



**Amsterdam University
of Applied Sciences**

*Optimizing Supply Chain Through the
Implementation of BI: The case of Agna
Group*

Gjovan Shpati

Student Number: 500789226

Supervisor: Einholz, D. (Duco)

Assessor: Janssen, R.J.W. (Ronald)

2019/2020

Optimizing Supply Chain Through the Implementation of BI: The case of Agna Group

A thesis written by Gjovan Shpati

500789226

Amsterdam University of Applied Sciences

International Business Management and Studies (Fast Track)

Supervisor: Einholz, D. (Duco)

Assessor: Janssen, R.J.W. (Ronald)

2019/2020



Executive Summary

The thesis has been written for the bachelor studies of International Business at the Amsterdam University of Applied science. The research has been conducted for Agna s.a, an Albanian based company that functions over several countries and specialize in bottling and distrinuting Pepsico products in its region. It focuses on the inventory waste that proved to be an issue for Agna, and how to solve it through the correct implementation of BI. In order to achieve the research, it was important to decide whether Agna should follow a cost strategy or a flexible strategy concerning its supply chain. Hence, the main research question of this thesis is:

How can Agna s.a optimize its supply chain operations by implementing BI to limit its inventory waste by 30%?

To answer the question, three sub questions were put in place based on the three theoretical frameworks, including Supply chain risk management, Analytical hierarchy process, and Multi-layer framework business intelligence, primary qualitative research have been conducted and has led to the following outcomes.

Agna has various flaws in its supply chain that need to be addressed, mainly inventory waste, but also, in organizational communication, bureaucratic production process, malforecasting of sales, and unnecessary staff and departments.

Second, Agna needs to have its own ERP system within the company to organize its purchasing and production orders, allow direct communication, limit inventory waste, and end the periodical material purchasing. Such software can be SAP or Oracle ERP

lasty, Agna is better following a flexible strategy rather than a cost strategy as the cost strategy is not reliable on the long term and does not fix the obvious issues but rather patching them. Therefore, through implementing a flexible strategy, Agna can cut off its dependence on 3rd party companies in its warehouses and have all of the bottling and stocking and main distribution point happening from its bottling facilities which already have their own warehouses.

Contents

Executive Summary	2
1. Introduction	5
1.1. Background of research	5
1.2. Company background	5
1.3. Opportunity analysis:.....	8
1.4. Main research question (MRQ)	9
1.5. Organization of the report	10
2. Theoretical Framework.....	11
2.1. Introduction:.....	11
2.2. Applicable theories:	12
2.1.1. Supply chain risk management - SCRM.....	12
2.1.2. Multi-layer framework for business intelligence.....	14
2.1.3. Analytic hierarchy process (AHP)	16
2.2. Selection and Justification of the Theory to be applied:	18
2.3. Sub-Questions:	18
3. Methodology	19
3.1. Introduction.....	19
3.2. Supply chain risk management – SCRM	19
3.3. Multi-layer framework for business intelligence	20
3.4. Analytic hierarchy process (AHP).....	21
4. Supply Chain Risk Management (SCRM).....	22
4.1. Introduction.....	22
4.2. Data presentation	23
4.2.1. Material planning:.....	24
4.2.2. Warehouse and fulfilment	24
4.2.3. Bottling & Distribution	25
4.3. Data analysis:.....	26
4.4. Conclusion	27
5. Multi-layer framework for business intelligence	27
5.1. Introduction.....	27
5.2. The Data Layer	28
5.3. The Logic Layer	29
5.4. The Access Layer	30
5.5. Conclusion	30
6. Analytic hierarchy process (AHP)	30
6.1. Possible scenarios:	31
6.2. Conclusion	34
7. Conclusions	34

8. Recommendations.....	37
8.1. Introduction.....	37
8.2. Implementation plan	37
Step 1: Purchase a software	37
Step 2: Organizational change	37
Step 3: changing the supply chain	38
8.3. Cost-benefit analysis.....	38
8.4. Limitations of the research:	42
8.4.1. Improvements for current research	42
8.4.2. Additional future research.....	43
References:.....	43
Appendix:.....	48

1. Introduction

1.1. Background of research

This capstone research project is written for the Amsterdam University of Applied Sciences by Gjoan Shpati. The research objective of this thesis is to deconstruct the concepts of Business Intelligence (BI) and Data Analytics (DA) and understand them in the framework of international businesses by using Agna Group, an Albanian based company as a case study. Therefore, the purpose of the thesis will be to understand the process of prioritization in applying business intelligence and data analytics in an international environment. To do that the concepts of BI and DA will be explored, the role they play in developing a business, their importance in today's local, national, and international business environments. This research will examine Agna s.a's supply chain and its potential bottlenecks. In this sense, it will trace the path that into data takes to turn into intelligence. Furthermore, by exploring the relationship between strategy and technology this research will argue for the necessity for businesses to formulate an educated model for strategic decision making based on identifying a clear problem that needs to be solved and using analytic modeling to achieve that. This paper also explores some of the ethical implications that come up from applying business intelligence and data analytics in everyday business decision making.

1.2. Company background

The focus of this research will be the Agna group, an Albanian/Greek company that functions in the Balkans. Agna group specializes in beverage production, import, and export of food products and marketing. The company was founded in Albania in 1992 as Alfa S.A, and was the official distributor of Amstel and Pepsi Co. Alfa built its first modern factory in an Albanian village of Gline and started producing its beverages, it later became the official bottler and distributor for Pepsi on the territory of Albania. It later entered the advertising sector in 2001 by purchasing Albartex LLC, owning 65% of the market share, and later established On Time Concept, a marketing company specialized in events, market studies, and media relations, mainly used to self-operated in Albania without the need for 3rd parties. They later entered the real estate market, and merged its sub-company, Agna Investor, with

Anonime Kakavi S.A. They used this merger to further penetrate the international market, by consolidating the economic profile of Albania, easing foreign investments into the country. The company does not include BI or DA in its daily operations as they heavily depend on the classic methods of processing data information, (e.i. Excel sheets, manual input, data operators), and it employs more than 2500 people. Being one of the first companies established in Albania after the fall of the communist dictatorship. Since then, the company has managed to grow to a multi-million dollars organization and was able to win various international awards, such as the “22nd European award for Quality” awarded by the Editorial Office and the Trade Leaders Club in Spain, and was able to implement its quality standards in business development in more than 122 countries worldwide. (Superbrands)

Agna Group operates in multiple markets in the Balkans region, including Albania, Kosovo, Serbia, Montenegro, and Greece. The large scale of its operations, and the fact that the region is currently just developing its data structures, create an especially delicate situation for Agna in implementing these systems. Nonetheless, their implementation would provide tremendous benefits to Agna’s management dynamic. Furthermore, in 2019 Agna Group made revenues of 0.93% of the total Albanian gross domestic product and was ranked number 14 on the list of the top 200 largest businesses in Albania. (Agna Group - States where we operate).

Agna Group operates in what is considered a conservative method of management where most power is held by the cofounders. They are the main decision-makers for all the sub-companies, while each smaller department in each company has its head of department. Figure 1.1 explains that further.

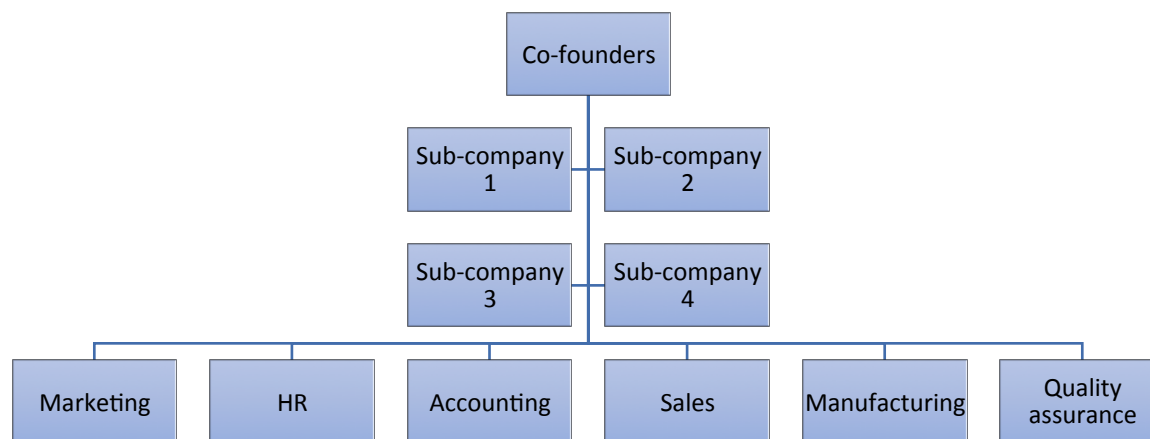
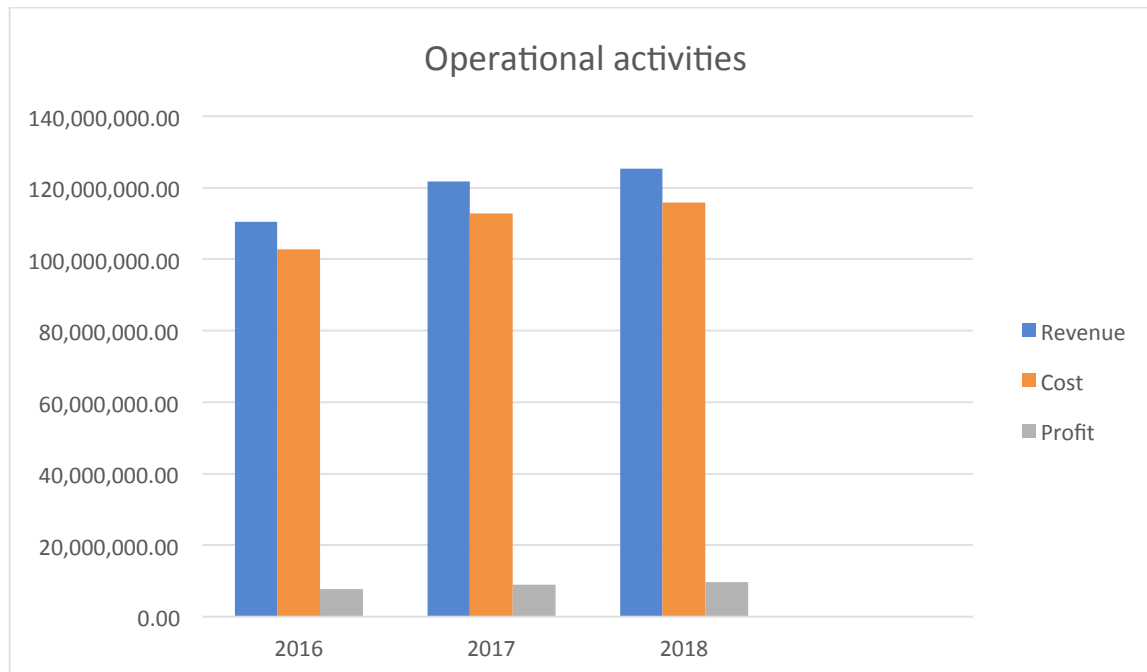


Figure 1.1

Furthermore, the implementation of DA & BI systems in a company's ecosystem is an internationally relevant topic that requires the tight cooperation of local entities, the providers of the systems, and the data centers, all operations being conducted in a free and cross-border fashion. The research will pull data from all the operation regions of Agna, compare where the implementation of BI systems was smoother, and then analyse both quantitative information and the qualitative data to provide a layout of a successful pipeline of BI implementation. Thus, this thesis will draw parallels between the organizational culture differences between these countries within the same Organization, and the speed and efficiency of implementing technological systems.

Furthermore, graph 1.2 provides the company's income from operating activities. It shows that in 2016, the Agna group total revenue from operating activities was 110,501,494.1 USD, operational expenses of 102,747,325.21 American Dollars, a total profit of 7,754,169 American Dollars. In 2017, Agna Group's total revenue from operating activities was 121,751,896.58 USD, operational expenses 112,792,223.21 American Dollars, a total profit of 8,959,673. American Dollars. Lastly, in 2018, Agna Group declared a total revenue from operating activities of 125,354,448.57 American Dollars operational expenses 112,792,223.21 American Dollars, a total 9,589,015 American Dollars. (Audit report of Agna S.A, 2019).



graph 1.2

However, there has been one obstacle in the way of the profit increase, as an increase in inventory waste rises in faster percentages than the expenses. For the years 2016, 2017, and 2018, there has been a waste of 310,571 USD, 420,736 USD, 525,311 USD accordingly, an increase of 35% from 2016 to 2017, and 25% from 2017 to 2018. Furthermore, looking deeper into these numbers and comparing them to the operating profit, in 2016, the company's inventory waste was equal to 2.9% of the profit, jumping to 4.7% in 2017, and 5.5% in 2018. This shows that there is an issue with the inventory waste that accompanied the company's big jump in profit between 2016 and 2017, and is still growing in 2017-2018, noting that 2018 is the latest audit report given by the company.

1.3. Opportunity analysis:

As the world advances, technology takes a bigger role in our life, we have seen a big jump in the use of technology in the business world, especially on the international level. Furthermore, big data started playing a bigger role in how businesses function, for this data to be understood and turned into results, the data needs to be collected, analysed, studied, and acted upon. Moreover, if such data is used correctly, enterprises will be able to have a very big competitive advantage over its market, develop at a

fast pace, and leave less space for human errors. According to a survey done by Bloomberg Businessweek, around 97% of companies with revenues that exceed one hundred million American Dollars were using some form of business analytics (Cahill, 2019).

In this sense, it is important to set a clear definition of the concept of Business Intelligence. This research will define BI as a compassed umbrella for all concepts of collection, analysis, and sharing of external and internal business information (Pirttimäki, 2007). Both internal and external factors will be considered, taking further results of trials of BI.

Agna s.a being the biggest Agna group contributor will be the focus of our study. Agna s.a is the sub-company for the beverages and Pepsi products. Currently, Agna s.a depends on people to conduct most of supply chain operations, leaving many bottlenecks unsolved. Bottlenecks in the supply chain can include various factors, this research tries to focus on Agna s.a's wasted inventory due to overproduction, delays, and lack of proper forecasting and how can we resolve them through data analytics and business intelligence.

1.4. Main research question (MRQ)

Nowadays, the most valued managerial skill seems to be the conscious manipulation of information, turning knowledge, apart from financial capital and physical resources, into a commodity (Pirttimäki, 2007). This is what makes or breaks businesses such as the Agna group. Companies use knowledge in the form of data and analytics and implement it into mechanisms for evaluating performance, understanding customer behaviour and forecasting market trends (Hedgebeth 2007), all to facilitate transaction costs, which are the glue that holds value chains together. The buzzword of the 21st century, which embodies the current understanding of knowledge, is data. Enough data, interpreted and manipulated correctly is what separates an unsuccessful business from an intelligent one (Davenport, 2006) which is capable of adequately adapting and tailoring its business strategy to the characteristics and demands of its customer base.

What this does is allow organizational functions to be improved by using sophisticated quantitative techniques in the form of Business Intelligence (BI) and Data Analytics (DA).

Business Intelligence and Data Analytics are in their essence support tools of information technology that are designed to aid decision making in businesses based on logical trends, models, and patterns. It allows organizations to utilize data gathered into their operational systems, convert it into useful information, e.g. identify inefficient business procedures and hidden patterns, find areas of strengths and weaknesses, discover new opportunities, etc. and afterward present it in a way to improve business decisions. By implementing BI, the organization can learn from the data already gathered into their operational systems, turn that information into strategic knowledge and stay ahead of the competition within their industry sector (Ramakrishnan et al. 2012). This gives businesses a necessary competitive advantage in a fast-paced and dynamic world. As technology develops, the ways and opportunities have become more pervasive, costs of acquiring data have gone significantly down making it ubiquitous and easily accessible. Companies realize the potential of data but struggle to find ways to utilize it as an asset (Chaudhuri et al. 2011).

Currently, Agna Group uses data operators, which is a team of 6 employees that their main job is to enter the data provided to them to one unified ERP system. The data takes between 48 to 72 days to be put in the system, this workforce would be more beneficial in different departments rather than just data input. Furthermore, the unified ERP for all sub-companies create

This thesis is going to delve into some of these challenges, analyse them, and try to find possible solutions to limit inventory waste by implementing BI and DA systems. This research is going to explore how Agna s.a uses these systems and what methods are implemented into resolving possible operational bottlenecks, specifically inventory waste as a strategy for improving profit margins through answering the question:

How can Agna s.a optimize its supply chain operations by implementing BI to limit its inventory waste by 30%?

1.5. Organization of the report

This report will start by identifying the main three theoretical frameworks that the research will use to understand the current case of Agna and the causes behind its inventory waste. Starting by explaining

the 3 different theoretical frameworks used, the supply chain risk management SCRM, the multi-layer framework for business intelligence, and the analytical hierarchy process. Moving forward to extracting the data and the methods used to achieve this research, which is mainly a primary qualitative and quantitative approach to gather this information. This includes an interview with the CEO and an interview with the COO. Furthermore, the research will dive into each framework, starting by dissecting the supply chain, understanding the flaws in each stage in the supply chain, further identifying the needs of the company when it comes to a BI software, ending with two possible strategies for the company to achieve its goal of limiting the inventory waste. Chapters 7 and 8 lead to the conclusion and recommendation of the report, pointing out that the company should follow a flexible strategy that has proven the best option through limiting the inventory waste, optimizing the supply chain, and is beneficial according to the cost-benefit analysis conducted at the end of the research.

2. Theoretical Framework

2.1. Introduction:

To answer the main research question and the following sub-questions of this thesis there needs to be formulated a theoretical framework based on scientific research. This chapter will build that framework to analyse and explore the different opportunities provided by implementing BI systems into international businesses such as the main case study of this report.

This chapter of the thesis will consist of four parts: To begin with, several theories will be introduced delving into the umbrella term of Business Analytics and the relationship between information, data, knowledge, and intelligence in connection to international businesses such as Agna Group. Secondly, a selection of relevant and pertinent theories will be made concerning this particular research and each theory's corresponding advantage will be weighed out. Next, there will be a discussion on the limitations of the selected theories to measure the sustainability of the selected theoretical perspectives. Lastly, several sub-questions will be formed derived from the main research question and based on the chosen theoretical perspectives.

2.2. Applicable theories:

To provide a scientific base for this research, several theoretical perspectives are selected regarding the nature, importance, difficulties, and benefits of using Business Intelligence systems to improve competitive advantage. The following theoretical perspectives will be analysed:

- Supply chain risk management - SCRM
- Multi-layer framework for business intelligence
- Analytical Hierarchy Process - AHP

2.1.1. Supply chain risk management - SCRM

Supply Chain Risk Management (SCRM) is one of the fastest-growing research areas in logistics. As its name points, SCRM helps find the risks in the supply chain, and assist in managing it. This works on an everyday basis and exceptional risks. Through the implementation of risk management process tools with the members of the supply chain, SCRM attempts to reduce the supply chain vulnerability through a holistic approach that identifies weak and failures points, or points of high risk within the supply chain itself (Manuj & Mentzer, 2008).

Supply chain management as an umbrella term is a business philosophy for managing information, materials, and monetary flows among numerous logistics levels such as suppliers, distributors, warehouses, transporters, and end-users. Many qualitative and quantitative factors go into SCM making it a complex and sophisticated tool for planning.

Furthermore, Wieland and Wallenburg (2012) found that SCRM is essential for a company's agility and robustness as they both show improving performance. Agility creates customer value in the supply chain, and robustness creates a positive effect in the supply chain's customer value and business performance, creating a low-risk value chain as a final product, eventually leading to a less risky distribution and retail chain, leading to less warehouse waste. This theory helps to identify, assess, and prioritize supply chain risks for the specific company. To extract key risk drivers in SCRM primary management processes will be reviewed in order to identify dysfunctional management processes

pertinent to supply chain risks; once supply chain risks are identified, assessed and prioritized, risk mitigation strategies will be proposed; Supply chain risk mitigation strategies include cost, quality, delivery and flexibility perspectives. According to Manuj and Mentzer (2008), the supply chain is a 5-step process:

- I. Risk Identification, through using multiple sources that clarify risks into supply, operations, demand, and security risks. It aims at generating a comprehensive list of risks and providing an understanding of the risk as to the basis for decision making for the following strategies. This can be carried out on several levels of details depending on the level of the risk, the purpose of analysis, and information are given.
- II. Risk Assessment and evaluation, through taking the risks from the first step, studying them, and understanding the risk and its possible results.
- III. Selection of an appropriate risk management strategy, various strategies can be applied, some are based on models such as the Analytical Hierarchy Process, and some are based on specific goals such as avoidance, postponement of risk, risk control, transferring or sharing risks.
- IV. Implementation of supply chain risk management strategy, referring to the strategy chosen in point III.
- V. Mitigation of supply chain risks, simply, the last and pre-first step for the whole process, and it focuses on preparing for the upcoming unforeseen risk events.

There are various advantages for SCRM, such as:

- Gives a clear overview of the supply chain
- Quantifies risks in the supply chain
- Allows for different possible strategies to be implemented
- Increases robustness and agility
- Avoid unpredictable risks
- No accounting ambiguities
- Agna has the required skills and knowledge to research it and apply it

The disadvantages of the SCRM model can be summarized in:

- No particular strategy to follow

- Different models can be applied
- A continuous process
- More control of the supply chain might require a higher cost or bigger staff
- Requires an up-to-date ERP
- Perception-based

2.1.2. Multi-layer framework for business intelligence

Collecting unstructured data for management support has been explored from several directions including case-based publications offering pragmatic solutions, ones focusing mainly on techniques for analysing document collections based on the extraction of structured data from unstructured content, and more. One of the approaches which aim to integrate structured and unstructured data for management support is the multi-level framework for business intelligence which can be used as a vendor-neutral conceptual reference for BI solutions. In other words, this particular model contributes towards the standardization and unbiased business practices in the field of BA by collecting data from a variety of sources to build a better competitive intelligence. This applies to the Agna case in the sense that the company frequently uses external information such as financial reports of competitors, patent databases, government and research publications, and more. This is all done in an integrative orientation to understand competitive intelligence as part of wider management support IT infrastructure which subsumes highly different systems.

The structure of this framework includes not only components to handle and analyse unstructured data but also a more holistic understanding of management support infrastructures. The presented framework can be used in the Agna case to structure BI initiatives within the company, which themselves are created to integrate unstructured data for competitive intelligence applications. This framework includes three layers: the data layer, the logic layer, and the access layer.

2.1.2.1. The Data Layer

This layer deals mainly with the storing of structured and unstructured data for management support purposes. Some of the currently existing data repositories include data warehouses, operational data stores, data marts, etc. On the other hand, unstructured content is handled with Content and Document Management Systems. The data which is collected is initially extracted from sources such as operational systems like ERP and SCM systems. Once the data is collected, but before it is analysed the data is transformed in several steps. (Kemper 2000). However, when applying this to the Agna Group case, it becomes evident that one of the main challenges during the data layer is the plethora of existing data which on its own creates multiple other issues. Companies such as Agna are not always financially or operationally prepared to handle the maintenance of data warehouses but instead can only have gotten as far as utilizing “core data warehouses” which contain all management support data. These core warehouses can only be applied for specific data serving a certain single business process. The shift towards bigger data warehouse infrastructure is something that a lot of organizations such as Agna Group are still struggling with.

2.1.2.2. The Logic Layer

This layer provides analytical functionality to analyse structured data or unstructured content. This includes processes such as data mining and OLAP, but also the ability to generate ad-hoc analysis, implement performance management concepts, generating interactive business reports, and more. Some of the tools coming from the knowledge management domain which are applied here include workflow support or tools for information retrieval.

This section of the research will focus on how the so-called “generic analytical systems” can enable accessing, combining, and analysing data for the Agna group with the organization having a build-in ex-ante condition of business logic.

2.1.2.3. The Access Layer

This layer is often made possible by some type of 'portal software' which is supposed to provide a harmonized Graphical User Interface (Priebe et al., 2003). And it allows the user to conveniently use all relevant functions of the logic layer within the confines of defined user roles and user rights.

This part of the thesis discusses the importance and conditions of utilizing such portals, concluding the Agna case. The company does not currently use any software portals or any architecture for this part of the approach. However, it can greatly benefit from one, since a main advantage of the approach is that it does not incur recurring costs.

2.1.3. Analytic hierarchy process (AHP)

The analytic hierarchy process (AHP) is a structured technique that organizes and analyse decisions based on mathematics and psychology, it is particularly used in group decision making and can be found in different fields. AHP aims at generating a decision that fits the decision-makers' end goal and their problem by providing a comprehensive and rational framework (Chang, Ellinger & Blackhurst, 2015).

This tool can be used for risk decomposition and prioritization based on Agna's case as AHP allows us to quantify the issue, creating a mathematical decision-making graph. It starts by building a hierarchy, where decision-makers evaluate the elements of the hierarchy through the usage of concrete data, comparing every two elements and their effects on the above elements, using the data and personal judgments, the decision-maker can come to move to the next element, and so on. This method is can be done through simple mathematic equations that can be done by hand or calculator. However, many computer software is available for specific cases and companies (Chang, Ellinger & Blackhurst, 2015).

Furthermore, AHP's hierarchy should involve an overall goal, different options and alternatives used to reach the goal, different components and constituents, and in some cases, alternative goals.

Furthermore, the alternatives can be broken down to different criteria, and usually include diagrams and graphs to describe the hierarchies. Figure 2.2 gives a sample of an AHP hierarchy diagram.

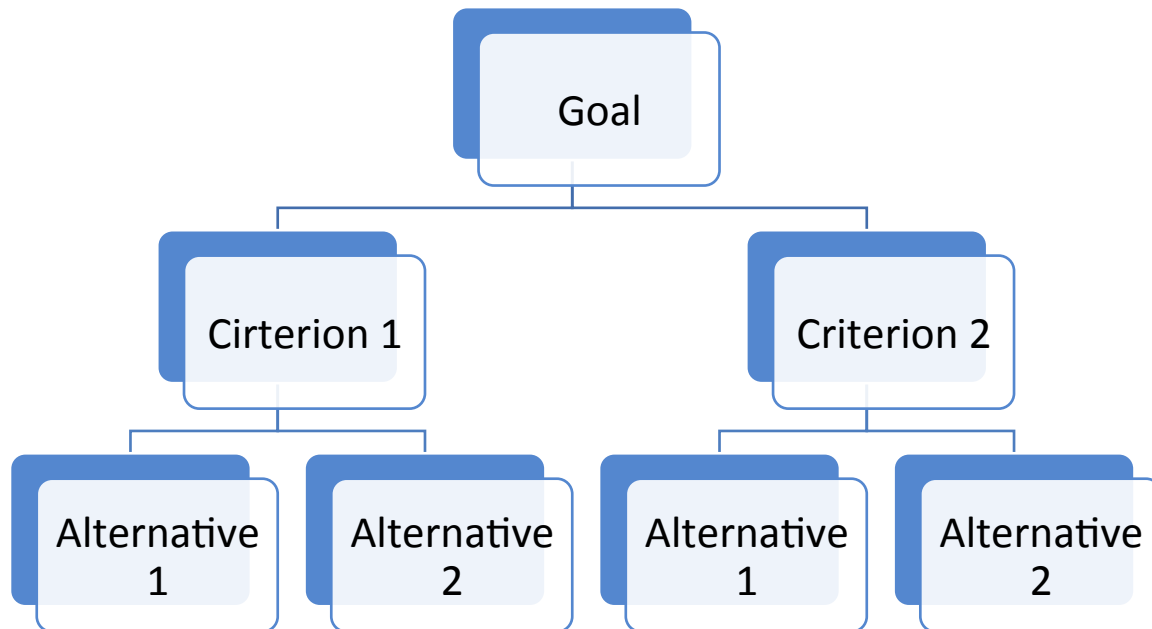


Figure 2.2

Advantages of AHP include:

- Adaptivity to SCRM
- Quantifiable measures
- Takes mathematical and psychological into perspective
- Assist in complex decision making
- Cost-effective
- Can be done manually and through software

Disadvantages of AHP include:

- Even though numerical values are based on data, much of it is based on personal perception
- Time-consuming
- Alternative and priorities can differ between departments and might not work on an organizational level
- No set rules, open to personal use

- Once new alternatives are added, old alternatives cannot change as it will shift the whole hierarchal model.

2.2. Selection and Justification of the Theory to be applied:

This research points out how Agna can improve all of the previously mentioned and even more if it switched to a modern BA and DA systems, build projections, and aimed at improving its business as a whole.

However, this does not come without disadvantages. Intelligence has been a part of different areas in life, for a while, and businesses have been collecting data for a long period. What is different nowadays is the amount of data available, thanks to the Internet of Things, fast pace globalization, fewer trade barriers, and technologies, the amount of data available every day is greater than the day before. Therefore, it is important to make use of this data, but what is more important is making use of the correct data. It is also important to note that our theory has limitations and it differs between different cultures and organizations, hence, the use of sociological literature to better understand the culture which applies to the current case. Through using the proposed theoretical framework and method, the company will be able to quantify this data, creating a possible list of solution that will assist Agna in removing some of its supply chain bottlenecks, specifically its inventory waste, as it puts priorities in order, deconstruct the issue, and allow the company to choose the correct software.

2.3. Sub-Questions:

In this sense, what companies struggle with can be broken down into **three** sub-issues that will be closely examined by using Agna Group., an Albanian company, as a case study and exploring the results and findings which come up within an international framework. The **three** main issues are:

1. What are the company's priorities and biggest risks in terms of the supply chain?
2. What type of BI software does Agna Group need to address the identified issues?
3. How should the company decompose risk and prioritize its supply chain activities?

3. Methodology

3.1. Introduction

This chapter is dedicated to discussing the development of the framework established in Chapter 2. The research methods used are directly connected to the framework and founding academic theories. Hence, the theory-building and practical problem solving are both interconnected in our research, and focus is put on both of them simultaneously. Furthermore, business research is often divided between three separate approaches including quantitative and qualitative. Consequently, to provide answers to the research questions put forward in this research would consist of words and numbers almost equally and require a further explorative method. Therefore, this thesis uses a mixed approach.

3.2. Supply chain risk management – SCRM

To answer the first sub-question “What are the company’s priorities and biggest risks in terms of the supply chain?” we will have to apply the SCRM method. The data that needs to be collected and quantified is the following:

- The main risks the supply chain faces
- The expenses in the supply chain regarding the inventory
- The inventory management process

Due to the nature and characteristics of the global business environment such as demand fluctuations, supply disruption and delays, price changes, exchange-rate fluctuations, etc. supply chain risk management has become one of the core business competencies for companies such as Agna S.A. Developing certain business strategies to mitigate and effectively manage these risks in a pro-active way is an important step towards securing competitive advantage.

To do so, the researcher will layout the main 4 supply chain risks, financial, operational, human resources, and informational risk aspects, leaving out the cyber risks as neither the company nor the

Albanian government provides a reliable database to support the level of such risks. This data will be quantified in priority according to the CEO and the COO. Separating the 4 risks into a sum of 1, and relying on the average of their responses.

Furthermore, the financial data leading to the excess of inventory and the inventory waste will be harvested from the company's financial database. This will allow the researcher to pinpoint the main issues that are leading to such financial losses.

Lastly, the whole supply chain process will be further understood through the interview with the COO to fully understand the supply chain process that leads to the inventory and how is the inventory managed and decided upon.

The data is collected from primary sources, using qualitative and quantitative research in its nature as most of the research and applicable work to our theory of choice is dependent on human intelligence and observations, and the company's financial statements.

3.3. Multi-layer framework for business intelligence

To understand which BI software does Agna group need, it is required to fully understand the available data. Therefore, Multi-layer framework for business intelligence will be utilized because of its detailed, yet, inclusive framework, but also its ability to analyse and handle unstructured data and its holistic understanding of the management support infrastructures. To do so, data needs to be extracted from the company's database. What is needed to conduct the multi-layer framework for business intelligence is:

- Data storing method;
- Data processing method;
- Data access method.

Through the Data Layer, the data sources will be identified, then, the best data sources will be chosen out and moved to the storing method. Choosing a storing method will also be essential to the Agna Group BI system, therefore, the researcher will identify the available option through secondary quantitative options and apply the best data warehouse.

The Logic Layer will provide us with the analytical functionality of the gathered data. This will allow Agna to understand the best method to mine this data through the supply chain operations from the data layer. Using the Logic Layer, an ad-hoc analysis will be conducted that will clarify the performance management concepts and generate the required business reports. These reports will be narrowed to the supply chain management to fit with the research.

The last layer is the Access Layer, which is the software that is used to visualize this data and turn it into reliable information that decision-makers can understand. The data harvested, processed, and analysed will be provided to each user depending on their roles in the supply chain, therefore, it is important to understand each department's task from Chapter 3.1.

This will be a qualitative primary and secondary research, where the primary research is conducted through the type of data that needs to be studied and harvested, and secondary qualitative through the storing, processing, analysing and choosing the software that the supply chain operators need to use.

3.4. Analytic hierarchy process (AHP)

To answer the second sub-question, “How should the company decompose risk and prioritize its supply chain activities?”, the company needs to follow a mitigation strategy. To apply the most appropriate strategy, the following information needs to be known:

- The chosen strategy
- The risk priority
- What risks need to be decomposed

To do so, the researcher will need to rely on information from the SCRM method, realizing which are the suitable strategies according to the company's CEO. It is essential to decide between the four different possible strategies:

- Cost strategy
- Quality strategy

- Delivery strategy
- Flexibility strategy.

As the Quality strategy is not possible because the quality is decided by different factors including PepsiCo, the decision will depend on the other 3 strategies.

The data will be collected from the interviews with the CEO and COO, it will be primary qualitative and quantitative research.

Figure 3.3 visualises the research process.

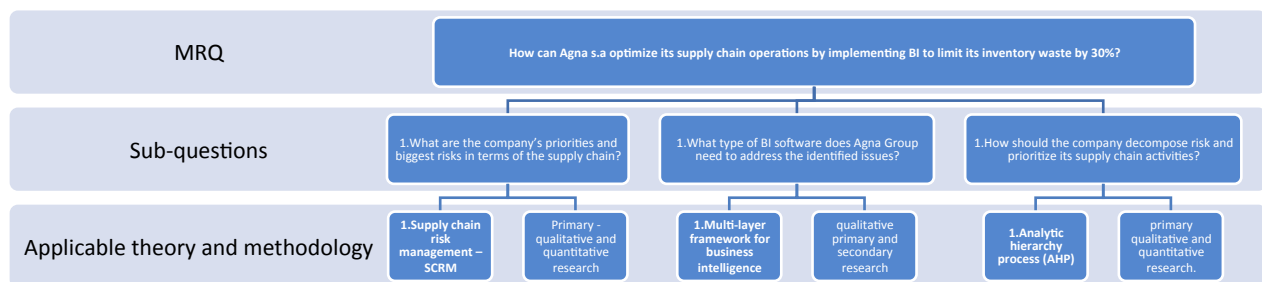


Figure 3.3

4. Supply Chain Risk Management (SCRM)

4.1. Introduction

In this line of thought in recent years Agna S.A has invested significantly (data?) in its management infrastructure with a specific focus on effective supply chain strategies. Some of the firm's goals include providing an organization-wide understanding of supply chain concepts, policy re-doing, working on cross-function alignment within the organization, investing in more sophisticated IT systems and personnel, and more. Agna s.a's target is to reduce its inventory waste by 30% by identifying and eliminating uncertainties, such as the ones mentioned above, in the company's supply chain. In order to

do that Agna's strategy includes risk management of both inbound and outbound supply streams taking into account all supply chain functions. Some of those include potential effects of various supply chain risk factors in areas such as manufacturing and production, purchasing and procurement, outsourcing, warehousing, logistics, and more. This framework will help us answer the following sub-question:

What are the company's priorities and biggest risks in terms of the supply chain?

The four steps to the process of risk management include identifying risks and where they stand in relation to the supply chain, quantifying them in order to determine what financial impact they could have on the company's sales and profitability. Next, a response strategy is formed to address the disruption and return to normal operations as fast as possible. The final step is mitigating by laying out actual strategies and tactics designed to minimize the disruption to the business as a whole. We will need to understand the main risks, the expenses, and how is the inventory managed. This data will be collected through primary research and interviews with the CEO and COO.

4.2. Data presentation

According to the interviews with the CEO and COO (2020), Agna's supply chain management are presented in the following table 1

Risk/Strategy	Cost strategy	Flexibility strategy	Delivery Strategy	Risk Relative Priority	Risk priority
Financial risk	0.256	0.424	0.337	0.317	2
Operational risk	0.430	0.321	0.320	0.382	1
Information risk	0.042	0.106	0.220	0.251	3
Human resources risk	0.314	0.149	0.123	0.50	4
Strategy criteria relative priority	0.546	0.310	0.144	1.000	
Strategy rank	1	2	3		

TABLE 1

To understand the expenses of the supply chain, it has been broken down into 4 main activities shown in figure 4.5. Through the segmentation of the supply chain, risks will be easier to identify, and over expenses can be pointed out.

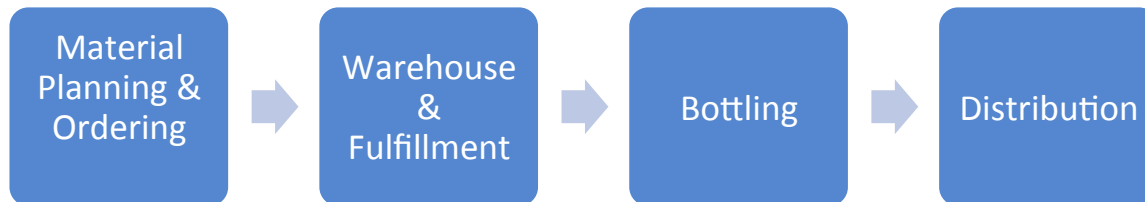


Figure 4.4

4.2.1. Material planning:

Material planning is an essential part of supply chain management as it is the first step. Through this stage, the organization plans on the required material that it needs, its suppliers, warehousing, and forecast sales. This stage involves different teams, including sales, marketing, warehouse, and logistics. In the case of Agna, the whole material planning process is based on the sales forecast by the sales team and is based on a bi-annual purchasing of all raw materials.

The sales department decides on predicted selling with a margin of error of $\pm 4\%$ of total sales, criteria, and warehousing. This is filled up by the logistics department and later sent to the COO for the final signature. Once the COO signs the order, it is sent to the “input department” where the employees type it in the system within 24-48, to later upload it to the accounting system and send a copy to the purchasing department to place the orders. This process in total takes between 1-4 working days and involves various departments. (Koxhuku, 2020).

4.2.2. Warehouse and fulfillment

Agna s.a rents 3 out of the 8 warehouses used to store its materials and production and owns 5 of them (Naci, 2020).

. The rent cost of the 3 warehouses is 117,500 USD annually, with the cost of 30,000 USD each, all rented from the same company. These 3 warehouses are located near Agna's bottling factories, and stores 35% of the biannually ordered materials and managed by the logistics department. Table 2 shows the total expenses for each warehouse.

	Warehouse 1	Warehouse 2	Warehouse 3
Rent	39,167USD	39,167USD	39,167USD
Operating expenses, including wages	55,600USD	63,309USD	65,432USD
Total cost	94,767USD	102,476USD	104,599USD

TABLE 2

4.2.3. Bottling & Distribution

Agna bottles its products in its own facility that includes different warehouses and productions in Albania and stores it in its own in-house facilities. Once a shipment of materials is received, the handling team writes a report of the quantity, passes it to the warehouse manager, who in his turn passes it to the head of the logistics department. After having the order signed, the logistics send it using in-office mail to the data input team, which in their turn uploads it to the ERP within 24-48 hours. As for the orders, Agna receives orders through the sales department from its certified sellers within its operating countries, in its turn, the sales team sends an in-office mail to the bottling facility with an order to start production for the sold quantity, with the name of the client, quantity, specifications, and importance of production time. After the product is bottled, Agna contacts a shipping company to pick it up. Once the whole batch is bottled and shipped, the production team sends a report to the sales team, who in turn mail it to the input team to insert it in the ERP (Koxhuku, 2020).

4.3. Data analysis:

Referring to table 1, the management's and organizational priorities for strategy and risk become more visible. A cost strategy that gives higher importance to the operational risk would be the organizational priority. However, a flexible strategy that gives special attention to the financial and operational risk also is of high probability to be a suitable decision according to the CEO and COO. Choosing a cost strategy would mean that the company will be looking for longer-term stability rather than direct results improvement (Naci, 2020). The flexibility strategy on the other hand would prove to be riskier, however, it would prove to be a faster, reliable, and sustainable strategy. Having one strategy does not cancel the other, as Agna can follow a mixed strategy that focuses on cost reduction through flexibility improvement.

Furthermore, Agna s.a spends a large amount of money on renting warehouses, which include costs such as operating, staffing, depreciation, and rent. This is because the company follows a hefty and long process to input its data into the system and forecast its sales numbers, which in many cases, prove not to be very accurate. Agna has an obvious data input issue caused by the various factors, including lack of staff education, lack of appropriate ERP and CRM, hefty paper process and physical paper dependency, and the bureaucratic process and company hierarchy. It costs Agna an annual 301,842USD to sustain 35% of the inventory on a two annual purchasing period. This is caused by the inability of the company to forecast sales right and process orders fast. According to the COO, most of the inventory waste caused by damage happens in the off-site warehouses, causing around 40% of the total waste. (Koxhuku, 2020).

Moreover, the chaotic and lengthy ordering process leads to an excess or lack in orders/production batches due to the time it takes and the time until the different departments are able to retrieve the information from the assistants with the paper trail or the input department with the ERP. Most of the company's work is reliant on internal mail and written information. There have been many occasions where such mistakes were unavoidable, and Agna had to deal with different orders errors. According to the COO, Agna receives orders equal to 20% of its waste because of human errors that can be avoided easily. (Koxhuku, 2020).

4.4. Conclusion

Agna s.a has an obvious problem with its supply chain management. It has proven to be outdated, lengthy, bureaucratic, over monitored, and rather costly. The managers have shown a great want for change and have shown interest in following different strategies to improve their supply chain and cut their waste and expenses. Agna's losses are mainly caused by their staff, human errors, lack of education, lack of appropriate software, and lack of training programs for its staff. The possible scenarios for these problems will be studied using the AHP framework.

5. Multi-layer framework for business intelligence

5.1. Introduction

One of the main challenges in utilizing business bits of intelligence is the abundance of data, its storage, and management. Collecting unstructured data for management support has been explored from several directions including case-based publications offering pragmatic solutions, ones focusing mainly on techniques for analyzing document collections based on the extraction of structured data from unstructured content, and more. One of the approaches which aim to integrate structured and unstructured data for management support is the multi-level framework for business intelligence which can be used as a vendor-neutral conceptual reference for BI solutions. In other words, this model contributes towards the standardization and unbiased business practices in the field of BA by collecting data from a variety of sources to build a better competitive intelligence. This applies to the Agna Group's case in the sense that the company frequently uses external information such as financial reports of competitors, patent databases, government and research publications, and more. This is all done in an integrative orientation to understand competitive intelligence as part of wider management support IT infrastructure which subsumes highly different systems. Part of Agna Group's operational model includes opening new positions in the IT department and build necessary structures to manage the available data such as "data warehouses" and vendor portals.

This framework will be used to answer the second sub-question:

What type of BI software does Agna Group need to address the identified issues?

The structure of this framework includes not only components to handle and analyze unstructured data but also a more holistic understanding of management support infrastructures. The presented framework can be used in the Agna s.a's case to structure BI initiatives within the company, which themselves are created to integrate unstructured data for competitive intelligence applications. This framework includes three layers: the data layer, the logic layer, and the access layer.

5.2. The Data Layer

This layer deals mainly with the storing of structured and unstructured data for management support purposes. Some of the currently existing data repositories include data warehouses, operational data stores, data marts, etc. On the other hand, unstructured content is handled with Content and Document Management Systems. The data which is collected is initially extracted from sources such as operational systems like **ERP and SCM systems**. Once the data is collected, but before it is analyzed the data is transformed in several steps. (Kemper 2000). First, the data is transferred into the company's data warehouse by using "ETL" (used to extract, transform, load data) tools. However, when applying this to the Agna Group case, it becomes evident that one of the main challenges during the data layer is the plethora of existing data which on its own creates multiple other issues. "The transformation encompasses filtering out syntactical and semantic errors, harmonizing data from different sources, aggregating data, and enriching it by calculating additional business metrics." (Kemper 2000). Companies such as Agna are not always financially or operationally prepared to handle the maintenance of data warehouses but instead can only have gotten as far as utilizing "core data warehouses" which contain all management support data. These core warehouses can only be applied for specific data serving a certain single business process. The shift towards bigger data warehouse infrastructure is something that a lot of organizations such as the Agna Group are still struggling with.

A lot of companies have implemented document and content management solutions in the form of tools for input, archival, indexing, versioning, and provisioning of electronic documents.ⁱ The main benefit of these systems is that they allow companies to efficiently store, administer, and distribute administered content, which is facilitated by the fact that the system is designed in a way that it separates content, structure, and layout. Furthermore, content and document management systems

can also be used as sources of structured (meta) data which can be very challenging for companies such as Agna. The extraction of metadata includes describing and clustering content, analyzing patent documents using text mining tools, generate metadata according to predefined dimensions, and finally classify accordingly. So far, this last step is far out of reach for Agna, since extracting semantic metadata requires text mining algorithms which the company is unable to implement for the moment. If Agna considers the implementation of such tools, the main consideration for their use would be their cost/benefit ratio.

5.3. The Logic Layer

This layer provides analytical functionality to analyze structured data or unstructured content. This includes processes such as data mining and OLAP, but also the ability to generate ad-hoc analysis, implement performance management concepts, generating interactive business reports, and more. Some of the tools coming from the knowledge management domain which are applied here include workflow support or tools for information retrieval.

This section of the research will focus on how the so-called "**generic analytical systems**" can enable accessing, combining, and analyzing data for the Agna group with the organization having a build-in ex-ante condition of business logic. Some of the techniques for data analysis which these systems include are **OLAP systems** – they allow the navigation of data in a multidimensional way, query-based access – allow users to read from the data layer through languages such as SQL and MDX. Another type of system is the 'model-based analytical' one, which offers algorithms to uncover complex patterns and relations by performing complex analytical operations. Decision support systems and data mining are also models-based analytical systems. Reporting systems combine numbers, text, and graphics to present data.

These systems are in many ways complementary and a full understanding of firm-level, competitive advantage requires an understanding of all of them and more.

5.4. The Access Layer

This layer is often made possible by some type of 'portal software' which is supposed to provide a harmonized Graphical User Interface (Priebe et al., 2003). And it allows the user to conveniently use all relevant functions of the logic layer within the confines of defined user roles and user rights.

This part of the thesis discusses the importance and conditions of utilizing such portals, concluding the Agna case. Part of the company's operational plan aimed to resolve the identified bottlenecks includes using consolidated user navigation, as a component of an independent software which has defined interfaces in order to allow communication. According to the COO, the main goal that Agna's management is working on right now is **integrating all of its vendors into the portal** that it's being currently used by the company (Koxhuku, 2020). This allows all stakeholders to have simultaneous and homogeneous access to structured, as well as unstructured data. One of the main benefits of this approach is that it only requires certain portal administration and maintenance which do not incur recurring costs or additional efforts on the end-user side.

5.5. Conclusion

Agna needs to be able to integrate its management and strategies with a software and a data warehouse that fits them. Therefore, Agna is lacking all layers of this framework, and it has been looking for the implementation of a unified portal for vendors, data warehouse, and a data mining system that does not depend on human structuring the unstructured data. Therefore, Agna should be looking for a software that can unify all departments through a one access portal, a cloud-based software as a service SaaS, that takes into account all the departments involved in the supply chain process, including the purchasing department, sales department, logistics, and warehouses.

6. Analytic hierarchy process (AHP)

AHP will be used to further understand the risk and strategies available for Agna, and come to decisions using the hierarchy process, answering the question:

6.1. Possible scenarios:

From the interviews with the CEO and COO, we understand that the company is looking for different available options (Naci, 2020). These options include different scenarios that include different risk cutting strategies that lead to cutting costs in the operational activities of Agna as a whole and for the inventory waste specifically. The common goal is reducing the inventory waste by 30%, or what is equal to 376,985USD. To do so, there are two main strategies that the management sees as viable options. These options are one of these two strategies:

- **Cost strategy.** A strategy that depends on cutting the cost taking into consideration the financial and economic risks as primaries. Such a strategy would mean that the company is looking at the cheapest options that still provide the efficiency needed to have a product that fits Pepsico standards. This will include a departmental ERP that functions between the sales and logistics department to forecast sales, process purchasing, and production orders. This solution would also involve some cost-cutting when it comes to staff, including the lay off of the input department and the merger of the purchasing and sales department. The last step would be selling the excess product directly to the local market for cheaper prices rather than distributors, with up to 10% price off, allowing the company to avoid a possible 130,348USD, which is equal to 22% of the total inventory waste. This strategy does not limit the inventory waste by 30%, however, it aims at cutting cost in different parts of the supply chain process, such as staffing and the scale of the ERP, and through sales forecasting and purchasing process.
- **Flexibility strategy.** A strategy that focuses on shifting the whole supply chain process through empowering the logistics department through having bigger power in the inventory. This goes through having a cloud-based ERP system that is integrated through the sales, accounting, and logistics department, supported by a CRM that ensures that the outbound stream of the supply chain is also well planned and managed, allowing Agna to ship batches on the date and lower its finished product inventory massively, cutting the time for the process of processing orders described in chapter 4, which costs time, money, and space that can be used for different inventory. Furthermore, the input department is no longer needed as the software has integrated cross-departmental communication and data input. Furthermore, switching from periodical purchasing to a certain limit that is set on the ERP that balances the shipping costs,

and cutting the 3rd party warehouses, which by itself, should cut the inventory waste by the more than 30% caused by inner-city shipping, handling, 3rd party warehousing, late delivery, and late inventory process. This strategy tackles the 30% inventory waste while optimizing the company's sales forecasts, accounting, relation with customers, organizational communication, and appropriate staffing and training.

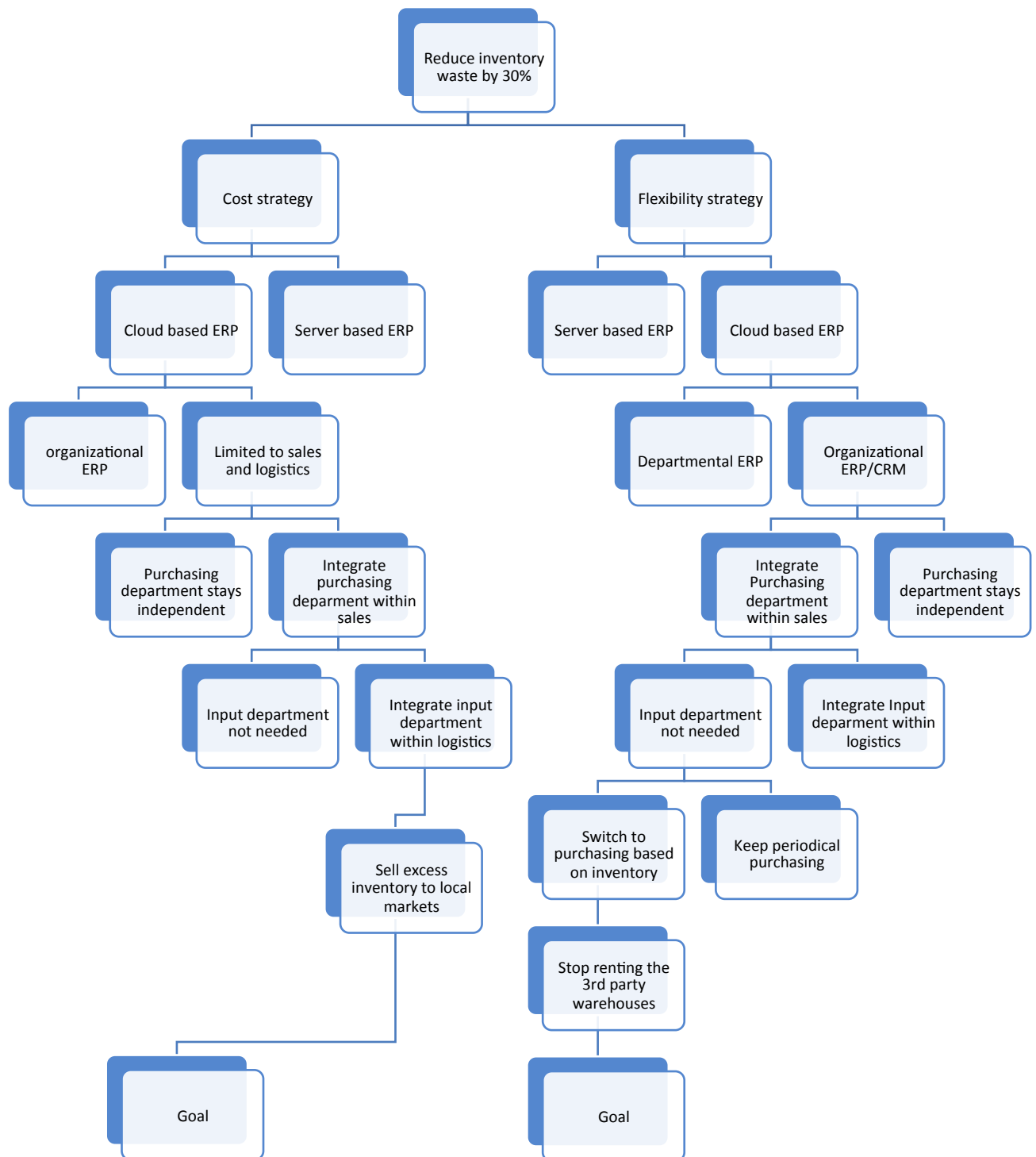


Figure 6.5

6.2. Conclusion

The two strategies are viable and are easy to put into effect. As the workforce in Agna is rather educated, 87% of workers in administrative positions have at least a bachelor's degree, this will allow for an easier transition and a training period. Implementing any of both theories would lead to a cost cut. However, the cuts focus on rather the supply chain as a whole rather than inventory waste, and it relies on staying relevant and close to the status-quo rather than having an efficient and effective change that would lead to the right implementation of a BI system. On the other hand, the flexibility focuses on creating a plan that will lead to the drop of the 3rd party warehouses, leading to a massive cut in the inventory waste, while redefining the supply chain thoroughly with some organizational changes. The cost of training is admissible in the case of Agna, as it will not be a recurrent thing, but can rather be done through staffing through trained staff, or having a specialized member of the IT department with extensive training on the ERP/CRM that can train the colleagues on their departmental roles and possible uses of the software.

7. Conclusions

In this chapter, the answers of the sub-questions will be given combined with their perspective answers, leading to the answer of the MRQ and the final conclusion of this research.

1. What are the company's priorities and biggest risks in terms of the supply chain?

The management priority concerning the supply chain is the operational risk followed by the financial risk, while the human resources risk has proven to be of least importance. Meaning that Agna acknowledges that the operational management of the supply chain has many flaws that need to be addressed while giving appropriate attention to the financial risk of the strategies chosen to address these issues as shown in table 1.

Furthermore, the supply chain process of Agna was broken down into 4 main parts, 1)Planning and ordering 2)Warehouse & fulfillment, 3)Bottling, and 4)Distribution. Through breaking down and studying there are various flaws in the process, starting with the planning and ordering with a major safety margin and margin of error that goes up to 7%, followed by a bureaucratic process that has to go

between different departments and take up to 4 days to be fully processed within the organization itself before having it sent to the supplier. This is the first step in a block of flaws, as this lack of forecast, inability to process information properly, and periodic purchase of materials lead to the rent of 3 different warehouses that cause around 40% of the total waste inventory through over stacking, bad infrastructure, distance to the bottling factory, where in many cases they end up being unused due to such mistakes. When it comes to the bottling part, the process goes the same way that planning and ordering go, taking up to 4 days to process a production and sales order, which can be used in having better delivery times.

To conclude, Agna is facing different obstacles in the way of having a cost-efficient, flexible, and stable supply chain due to human errors that can be avoided easily through proper project and supply chain management.

2. What type of BI software does Agna Group need to address the identified issues?

For this question, the 3 layers of data, logic, and access. Through the data layer, the research pointed out that Agna currently lacks proper data management, such as harvesting and management. The company currently uses hard drives to store its financial data, and paper trails and excel sheets with orders and purchasing, which is unsustainable for a multi-million dollar company. It is important to note that Agna is not capable of maintaining a data warehouse or creating its own ERP software, and is best at using a cloud service from a SaaS, or a core data warehouse. The logic layer shows that Agna lacks algorithms in its software that allows one big weak point that the company has, which is sales forecast, and warehouse and inventory management, with the access layer concluding that the company needs a portal software that allows access through different departments cutting the whole data input process in the company.

To conclude, the company needs an ERP and possibly a CRM to connect its departments without having to relate to different departments and cut the lengthy processes. Furthermore, having one portal software that can lead to different departmental roles.

3. How should the company decompose risk and prioritize its supply chain activities?

The company has two viable strategies the can follow to limit their inventory waste, a cost strategy, and a flexibility strategy. While both strategies include similar steps, the flexibility strategy has a bigger focus on creating a digital infrastructure within the company that can lead to sustainable supply chain and

limits the risks, through creating an ERP that involves the whole organization, closing the input and integrating the purchasing department within the logistics team. It also allows the sales forecast to be produced through the ERP rather than the error viable human-based forecast. It also limits periodical purchasing that eventually leads to an excess of ordering and damaged materials in the warehouses and eventually leading to cutting costs on the inventory warehouse and the rent costs from the warehouses.

On the other hand, the cost plan does meet the proposed cut in the inventory waste, however, it is easier to put into action, it involves a limited ERP system and focuses on cutting different costs through the chain rather than cutting down the inventory waste directly.

“How can Agna s.a optimize its supply chain operations by implementing BI to limit its inventory waste by 30%?”

As the research shows, Agna s.a currently has different flaws in its supply chain considering that it goes in parallel with its financial growth, with a lack of digital presence through the supply chain or in the organization itself. Therefore, it is not only important to reduce inventory waste, but also essential to digitalize the communication and data management methods within the company as a whole and the supply chain specifically.

Through the first question, it becomes clear that Agna has expenses that can be easily cut off that are directly causing the waste of inventory, which is the bad forecasting, bureaucracy, and periodic ordering. This causes major financial losses within the supply chain, either the inbound or outbound stream, caused by the rigorous process that orders have to go through. Adding that expanding storage facilities is costly and causes more damage than good because of that issue.

Based on the multilayer framework for business intelligence, the research indicates the lack of the proper infrastructure for Agna to have its own ERP data warehousing and system and would need to rely on 3rd party companies to be able to fit in any strategy the company takes. However, such a system must use a one portal system that allows different departments to log in to the same software than having different software for each department.

By the end, it comes to deciding on two different strategies, one that cuts budgets and artificially trims the supply chain for a short term solution, and the second being an aggressive intervention in the supply

chain as a unit, rebuild its blocks and create a whole new system for the supply chain that limits the risks on the longer term, and cuts the company's inventory waste.

8. Recommendations

8.1. Introduction

This chapter discusses the implementation plan, cost-benefit analysis, and the limitations of this research, and advice for future research. The implementation plan is a collection of actions through a timeline of Agna to be able to apply the **flexible strategy**. The cost-benefit analysis discusses the costs and benefits coming from these actions, and the limitations and advice discuss the improvements and additional research that can be done to this research in the future.

8.2. Implementation plan

In order to implement the plan, Agna should follow the flexibility plan laid out in chapter 6, and figure 6.6.

Step 1: Purchase a software

The first step that Agna should do is decide on the software it wants to have. Software such as SAP includes the various services that Agna is looking for such as sales forecasting, accounting, purchasing, production orders, in-mail, and stock tracking, and is a cloud base, cutting the costs for Agna. Through communicating with SAP, Agna can receive a customized price depending on the required services and number of employees using it.

Step 2: Organizational change

Agna needs to reorganize its departments, through integrating the purchasing department with the logistics department or assigning a member of the logistic teams for purchasing, rather than having a 3 people department to take care of that. Furthermore, the company needs to remove the input department. The company must build good communication channels within the organization through

the ERP, and through team buildings, retreat and training, as the employees from different departments used to communicate through the input department rather than directly, it is also essential for Agna to train its employees, or key employees on SAP and their role and the proper way to use it.

Step 3: changing the supply chain

The last step Agna needs to do is to change the status quo in its supply chain management. Agna needs to cancel periodic orders and base its orders on its need to limit the excessive amount of inventory waste the company ends up with annually, this will assist the company not only in cutting costs and having a more efficient supply chain, but it will also allow the company to give up on the rent of the warehouses that are off-site and cause the biggest inventory waste within a year of the plan implementation.

8.3. Cost-benefit analysis

The implementation of a general system that control and manages the supply chain along with other operations in the company would introduce great gains in efficiency and would effectively limit, and in time eliminate the current issues with inventory management, and other snowballing issues that derive directly from the large presence of manual processes in the workflow of Agna. Based on the data provided Agna which calculated that they had inventorying inefficiencies amounting to \$310,571 in 2016, \$420,736 in 2017, and of \$525,311 in 2018.

The goal is to reduce these inefficiencies by at least a yearly 30%, which would translate in savings of approximately \$180,000 for the year following the implementation. In the same time Agna, would be able to write off and dispose either by sale or depreciation of the remaining inventory from previous years. Nonetheless, the write off is not considered one of the main benefits of the implementation, but rather comes as a benefit of the financial processes involved in putting the system to work, and re-configuring the internal financial and monitoring management system of the company.

Analyzing the costs which would be incurred by the implementation of an automated business intelligence system can be divided in four categories, namely the costs of purchasing licenses for the users of the system, the costs associated with the training and implementation of said system widely

within Agna's workflow, the hiring of an IT team to manage and resolve issues in real time, and the costs associated with the update of current old hardware the company possesses in its whole distribution network, so that they can effectively handle the new software.

To calculate these costs the licensing costs are calculated based on the pricing Albanian resellers of Microsoft Dynamics NAV, which is approximately \$70,000-\$130,000 for large corporations with hundreds of employees, along with a yearly updates and maintenance fee of \$35,000.

The implementation of a BI system would necessitate the hiring of 4 network specialists and IT workers, which usually are paid a yearly wage of approximately \$12,000 in Albania, while other mid-level specialists who may be involved in the manual processing of materials and information are paid around \$9000 yearly. Currently there's approximately 10 people working with manual processing of data and information for the company costing the company a total of \$90,000. Training current finance and operations employees, would cost an approximated \$17,000 for materials and professional corporate programs.

The updates of old computer systems, to more updated and safe systems, can be approximated at around \$120,000 so that all Agna's main inventorying and processing points are well-equipped to run the business intelligence software.

Agna hence would have to invest a total \$267,000 for the direct one-time costs involved in the implementation, with \$17,000 going to training, \$120,000 to hardware upgrades, and \$130,000 in software. The company expects a breakeven in 2 years for this investment, or \$133,500 a year.

Currently Agna expects the following years to have inventory increasing inefficiencies as per the observed trends, of \$633,613 in year 1, \$740,983 in year 2, and \$848,353 in year 3. The goal is to have a decrease of these inefficiencies of 30% in the first year, 35% in the second, and 40% in the third, compared to the projected values. This would translate to savings of \$190,084, \$259,344, and \$339,341 for each year respectively.

Based on the above, performance for scenarios are constructed, one where the BI is implemented and the other where the situation continues as it is in the present. As per the present dynamic, the company expects total costs of \$723,613 for year 1, \$830,983 for year 2, and \$938,353 for year 3.

Following the proposed changes in the labour dynamics, as well as the reduction in inefficiencies, the company estimates yearly total costs of \$526,529 for year 1, \$564,639 for year 2, and \$592,012 for year 3.

According to the expected break-even agenda the company expects to cover one-time costs incurred within a 2 year frame, which would translate to a total improvement of 9% of \$63,584 for the first year, 16% or \$132,844 for the second year; and once the costs are covered, an improvement of 37% or \$346,341 in the third year.

The tables below provide more quantitative information on the cost benefit analysis.

Assumptions			
Inventory Optimization due to implementation of BI (reduction in losses in %)	30%	35%	40%
Inventory optimization in USD	\$190,084	\$259,344	\$339,341

		Year 1	Year 2	Year 3
	No Change	Labour (manual data processing) \$90,000	\$90,000	\$90,000
		Inventory Inefficiencies \$633,613	\$740,983	\$848,353

	Licensing	-	-	-
	Total	\$723,613	\$830,983	\$ 938,353

		Year 1	Year 2	Year 3
Implementation of BI		\$48,000		
	Labour		\$48,000	\$48,000
	Inventory Inefficiencies	\$443,529	\$481,639	\$509,012
	Licensing	\$35,000	\$35,000	\$35,000
	Total	\$526,529	\$564,639	\$592,012

Total investment cost	Software Microsoft Dynamics NAV	\$130,000
	Training	\$17,000
	Hardware	\$120,000
	Total	\$267,000

		Year 1	Year 2
Breakeven agenda	To break even in 2 years based on the	\$133,500	\$133,500

	investment	
--	------------	--

Total Savings/Optimization		Year 1	Year 2	Year 3
	Total Optimization per year	\$63,584	\$132,844	\$346,341
	As a percentage	9%	16%	37%

8.4. Limitations of the research:

8.4.1.Improvements for current research

Even though the conclusion is solid and supported by all the data collected, like most research, the researcher has found restrictions and constraints while conducting this research:

First of all, the current state of the world in general and Albania specifically. This research has been done during winter and spring 2020 where the COVID-19 pandemic was ongoing. This has led to different difficulties, such as the ability to put in the system to work and collect data after it is functional, communication within the company, a full-on lockdown in Albania that lasted for 2 months, and a very strange economic period that took the country and the world by storm. The fluctuating exchange rates between the Albania Lek and the American Dollar has been going up and down with no stability in the line. This comes with the fear of an economic crisis in the region Agna works in and the company investing in resisting such a risk.

Second of all, the research is mainly based on interviews and information collected from the company's management with information from the audit report from Agna, however, getting an accurate price on the software has proven close to impossible as most company's that sell a cloud base ERP require further information about the company and their functionality level which, in these unstable time, they were not able to clearly acquire or has refused to establish a final price until all the information asked for are available.

Last, the research is studying a theoretical solution and different changes might come on the way. Even though the researcher has tried to consider everything, it is always the nature of the business to have a contingency fund and be prepared for different issues that might arise along the way.

8.4.2. Additional future research

Future research regarding Agna's inventory cost should not focus on implementing a BI or DA system anymore, but rather focus on the project management side of the supply chain.

Additional research should focus on the supply chain risk management and the company's preparedness to sustain a profitable supply chain in the long term by cutting unnecessary costs and amplifying its communication and IT infrastructure.

References:

Adiguzel, Z. (2019). Examining the Effects of Strategies, Competition Intelligence, and Risk Culture on Business Performance in International Enterprises. *Advances in Marketing, Customer Relationship Management, and E-Services*, 115-144.

Agna Group. (n.d.).

Agna Group - States where we operate. (n.d.).

Audit report of Agna S.A. Albanian ministry of economy. (2019).

Baars, H., & Kemper, H.-G. (2018). Management Support with Structured and Unstructured Data - An Integrated Business Intelligence Framework. *Information Systems Management. Information Systems Management*, 132-148.

Bryman, A., & Bell, E. (2011). *Business Research Methods*. Oxford: Oxford University.

Cahill, C. (2019). *microstrategy-global-analytics-study-finds-97-of-real-time-enterprise-decisions-are-data-deprived*. Micro Strategy Global Analytics.

Chang, W., Ellinger, A., & Blackhurst, J. (2015). A contextual approach to supply chain risk mitigation. *The International Journal Of Logistics Management*, 26(3), 642-656. doi: 10.1108/ijlm-02-2014-0026

Davenport, T. H. (2006). Competing on analytics. *Harvard Business Review*, 99-107.

Dedic, N., & Stanier, C. (2016). Measuring the success of changes to existing Business. *10th International Conference on Research* (pp. 225-236). Vienna: HAL.

Elbashir, M. Z., Collier, P. A., & Sutton, S. G. (2011). The Role of Organizational Absorptive Capacity in Strategic Use of Business Intelligence to Support Integrated Management Control Systems. *The Accounting Review*, 155-184.

Gittman, L. J., McDaniel, C., Shah, A., Reece, M., Koffel, L., Talsma, B., & Hyatt, J. C. (2018). *Introduction to Business*. Texas: OpenStax, Rice University4.

Greene, R. (1966). *Business Intelligence and espionage*. Homewood : Dow Jones-Irwin.

Hofstede, G. (2020). Retrieved from <http://www.geerthofstede.nl/>.

Kemper, H. G. (2000): Conceptual Architecture of Data Warehouses – *A Transformation-oriented View*. *Proceedings of the 2000 American Conference on Information Systems*, pp. 108-118.

Kohavi, R., Rothleder, N. J., & Simoudis, E. (2002). Emerging Trends in Business Analytics. *Communication of the ACM*, 45-48.

Koxhuku, A. (2020). Personal interview

- Manuj, I., & Mentzer, J. (2008). Global supply chain risk management strategies. *International Journal Of Physical Distribution & Logistics Management*, 38(3), 192-223.
- Meier, M.C. (2004). Competitive Intelligence. *Wirtschaftsinformatik*, 46(5), 405-407
- Naci, V. (2020) Personal interview
- Pirttimäki, V. (2007). Business intelligence as a managerial tool in large Finnish companies. *Tampere University of Technology, Publication 646*.
- Pirttimäki, v. (n.d.). Business intelligence as a managerial tool in large Finnish companies. *Tampere University of Technology, Publication 646*.
- Robbins, S. P., & Coulter, M. (2018). *Management*. Harlow: Pearson Education Limited.
- Seethamraju, R. (2007). ERP Systems and Decision Support—An Exploratory Study. *International Conference on Decision Support Systems*.
- Sharma, R., Reynolds, P., Scheepers, R., & Seddon, P. S. (2010). Business Analytics and Competitive Advantage: A Review and a Research Agenda. *Bridging the Socio-technical Gap in Decision Support Systems - Challenges for the Next Decade*. Lisbon: University of Lisbon.
- Superbrands. (n.d.).
- Teece, David; Pisano, Gary; Shuen, Amy (1990). *Firm Capabilities, Resources, and the Concept of Strategy* (CCC Working Paper 90–8 ed.). University of California, Berkeley: Center for Research on Management.
- Trkman, P., McCormack, de Oliveira, M., & Ladeira, M. B. (2010). The impact of business analytics on supply chain performance. *Decision Support System*, 318-327.
- Watson, H. J. (2019). Addressing the Top Concerns of BI and Analytics Managers. *Business Intelligence Journal*, 5-11.
- White, G. (2016). Big Data And Ethics: Examining The Grey Areas Of Big Data Analytics. *Issues in Information Systems*, 1-7.
- Xia, B. S., & Gong, P. (2014). Review of Business Intelligence Through Data Analysis. *Benchmarking: An International Journal*.

Appendices

Appendix 1: Interview with COO Mr. Koxhuku

1. What are the main parts of the supply chain?

Well the whole process is a bit complicated and bureaucratic that involves various departments, but to put into 4 main parts, its planning and ordering, warehouse and fulfillment, bottling or production, and distribution, which is outsourced.

2. What is the purchasing and production process?

Well the process is a bit complicated to be honest, we have been trying to change it for a while now, but we still have not decided on the most appropriate way to do so. We are trying to find a way to balance the organizational structure without having a department be overwhelmed or under work. For the purchasing process, we need to start with our sales forecast. The sales team start by building a sales forecast according to previous years sales according to regions. This usually has a margin error of 4 or 5, but usually end up having a bigger than the margin. After forecasting the sales, the sales department fills in a purchase order that goes to the logistic department with our sweet in office mailman, Geri, it gets crosschecked with our current warehouse capacity and then signed by the logistics team to be passed to me. I give the final signature and send it to what we call the “input” department, where 3 employees fill in the data files, and enter it in the system, and this is our weak point, as hiring more people has proven not very useful, and it with the load of work coming from all the sub companies, such purchases can take 24 hours to 4 days sometimes to be inserted in the system and sent to the purchasing department to have it ordered.

The production is very similar, as you know, we bottle in our facility here, in Albania, and we receive product that is ready to be produced. As we have a major market, we are almost bottling 24h a day, but through the winter these working hour dips. We usually receive the shipment, and have it stocked up, send a report to the “input” department from the head of logistics team. As these are usually smaller paper, they get processed within 24 hours. When a sale is made, the sales department sends a production order to the bottling facility with the sales order, quantity, specification, and importance of

production time. Once it is shipped, the logistics team fill in a shipping report and send it to the “input” department to input it, and a copy to the sales department to confirm it.

3. I am trying to build a risk to strategy table, would you mind filling this table up with the CEO according to the strategies?

See TABLE 1.

4. Why does Agna still depend on 3rd party warehouses?

These 3 warehouses have been an ongoing issue for a few years now, and with the current production growth that Agna is going through, we are tirelessly looking for a solution, these storage facility ends up having most of the unused inventory because of the cost of shipping them to the bottling establishment, it is always better to produce what we have on the ground than to ship from the warehouses. They are also built and owned by a 3rd party company and have a some staff working there without actually having any significant input on the supply chain, in total, these storage units had what is equal to 240 thousand dollars. That’s a lot of inventory waste, I believe they play a big role in the problem you are trying to research.

5. Which strategy do you see fit for Agna, a cost or flexible strategy?

Well I prioritize cost because these are strange times we live in and we need to ensure survival. However, dropping the fact that we might be going into a recession, if not a depression, then I would definitely take a flexible strategy, I can totally see how it can be efficient on the longer term. And really, it is not that expensive.

Appendix 2: interview with COO Mr. Naci

1. Does agna work outside its main bottling facility?

We currently are renting 3 storage units from a 3rd party. However, we are planning on not using them hopefully when everything settles down

2. Why does Agna lack a proper ERP system

I have never been into technology, I trust our great workers to do a great job, we hire the best of the best, and we always expect the best from our employees. But you are correct, this has been an issue discussed in the company for a while, and we are working toward that. However, the current events have stopped us from doing so.

3. Would you please fill in the table with Mr. Koxhuku, the risks need to add up to 1 to decide on a certain strategy and risk.

Check table 2

4. What do you think is the next step for Agna?

Well, my main policy for the group as a whole is merger, buying, expanding and growth. However, these are uncertain times, and we are focusing on coming out with the least possible financial and human capital losses.

5. Which strategy do you see more fit for Agna in the near future between cost, quality, delivery, and flexibility?

Well, it is impossible to take quality into consideration as we have specific requirements we need to live up to, as for the delivery, we depend on 3rd party shipping companies and distributors in different countries we work with small offices based in the countries. This is for a simple reason which is the we cross borders and it will be of great cost and time to establish a shipping company, we are very satisfied with the companies we deal with and so are our customers. So, I would choose the flexibility as my primary strategy for our current supply chain, even though flexibility could mean we might have to face different risks on higher levels, I am sure we have the human capital to deal with it. However, because of the current times, I would choose cost over flexibility as it is a matter of maintaining profit through this tough economic year rather than growing.