops and final-year projects regarding this study. Moreover, this framework was not developed based on the information and data available in the industry, but based on an ideal scenario where all information and data would be available.

Chapter 4

Results and discussions

Contents

The findings for *Stage 1* and *2* are predominantly focused on *work-stream B*. The feedback is provided in the same manner as the methodology, enabling the reader to simultaneously compare the methodology stages with the findings for each stage. The chapter commences with the findings from *Stage 1*, which comprises of problems that have to be addressed in *Stage 2*, as well as the benefits that were discovered. The chapter continuous on to discuss *Stage 2* and its findings, before concluding with the problems and benefits identified in both stages, the latter of which will be used for the development of the ideal framework.

4.1 Findings for preliminary investigation (Stage 1)

The objectives for *Stage 1* were:

- To begin and complete *work-stream A*
  - To enrich the research team's supply chain knowledge regarding SA's wine supply chain.
- To begin *work-stream B*
  - To schedule semi- and unstructured interviews with cellars participating in the study.
  - To develop a new framework based on an outcome of latter.
  - To design user-friendly methods to collect data.

As mentioned in the methodology, the first workshop at each cellar was the starting point for this thesis. Each wine cellar was visited and a series of questions were asked to identify which two of the four segments are most relevant for their business strategy. Some cellars selected only one segment, since they do not participate in any of the other segments. Eight out of the 16 cellars, which represents 29.2 % of the industry volume, identified bulk exports as one of the two segments they intend to focus on (See Table 4.1). The cellars were asked to identify which attribute should be superior, and which two attributes should be advantage as displayed in Figure 2.7 and 2.8. Not all cellars chose two attributes to be advantage, some only selected one. This feedback provided sufficient information with reference to the strategy most bulk export cellars apply. Moreover, seven out of the eight cellars, who identified bulk export as one of their segments, selected reliability to be superior for this segment (highlighted in red in Table 4.1). Therefore, a primary concern for all cellars focusing on bulk export was their reliability. Reliability is defined as all items and quantities received on-time, complete documentation and in the right condition (SCC, 2014). Six of the seven who selected reliability as superior, selected responsiveness to be advantage (highlighted in blue in Table 4.1). This trend provides a starting point for developing a performance measuring framework of SA's wine industry that focuses on the export bulk segment.

Table 4.1: Summary of cellars segmentation focus

Segments	**Bulk Local**		**Bulk Export**		**Packaged Local**		**Packaged Export**	
Attributes	[1]**S**	[2]**A**	**S**	**A**	**S**	**A**	**S**	**A**
Reliability	1	4	7	1	2	4	1	3
Responsiveness	2	2	1	6	1	4	4	2
Flexibility	1	3	0	4	0	2	0	1
Cost	2	2	0	4	3	2	1	2
Assets	1	3	0	0	1	2	0	3
Number of wine cellars focusing on specific segment	**7**		**8**		**7**		**6**	

[1]**S**: *Superior* [2]**A**: *Advantage*

Table 4.1 was observed, and although a certain trend follows the bulk export segment, it should be emphasised that all attributes must be measured. As mentioned in Section 2.3.1, performance attributes impact one another, therefore, at least one metric from each attribute was selected and measured. Since *Stage 1*'s primary focus was to enrich the research team's knowledge and to evaluate the level of data available in SA's wine industry, only six high-level metrics were selected and measured for the bulk export segment. These six high-level metrics represents all five attributes and would provide a clear depiction of the industries data availability. The six metrics selected for *Stage 1* are shown in Table 4.2 with a description provided for each.

Table 4.2: Metrics with description SCC (2013)

Attribute	Metrics	Description
Reliability	Perfect Order Fulfilment	Measure the % of orders that meet the delivery performance.
Responsiveness	Order Fulfilment Cycle Time	The average actual cycle time consistently achieved to fulfil customer orders. For each individual order, this cycle time starts from the order receipt and ends with customer acceptance of the order, namely FOB.
Agility	Upside Supply Chain Flexibility	The number of days required to achieve an unplanned sustainable 20% increase in quantities delivered.
Cost	Storage cost	Storage cost for finished goods stock (Measurements: Rand per litre)
Cost	Transportation cost	All calculations start where the goods leave the facility where it is stored after production up to FOB
Asset	Inventory days of supply	The amount of inventory (stock) expressed in days of sales

The measurements were selected from the SCOR framework (Revision 11) and were developed in Excel (See Appendix E). This enabled the participating cellars to answer and provide data in Excel for the selected measurements. This Excel file was sent out via email to all participants, after which the data were collected via email and subsequently analysed. The results for each metric are detailed in Figure 4.1.

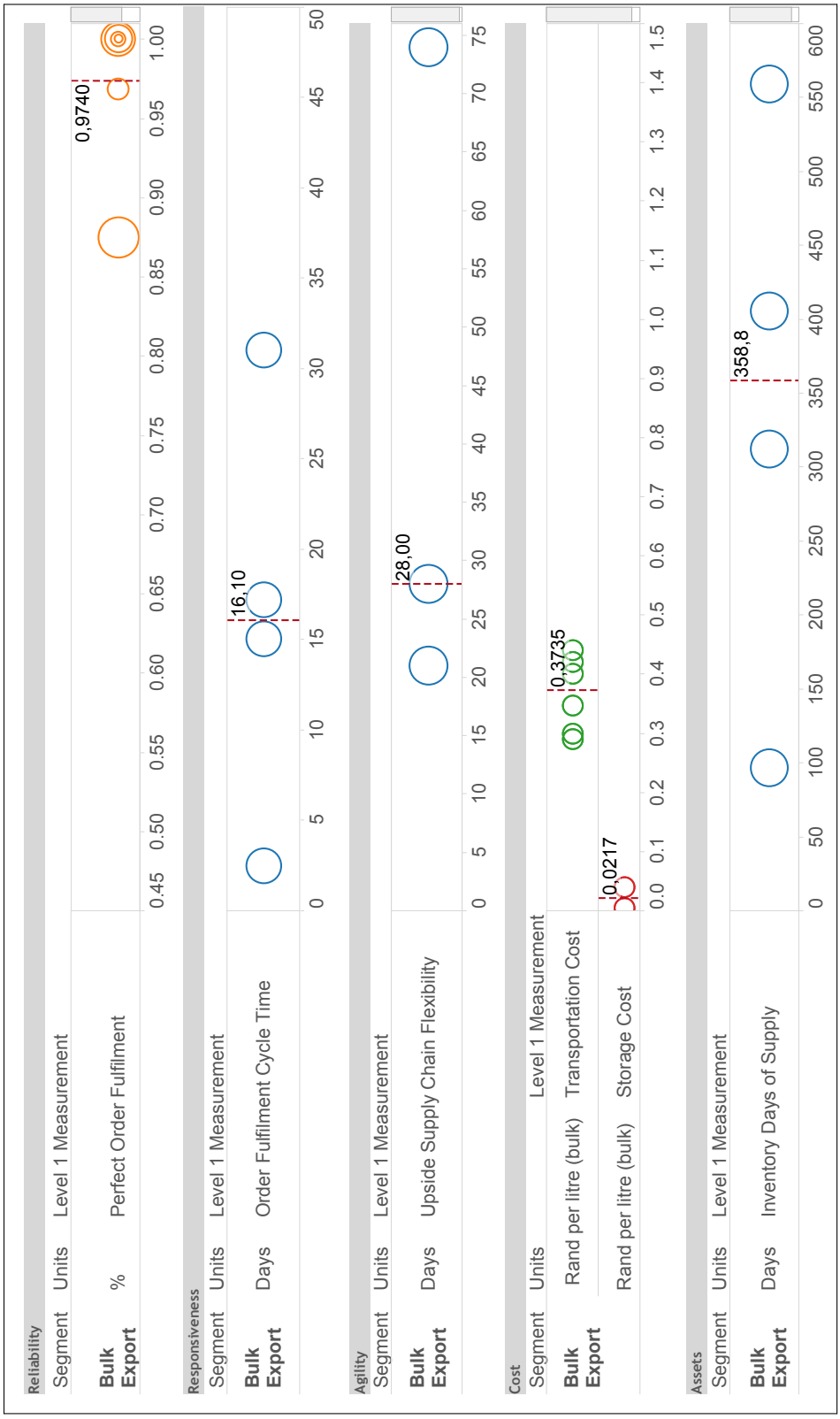

Figure 4.1: Preliminary findings for *Stage 1*

In Figure 4.1, each circle represents a cellar participating in the study. Though eight cellars participate in the bulk export segment, it should be noted that with certain metrics fewer than eight circles are indicated. There are two main reasons for this: the first and most common reason is that measurement could not be determined. Specifically the cellars use operating systems that incorporate data into one supply chain, whereas this study focused on selecting data divided into different supply chain segments. Therefore, the operating systems could not provide adequate data for specific metrics that were required from the cellars. The second reason is the specific measurement was misunderstood by participating cellars and consequently, the results could not be interpreted. Therefore, including the outliers would give an inaccurate indication as to what is actually taking place in the industry. Next, the development of the metrics and the results from *Stage 1* will be discussed.

4.1.1 Reliability

Metric: Perfect order fulfilment

A perfect order is seen as an order where the correct product and quantity are delivered on time. If available, the cellars were asked to specify any reliability issues that caused an imperfect order. The list of reliability issues that were provided included product type, customer, quantity, condition, date and time window, and supporting documentation. This would give an indication as to where the majority of problems may exist. All cellars understood this metric, but some did not have the recorded data on the system required for quarter 2 (April, May and June) in 2014, or any quarter for that matter. Thus, only three circles can be seen in Figure 4.1. Figure 4.1 displays three circles, however, six measures have been provided where four circles are displayed on top of each other. These circles include four 100% reliability measures.

Since cellars only manage the production part of the supply chain, it was often unknown to them if the order was perfect with respect to SCOR's criteria. Only the operations that affect cellars, pertaining to the order fulfilment process, were brought to their attention. The cellars would correct the problem or do the necessary to satisfy the clients' needs, but the event is never recorded in their system. Therefore, asking the cellars about reliability issues is problematic, since they can only recall some events and could not display it in a report for further investigation. Only the orders that were shipped back are recorded and only these were provided. Therefore, cellars are believed to have 100% reliability or close to that, when in fact many reliability issues

could occur without the cellars' knowledge.

Data were available in their documents, but these were kept in hard copy format and stored away in cabinets. To fully comprehend the effects of this metric, cellars had to provide data for each order that was exported in bulk format. To collect the data in this manner was beyond the scope of the study and would require sufficient time and manual labour, which was not available. Therefore, the cellars and the research team together declined this cumbersome process.

In spite of these complications, data were still obtained for this metric. As previously noted, cellars viewed an imperfect order as one that has been shipped back. Therefore, the circles in Figure 4.1 represent the cellars' reliability in terms of their understanding of a perfect order. Of course, there are numerous other factors that could affect a cellar's reliability, of which none were taken into consideration for this metric. This suggests that the current measurement the cellars obtained for this metric represents their maximum reliability. When the other factors are included, only then will the true reliability of cellars be revealed.

4.1.2 Responsiveness

Metric: Order fulfilment cycle time

Order fulfilment cycle time, for simplicity, was measured from when the order was placed to when it was loaded onto the ship, and not delivered to the importer's warehouse. Roughly 95% of orders were shipped with Free on Board International Chamber of Commence terms, commonly known as FOB INCOTERMS ® 2010. For this reason, the metric was measured until the cellars' transportation responsibilities for the wine ended. The measurement selected for this metric is defined as the average speed of all orders received by the cellar in the second quarter of 2014 (April, May and June). By observing Figure 4.1, it can be noted that one cellar obtained an average order cycle time of 2.5 days from 39 orders. This is highly unlikely, since, according to Watson (2015), the industry average for geting wine ready for shipment is around 14 days. Also, samples are sent to SAWIS and Vinetech for quality approval and needs to be accepted before the wine can be exported. This process takes approximately 3 days and therefore an average cycle time of 2.5 days is extremely unlikely (van Lill (2015); Watson (2015)). Another process that may delay the average cycle time, is the time it takes for freight forwarder companies to schedule a shipping time, which should ideally

be scheduled well in advance. Therefore, there is enough evidence to support the fact that the 2.5 average cycle time is inaccurate and the measurement was incorrectly calculated by the cellar.

Upon further analysis of the data, it came to our attention that the cellars did not have all the data regarding the order information required for the complete measurement. The cellars could only provide the data they required for their personal use, for example the quantity, client name, blend and freight forwarder used. This is because information that affects data records further down the supply chain was not a prerequisite for the cellars, seeing that they apparently they have no a use for it. The cellars take approximately 14 days to prepare a bulk order for shipment, therefore the cellars estimated, in days, the speed at which they presume to deliver at port. No accurate dates were provided, since they do not record this information.

For *Stage 2*, it became necessary to include other industry partners in the study who capture relevant data further down the supply chain. These industry partners are the freight forwarder companies that handle the exporting documentation and deal with the shipping companies. After being acquainted with the freight forwarder companies, it was discovered that the transporting function is divided into two operations and each function could be handled by any two freight forwarders. The freight forwarder companies refer to the two as the importer's agent and the other FOB agent. The importer's agent has a direct connection with the importer and handles the product, whereas the FOB agent does most of the documentation and communication with the cellar. Both agents communicate regularly with each other to ensure that the order is fulfilled. Relationships are built over time and the importer (the customer) decides which company should be used as the importer's agent, while the cellars decide who the FOB agent should be.

In light of these discoveries, and in future, data should instead be gathered from multiple freight forwarders and orders should be linked to determine the dates along the transportation process. A consistent number that is used throughout the transportation process is the importer's purchase order number. Through this, it is possible to track the order from the cellar, to FOB agent, to the importer's agent to the POD.

4.1.3 Agility

Metric: Upside supply chain flexibility

Cellars interpreted this measurement differently, which subsequently caused them to provide inaccurate data. The metric was measured for three sections of the cellar, namely *source*, *make* and *deliver*. For each section, the cellar had to calculate how long, in days, it would take to up-scale each section with 20%. The approach, explaining the definition for this metric, was unsuccessful, seeing that the research team lacked knowledge with reference to how wine making-related processes were executed in the cellars. The first problem surfaced after measuring the ability to up-scale the sourcing section. Cellars understood the question differently: some cellars assumed that to up-scale, they needed to plant more grapes, whereas others assumed they could purchase grapes from surrounding grape growers to up-scale. Therefore the answers were vastly different. Also, it is not an easy task to up-scale sourcing, since the cellars are susceptible to harvest fluctuations.

Measuring the make section was also misunderstood. Cellars do not fully utilise their production and storage facilities and tend to have an excess capacity in both their production and storage facilities. Therefore, it would generally take zero days to up-scale their make stage. The cellars invested in machines, tanks and storage areas to handle a large harvest. A large harvest in this case could refer to the 2013 harvest, where the harvest, was the largest it has been in 14 years. Cellars' infrastructures are generally equipped to handle such a harvest and the facilities are therefore not optimised during a normal harvest. Only when SA has a great harvest are the facilities fully utilised. Up-scaling the delivery stage thus seems effortless for the cellars, seeing that it only affects the freight forwarders. The cellars have a selection of freight forwarders to use that are capable of managing a 20% volume increase from the wine industry. For this reason, this metric would not provide a valid benchmark measurement for the wine industry.

Although the measurements were confusing to the cellars, data were nonetheless obtained. The cellars provided the time, in days, it would take for them to up-scale each of the three measurements. The circles in Figure 4.1 represents the sum of the three measurements. For example, it takes a cellar 15 days for sourcing, 18 days for making and 2 days for delivery. The value that will be used as a benchmark will thus be 35 days (18 + 2 + 15). Considering that the metric's definition does not adhere to

the wine industry's processes, further development is needed. Although cellars selling predominantly bulk wine identified reliability as the superior attribute on their list, it is assumed that the agility or flexibility of a cellar will be the determining factor to differentiate cellars in the industry.

4.1.4 Cost

Metric: Storage cost

The storage cost measurement included only the finished goods of bulk wine (local and export bulk wine), measured in (R/ℓ). This metric was especially difficult for cellars to calculate and only two cellars provided answers (See Figure 4.1). The first reason for the incomplete data is that the production and storage areas are shared in some cellars. This proved to be a challenging calculation for cellars, seeing that the cellar had to divide the storage and production area. The section set out to store wine in the cellars, varies each year, depending on the harvest or unsold stock from the previous year. From the cellar's viewpoint, it was an effort to calculate this metric. It was necessary to measure storage costs in order to acquire a clear view of the metric, but at the same time enforcing too much effort onto the participants would make them less enthusiastic about their participation in the project. The final reason for incomplete data, is that one of the cellar's warehouse was paid off and the cellar's financial manager viewed the storage cost as zero, seeing that they do not have to pay for the building they use for storage. Therefore, it was accepted for *Stage 1* that the storage area could not be calculated. Seeing that the storage cost would not form part of *Stage 2* framework, further investigation was not required.

Metric: Transportation cost

Six out of the eight cellars provided sufficient data for this metric (see Figure 4.1). This metric was easier to calculate than storage cost, since transportation is mostly outsourced. The cellars were able to calculate the transportation cost (R/ℓ) from the quotations of the transportation cost and the quantity of bulk wine on their financial records. Each cellar's average transportation costs are closely grouped (See Figure 4.1), which substantiates that the cellars understood the metric. One main reason why some cellars pay more for transportation than others, is because of the cellar's location. Some cellars are further located from the Cape Town port than others and would in reality, pay more for transport. Therefore, the cost variation for transport is directly

proportional to the location of the cellars.

4.1.5 Assets management efficiency

Metric: Inventory days of supply

For this metric, cellars were asked to provide the average value of inventory at standard cost and the cost of goods sold for the second quarter in 2014 (April, May June). The inventory days of supply (IDOS) metric was measured using the information requested. After the data were analysed, the answers revealed that the metric was misunderstood. It is very unlikely that a cellar has an average IDOS of more than 550 days. This was the first indication that the metric was misinterpreted. Wine is stored in bulk format, but cellars were oblivious as to whether the wine will be sold in the format of packaged or bulk. Therefore, calculating the IDOS for the bulk export segment caused confusion and cellars did not know whether to include all bulk in storage or only the wine that was sold for the year. The general consensus, derived from the interviews, is that around 80% of wine produced by cellars, which is sold in bulk format, is contracted and sold for the year. Therefore around 20% of the wine is neither classified as bulk, nor as packaged, and would be sold in any format.

In Figure 4.1, four cellars provided data. As previously mentioned, 550 IDOS is very unlikely. It should be noted in Figure 4.1 that two cellars obtained a IDOS of more than 300 days. This suggests that these cellars have close to a year's inventory on a monthly basis. After becoming acquainted with the wine industry, it was recognised that cash flow is highly regarded in the wine industry. With that in mind and the fact that cellars' sales and marketing team's goal is to sell all the wine before the next harvest, excluding work in progress (WIP), makes it unlikely that cellars store that much wine during the year.

4.1.6 Summary

Stage 1 provided the research team with valuable information in order to develop a new framework in *Stage 2*. It was found that the maturity of SA wine supply chain was between Level 1 or 2, seeing that information regarding the interactions and progress of activities further down the supply chain are unfamiliar to the cellars (See Section 2.1.3 for supply chain maturity). After the data from *Stage 1* were analysed, feedback sessions were scheduled, which both sponsors and participants attended. The

feedback sessions' objectives were to provide the attendees with the progress of the study, mentioning problems that surfaced and receiving feedback from the attendees regarding their view of the results found. More emphasis was placed on the positive results during the feedback sessions. In retrospect, the problems identified in *Stage 1*, highlighted below, should be addressed before a new framework is developed in *Stage 2*. The problems that surfaced during *Stage 1* were addressed in *Stage 2* in order to obtain accurate data. The problems identified in *Stage 1* are listed below:

- Cellars have little transportation data.
- Storage cost was difficult to measure and requires a detailed definition.
- Transportation cost is not a relevant measurement to benchmark.
- The definition for up-scaling source, make and deliver was vague and misunderstood by most cellars.
- Inventory days of supply metric has to be reviewed in order to measure it in a segmented manner.
- Cellars do not have order data further down the supply chain.
- Cellars have insufficient supply chain segmentation.

4.2 Findings for developing framework (Stage 2)

The new framework was developed in *Stage 2* that addressed the problems identified in *Stage 1*. In *Stage 2*, 23 invitations, which included the 16 cellars participating in *Stage 1*, were sent out, of which 18 responded. Eight of the 18 cellars that responded, practise in the bulk export segment. The new framework developed for *Stage 2* is discussed next with a description for each metric in response to the problems identified in *Stage 1*. In *Stage 2*, only three attributes with partially available data were measured, seeing that the SA wine industry lacks information regarding the other metrics (See Table 4.5). These three attributes were measured in more detail and received more metrics, segments and demographics. The remaining attributes that were not measured, underwent further development, and will form part of the ideal framework. Also, at this stage there were no suitable measurements for the cost and agility attributes. The attributes that were measured included reliability, responsiveness, and assets. The first attribute that will be discussed is reliability, followed by responsiveness, and assets.

The objective for *Stage 2* was to complete *work-stream B*. *Work-stream B*'s objectives are listed below.

- To analyse feedback based on the new framework outcomes, workshops, interviews and final year projects.
- To expand the scope of participants.
- To design user-friendly methods to collect data.
- To develop a new and refined framework.

4.2.1 Reliability

Reliability refers to the ability to perform tasks as expected with reference to the timeliness, quality and quantity of the product being delivered (SCC, 2014). This performance attribute is customer focused and will greatly impact an organisation's customer satisfaction level. The wine industry is a competitive industry and as a result, wine cellars will do what they can to gain a competitive advantage. This includes boosting their reliability to ensure sales remain high and to stay competitive in the SA wine industry. This does not only include the wine cellars competing on an individual level, but also includes SA's wine industry competing against international wine industries, such as Australia, Argentina, and Chile, among others. SA's wine industry's largest market is exporting bulk wine, which faces competition against other southern exporting countries. Therefore, not only should each individual wine cellar's reliability be advantageous, but so should the SA wine industry's reliability as a whole. For the above-mentioned reasons, reliability was selected to from part of this framework.

Reliability consists of a Level 1 metric, namely perfect order fulfilment (RL.1.1) which can be calculated as shown in Equation 4.1. Perfect order fulfilment consists of four Level 2 metrics (RL.2.1 to RL.2.4); see Figure 4.2 for an illustration. Perfect order fulfilment is a high-level measurement that only captures orders and assigns a value of 1 when completed and 0 when incomplete or awaiting completion. Incomplete orders receive an abstract reason as to why an order failed, which makes finding solutions strenuous. Capturing Level 2 metrics provides more detailed reasons as to why the product delivery was incomplete. This enables cellars to narrow the problem down to a specific operation within the delivery process. In order to gather Level 2 metrics data, it was necessary to involve other supply chain partners. These supply chain partners,

namely freight forwarders, have more mature processes and systems than that of cellars, and were therefore able to provide more reliable information.

$$\text{Reliability} = \frac{(\text{Total Perfect Orders})}{(\text{Total Number of Orders})} \times 100\% \tag{4.1}$$

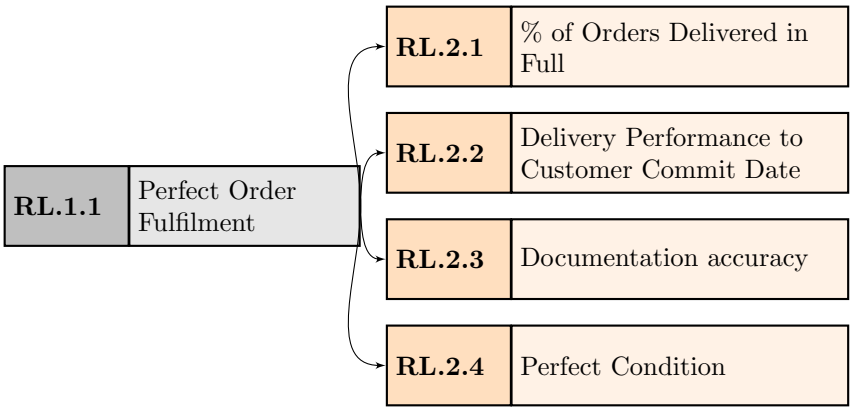

Figure 4.2: Reliability measurements

The freight forwarder companies were asked to complete four Level 2 metrics. The companies only captured one of the four metrics on their systems, namely *delivery performance to customer commit date*. This metric is defined by SCC (2014) as "the percentage of orders that are fulfilled on the customer's originally committed date". In the case of exporting, this metric will almost always receive a 0, seeing that transportation is mainly dependent on the weather conditions. The ship departs from Cape Town port and propels toward its destination. During this journey, weather may change which may cause the ship to delay or advance its arrival time. As such, for the SA wine industry, the metric should not specify a "committed date", but should rather stipulate a time window during which the ship has to arrive.

Furthermore, *Documentation accuracy*, *perfect condition* and *% of order delivered in full* are not captured on the freight forwarder's systems. *Documentation accuracy* is defined as the percentage of orders with accurate documentation supporting the order. *Perfect condition* is the condition in which the product arrives at the importers warehouse, and *% of order delivered in full* is the percentage of perfect orders received by

the customer with correct quantity. (SCC, 2014). Faulty documentation and imperfect conditions of products do sometimes occur. These problems are handled instantly, but are not recorded on their systems. Therefore, the freight forwarder can indicate those problems that occur most, but no record is kept regarding these problems. It rarely occurs that the wine is shipped back due to poor quality or the documentation being false. After all, a sample from the same wine is exported to the importer and needs to be accepted by them prior to shipping the full container. In addition, a sample of the wine that was pumped into the flexitank, is collected by SAWIS to manage the quality of wine being shipped (van Lill, 2015). Under the above mentioned circumstances, the exporting cellar would be suspicious regarding the actual reasons for returning the wine. One response from a cellar was that importers' forecasts predicted that more wine would be sold before the next order from SA arrives. If the container arrives after a two-week lead time, the importer would rather send it back because of alleged poor quality than to pay for wine that would be laborious to sell (van der Watt & Lötter, 2015). Nonetheless, taking the latter argument into consideration, there are certainly occasions where the product is of poor quality, or it simply does not meet the necessary requirements of customer's demand, but this is rarely the case.

As previously mentioned, d*elivery performance to customer commit date* was the only level-two metric that could be measured due to the availability of the data on their systems. This metric received time stamps to differentiate between various processes and to distinguish between responsibilities for the order during specific periods. The time stamps the freight forwarders provided are shown in Figure 4.3.

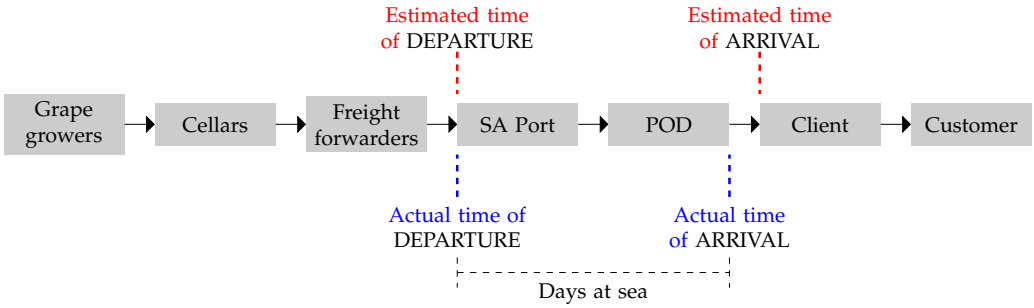

Figure 4.3: The requested time stamps

By calculating the difference between the estimated time of departure (ETD) and the actual time of departure (ATD), the team was able to determine whether the order departed on time or late. A similar calculation could be done for the actual time of

arrival (ATA) of the shipping vessel. The freight forwarders could only provide the estimated time of arrival (ETA) for when the finish goods should arrive at the importer's warehouse and not the ETA at POD. Therefore, calculating the difference between ETA and ATA would not portray a true depiction of the arrival reliability of ships. Although the calculation is problematic, it can still be concluded that when the order arrives (ATA) after the ETA date the order is late. This provides an effective reliability measure for entities pertaining to the exporting wine process.

The first to be discussed is the departure reliability measure. To be able to ship the wine on time requires collaboration between the cellars, freight forwarders and shipping companies. These three entities can therefore affect the time of departure. However, other unexpected events may also hamper this process. These include natural disasters, labour strikes at port or other service providers, weather conditions, and terrorism, among others. For our data collection purposes, the freight forwarders supplied data, which only contains the date for ETD and ATD with no explanation for late arrivals. Therefore, during the analysis of the data, if an order was late, it was assumed that either the cellar, freight forwarder, shipping company, payment issues from the importer, or the weather was the cause.

The second reliability measure is the arrival of the shipping vessel at POD. In this case, the entity that can affect the time the order is delivered at POD is the shipping company, however, weather conditions may also hamper the delivering process. Therefore, during the analysis of the data, if a shipping vessel was late, it was assumed to be the weather conditions', or shipping companies' error that prevented the shipping vessel from being on time.

Figure 4.4 displays the reliability of orders that were shipped on time. The size of the circles in this figure represent the number of orders. It should be noted that only 30% of cellar C's order departed on time, while the rest was late. As previously mentioned, major entities that may prevent the order from being shipped on time, include the cellar itself, freight forwarders, the shipping company, payment complications or the weather. In the case of the other cellars, 0% of the order departed on time. This is therefore inferred to be a problem area in the supply chain, and one that should be measured and addressed in future. Moreover, as previously indicated, the ETA and the ATA cannot effectively be compared in the same manner as ETD and ATD, but results could nonetheless be derived from the data. It was found that nearly 30% of the samples

of orders retrieved from freight forwarders arrived later that the ETA. This confirms that the orders' POD arrival were later than the ETA at the importer warehouse and as such, the orders were exceptionally late. In addition, the 30% represents the reliability of orders delivered on time. This is essentially the highest reliability measure that can be obtained, considering the possibility that the order, having arrived on time at ETA, could still arrive late at the importer's warehouse. Two undergraduate students conducted studies regarding the responsiveness and reliability aspects of the packaged export supply chain segment. It was found that the bottling of packaged wine must be booked in advance and any delay of dry goods or wine may hamper this process. Therefore, orders that arrive late at the importer's warehouse could have a ripple effect, resulting in processes being delayed, which incorrectly portrays SA wine industry's reliability to be poor.

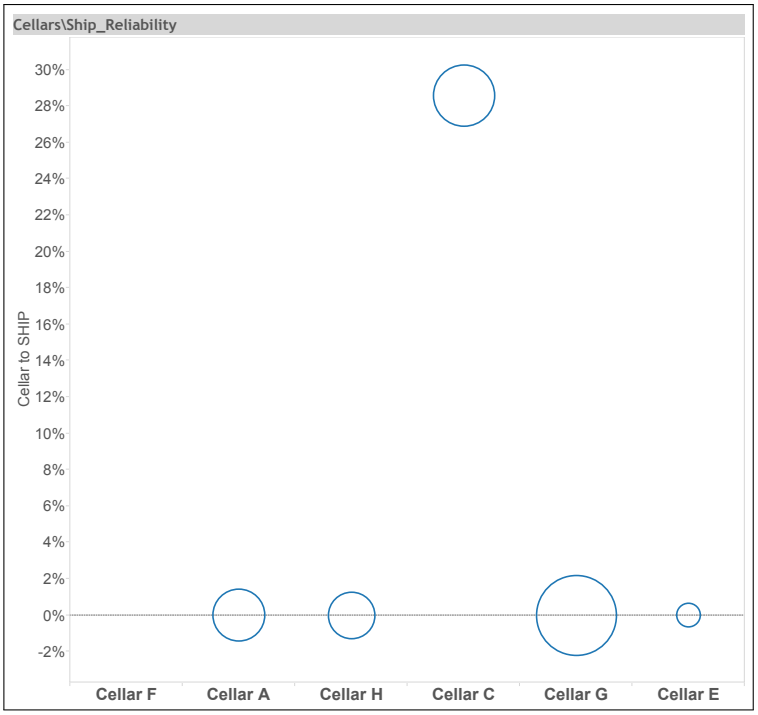

Figure 4.4: Reliability findings for *Stage 2*

Upon further investigation, it became clear that there were inconsistencies in the data. Figure 4.5 presents the events where the orders were shipped late from Cape Town port ("ETD to departure" indicated in blue), but also arrived late at POD ("ETA to arrival" indicated in black). This sample represents 62% of all the order data obtained from the freight forwarders. It should be noted that most of the time,

shipping vessels arrived between one and ten days late, whereas the shipping company frequently departed 12 days late, or more. The average of the "ETA to arrival" was calculated, excluding the outliers, and a value of seven days was obtained. Similarly, the "ETD to departure" was calculated and we obtained a value of 14 days. This indicates that on average the shipping vessel arrives seven days late at POD, as to the shipping vessel departing 14 days late from Cape Town port. This suggests that on average, the shipping company advances travelling at sea by seven days (14 - 7), which is unlikely seeing that the average time a shipping vessel spent at sea was 24 days for this sample. This implies that the shipping vessels have to perform an average of 30% more efficiently during sea travel.

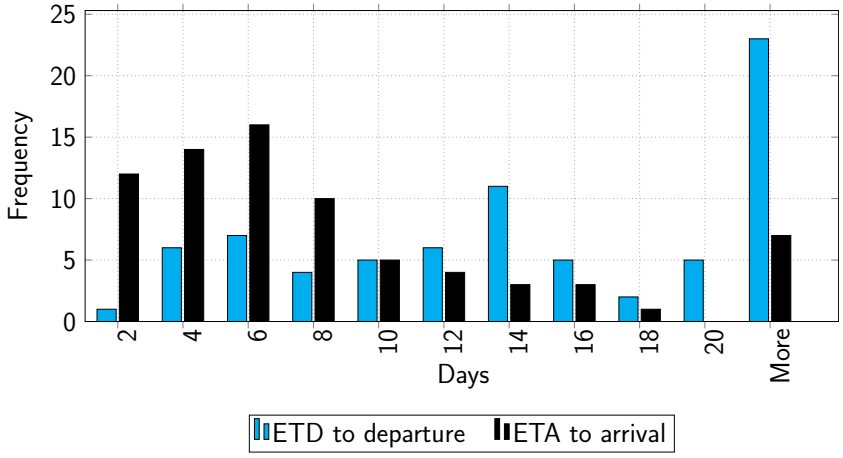

Figure 4.5: Orders shipped late and arrived late at POD

Investigation of specific case studies representing extreme outliers, revealed that the data were unreliable. One such extreme outlier, namely order information, is shown in Table 4.3 below. In this example, the order departed 197 days late form Cape Town port, spent 29 days at sea, and arrived 5 days late at Liverpool. According to the sample, the average time a shipping vessel travels to Liverpool, is 30 days. This suggests that it is not possible for a shipping vessel to arrive five days late at Liverpool after it departed 197 days late at Cape Town port. The sample of data obtained from the freight forwarders represents another 14 cases similar to the Liverpool order, which is problematic. This concern was presented to a freight forwarder participating in the study. The response was that the ETD is automatically updated by their system after the ETA is entered; where the ETA is the date the importer expects the wine to arrive at its warehouse. The system then calculates, using historical data, the date the wine should be shipped from Cape Town port. In some cases, the ETA is updated, but the

ETD is not updated accordingly. In light of this, caution is urged when attempting to draw conclusions from the data in this regard.

Table 4.3: Unreliable order information

Cellar	Cellar F
Days departed late	197
Days at sea	29
Days arrived late	5
Wine type	Bulk
Destination	Liverpool

4.2.2 Responsiveness

Responsiveness is defined by SCC (2014) as "the speed at which a supply chain provides products to the customer". The metric is considered to be highly important for SA cellars, seeing that the feedback from the *Stage 1* suggested responsiveness to be an order-winning criteria (See Table 4.1). According to Nel, Dippenaar & Hertog (2015), exporting wine in bulk format generally has a lead time of 12 weeks. For example, when the importer purchases new wine in bulk format from SA. This process from when the order has been placed to receiving the wine at POD will take approximately 12 weeks in total.

Shipping wine in bulk format is complex, time consuming, and requires excessive paperwork. This laborious process is discussed next (See Figure 4.6). The first step for ordering wine in bulk from SA, is for the importer to request samples if the wine is unknown to him/her. Otherwise, the importer will request an order directly, but in most cases a sample is required for verification purposes. The order generally contains relevant information, namely the date of shipping, date of arrival, volume, POD, and cost information, among others (JF Hillebrand, 2014). Before an order is shipped, three samples are sent away in order to test the necessary qualities of the wine. The samples are sent to SAWIS and the Department of Agriculture, Forestry and Fisheries (DAFF). This certification from SAWIS has a 42 days guarantee that allows the cellar to request export documentation during that period (van Wyk, 2015). This document can be requested online upon placing an order by using the reference number SAWIS assigned to the cellar's wine.

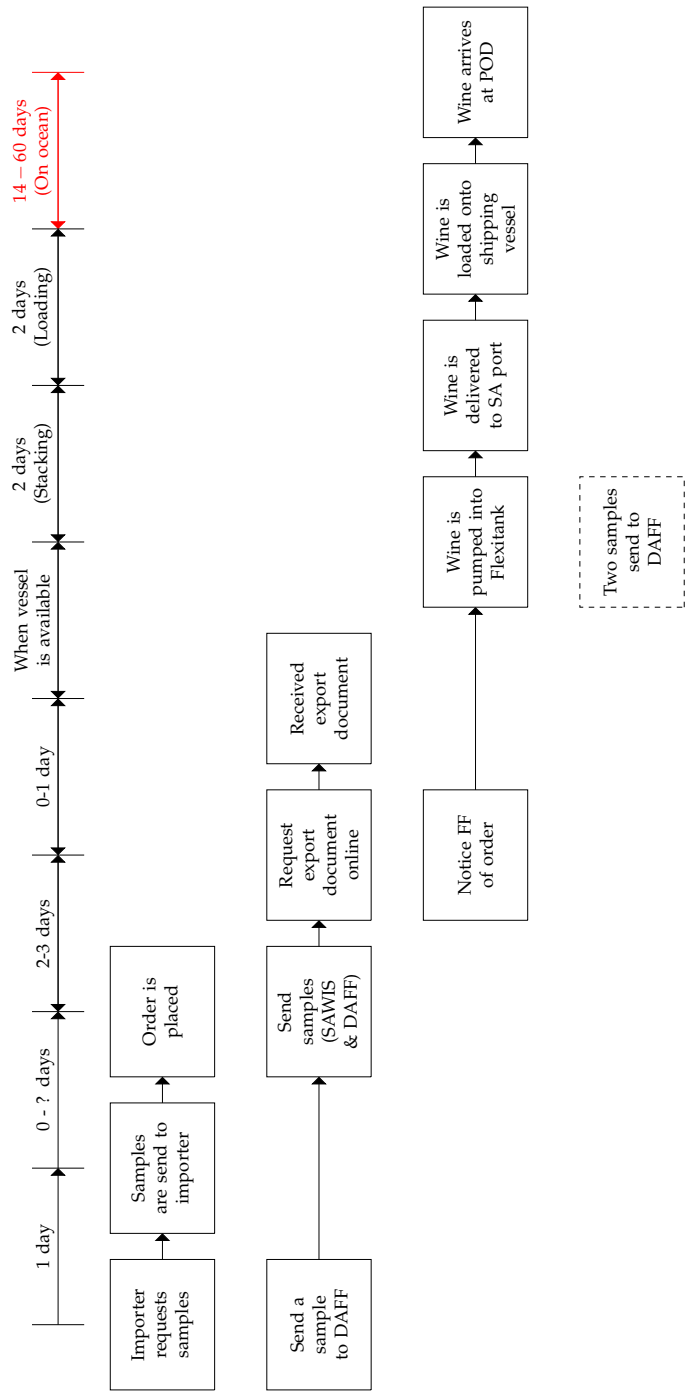

Figure 4.6: Flowchart of entities and lead times in supply chain (van Lill (2015); Watson (2015))

Continuing on from when the order is placed, the cellar has to react and give notice to the freight forwarder. The freight forwarder then notifies the cellar when the wine should be ready for shipping and schedules a time and date for the wine to be pumped into the flexitank. Pumping the wine into the flexitank takes place at the cellars, where the wine is stored. The port generally has a stack time of two days, in which the cellar has to deliver the wine. Prior to pumping the wine into the flexitank, the cellar notifies the DAFF to schedule an inspector. The inspector's purpose is to extract wine from the flexitank and deliver it to the DAFF. Occasions do occur when the inspector is not able to visit the cellar, mainly due to the inspector being busy inspecting other cellars' wine. In this case, the cellar contacts the inspector, asking for permission to load the flexitank. After the permission has been granted, the cellar is responsible for extracting two bottles of wine from the flexitank and sending it to DAFF. The loaded flexitank is shipped to the port during the assigned stack time. After the stack time is due, the ship is loaded which takes approximately two days, but weather may hamper the loading process. The ship will stay at bay for two days, after which the ship will sail to the next destination even when the ship was not loaded due to bad weather. This is commonly known in the industry as "cut and run" (van Lill, 2015). According to van Lill (2015), it is too expensive for the ship to stay longer, causing full containers to stay behind those that were not loaded onto the ship due to poor weather conditions. The next set of ships to arrive are generally pre-booked with containers. Only when space becomes available, are the "cut and run" products loaded; else they are loaded on the next available ship. This can affect a cellar's responsiveness negatively.

After the ship has sailed across the ocean and arrived at POD, the wine is unloaded and transported to the importer's warehouse of choice. Thereafter, two additional samples are extracted from the flexitank and are sent to DAFF. The wine is then compared to the samples that were extracted in SA in order to establish whether the wines are the same kind and the same quality.

The metric used to measure the responsiveness of cellars is referred to as *Order Fulfilment Cycle Time (RS.1.1)* and will be discussed below. This metric measures the average cycle time taken from when an order is placed, until the order is delivered and accepted by the customer. Since SA's wine industry is in fierce competition with other southern hemisphere countries that also export the majority of their wine to the northern countries, responsiveness will have a great effect on the SA wine industry. There are many operations that may reduce cycle time, and as such, the metric was

customised from *Stage 1* to adhere to the SA wine industry supply chain. The *Order Fulfilment Cycle Time* was divided into three additional cycle times, each containing the cycle time of an important operation in the supply chain (see Figure 4.7). Adding these three cycle times will effectively provide the *Order Fulfilment Cycle Time*. This metric was divided into the three cycle times to be able to pinpoint precisely where the problems occurred during the entire cycle time.

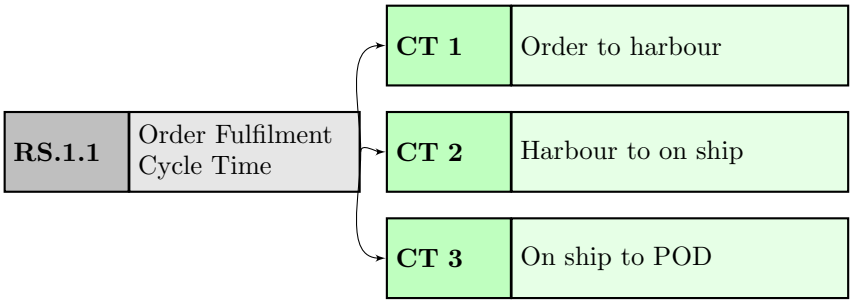

Figure 4.7: Three cycle times (CT) measurements

The data requested from the freight forwarders are listed in Table 4.4. There are four actual dates required to determine the three cycle times. The first cycle is from when the order is placed until the order is delivered at the port. The initial date on which the order was placed is only available at the cellars, whereas the date of products' arrival at port is available on the freight forwarder system. Therefore, the data should be linked between the cellar's system and the freight forwarders' systems. A unique entity that is used throughout all parties' systems, is the importer purchase order. The next required date is when the ship departed from Cape Town port. The time the wine was stationed at the port can be determined with the second cycle time. Finally, the third cycle time is the duration of the ship at sea. The last three dates mentioned, namely the date delivered at Cape Town port, actual date when order was shipped from port and actual date when order arrived at POD, each have a requested date. By capturing both the actual and requested dates, reliability issues can effectively be found. Although the largest volume of wine is shipped with FOB Port of Cape Town INCOTERMS ® 2010 and the cellars have no influence from that point onwards, it is proposed that the cellars should be aware of the products reliability. If the customer experiences bad service from the FF in SA, the cellars is effected by it.

Table 4.4: Data required from freight forwarders for each order

Number	Data required
1.	Cellar name/code
2.	Unique ID_Exporters Custom code
3.	Importer's PO
4.	If applicable_name of FOB agent
5.	If applicable_name of importer's agent
6.	Delivery Point: If applicable_date delivered at FF warehouse
7.	Delivery Point: Date delivered at Cape Town port
8.	Requested date when order was shipped from port
9.	Actual date when order was shipped from port
10.	Requested date when order arrived at POD
11.	Actual date when order arrived at POD
12.	Port of destination (name)
13.	Volume (litres)
14.	Reliability issues
15.	Consolidation (LCL/FCL)
16.	Shipping line
17.	Inco-terms

The average time, presented in number of days, that ships travel at sea are displayed in Figure 4.8. By observing this figure, it should be noted that the data is consistent and no extreme cases are presented here. This suggests that there are few responsiveness issues pertaining to travelling at sea. Upon further analyses of the data, however, one shipping route revealed a difference in responsiveness for the same destination. This issue is highlighted in Figure 4.9.

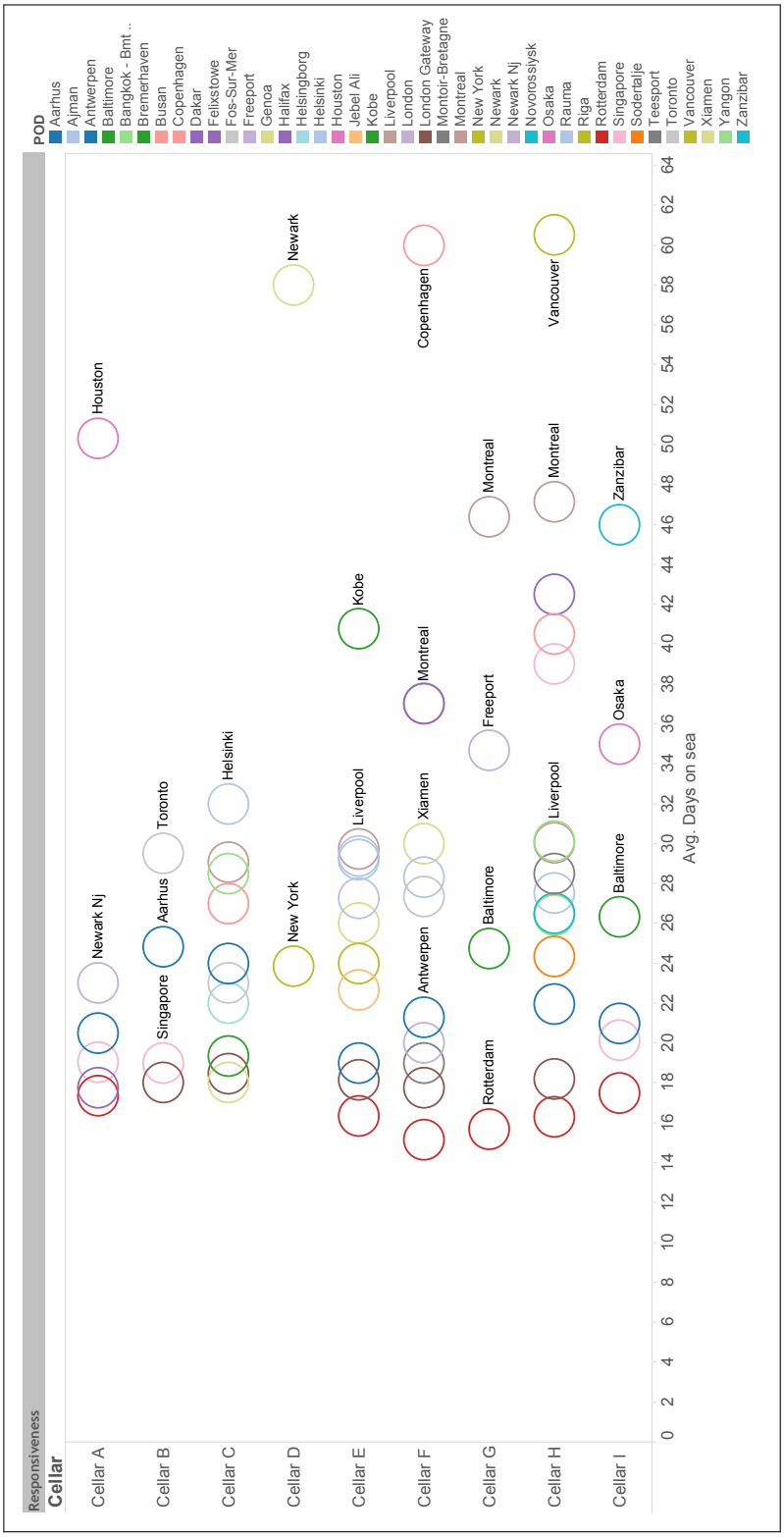

Figure 4.8: Responsiveness findings for *Stage 2*

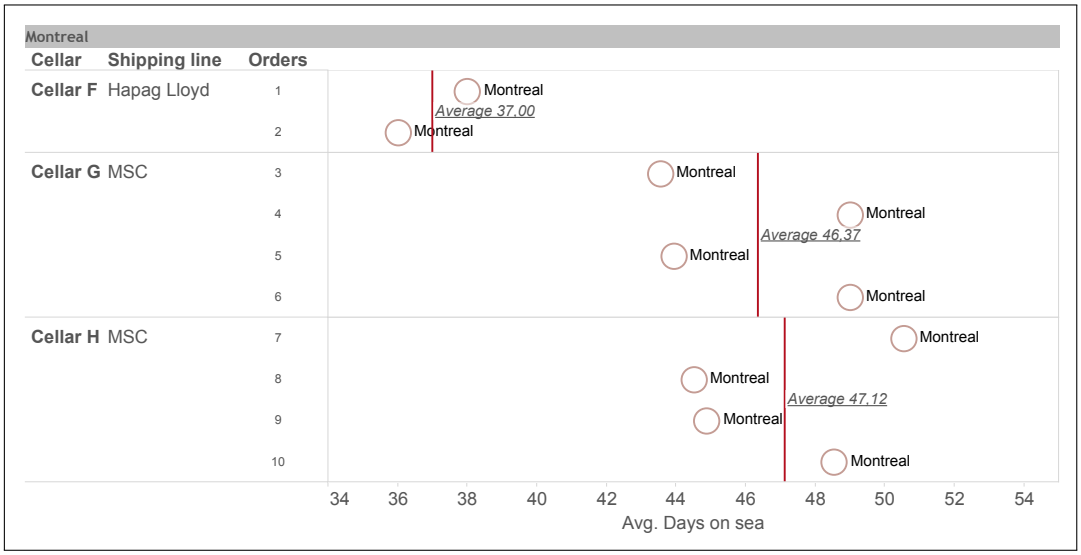

Figure 4.9: Montreal

Hapag Lloyd, a shipping company, travels on average, ten days less than the Mediterranean Shipping Company (MSC). There are two potential reasons for this: the first reason is that Hapag Lloyd has a better shipping vessel than MSC, which can travel faster at sea. The second reason is that the two shipping lines' routes are different (See Figure 4.10 for different routes). This matter was presented to a freight forwarder participating in the study, who then confirmed that Hapag Lloyd travelled using "Option 2" as a direct root (see Figure 4.10). Although the route takes an average of ten days faster than "Option 1", this route will no longer be used as an direct root, unless it becomes more economically viable. No further complications arose during the analyses, which suggests that measuring responsiveness for the shipping vessels travelling at sea is not necessary for external benchmarking between cellars.

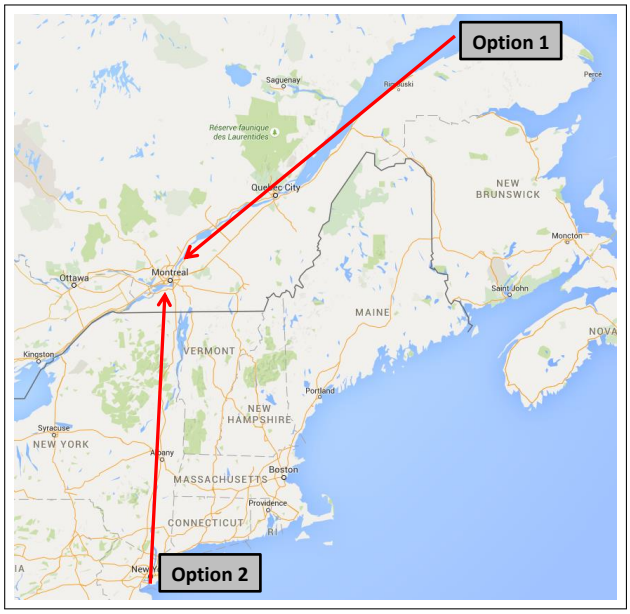

Figure 4.10: Montreal route options

4.2.3 Asset management efficiency

SCC (2014) defines asset management efficiency as the ability to efficiently utilize assets. This includes the management of all assets in a company and their performance. The metrics selected for this attribute included *capacity utilisation* and *IDOS*. The latter metric was measured in *Stage 1*. This metric did not provide accurate results, and consequently, a better definition was provided and measured accordingly. A few changes were made to this metric for *Stage 2*. The metric received a demographic in order to distinguish the order type. In the feedback sessions after *Stage 1*, it was found that the IDOS depended on the kind of order placed. Two kinds of orders were identified, namely contracted bulk and spot bulk orders. Another change made to the metric was the period in which the data were captured. The period changed from quarter 2 in 2014, to the full year of 2014 (January 2014 to December 2014).

Two demographics were identified during *Stage 2*, as mentioned. These two demographics cannot be compared to one-another since each of the two have different source or make cycle times. The first demographic, contracted bulk, is wine that is ordered in advanced before the end of harvest for that year. In other words, contracted bulk refers to all bulk wine that is sold in terms of a contracted agreement before the end of harvest. This represents a make-to-stock environment. The cellars are always aware

when the wine will be shipped and can plan accordingly. Therefore, with contracted bulk there is substantial dwell time, but in the case of spot bulk, there is little to no dwell time. Dwell time is the time spent in the same stage of a process. For example, dwell time is the time bulk wine spends in storage after an order has been placed for that wine and until the wine is pumped into a flexitank. Some importers order 3 million litres at once, but request it to be delivered in different quantities during the year. Therefore, much dwell time occurs during these orders since the wine spends time in the same stage after the order has been placed.

The second demographic is spot bulk. Bulk wine is considered to be spot bulk when wine is ordered during the year and the cellars have to react quickly to get the order ready. This represents a make-to-order environment. Therefore, there is little to no dwell time and the cellars have to react immediately to get the order shipped. Since the first demographic represents a make-to-stock situation and the second demographic represents a make-to-order setting, the two are not comparable to each other. Therefore, the two cycle times are also not comparable. The demographics are necessary and distinguish between different markets the cellars are involved in. Spot bulk would represent a cellar's responsiveness the best, since they have to respond and get the order ready immediately after the order has been placed.

The metric's data were collected via a survey, namely SurveyMonkey Inc. (2015), which provided security, user-friendliness and was less intimidating for participants (See Appendix F for survey). The questions in the survey were designed to capture both cycle times. In *Stage 1*'s findings, it was found that each quarter represents a different order pattern. This could not be discovered in the data from *Stage 1*, but was highlighted during one of the feedback sessions for *Stage 1* (Van Eeden, 2015). It was found that to be able to compare IDOS for contracted and spot bulk, the metric should be compared for each quarter.

The results were collected via the survey and were evaluated. After evaluating the data, it was found that some cellars do not capture the data according to the two categories, yet they confirmed it is possible to extract the data according to the categories. The equation SCOR (Revision 11.0) used to determine the metric is:

$$\frac{(5\ point\ rolling\ average\ of\ gross\ value\ of\ inventory\ at\ standard\ cost)}{(Annual\ cost\ of\ goods\ sold) \div 365\ days} \tag{4.2}$$

Equation 4.2 was difficult to calculate, since each cellar calculates the value of their wine differently for insurance purposes. The numerator (value above the line) was calculated using different inventory at standard costs values for each cellar. This was problematic, seeing that the measure could not be used as a benchmark. The equation was then re-evaluated and redeveloped to conform to benchmarking standards. The equation used to determine this metric in *Stage 2* is:

$$\frac{(Average\ of\ inventory\ for\ quarter\ i\ (litres))}{(Inventory\ sold\ for\ quarter\ i\ (litres)) \div 90\ days} \tag{4.3}$$

$$Where$$
$$i \quad = \quad 1,\ 2,\ 3 \text{ or } 4$$

The results for *Stage 2*'s IDOS metric for bulk export (contracted and spot together) are detailed in Figure 4.11. The cellars' names are kept secret for non-disclosure reasons. The first matter to address is the sensibility that the data represents. It can be noted that IDOS in quarter 1 (1 Jan to 31 Mar) is far less than the other quarters. This is considered sensible, seeing that the store is nearly empty and ready for new wine to be produced during this quarter. The effect of the new wine produced can be seen in quarter 2 when a spike in IDOS occurs. After quarter 2, the IDOS slowly decreases as the wine is sold during the year. The survey's results revealed that the largest purchase of additional bulk was during quarter 4.

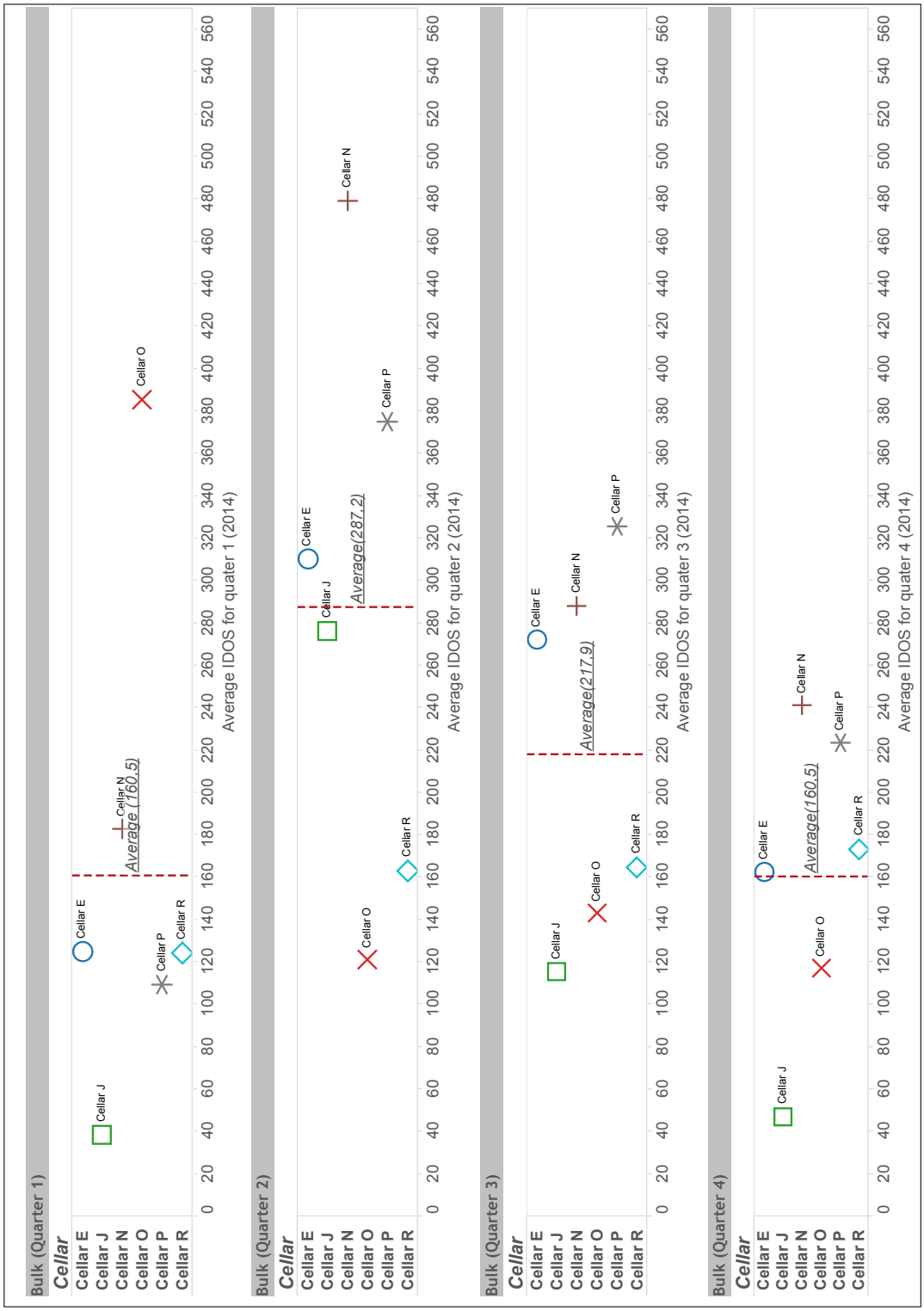

Figure 4.11: Bulk IDOS results for *Stage 2*

It should be noted in Figure 4.11 that all cellars, except cellar O (displayed as a red cross) follow a sensible pattern during each quarter. Upon further investigation, cellar O confirmed the data to be accurate and that the cellar indeed stores large quantities of wine during the first quarter for non-producer markets, namely Japan and UK. Cellar O cultivates their own grapes, but purchase majority of the grapes from other farms. They purchase grapes early in the year from the northern cape and produces wine, which is then immediately sold in large quantities (3 - 6 million litre) to the non-producing markets. Seeing that the data provided by the cellars was accurate, it was further inspected to determine the two demographics of IDOS. Figure 4.12 displays contracted bulk and Figure 4.13 displays spot bulk. From these figures it can be observed that two of the cellars contract 90% of their bulk wine, another two 50%, and one 20%. Analysing these two figures revealed a unique trend that not only proves the accuracy of the data, but also illustrates the difference between contracted and spot market focusses.

As previously mentioned, contracted bulk is wine that is sold in terms of a contracted agreement. Thus, prior to producing wine, it is contracted and then shipped in different quantities during the year. In the case of spot bulk, cellars sell the wine to any market during the year and it would therefore be more laborious to sell. This reasoning can be seen in Figures 4.12 and 4.13. Focusing on the cellars that contract 50% of their bulk wine (cellar R and P), it should be noted that these cellars' IDOS for contracted bulk is an average of 48% less than for spot bulk. This confirms the rational that the spot market is less predictable, the wine is more difficult to sell, which in turn, creates a larger IDOS. Similarly, observing the cellar that contracts 20% of their bulk wine, it can be noted that the IDOS for their bulk wine is always above the average of the sample (See Figure 4.11). Also, by observing all cellars in Figure 4.11, it can be concluded that cellars competing in the spot market have on average 16% higher IDOS than contracted bulk.

In light of these discoveries, contracted bulk and spot bulk are not comparable and should be measured separately. The figures indicate that cellar N has a high IDOS compared to other cellars competing in the contracted bulk market, when in fact, cellar N may have a low IDOS compared it to other cellars competing in the same market. Similarly, cellars that contract 50% of their bulk wine cannot be compared to those who contract 90% of their bulk wine. Although the data makes sense, their remain some unanswered questions regarding the accuracy of the data. Of course, when the total

volume for spot bulk sales and contracted bulk sales are added, it would reflect the exact same volume as total export bulk sales. In some cases, however, it did not reflect the exact same quantities. Therefore, it is assumed that cellars estimated these values in some cases, but did not have the data on any system to accurately display it in a report.

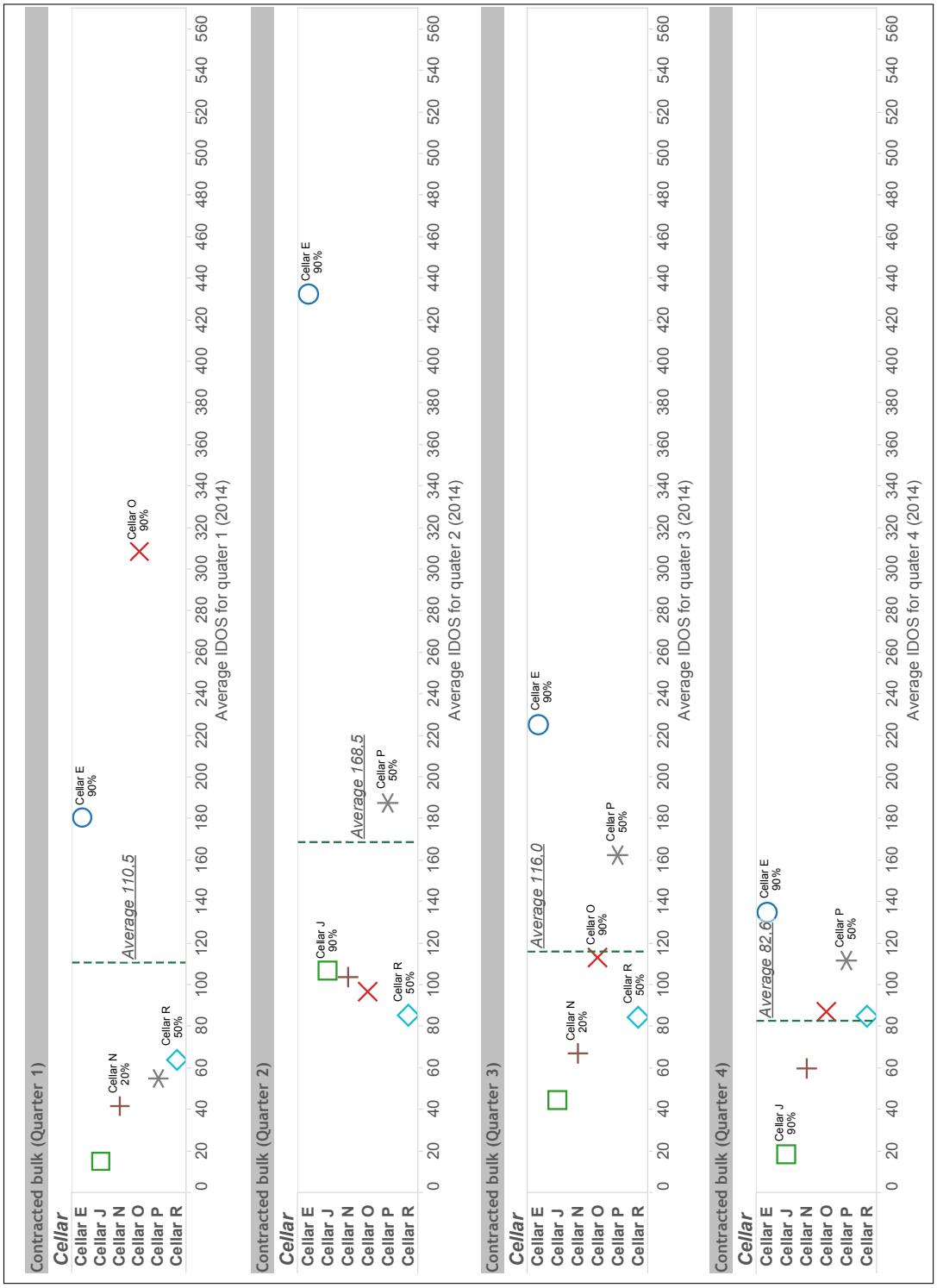

Figure 4.12: Contracted bulk IDOS results for *Stage 2* (percentage are indication of contracted bulk)

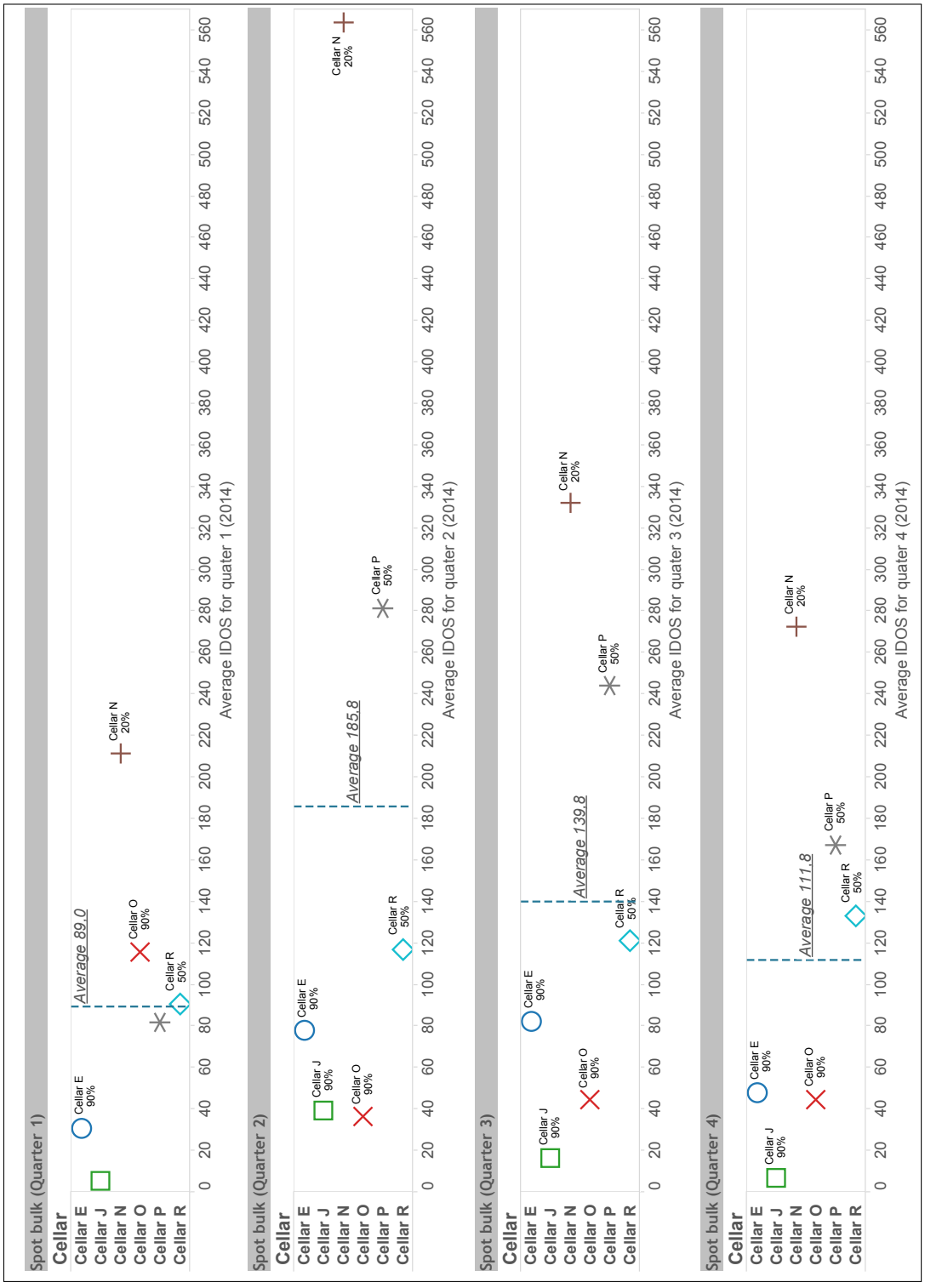

Figure 4.13: Spot bulk IDOS results for *Stage 2* (percentage are indication of contracted bulk)

4.3 Conclusions

Many problems and challenges surfaced during *Stages 1* and *2*. These complications prevented the research team from gathering complete quantitative data that would have provide an added sense of validity to the ideal framework. The major challenges the research team experienced are listed below:

- The cellar's records contained little to no quantitative data that were required for the new framework.
- The participants, mainly the cellars, lacked supply chain knowledge.
- The cellars' warehouse, production, financial systems, among others, were designed to present their data as one supply chain and not in a segmented manner.
- The freight forwarders lacked data that were required for the new framework.

Although the quantitative data were insufficient, many challenges that the cellars experienced were brought to the attention of the research team. These led to important questions being asked in order to discover the root cause of these complications. Delving deeper into these complications revealed a true depiction of SA's wine industry comparing it to what it could, or should be. By asking these questions, it made professionals in the industry rethink the way they defined their supply chains, or to at least start thinking in a supply chain manner in order to define their supply chains. By viewing Table 4.5, it should be noted that quantitative data were available for *Stage 1* and *2*. Yet, although the data were available, the accuracy of the data seemed to lack. Not one metric received 100% accurate data, only partially accurate data. The latter also applies for the completeness of the data. Freight forwarders stored important files containing the data required for *Stage 2* hard copy format, similar to the cellars. Therefore, collecting the information was an burdensome exercise and beyond the scope of the study. Seeing that *Stage 1* and *2* derived greater value from the qualitative data, the ideal framework was based primarily on the results obtained from qualitative data.

Table 4.5: Summary of data quality

STAGE 1							
Attribute	**Metric**	**Data availability**	**Completeness**	**Consistency**	**Accuracy**	**Transparency**	**Traceability**
Reliability	Perfect Order Fulfilment	P	N	Y	N	N	Y
Responsiveness	Order Fulfilment Cycle Time	P	N	Y	N	N	N
Agility	Upside Supply Chain Flexibility	N					
Cost	Storage cost	N					
	Transportation cost	Y	Y	Y	Y	N	Y
Asset	Inventory days of supply	P	P	N	P	N	Y
STAGE 2							
Attribute	**Metric**	**Data availability**	**Completeness**	**Consistency**	**Accuracy**	**Transparency**	**Traceability**
Reliability	% of orders delivered in full	N					
	Delivery performance commit date	Y	P	Y	P	P	Y
	Documentation accuracy	N					
	Perfect condition	N					
Responsiveness	Order date	N					
	Arrived at port	N					
	Estimated and actual time of departure	Y	Y	Y	P	P	Y
	Estimated and actual time of arrival	Y	Y	Y	P	P	Y
Asset	Bulk (Export)	Y	P	P	P	P	Y
	Spot bulk	Y	P	N	P	P	Y
	Contracted bulk	Y	P	N	P	P	Y

Key	Description
Y	Yes
P	Partially
N	No

Chapter 5

Developing ideal framework

Contents

The ideal framework is based on the quantitative and qualitative findings from *Stage 1* and *2*. Both the latter stages' frameworks were developed using the data availability in the wine industry in order to obtain quantitative results. Some of these results were used to develop the ideal framework, but it was mostly the results of qualitative data that were used for the development of the ideal framework. As mentioned, the ideal framework is not based on the current data availability in the industry, but on an ideal situation were all data are available. The ideal framework includes all five of SCOR's attributes, seeing that they are trade-offs of one another. The ideal framework is a combination of metrics for each attribute and will be discussed below.

5.1 Reliability

The cellars have a responsibility to their customers to deliver the correct quantity and quality of wine on time and with correct documentation. Since the majority of wine

is shipped with FOB Port of Cape Town INCOTERMS ® 2010, the cellar's responsibility stops after the wine is loaded onto the ship. Thereafter, the customer's (the importer's) responsibility starts. In addition, the cellar's wine is delivered at the customer's warehouse, which implies that the cellar is responsible for the correct quality and quantity of wine until then, but not the time of arrival and/or its documentation accuracy. Therefore, the customer experiences SA's cellar's time and documentation reliability until the wine is loaded onto the ship and the quantity and quality reliability throughout the shipping process (see Figure 5.1). For example, if the cellar did not add the correct amount of protein stabiliser to the wine, the wine will not taste the same after it has been on sea for roughly two weeks. This problem will only be discovered after the wine has been tasted, therefore the reliability regarding the quality of the wine should be measured again at the importers warehouse.

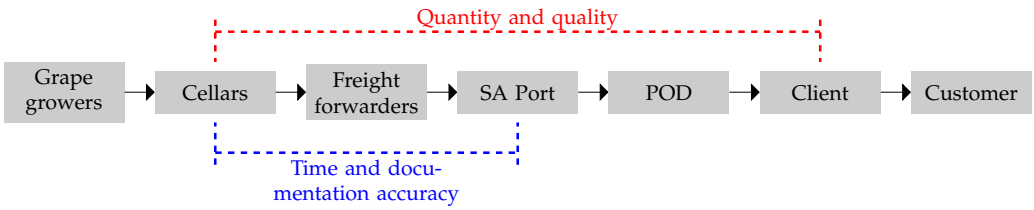

Figure 5.1: Cellars' responsibility regarding reliability

Now that the cellars' responsibilities have been identified with reference to the customer experience of the reliability of SA's cellars, measurements can be determined to record these events that will reveal where reliability issues may occur. The areas to be discussed first, are the *time* and *documentation accuracy*, respectively. Measurements were developed for each area that provide meaningful measures on which important business decisions can be based.

As previously mentioned, the cellars are responsible for delivering the wine to the port on time. These events and dates should be recorded on both the cellar's and freight forwarder's systems. Both entities in the supply chain should record the following information regarding the time and date of events:

- Date the order was placed.
- Estimated time and date the wine should arrive at the Cape Town port.

- Actual time and date the wine arrived at the Cape Town port.
- Estimated date the wine should be shipped from the Cape Town port.
- Actual time and date the wine was shipped from the Cape Town port.
- Estimated date the wine should arrive at POD.
- Actual time and date the wine arrived at POD.
- If late, what was the reason for not being on time.
- If the wine was rejected by the importer or DAFF, what was the reason.

Recording these events would provide visibility in this section of the supply chain for both cellars and freight forwarders. In addition, reoccurring problems that hampered the customer's experience of SA's reliability can be revealed. These problems can be dealt with and SA's reliability will improve. Looking back at Figure 4.4, it should be noted that the reliability of SA, whether it is the shipping companies' error, the cellar, or the weather, is poor. By recording these events, the root cause as to why these measurements are poor can be resolved.

Documentation accuracy relates to all documentation supporting the order. This includes shipping, payment, compliance and other required documentation. Documentation between countries is vital, as without it, products cannot be delivered. Since documentation is a fundamental process for exporting wine, it should be measured strictly. The cellars and freight forwarders already realised this, and strict protocol have been implemented to avoid unnecessary documentation errors. However, a strict protocol will not always prevent error, since human error always plays a part. Therefore, each document in the shipping process should be recorded on the freight forwarder and cellars systems, as well as any problems that occurred. Again, this may prevent reoccurring problems, while the root cause of the problem can be established.

Although the term FOB INCOTERMS ® 2010 suggests the importer takes full responsibility for the wine after it has been loaded onto the ship, the cellars play a large part in the quantity and quality of the wine. The cellars pump the wine into the flexitank, and are subjected to the quantity they inject. The wine may decrease in volume, seeing that wine is a Newtonian[1] liquid (Spitzer, 2012). Therefore, when wine

[1] A Newtonian liquid decreases in viscosity and density when temperatures increase.

is shipped during summer from the warmer climates of Cape Town to cooler temperatures in the northern countries, the weight may differ, regardless of the different scales used in both countries. To ensure quality throughout the shipping process, a check-list should be developed to ensure that the processes for which the cellars are responsible, are executed correctly. The check-list can be modified uniquely to adhere to the wine specification. In addition, the check-list should be divided into two sections, namely the pre-loading and loading check-list (See Table 5.1 & 5.2); (Australia, 2015).

Table 5.1: Pre-loading check-list (Australia, 2015)

Check-list			
1	Oxygen levels	5	Samples
2	Microbial stability	6	Pre-shipment approval
3	Organoleptic status	7	Container status
4	Wine chemistry status	8	Flexible containers (flexitank)

Table 5.2: Loading check-list (Australia, 2015)

Check-list			
1	Oxygen levels	5	Seals
2	Temperature of wine	6	Samples
3	Ullage	7	Chemical and organoleptic status
4	Volume	8	Traceability

In addition to the check-list, this list can be used to minimise human error and will provide accountability. This may enhance the customer's experience of SA's wine industry. Having these procedures in place will provide a sense of professionalism and security for the customers. Now that all four measurements have been discussed in relation to the SA wine industry, a summary displaying the measures for reliability, is provided in Table 5.3.

Table 5.3: Summary of reliability measures

Reliability issue	Record until	Measurement
On time	On ship	Record the five dates and information regarding the delay, if any.
Documentation accuracy	On ship	Record all shipping related documentation, as well as problems.
Quantity	Importers warehouse	Measure quantity before and after shipping.
Quality	Importers warehouse	Create check list and record these events.

5.2 Responsiveness

The activities prior to shipping are mostly within the cellar's control. Briefly, the cellars have to prepare the wine for shipment, complete or outsource the necessary documentation, and give notice to deliver the wine at the port. Therefore, responsiveness is mostly the cellar's responsibility. Other problems may occur over which the cellars do not have control, such as trucks that do not arrive on time, a flexitank that is faulty or unclean, documentation that is incorrect, among others. However, those problems that the cellars do have control over can be prevented. These problems are not the cellar's fault, but the customer nonetheless experiences poor responsiveness as a result of these unforeseen events.

For the ideal framework, the first section of responsiveness was measured from when the order was placed, to its arrival at the Cape Town port. The second section was measured from when the ship departed from Cape Town port to the POD. Although in *Stage 2* the results indicated no problems with responsiveness regarding travelling at sea, this section of the supply chain should still be measured. At present, this part of the framework will not provide the cellars with a benchmark they can use to compare with each other, but it should be used in future when the SA bulk export framework is comparable to other southern hemisphere wine countries.

Furthermore, as mentioned in Section 4.2.3, bulk can be divided into two demographics. The first demographic is contracted bulk and the second is spot bulk. In the case of contracted bulk orders, customers request orders during the year in different

quantities, depending on importers' sales forecasting. Although the cellars expect the contracted wine to be shipped during the year, it sometimes occurs that an importer requests an order on short notice. The cellar will then prepare the order for shipment and request the correct documentation. In such an event, the responsiveness for contracted bulk and spot bulk would be comparable. In order to compare contracted and spot bulk in any event, dwell times should be recorded and excluded from the order cycle times. Seeing that the two demographics cycle times are comparable, both ought to be measured.

Cellars competing in the contracted bulk market have, in most cases, more time to complete an order. Consequently, this reduces the pressure to prepare an order hastily, and therefore, this measurement will not benefit the cellars competing in the contracted bulk market as much as it would benefit those competing in the spot market. Similar to the on-time reliability measurement, the customer only experiences cellar's responsiveness until it is loaded onto the ship. Therefore, the responsiveness of a cellar will be measured only until the wine is loaded onto the ship. In order to measure this attribute, events needed to be identified that differentiate between time occurrences. The time stamps selected for bulk export that should be measured are:

- Time and date the order was placed.
- Time and date samples are send and received.
- Time and date the order was ready.
- Time and date the wine was pumped into the flexitank.
- Time and date the wine arrived at the Cape Town port.
- Time and date the wine was shipped from Cape Town port.
- Time and date the wine arrived at POD.
- Record of any dwell time during any stage.

This will effectively provide the cellar with information regarding the different processes during the time the order was placed until it is on board the ship. This information can be used to identify stagnant areas that can be improved. For further investigation, cellars can add time occurrences, specifically during the first and second bullet, to adhere to cellar-specific processes. In conclusion, in order to compare the

responsiveness of the cellar for spot and contracted bulk, dwell time should be recorded and should be excluded from the calculation. A summary displaying the measures for responsiveness, is provided in Table 5.4.

Table 5.4: Summary of responsiveness measures

Bulk order	Record until	Measurements
Spot bulk	POD	Measure all eight data measure identified (Order fulfilment cycle time)
Contracted bulk	POD	Measure all eight data measure identified (Order fulfilment cycle time)

5.3 Agility

Briefly defined, flexibility is the organisation's general ability to react to external and a variety of other changes. In the SA wine industry, there are many changes the cellars have to consider with short-term or long-term effects. For example, when an order is changed from white to red wine, the cellar has to be flexible and respond to such a change. This is referred to as short-term flexibility. For long-term flexibility, consider the event where the harvest for the year has decreased with 10% from the previous year. With this change, the cellars have to adapt over a period regarding their storage, production facilities, raw material, and equipment, among many others. Similarly, when the harvest increases the cellars have to adapt to this change. Therefore, cellars also have to be flexible in the long-term. SA's wine production fluctuates every year, although it has been more consistent from 2011 (see Figure 5.2). Looking at bulk wine exports (See Figure 5.3), it can be noted that the demand for SA's bulk wine fluctuates vigorously. The main reason for this is that global harvests fluctuate and there is consequently a shortage or a surplus of wine in the international market. Therefore, a need exists to determine the cellar's exposure to market fluctuations. This will enable cellars to better utilise their assets and would, in essence, save money.

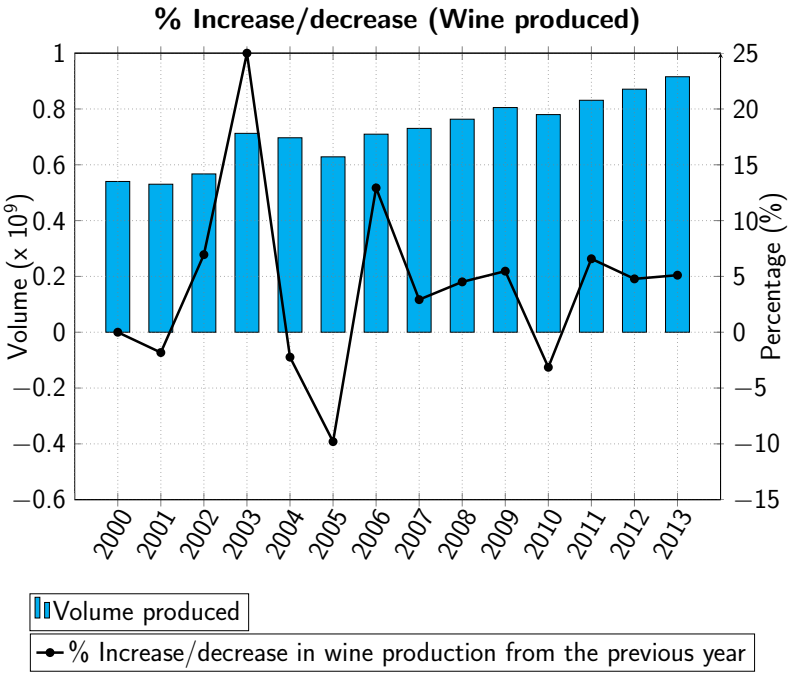

Figure 5.2: Variation in wine produced per year (SAWIS, 2014a)

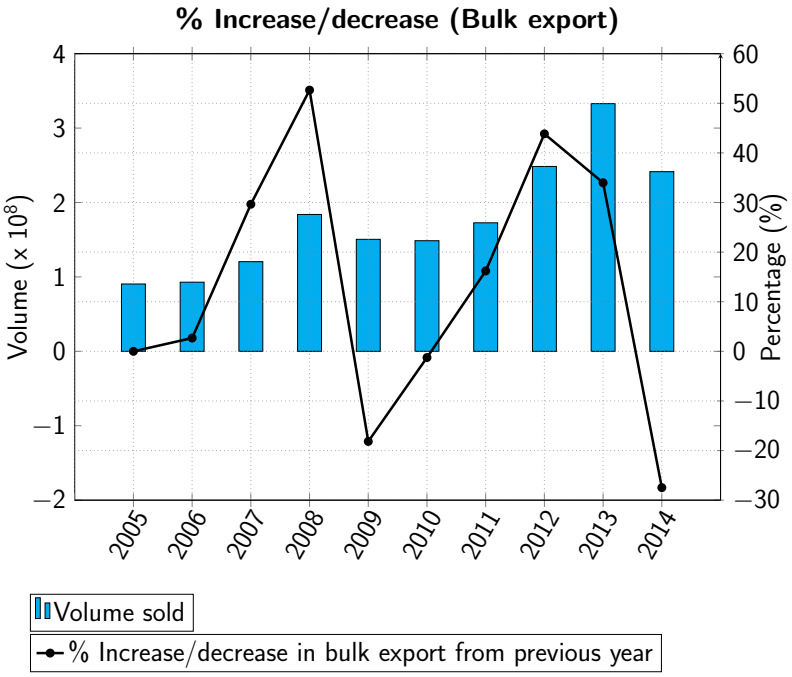

Figure 5.3: Variation in bulk wine exported per year (SAWIS, 2014a)

Cellars exporting wine in bulk aim to invest in long-term (1 year) customer contracts, providing them with the security to sell the majority of their wine. The local harvest fluctuates from year to year, and to forecast long-term sales for all available wine seems problematic. Prior to a harvest, the cellars are able to predict the volume and variety of wine that can be produced. This enables the marketing and sales teams to obtain contracts. The wine sold from long-term contracts represents the majority of the cellars production, but in most instances cellars have an excess of wine that needs to be sold. In the event where cellars do not have excess inventory to sell, it is generally the result of a poor local harvest where the wine that was produced was sold. A poor international harvest also affects SA's wine sales and would consequentially diminish SA's cellars' excess wine. The 2012 drought in Italy is an example of such an event (Hall, 2012). The drought affected SA's wine exports and can be seen in the increase in volume of bulk exported from 2012 to 2013 (See Figure 5.3). The customers, who in this case are the individuals who purchase the bulk wine, do not necessarily want to commit to long-term contracts. There are a two main reasons for this, namely the global harvest fluctuations and consumers' needs change. Therefore, cellars are predominately exposed to global harvests, which has a considerable effect on sales.

Since cellars are exposed to factors that are not in their control, it is important to know how exposed each cellar is to these factors. This will indicate how flexible a cellar is towards market fluctuations over a period. One way to measure this is by evaluating the income statement and plotting it in a 2 x 2 matrix against export sales fluctuations. This metric was developed by using only qualitative data obtained during *Stage 1* and *2*. An undergraduate student conducted a dissertation on how to measure agility in the SA wine supply chain. It was concluded that no absolute metric could be used from the SCOR (Revision 11) guide that adheres to the wine industry and therefore, a new metric was developed for agility. Figure 5.4 is a simple illustration of a 2 x 2 matrix, where the y-axis is presented as the percentage exposure to market and the x-axis is the difference between SA's present year's export sales for bulk wine, and the previous years. The horizontal dotted purple line represents the average of all cellars' exposure to the market, and can therefore change. Firstly, the SA bulk export sales will be discussed (x-axis), after which the cellars' exposure to the market equation will be discussed (y-axis).

Variability in sales for SA's bulk export market is determined by the difference in sales from the previous year and the present year's sales. For example, the total sales

for quarter 1 in 2014 was $500,000\ell$ and total sales for quarter 1 in 2015 was $512,500\ell$, indicating that the export sales have increased by 2.5%. This shows that the cellar's sales have increased from the previous year, and in general the cellar's gross profit would also increase. Next would be to determine how much the profit before tax has increased regarding the increase in sales. It is at this stage when a cellar would be able to determine how exposed their profit is to sales. In other words, how exposed the cellar's cash flow is towards sales fluctuations. If the previous example were to change and sales dropped by 2.5% from the previous year, the same could be argued for this prediction.

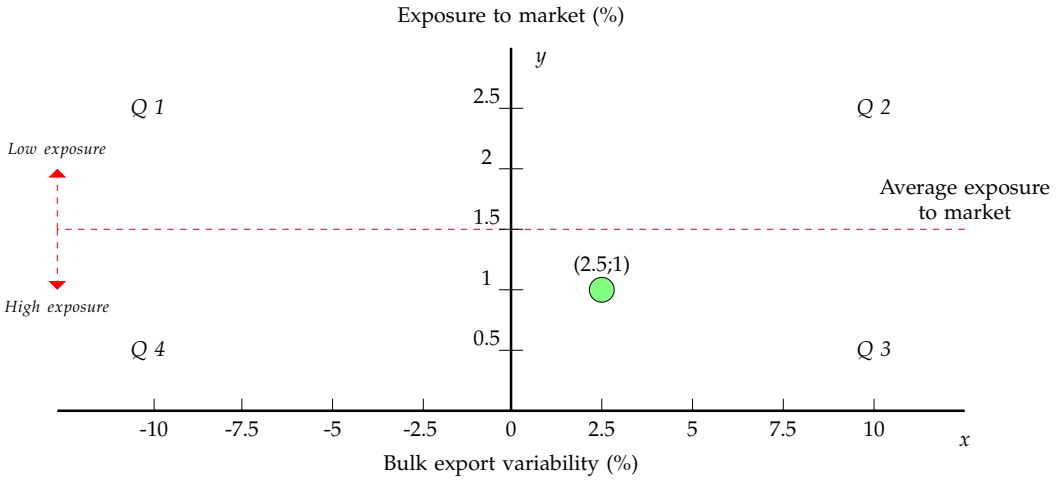

Figure 5.4: 2 x 2 matrix to illustrate a cellar's exposure to the market

In order to calculate the cellar's exposure to the market, an equation is required. The percentage exposure to market is calculated as follows:

$$(y+1)(Gross\ profit) + (Income_{ws} - Expenses_{ws}) \quad = \quad Profit(1+z) \qquad (5.1)$$

$$
\begin{aligned}
&Where \\
z &= 10\% \text{ (Use when profit is positive)} \\
&Or \\
z &= -10\% \text{ (Use when profit is negative)} \\
&And \\
y &= \% \text{ Exposure to market} \\
ws &= \text{Expenses and income related to wine activities}
\end{aligned}
$$

This formula will indicate with what percentage gross profit has to grow in order to increase the profit before tax with 10%. For example, if a cellar calculates x and obtains a value of 0.1%, the cellar's gross profit almost directly affects the profit before tax, which implies that the cellar's total sales has a large impact on profit before tax. Also, considering a cellar with a larger exposure to market percentage would indicate that the cellar is less exposed to the market, since it requires sales to increase with a larger margin before profit before tax has a similar effect to when exposure to market equals 0.1%. The only factors that are able to influence the profit before tax are sales, cost of goods sold, income and expenses. Equation 5.1 takes all those factors into account, except for tax percentage. In addition, only income and expenses related to wine sales, production and storage are used in this calculation. The reason for this is that some farms have many sources of income that are not related to the cellar's financial statements, for example, a restaurant. Also, the financial documents are kept separate and are independent from the pool system of the cellar. In some cases, the financial documents are not separated, which would indicate that the cellar is less exposed to the market than those whose financial documents are separated, since the extra income would decrease the exposure to market percentage (See Equation 5.2).

$$y = \frac{Profit * (1 + z) - (Income_{ws} - Expenses_{ws})}{(Gross\ profit)} - 1 \tag{5.2}$$

A few examples will now be provided to illustrate the effect of the 2 x 2 matrix. There are *four examples* explaining the effects for each quadrant in the matrix. Figure 5.4 represents a cellar who currently has had an increase in bulk export sales from the previous year. Using the previous example, where the bulk export sales increase from $500,000\ell$ to $512,500\ell$ from 2014 (Jan to Apr) to 2015 (Jan to Apr). This is indicated

by the green dot, which represents the position of the cellar, that is positioned at 2.5% on the x-axis. Let us assume that the cellar has calculated their exposure to market percentage and obtained a value of 1%. This shows that the cellar is in quadrant three (*Q3*). After the cellar has identified their position on the matrix, conclusions can be drawn from this position on the 2 x 2 matrix.

For *example 1*, the first matter that will be addressed is that the cellar is positioned below the exposure to market average and has a positive export sales compared it to the previous year (See Figure 5.4). This is considered to be a safe quadrant, since the cellar's export bulk sales is at an upward trend and it's exposure to the market is high. Therefore, a small percentage increase in gross profit, which implies that sales are increasing, will have a great positive effect on the profit before tax.

Example 2 is where a cellar has a decrease in export bulk sales from 2014 to 2015 and has calculated the exposure to market as 1% (See Figure 5.5). This places the cellar in quadrant four (*Q4*). This is not considered to be an ideal quadrant, since the cellar is highly exposed to the market fluctuations and has a decrease in bulk export sales. Therefore, the decrease in sales almost directly impacts the profit before tax and is seen as a major disadvantage for the cellar.

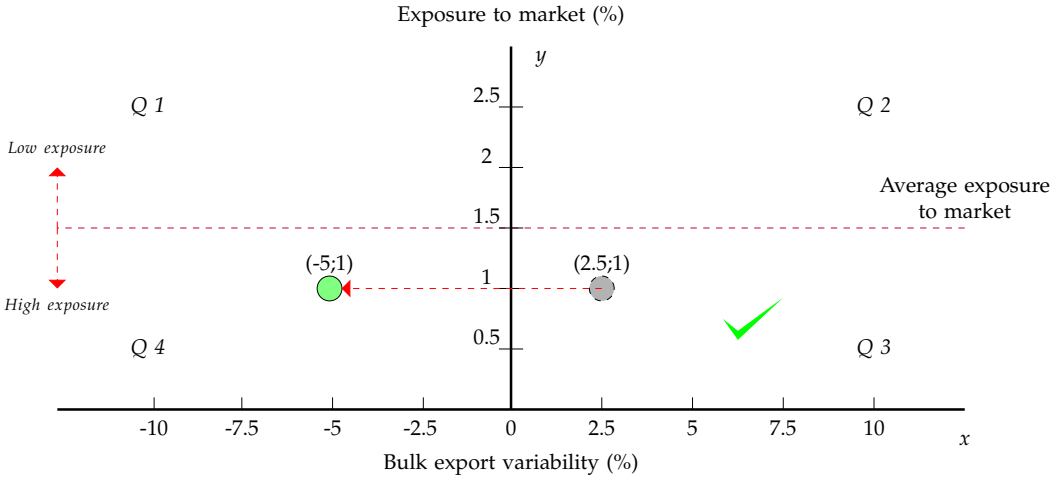

Figure 5.5: 2 x 2 matrix to illustrate a cellar's exposure to the market

Example 3 shows a cellar which has a decrease in sales from 2014 to 2015, but has obtained an exposure to market value of 2.5%, placing the cellar in quadrant one (*Q1*);

(See Figure 5.6). The exposure to market percentage is above the average and indicates that the value is higher than the average exposure to market of all cellars. Therefore, the cellar has a low exposure to the market, which is beneficial in this case, since the export bulk sales is showing a decreasing trend. The decreasing trend in sales could include factors that are not in the control of the cellar, for example a greater than normal harvest in the northern wine countries. If a year strikes where sales are very poor, it would be in the cellar's best interest to roam in *Q1.*

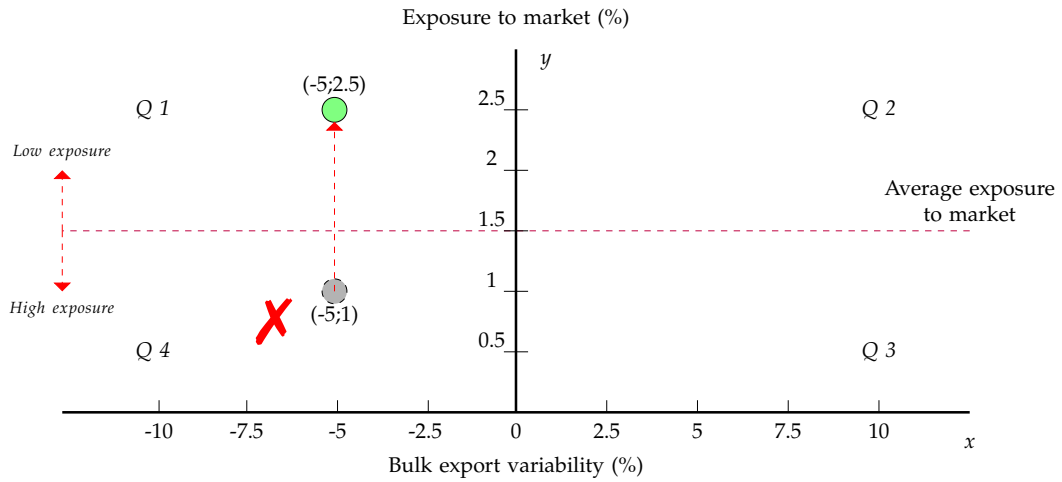

Figure 5.6: 2 x 2 matrix to illustrate a cellar's exposure to the market

Now looking at the last example, *example 4*: Here, the cellar is in quadrant two (*Q2*) with a increase in export bulk sales of 7.5% and an exposure to a market percentage of 2.5% (See Figure 5.7). This quadrant is also not an ideal position to be in, since the cellar's exposure is low and sales are increasing. Therefore, profit before tax would slowly increase where sales increase with a more rapid trend. It could be argued that the low exposure to the market is caused by the effects of the increase in sales, which would result in wine-related expenses to increase, such as outsourcing. *Q2* is still more desirable than *Q4*, since the sales are in an upward trend.

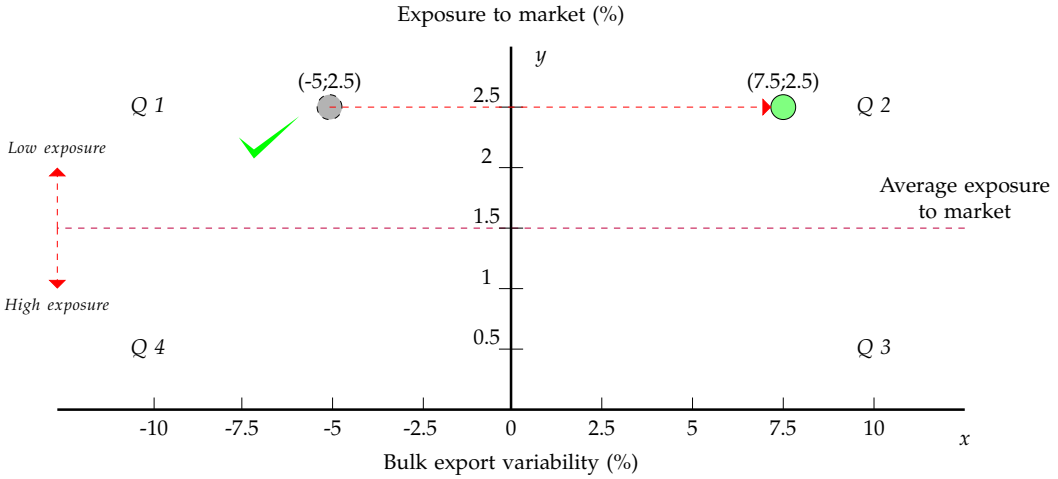

Figure 5.7: 2 x 2 matrix to illustrate a cellar's exposure to the market

In summary, this 2 x 2 matrix only gives an indication as to where the cellar is positioned relative to the other cellars. Therefore, it is not a fixed measurement on which all strategic decisions should be based, but it can nonetheless support the decision-making of a cellar. For example, after a few years, the cellar would be able to determine whether they are mostly in the upper quadrants (*Q1* & *Q2*) or in the lower quadrant (*Q3* & *Q4*). The bulk export segment is highly dependent on the local and international harvest, and as such it is difficult to manipulate or change the cellar's position from the left quadrant (*Q1* & *Q4*) to the right quadrant (*Q2* & *Q3*); (See Figure 5.8). But the position from the upper to the lower quadrants and *vice versa* can be influenced by better management of the expenses. Expenses which can be better managed are mostly outsourcing expenses. In the case where SA's wine production is low, similar to the event in 2005 (See Figure 5.2), cellars' production and storage facilities are under-utilised. In another case, where SA's wine production is high, the facilities are over-utilised. Therefore, it is important to find the acceptable point where facilities are utilised optimally over a long period. A figure that summarises this metric is shown below.

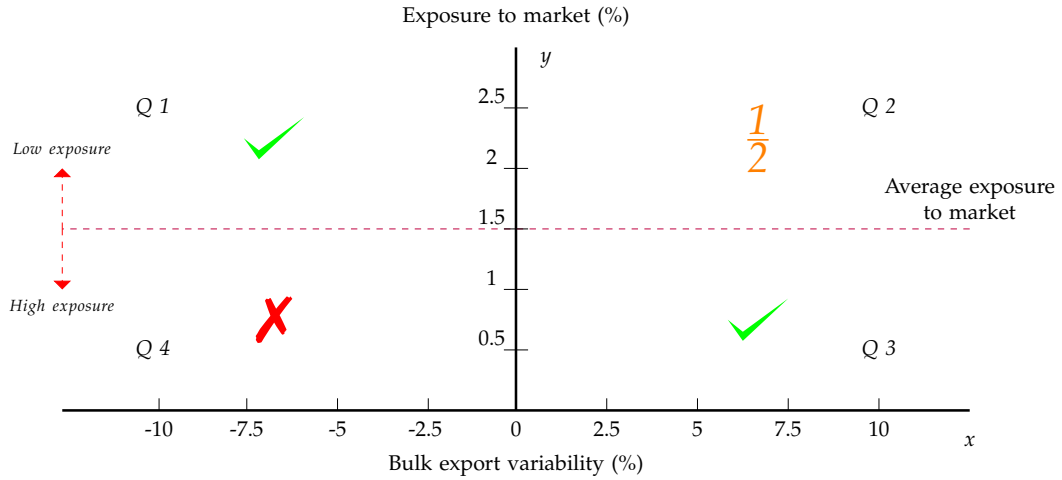

Figure 5.8: Summary of 2 x 2 matrix that illustrate a cellar's exposure to the market

Furthermore, when the facilities are under-utilised the cellar would most likely be positioned in Q1 or Q4, depending on the previous year's sales. Since Q4 is not the ideal position to be in, the cellar should have an exit (or risk management) plan in order to shift to Q1. Specifically, the cellar has to effectively change its exposure to market percentage. In order to achieve this, more wine should be sold, the wine-related income should increase or wine-related expenses should decrease. Increasing sales is in this case, not an option to change, since the objective of the sales team is to sell all the wine. The challenge lies in changing the wine-related income and expenses. Cellars' risk management plans should be able to turn under-utilised facilities into a profit. An example would be to outsource the under-utilized facilities, namely storage, and transport, among many others. If such operations do not exist for outsourcing, it could be an opportunity for cellars to invest in order to be flexible when the wine production or bulk export sales fluctuate.

5.4 Cost

Of all the metrics, identifying cost metrics proved to be the most challenging. Numerous cost metrics were selected to form part of the cost attribute, however, this attribute is not restricted to the identified metrics. These metrics are listed below:

- Transportation cost

- Chemical, cleaning and filtration cost
- Labour (direct and indirect) cost
- Return cost
- Storage cost

Cellars can select other cost metrics that would support a relationship between the cost attribute and other attributes in order to monitor the effect that other attributes have on cost. All attributes should be in balance, otherwise one attribute may advance at the expense of another, which will lead to overspending without realising the effect that attributes have on one another. It is therefore imperative that the cost attribute should be measured, but should only be used as an internal measure.

The first metric to be discussed is transportation cost. In *Stage 1*, transportation cost was measured form the cellars to Cape Town port. In the ideal framework, transportation cost should include the shipping cost as well. The reliability and responsiveness of wine that is exported, is largely affected by the road transport, the flexitank provider, documentation, freight forwarders and shipping lines. As such, measuring all transportation costs up to POD would represent the reliability and responsiveness attributes' effects on cost the best. The transportation cost can be broken down into more detail, providing a cost breakdown for each step of the transportation process. This is the cellar's choice, but for initial implementation purposes, the transportation cost should be seen as one metric without sub-divisions. In the event where this cost increases due to unknown reasons, the metrics can be sub-divided to identify the root cause of the problem. Importantly, this metric should be measured in R/litre to compare it internally.

The next two cost metrics that were identified, are labour and chemical, cleaning and filtration costs. According to a survey conducted by PwC (2014), labour (direct and indirect) is the highest cost, whereas chemical, cleaning and filtration form the second highest cost (See Appendix G). Since these are major expenses for cellars participating in the bulk export segment, it should be monitored and measured in R/litre. This measurement is provided by PwC and can therefore be accessed from them, however, there would be a time delay in retrieving the data, and the data would also not be segmented. PwC conducts an annual survey, which allows cellars to access the information at that time. Therefore, cellars should measure these cost metrics themselves

in order to track any trends that surface during the year, and also to capture the data in a segmented manner.

As already mentioned, it rarely occurs that wine is rejected by the importer after it has been shipped, but there remain such events. In most cases, the wine is rejected before it leaves the port and, therefore, has a large impact on responsiveness and reliability of the cellars (van Wyk, 2015). These events should be recorded and accounted for. Therefore, the return cost was identified to form part of the cost metric. Not only can the effect of the return cost be seen in relation to the other attributes, but also with the monetary value lost due to wine that has been rejected by DAFF or the importer.

The final cost metric identified, is storage cost. Since bulk is stored in tanks, the cost for storing wine will only include direct costs associated with the tanks that are used to store the wine. This includes the cost of leasing, rent, depreciation, acquisition, maintenance labour cost and expenses of internal and/or external maintenance. This metric is considered to be important, since the harvest fluctuates every year and the cellars are in some cases, out of storage space or in other cases, are under-utilising their storage capacity. Similar to the agility metric, decisions are based on the harvest fluctuations, and it is therefore important to know how much money would be lost if the cellars' storage facilities are under-utilised. In addition to the latter, cellars would then be able to scale down and find an optimum utilisation point for their storage equipment. The money that will be saved can be used to outsource storage when needed. Bulk that is exported is stored in tanks and as such, the storage cost is simpler to calculate. This metric would also effectively provide a monetary value that will be saved if IDOS for bulk decreases.

It is important that all cost measurements be measured in R/litre in order to compare these measurements to one another. The logistics of exactly what to include in each metric is subject to interpretation. Seeing that it is an internal benchmark, it is imperative that the metric is measured consistently throughout. This will allow the cellar's financial manager to identify a consistent trend between attributes. For example, the cellar wishes to be more responsive and they intend to outsource their flexitank provider, road transport and other related operations to be a top performer in the industry. This will ultimately have a great impact on cost. Hypothetically, the cellar would then be able to determine that a 5% increase in responsiveness would effectively increase transportation cost with 12%. The cellar can then evaluate whether this is an

option to venture into. Also, trends can be identified over periods of time. Similar to the previous example, if the cellar wishes to improve responsiveness and invest into that area of the company, responsiveness can improve, while showing an increase or decrease in cost. This will support the platform on which decisions are based, ultimately leading to better decision-making in the future.

5.5 Asset Management Efficiency

The metrics selected to form part of the ideal framework for this attribute are IDOS for bulk export and cash-to-cash. These metrics will provide the cellars with internal visibility, on which business decisions can be based. IDOS for bulk export, will now be discussed followed by the cash-to-cash metric for the bulk export segment.

IDOS should be measured in segments, as conducted in *Stage 2*. As previously mentioned, bulk export has two demographics, namely contracted and spot bulk. IDOS should be calculated with Equation 5.3 shown below. Although the results in *Stage 2* for IDOS provided partially accurate data, the cellars had difficulty determining the volume of wine at the end of each month that was assigned to contracted and spot bulk. The cellars do not record the inventory of wine in a segmented manner. Therefore, it was a laborious process to obtain the data. In order to measure this metric effortlessly, cellars should record the inventory and sales of the wine in segments. This is a historical measurement and should be viewed in the way it has been illustrated in Figure 5.9. This figure represents one demographic, namely contracted bulk.

$$\frac{(Average\ of\ inventory\ for\ quarter\ i\ (litres))}{(Inventory\ sold\ for\ quarter\ i\ (litres)) \div 90\ days} \tag{5.3}$$

$$Where$$

$$i \quad = \quad 1,\ 2,\ 3 \text{ or } 4$$

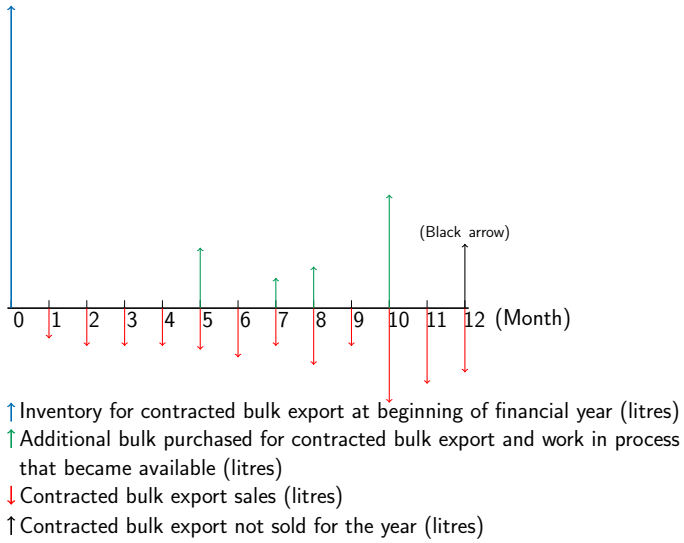

Figure 5.9: Illustration of contracted bulk export volume flows

As mentioned before, cellars do not know in which segment the wine will be sold. Therefore, by analysing the volume flows of wine for each segment at the end of a financial year or every month, the IDOS for each segment can be calculated. The IDOS for a segment can be calculated as illustrated in Figure 5.10.

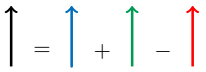

Figure 5.10: Illustration of segment IDOS calculation

The black arrow represents all wine not sold for the year. It is important to note that this only includes wine that was planned to be sold for the year. This excludes WIP, other liquors, grape juice and fortified wine. In *Stage 2*, cellars were asked to estimate a percentage of wine not sold for the year, which only included the wine that was planned to be sold for that year. The sample average of wine not sold for the year 2014, obtained a value of 13.3%. It is still unknown in which segment this wine would have been sold and therefore presents a problem for dividing the wine into segments. As such, an accurate method for dividing the unsold wine is to divide it relative to the year's sales for each segment. For example, a cellar sold 50% of the wine in the bulk export segment and the other half in the packaged export segment. The total volume of unsold wine would be halved and each half would be included in the respective seg-

mented IDOS calculations.

The contracted bulk export sales (red arrow) can be determined by adding all sales during the year, or at the end of a month that pertains to this demographic. An identical calculation should be made for the additional bulk wine purchased or WIP that becomes available (green arrow) during the year or during the month. At the end of the financial year or month, the total sales minus the additional export bulk wine purchased, plus the unsold wine (black arrow), would provide an accurate indication of the bulk export segments inventory (blue arrow) at the beginning of the year or month (see Figure 5.10). In *Stage 2*, the cellars' systems did not capture each order in a segmented manner and would have resulted in a cumbersome manual search procedure to accurately calculate IDOS.

As already mentioned, IDOS should be calculated in a segmented manner and should be further divided into demographics. For the cash-to-cash metric, the bulk export IDOS should be used and not the two demographics. After the IDOS is calculated, there remain two other variables to calculate, namely days sales outstanding (DSO) and days payable outstanding (DPO). The SCOR (Revision 11) framework calculates cash-to-cash as follows:

$$\begin{aligned} \textbf{Cash-to-Cash Cycle Time} &= \textit{Inventory Days of Supply} \\ &+ \textit{Days Sales Outstanding} \\ &- \textit{Days Payable Outstanding} \end{aligned} \tag{5.4}$$

DSO and DPO should be calculated in a similar manner as bulk export IDOS. In other words, both DSO and DPO should be segmented in order use this metric as a benchmark. At the end of the financial year or month, the financial manager should view the payment history of their creditors and debtors in order to calculate both DSO and DPO (see Equation 5.5 and 5.6).

$$\frac{5 \textit{ point annual average of gross accounts receivable}}{(\textit{Total gross annual sales } \div 365 \textit{ days})} \tag{5.5}$$

$$\frac{5 \textit{ point rolling average of gross payable}}{(\textit{Total gross annual material purchased } \div 365 \textit{ days})} \tag{5.6}$$

After all three variables are calculated, the cash-to-cash metric can be calculated in a segmented manner. If cellars computer systems are configured to capture the data in segments, this metric will be effortless to calculate. At present, cellars' systems do not, but are able to, capture the information in a segmented manner. Table 5.5 is a summary displaying the measures for assets management efficiency attribute.

Table 5.5: Summary of assets management efficiency measures

Bulk order	Measurement
Spot bulk	IDOS
Contracted bulk	IDOS
Bulk wine (contracted + spot bulk)	IDOS
Bulk wine	DSO
Bulk wine	DPO
Bulk wine	Cash-to-cash

5.6 Conclusion

In summary, the ideal framework was proposed that consists of five attributes, each of which received metrics that should be measured (See Table 5.6 for summary of idela framework and the primary outcomes of each attribute). Table 5.7 is a summary of all metrics, showing the frequency each metric should be measured and who is responsible to capture the data for that specific metric. In Table 5.8, each metrics definition is provided.

Table 5.6: Ideal framework summary

Attribute	Metrics	Data measures	Primary outcomes of attribute
Reliability	3	11	Satisfying customers experience
Responsiveness	1	8	Create visibility by tracking time occurrences from when an order has been placed
Agility	1	2	Better utilisation of facility and equipment
Cost	5	5	Better decision making (opportunity cost)
Assets	2	6	Improve inventory management
Total	**12**	**32**	

Table 5.7: Proposed data capturing for ideal framework

PHASE 3 (Ideal framework)			
Attribute	**Metric**	**Frequency**	**Responsibility**
Reliability	Date the order was placed.	Per order	Cellar
	Estimated time and date the wine should arrive at the Cape Town port.	Per order	Cellar and FF
	Actual time and date the wine arrived at the Cape Town port.	Per order	Cellar and FF
	Estimated date the wine should be shipped from the Cape Town port.	Per order	Cellar and FF
	Actual time and date the wine was shipped from the Cape Town port.	Per order	Cellar and FF
	Estimated date the wine should arrive at POD.	Per order	FF
	Actual time and date the wine arrived at POD.	Per order	FF
	If late, what was the reason for not being on time.	Per order	Cellar
	If the wine was rejected by the importer or DAFF, what was the reason.	Per order	Cellar
	Pre-check list	Per order	Cellar
	Loading check list	Per order	Cellar
Responsiveness	Time and date the order was placed.	Per order	Cellar
	Time and date samples are send and received.	Per order	Cellar and DAFF
	Time and date the order was ready.	Per order	Cellar
	Time and date the wine was pumped into the flexitank.	Per order	Cellar and FF
	Time and date the wine arrived at the Cape Town port.	Per order	Cellar and FF
	Time and date the wine was shipped from Cape Town port.	Per order	Cellar and FF
	Time and date the wine arrived at POD.	Per order	FF
	Record of any dwell time during any stage.	Per order	Cellar
Agility	Exposure to market	Monthly	Cellar
	Fluctuations in bulk export sales	Monthly	Cellar
Cost	Transportation cost	Monthly	Cellar
	Chemical, cleaning and filtration cost	Monthly	Cellar
	Labour (direct and indirect) cost	Monthly	Cellar
	Return cost	Monthly	Cellar
	Storage cost	Monthly	Cellar
Assets	IDOS	Monthly	Cellar
	Cash-to-cash	Monthly	Cellar

Table 5.8: Summary of definition for each metric

Ideal framework - Bulk export		
Attribute	**Metric**	**Definition**
Reliability	**Delivery performance to customer commit date**	Percentage of orders which all of the items are received by customer on-time.
	Documentation	Percentage of orders which all of the items are received by customer with correct documentation.
	Perfect condition	Percentage of orders delivered in undamaged state that meet specification, have the correct configuration, are faultlessly delivered and accepted by the customer.
Responsiveness	**Order fulfilment cycle time**	The average actual cycle time consistently achieved to fulfill customer orders. For each individual order, this cycle time starts from the order receipt and ends with customer acceptance of the order.
Agility	**Exposure to market (new metric)**	This is calculated with the exposure to market equation. Fluctuations in bulk export sales from year to year.
Cost	**Transportation cost**	The cost associated with the physical transportation of goods between supply chain nodes.
	Purchased material cost	The total cost of chemical, cleaning and filtration cost.
	Production labour cost	The total cost associated with the personnel performing the activities of Make.
	Return cost	The total cost of disposition of materials returned due to planning errors, supplier quality, production, order management, quality rejections and delivery errors.
	Storage cost	The cost associated with tanks designed to support the fulfilment of customer orders.
Asset	**IDOS-bulk export**	The amount of bulk export inventory expressed in days of sales.
	IDOS-contracted bulk	The amount of contracted bulk export inventory expressed in days of sales. (Contracted bulk is wine that is ordered in advanced before the end of harvest for that year)
	IDOS-spot bulk	The amount of spot bulk export inventory expressed in days of sales. (Spot bulk is wine that is ordered during the year, meaning not contracted bulk)
	Days payable outstanding	The length of time from purchasing materials dry goods (bottles, labels, corks, capsules and boxes)until cash payments must be made expressed in days.
	Days sales outstanding	The length of time from when a sale is made until the cash is received from customers. The amount of sales expressed in days.
	Cash-to-cash	The time it takes for an investment made to flow back into a company after it has been spent for raw materials (focusing on bulk export segment).

Chapter 6

Conclusion

Contents

This chapter consists of three sections. Section 6.1 contains a brief summary of each chapter comprising this thesis. Section 6.2 provides the industry with suggestions and recommendations in order to apply or commence with the ideal framework. Lastly, in Section 6.3, suggestions for future work are provided that will further enhance the ideal framework as it stands.

6.1 Thesis summary

The introduction to the thesis, Chapter 1, provided and overview of the history of SA wine industry and followed with an informal discussion on the current status of SA's wine industry. It continued on to discuss the rational of the research, provided a problem statement, scope, as well as objectives of the study.

The aim of Chapter 2 was to present the body of literature that provided the background to this study. The chapter presented the literature with a theoretical focus on supply chain concepts and management methods. The necessary literature on benchmarking was also provided, together with an implementation process. This process was used as a guideline for the development of the ideal framework and proved to be

appropriate for the wine industry. This chapter also contains relevant literature on performance measuring frameworks, and established SCOR to be the suited framework for this thesis.

Chapter 3 presented a comprehensive overview of the methodology that was implemented in the present study, consisting of the background and scope of the study, followed by the thesis methodology. The thesis methodology consisted of three stages, of which the first and the second made alternative use of quantitative and qualitative data collection strategies. The data were collected via final year undergraduate projects, semi-structured and unstructured interviews, surveys and workshops.

The data were analysed and the results were discussed in Chapter 4. Findings showed that the wine industry lacks quantitative data and consequently, the ideal framework was developed using mostly those results obtained from qualitative data. One of the main reason why cellars lacked quantitative data was due to the inadequacy of their systems. Cellars' systems did not capture all the necessary data, but the team nonetheless requested the data in the form of segments. This also revealed that cellars are in some cases unaware of the activities that occur from production further down the supply chain. The ideal framework was not developed based on the availability of quantitative data, but was based on an ideal situation where all data would be available. This framework was further discussed in Chapter 5, including implementation strategies to apply these metrics in a cellar.

6.2 Suggestions and recommendations for the industry

Chapter 5 proposed metrics for each attribute that would differentiate cellars competing in the bulk export segment from one another. The combination of metrics for each attribute represents the ideal framework. This framework is a tool that cellars in the industry should use to measure their own supply chains and to then compare their metrics to those of other cellars in order to identify areas lacking in their performance. This would enable cellars to improve logistical processes where they lack, whilst keeping them aligned with their strategy. This section aims to provide some practical guidelines for implementing the ideal framework.How a cellar should go about the process of starting a journey to measure their supply chain performance is explained next.

The **first** step before measuring a cellars bulk export supply chain is to assign a

strategy to it. This strategy should be aligned with the market in which the cellar is competing. The strategy most cellars selected in the SA wine industry was having a reliable bulk export supply chain. The cellars deemed reliability as the superior performance attribute. Cellars may differ vastly in this, since the strategy mostly depends on the customer.

The **second** step is to measure one performance attribute for initial implementation purposes. The attribute selected first should be aligned with the strategy assigned in the first step. For example, a cellar with a strategic focus to be reliable should first focus on that section of the framework. This enables cellars to improve the performance of the attribute most important to them. Whilst measuring a specific section in the framework, cellars are able to determine if the measurements are meeting their desired targets. If not, the root cause should be identified and dealt with. During the measuring or implementation phase of the framework, cellars can add measurements to the framework to conform to their specific processes in their supply chain.

The **third** step follows after the framework has been implemented. Cellars should continue to measure and perform internal benchmarking, and then start their first improvement cycle, namely plan-do-check-act cycle. This is an iterative process cycle that can help improve the measuring and internal benchmarking results of a cellar. This enables them to track their performance over a period of time and react to that while measuring their progress.

The time it should take to implement the above mentioned process is dependable on two factors. The first would be the number of resources assigned to this process, and secondly the current performance status of the cellars. After a sufficient number of cellars have performed internal benchmarking, cellars can in future perform external benchmarking to track their performance against the industrys performance. This in essence will advance the industry as a whole.

The combination of metrics for each attribute represents the ideal framework. This framework is a tool that cellars in the industry should use to measure their own supply chains and to then benchmark their results to themselves or those of other cellars in order to identify areas lacking in their performance. This would enable cellars to improve logistical processes where they lack, whilst keeping them aligned with their strategy. Areas where cellars may lack are exposed, and corrective action for these

areas will commence. This will ultimately add value to the SA wine industry as a whole, seeing that each cellar corrects their problematic areas. Implementing this framework is seen as an independent effort from cellars to collaboratively improve all cellars supply chain performance, making the SA wine supply a new benchmark for exporting wine in bulk format.

6.3 Future directions

As with most projects, there was insufficient time to cover all aspects of the industry. This section aims to provide suggestions for future work in order to develop an improved ideal framework. There are four main suggestions which should be addressed in future. These are discussed below:

Suggestion 1: *Apply agility metric and improve necessary gaps*

Seeing that the harvest, together with the total bulk exports of SA, fluctuates every year, the cellars have to adapt their facilities in order to adhere to these changes. For this reason, the student believes that the agility metric would be the differentiating factor. An agility metric was proposed in Chapter 5, but was never applied. Therefore, this metric needs further work to improve or refine the metric.

Suggestion 2: *After data has been captured in segments, the ideal framework should be applied*

During *Stages 1* and *2*, it was discovered that the cellars did not provide the necessary quantitative data required for this study. Therefore, the ideal framework was based primarily on qualitative data which was sufficient, seeing that a large portion of the wine and freight forwarder industries were represented in this study. In order to experience the full impact of the ideal framework, it should be applied using quantitative data. Thus, when cellars capture data in segments, the ideal framework can be applied.

Suggestion 3: *Refine cost metric for internal benchmarking and then refine cost metric to be used as an external benchmark*

At present, cost metrics are proposed in the ideal framework, however, it is not compulsory to measure the identified metrics. Financial data are considered to be highly

important and are not easily shared. Therefore, financial data should be measured internally. Many cellars will select the same cost metrics and other different metrics. In order to develop the cost metrics as an external benchmark, cellars should share financial data as well as the metrics they selected to measure. This will provide a selection of metrics to benchmark, of which only the most relevant will be selected for external benchmarking.

Suggestion 4: *The ideal framework should be compared on an international level*

For this thesis, the SA wine supply chain was divided into four supply chains. These supply chains were selected on the basis that they include various operations and information flows regarding all activities required to produce and supply wine. Future investigations should be conducted with the aim of identifying additional supply chains. In addition, each supply chain consisted of five attributes, each of which received demographics. A suggestion would be to identify additional demographics that would distinguish processes from one another and make distinctive processes comparable.

Suggestion 5: *The ideal framework should be compared on an international level*

Not only do SA's cellars compete against one another for market share in the bulk export segment, but SA's wine industry competes against other countries' wine industries for global market share, especially against the southern hemisphere due to the seasonality nature of the agricultural product. SA's wine industry wishes to compare their overall performance against other countries, which will highlight their lack of performance. This could serve as a drive for improvement in order to enhance their processes and in essence, outperform competitors. Thus, the final suggestion is to compare the ideal framework on an international level in order to provide the industry with relevant data on which business decisions should be based.

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Appendix A

Formal institution and organisations in the SA wine industry

(Ponte & Ewert, 2007)

Institution	Acronym	Established	Members	Mission	Functions and positions
Industry Association for Reponsible Alcohol Use	ARA	1981 with a different name	SAB, VinPro, Wine cellars SA, members of SALBA, and 50 associate members	promotion of respnsible use of beverage alcohol	representative authority and policy-making body on the social ascpects of alcohol consumption; supports stringent age limits on consumption (age 18), moderation in consumption as a quality of life factor, medical advise on consumption during pregnancy
Black Association of the Wine and Spirits Industry	BAWSI	1998	100 black-owned businesses, 48 NGOs under RUDNET (Rural Development Network), 16 labour unions, farmworker co-ordinating council, other organizations and 'emerging farmers and taverners'	transforming the wine industry to make it representative of South African society	mobilise individuals and interested parties from historically-disadvanteged backgrounds for social upliftment of people on farms, implement fair labour practices, and empowerment of members
Biodiversity & Wine Initiative	BWI	2004	4 champions, 4 coops, 70 private wineries and conservation partners	conserving the biodiversity of the Cape Floral Kingdom	prevent further loss of biodiversity in threatened habitat in crtitical sites in wine areas ; set aside areas as natural habitat; promote changes in farming practices that enhance the suitability of vineyards as habitats for biodiversity;
Cape Estate Wine Producers Association	CEWPA	1968	111 units that are registered for the production of estate wine	to maintain and promote the unique postion of the estate as the pinnacle of the Wine of Origin system, and to represent the interests of its members in industry forums	Management committee with 11 elected and 2 co-opted members; 4 committee meetings a year and two general meetings. Lobbied for the establishment of estate demarcations in the 1973 SA Wine of Origin system.
Cape Winemakers Guild	CWG	Started by eight founding members in 1982	approximately 40 members, by invitation only	to nurture and develop members' winemaking expertise; to serve as benchmark of South African winemaking through the showcasing of members' wines	For nomination, a winemaker must have been responsible for producing outstanding wines for five years minimum and continue doign so; only those nominated that are voted positively by 2/3 by the AGM can enter; the CWG Auction is its annual showcase
South African Black Vintners Alliance	SABVA	2005	12 black-owned wine companies	creating an enabling environment for emerging black-owned wine companies	linking wine enterprises to business resources; develop a business model to ease entry into the wine industry for prospective enterpreneurs
South African Society for Enology and Viticulture	SASEV	1979	1100 members	to optimise the quality of SA grapes, wines and related products by distributing scientific knowledge	includes viticulturists, enologists, laboratories, scientists; publishes a scientific journal, organises meetings and disseminates information
South African Wine and Brandy Company	SAWB	2002-2006	organizations representing wine industry constituencies	enchance the strategic enviroment for the benefit of the industry:	representative body of the wine industry; drew up the Wine Industry Strategy PLan (WIP); seeks to increase global competitiveness and profitability; generate quitable access and participation in the wine value chain; enable environmentally sustainable producction of wine
South Africa Wine Industry Council	SAWIC	2006	board of directors has members from: VinPro, WCSA, Salba, labour, civil society, and emerging farmers	not available	emerged from the restructuring of SAWB; includes four business units: Winetech, SAWIS, WOSA and DTU (the Development and Transformation Unit), focusing the development of a Wine-BEE Charter
South African Wine Industry Information and Systems	SAWIS	1999	part of SAWB/SAWIC	provides data and information to wine industry players and applies the wine of origin system	one of the business unit of SAWB (now SAWIC)
South African Wine Industry Trust	SAWIT	1999	trusteees appointed by the Minister of Agriculture	transformation of the SA wine industry for the benefit of the historically disdvantaged	created through agreement between KWV and the government to focus on the transformation of the wine industry in SA; includes 3 non-profit companies: BUSCO (Business Support Company); DEVCO (Development Support Company); and WIECO (Wine Industry Empowerment Company)
VinPro	VinPro	2003	5000 bona fide wine producers	wine farmers' service organization providing services and representation in wine industy bodies	formerly part of the service branch of KWV; provides services in viticulture, oenology, soil science, agro-economics and management
Vine Improvement Organisation	VIO	1986	KWV, Distell, TechnoGrow, VinPro, Nurserymen Association	plant improvement and certification	executing the Plant Improvement Scheme for wine grapes; official body concerning vine propagation material
Wine Cellars of South Africa	WCSA	2002	56 cellars and wine marketers	to establish an environment within which its members can optimally produce and market wine with consideration for other sectors of the industry	Members represent about 75% of all wine sold in South Africa -- mostly cooperatives or former cooperatives; majority of these used to be part of KWK (Co-operative Wine Cellars Committee) and WBA (Wine Marketing Association)
Wine and Agricultural Ethical Trade Association	WIETA	2002	128 grower and producer sites; 94 in wine industry (25 fully accredited)	improve the working conditions of employees in agriculture by promoting the adoption of and adherence to a code of good practice	measures how agricultural producers are responding to the rights and obligations established in the labour legislation introduced after 1994 and assists them in ensuring compliance
Wine Industry Network for Expertise and Technology	Winetech	1996, operational from 1999	part of SAWB/SAWIC	provide the industry with forefront technology and human resources to strenghten competitiveness and profitability	support the industry through expertise, training, education, technological innovation, scientific network
Wines of South Africa	WOSA	1999	350 SA wine exporters	generic marketing of South African wine abroad (from 2006, also promotion of wine domestically, and promotion of wine tourism)	generic marketing body falling under SAWB (now SAWIC); aims at building 'Brand South Africa' for wines; runs wine shows, keeps media informed, brings wine and lifestyle writers to the Cape
Wine and Spirit Board	WSB	1973	participants to the wine of origin and IPW schemes, Department of Agriculture, and Agricultural Research Council	administers the wine of origin system	runs tasting committees, administers the Integrated Production of Wine scheme, certfies wines and issues seals of certification; advises the Department of Agriculture on technical issues regarding wine and liquors
Independent vignerons		1974	45 independent grape growers	comminucate the interests of independent grape growers and represent them in industry bodies	initially, active in obtaining the right to sell grapes directly to wholesalers (before liberalisation); currently, mainly communicating with wholesalers on grape prices, contracts, strategies; provide market information to members;

Source: *Wineland* , various issues, and fieldwork interviews

Appendix B

Average prices of wine sold in bulk

(Bezuidenhout, 2014)

TYPE	CENT PER LITRE							
	2005	2006	2007	2008	2009	2010	2011	2012
Cabernet Sauvignon	596.76	495.27	430.49	451.74	539.66	583.72	618.50	636.47
Cabernet Franc	384.92	408.12	436.73	396.56	448.48	524.20	541.91	617.37
Merlot	471.33	426.29	396.68	417.67	495.26	556.81	584.34	612.21
Pinotage	443.73	392.88	396.68	410.15	472.69	535.38	584.01	607.15
Ruby Cabernet	411.45	393.36	302.83	352.68	418.68	464.00	508.14	525.46
Shiraz	548.21	514.37	458.12	471.89	560.82	601.86	621.41	647.82
Cinsaut	396.57	349.50	317.42	328.71	377.52	442.36	482.62	487.79
Pinot Noir	652.16	420.45	673.14	523.10	779.54	712.47	774.48	762.61
Rosé & Blanc de Noir	305.31	304.68	297.13	312.58	346.20	382.08	405.46	411.97
Other red & blends	384.24	366.77	336.41	346.98	431.30	488.21	508.16	531.20
Chardonnay	494.22	495.11	474.14	481.54	523.90	530.75	532.66	511.98
Sauvignon blanc	522.11	547.53	517.21	519.00	546.06	538.00	540.69	532.08
Colombard	277.70	293.68	297.46	297.23	314.72	328.17	346.81	350.15
Crouchen Blanc (Cape Riesling)	313.12	323.79	317.82	326.05	357.14	360.79	384.29	395.96
Sémillon	332.64	339.03	352.93	365.78	406.10	408.47	409.10	427.16
Chenin Blanc	304.43	317.27	323.17	321.45	350.23	367.89	380.72	379.28
Other white & blends	254.85	274.39	275.02	270.91	296.57	320.46	334.69	348.52
Fortified wine *	346.88	354.58	371.37	385.37	410.41	441.74	468.57	486.38
All varieties	338.35	338.42	334.87	340.67	384.21	413.48	424.90	437.75
All red varieties	440.48	406.03	374.34	386.75	459.00	502.97	533.59	558.48
All white varieties	297.56	310.51	314.40	314.71	345.44	364.98	372.41	382.80
Concentrate / Sweet must for sweetening	240.21	236.43	262.13	293.28	362.17	365.57	366.56	424.27
Wine for brandy **	207.30	210.59	222.43	225.45	236.33	247.60	249.71	289.58
Distilling wine	97.43	94.10	93.36	95.50	97.84	109.66	111.42	124.01

* Price excludes added wine spirit.

Including juice

Price to the point of delivery at the buyers premises
Prices are ex-cellar price, filtered, but excluding VAT, wine industry levies, excise duty, cold and protein stabilisation, transport, storing costs, commission and agent fees.

** Rebate sediment (lease) included in price

Prices excluded rebate brandy

Appendix C

The Gartner Supply Chain Top 25 for 2015

(Rivera, 2015)

Rank	Company	Peer Opinion	Gartner Opinion	Three-Year Weighted ROA	Inventory Turns	Three-Year Weighted Revenue Growth	Composite Score
		(200 voters) (-25%)	(35 voters)	(-25%)	(-15%)	(-10%)	
1	**Amazon**	3,394	468	0.0%	8.7	21.7%	**5.32**
2	**McDonald's**	1,626	283	14.6%	157.3	-0.2%	**5.23**
3	**Unilever**	1,996	619	11.3%	6.7	-0.2%	**5.15**
4	**Intel**	1,064	481	12.1%	5	2.4%	**4.09**
5	**Inditex**	1,003	297	17.0%	3.8	8.8%	**4.04**
6	**Cisco Systems**	1,147	500	8.4%	12.6	1.5%	**4.01**
7	**H&M**	809	89	26.6%	3.7	12.8%	**4.01**
8	**Samsung Electronics**	1,568	330	10.5%	17.7	0.5%	**3.91**
9	**Colgate-Palmolive**	1,034	318	17.8%	5	0.6%	**3.91**
10	**Nike**	1,369	214	14.5%	4.1	10.7%	**3.78**
11	**Coca-Cola**	1,938	287	8.9%	5.4	-1.0%	**3.49**
12	**Starbucks**	1,215	174	13.0%	6.8	11.6%	**3.48**
13	**Walmart**	1,794	259	8.4%	7.8	2.5%	**3.39**
14	**3M**	1,161	150	14.9%	4.2	2.7%	**3.09**
15	**PepsiCo**	890	330	8.9%	8.3	0.3%	**3.04**
16	**Seagate Technology**	176	114	19.9%	10.8	3.9%	**2.99**
17	**Nestlé**	1,123	244	9.9%	5.1	2.0%	**2.93**
18	**Lenovo Group**	771	218	3.9%	12.8	18.9%	**2.89**
19	**Qualcomm**	218	50	15.5%	8.8	17.8%	**2.85**
20	**Kimberly-Clark**	819	243	10.5%	5.9	0.8%	**2.76**
21	**Johnson & Johnson**	1,192	139	11.1%	2.8	4.6%	**2.73**
22	**L'Oréal**	749	118	12.5%	2.9	2.9%	**2.41**
23	**Cummins**	148	149	11.5%	5.2	4.7%	**2.16**
24	**Toyota Motor**	1,322	23	3.6%	10.6	13.4%	**2.16**
25	**Home Depot**	268	44	14.1%	4.6	5.6%	**2.11**

Appendix D

Agenda for semi-structured interview

D.1 Description

This Appendix displays the agenda of the first semi-structure interview in *Stage 1*. The majority of the cellars managers are Afrikaans speaking, therefore it is presented in Afrikaans.

Geagte Kelderbestuurder

Die volgende inligting ter voorbereiding vir die beplande werkswinkel.

Die agenda vir die werkswinkel is:

a. Kennis maak met mekaar
b. Bekendstelling van die metodologie wat ons gaan volg
c. Supply Chain Prioritisering (sien matriks hieronder)
d. Identifiseer die fokus segment en omvang van die studie
e. Hoëvlak identifisering van bekende probleme en geleenthede tot verbetering

Inligting wat ons nodig het:

Ek sal dit waardeer as julle die volgende kan doen ter voorbereiding. Ons het nie die fisiese waardes nodig nie, net die volgorde van belangrikheid van elkeen vir julle spesifieke besigheid.

Plaas asb. vir elke kriteria (Omset, ens.) die vier segmente (*Bulk Local*, ens.) in die korrekte volgorde (waar 4 die meeste, 1 die minste is) soos vir julle kelder se unieke situasie.
(Vir alle inligting fokus asb op die 2013 kalender jaar.)

SC Segment \ Kriteria	Omset	Bruto Wins %	Kompleksiteit* (/ # Voorraad eenhede)	Eenheidsvolume
Bulk Local				
Bulk Export				
Packaged Local				
Packaged Export				

***Nota:** Kompleksiteit is 'n funksie van die aantal kliënte, bestellings per maand, voorraadhoudingseenhede, stoorplekke, verskepings per jaar, en die aantal verskaffers vir daardie segment. Hoe meer kompleksiteit, hoe belangrik om dit beter te bestuur, en hoe groter die impak wat jy kan maak met verbeterings.

Dink ook en maak solank notas oor:

- Probleme wat julle huidiglik ondervind wat 'n impak het op afleweringstyd, -koste, of produk kwaliteit
- Probleme kan deel wees van enige fase van die proses vanaf verskaffers tot by die aflewering van produkte
- Die probleme kan deur derde partye veroorsaak word
- Die probleme kan binne of buite julle beheer wees.
- Uitdagings wat bestaande sleutel kliënte/verskaffers aan julle maatskappy stel wat moeilik is om aan te voldoen met betrekking tot reaksietyd, kapasiteit, kontantvloei, ens.

Kontak my gerus indien daar enige vrae is. Gesels dan verder by die Werkswinkel.

Groete
Joubert van Eeden / Prof Johan Louw (en die Wine Supply Chain Projekspan)
Sel: 082 578 3862 / 082 097 2970

Appendix E

Designed measurements in Excel for *Stage 1*

Perfect Order Fulfilment		Measure the % of orders that meet the delivery performance			
		Bulk Local	**Bulk Export**	**Packaged Local**	**Packaged Export**
	Details	Apr, May, Jun 2014	Apr, May, Jun 2014	Apr, May, Jun 2014	Apr, May, Jun 2014
No. of Orders Delivered Complete	A complete order is seen as an order where the correct quantity and product was deliver and the order was on-time.				
Total Number of Orders					
Perfect Order Performance					
Imperfect orders (Reason Analysis)	**Measure used**				
If this information is known it can be entered.					
Product type	Where an order was incomplete, it may have missed only one criteria (either late or incorrect product quantities). If an order was both late and incomplete, it can count under more than one category.				
Customer					
Quantity					
Condition					
Date & Time window					
Supporting Documentation					

Order Fulfilment Cycle Time

	In order to compare order cycle times, it is important to include and exclude the same activities and processes.
Total Cycle Time	The purpose of measuring the total time for an order is to determine the time it took the cellar to respond to an order and complete it. Delays due to inefficiencies or stock outs should be included, but dwell time can be excluded. Dwell time refers to the time that passes once an order has been received but deliberately not responded to immediately. This may happen when an order is received early and delivery is only required or expected at a later stage.
	The total cycle time is split into two components (preparation and delivery times) for local products, but not for export products.
Cycle time for Preparing the product and the order	This is the time it takes to complete all the activities that takes place once the order is received until the order/shipment is ready for transportation. It does not include the wine making process (processing of grapes and aging processes).
Deliver cycle time	Only transportation time. Please state up to where information is available. In most exporting scenarios the time up to where the product is loaded (FOB) is measured. With local distribution it may be possible to measure either up to a distributor or a retailer.
	These times will differ depending on whether finished products are stocked and whether the wine is sold as bulk or packaged wine.
	Please include all orders for the second quarter of 2014 (Apr, May, June 2014)

Order Fulfilment Cycle Time

Please include all orders for the second quarter of 2014 (Apr, May, June 2014)

	Cycle Time	Description	Total	Order #1	Order #2	Order #3	ect
Bulk Export	**Total Time for order**	Start measure when order is received until the order was delivered to FOB. Measure in days					
	Average Total cycle time						

Upside Supply Chain Flexibility	The number of days required to achieve an unplanned sustainable 20% increase in quantities delivered.

Description
Upside supply chain flexibility is the ability to upscale your production activities with 20% over the long term. It is measured in days and will give an indication how long the cellar will take to upscale the supply chain with 20%. To achieve a 20% upscale, the cellar should be able to produce the 20% increase and remain consistent with that production volume in the long term.

Instructions
Please estimate the number of days the upscale will take and provide a breakdown of the answer in days. If possible, please also explain the implications that such an upscale will have. Depending on the amount of spare capacity and lead times, the increase will cause delays in either sourcing, production or delivery activities. The explanation will allow us to better understand why the estimated time is required.

		Explanation
Number of days required to scale up scourcing by 20%:		
Number of days required to scale up production by 20%:		
Number of days required to scale up delivery by 20%:		
Total days		

Cost

Please include all costs for the second quarter of 2014 (Apr, May, June 2014)

	Description	Different stages for packaged products	Bulk Local	Bulk Export	Packaged Local	Packaged Export
Storage cost	Storage cost for finished goods stock. For bulk use cost per litre and for packaged use cost per bottle	**Bulk**				
		Packaged				
Transportation cost	This cost may be outsourced. If it is not outsourced, it should include both the cost of driving and the equipment ownership cost. The different segments have comments on where the cost calculation should end. All calculations start where the goods leave the facility where it is stored after production.	**Bulk**				
		Packaged				

Inventory days of supply

The amount of inventory (stock) expressed in days of sales

	2014			
	Bulk Local	**Bulk Export**	**Packaged Local**	**Packaged Export**
Time Period	**Quarter 2 of 2014 (Apr, May, June)**			
Days in quarter	*91*	*91*	*91*	*91*
Average value of inventory at standard cost (R)				
Cost of goods sold (COGS)				
Equiv. COGS of one day	*0.0*	*0.0*	*0.0*	*0.0*
Inventory Days of Supply				

Appendix F

Survey developed for *Stage 2*

Wine Supply Chain Survey

10. Bulk Export (1 out of 2)

Please complete the questions on this page for all BULK EXPORT wines.

Note:
Bulk wine which is sold in advance before the end of harvest for that year is known as contracted bulk wine. In other words, all bulk wine which is sold in terms of a contracted agreement before the end of harvest.

***30. What percentage of your bulk wine was contracted before the end of 2014 harvest?**

○ Non contracted ○ 10% ○ 20% ○ 30% ○ 40% ○ 50% ○ 60% ○ 70% ○ 80% ○ 90%

***31. Also, provide the volume of bulk wine which was contracted before the 2014 harvest? (Litres)**

Volume (Litres)

***32. What percentage of your bulk wine was contracted before the end of 2015 harvest?**

○ Non contracted ○ 10% ○ 20% ○ 30% ○ 40% ○ 50% ○ 60% ○ 70% ○ 80% ○ 90%

***33. Also, provide the volume of bulk wine which was contracted before the 2015 harvest? (Litres)**

Volume (Litres)

34. Please specify the volume of additional bulk wine purchased during each month? (Litres)

Jan 2014
Feb 2014
Mar 2014
Apr 2014
May 2014
Jun 2014
Jul 2014
Aug 2014
Sept 2014
Oct 2014
Nov 2014
Dec 2014

Wine Supply Chain Survey

35. This is related to the previous question...

What percentage of the additional purchased bulk wine was used for contracted bulk?

	% of additional purchased bulk wine used for contracted bulk
Jan 2014	
Feb 2014	
Mar 2014	
Apr 2014	
May 2014	
Jun 2014	
Jul 2014	
Aug 2014	
Sept 2014	
Oct 2014	
Nov 2014	
Dec 2014	

Wine Supply Chain Survey

11. Bulk Export (2 out of 2)

Please complete the questions on this page for all BULK EXPORT wines.

36. If applicable, which companies do you use as freight forwarders for Bulk Export wines?

- [ ] JF Hillebrand
- [ ] Intersped
- [ ] Outsource Logistics
- [ ] Megafreight
- [ ] Kuehne & Nagel
- [ ] Hellmann
- [ ] Giorgio Gori
- [ ] N/A

Other (please specify)

Note:
Bulk wine which is sold in advance before the end of harvest for that year is known as contracted bulk wine. In other words, all bulk wine which is sold in terms of a contracted agreement before the end of harvest.

***37. How much wine did you have, in the form of bulk which was exported, in stock at the end of each month? (Litres)**

January 2014	
February 2014	
March 2014	
April 2014	
May 2014	
June 2014	
July 2014	
August 2014	
September 2014	
October 2014	
November 2014	
December 2014	

Wine Supply Chain Survey

***38. How much wine did you export, in the form of bulk, during these periods? (Litres)**

Begin January 2014 to end March 2014	
Begin April 2014 to end June 2014	
Begin July 2014 to end September 2014	
Begin October 2014 to end December 2014	

***39. Please specify the volume of contracted bulk wine that was exported during each month? (Litres)**

Jan 2014	
Feb 2014	
Mar 2014	
Apr 2014	
May 2014	
Jun 2014	
Jul 2014	
Aug 2014	
Sept 2014	
Oct 2014	
Nov 2014	
Dec 2014	

Appendix G

The South African wine industry insight survey 2014

(PwC, 2014)

Analysis of expenses attributable to bulk and packaged wine										
Expense	2013		2012		2011		2010		2009	
	Bulk wine	Packaged	Bulk wine	Packaged	Bulk wine	Packaged	Bulk wine	Packaged	Bulk wine	Packaged
	R/ton	R/L	R/ton	R/L	R/ton	R/L	R/ton	R/L	R/ton	R/L
Labour										
Permanent	204.03	1.04	190.77	1.05	202.41	0.79	196.89	0.57	160.42	0.70
Temporary	26.95	0.02	25.86	0.02	22.83	0.02	24.97	0.14	17.79	0.15
Insurance	16.66	0.05	15.69	0.04	16.82	0.04	16.79	0.03	13.08	0.03
Marketing and sales expenses	47.05	2.64	36.71	3.05	27.56	1.90	34.14	1.15	27.49	1.48
Bottling and packaging	2.45	7.40	16.63	7.39	-	5.26	-	5.03	4.99	4.26
Chemicals, cleaning and filtration materials	202.23	0.10	199.21	0.09	176.50	0.16	164.12	0.14	154.35	0.16
Distribution	77.78	0.78	42.22	0.82	33.60	0.66	30.32	0.34	18.38	0.37
Sundry administrative expenses	82.26	0.79	71.30	0.89	69.90	0.54	84.38	0.71	64.89	0.63
Sundry cellar expenses	46.73	0.38	84.51	0.55	34.94	0.36	43.70	0.32	38.20	0.28
Electricity and water	72.99	0.06	71.90	0.07	63.33	0.08	54.25	0.07	36.48	0.08
Finance charges	76.42	0.11	88.58	0.21	96.62	0.25	107.22	0.20	101.53	0.22
Rent paid	17.59	0.05	14.29	0.05	6.38	0.04	6.37	0.03	9.11	0.03
Repairs, maintenance and cellar consumables	91.42	0.14	80.47	0.14	78.59	0.15	87.68	0.15	76.51	0.21
Telephone and postage	3.65	0.03	3.99	0.04	4.81	0.03	4.77	0.02	4.54	0.03
Depreciation	107.64	0.15	116.07	0.16	123.87	0.16	115.09	0.15	84.07	0.22