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THE ANALYSIS AND MITIGATION OF RISKS IN FMCG SUPPLY CHAIN: THE CASE OF BAT EASTERN EUROPE

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ABSTRACT

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This work investigates the Bullwhip Effect, which is one of the most important phenomena in contemporary supply chain management. The author uses most recent theoretical apparatus to analyze operational activities of a leading FMCG company British American Tobacco Eastern Europe. This paper investigates and describes the process in BAT supply chain management and considers the impact of the Bullwhip Effect together with the potential risks threatening company's operations. Emergence of the Bullwhip Effect leads to supply chain inefficiency. This paper contains methodological supply chain risk mitigation recommendations, description of a real case study and an analytical study of internal and external supply chain processes

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Ключевые слова: Цепи поставок, Анализ и снижение рисков, Эффект хлыста Данная работа рассматривает один из важнейших феноменов современной цепи поставок - эффект Хлыста (Bullwhip Effect). Принимая во внимание теоретические аспекты, автор работы анализирует операционную деятельность одной из крупнейших в сегменте товаров повседневного спроса (FMCG) компаний БАТ Восточная Европа, описывает процессы, происходящие в цепи поставок, а также рассматривает влияние эффекта хлыста в совокупности с потенциальными рисками, угрожающими операционной деятельности компании. Последствиями присутствия Эффект Хлыста является неэффективность цепи поставок. Результатом работы выступает ряд методических рекомендаций по снижению рисков в цепи поставок, а также описание реального кейса и анализ внутренних и внешних процессов компании.

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Introduction

Over the last two decades supply chain management (SCM) remains one of the leading practices for reducing cost and improving customer value over the network of the companies (Giunipero et al.1990) SCM was a catalyst for change of relationship marketing and lean production theories, a driver for development of several concepts, for instance, demand chain management (Jüttner, Christopher, Baker, 2007); it was a core element of contemporary business models that already changed the landscape of several industries: Dell business model at computer manufacturing, Zara at apparel business, Wall-Mart at FMCG retail business, etc. Finally, the modest list of innovations, pushed by SCM, shows its wide contribution to business development: RFID, ERP, EDI, APO etc.

Contemporary supply chains have to be lean, fast, responsive, technological and productive because they face increasing market volatility, raise of complexity of products and services, shortening product life cycles and globalization of modern economy, (Christopher, 2005) which basically means globalization of supply chains (Friedman, 2006). As a result, a large part of success of the company depends on the success of supply chain, thus the supply chain risk had increased over last decades. Managing contemporary supply chains is like driving an expensive hi-tech supercar on a mountain road – the risk of a crash is minimized due to innovative support systems, however consequences of the crash are very high.

In era, when competitive strategies converge (Hamel, 2007) SCM become one of most valuable areas for strategic management and the ability to manage risks – one of the core capabilities of the company. “Supply chain risk management is rapidly developing into a favored research area for academicians as well as practitioners, especially in the modern era wherein firms operate in global environments” (Manuj and Mentzer, 2008, 193)

The risks are very different across the industries, however, the nature of all risks is the same – it is a Bullwhip effect. Regardless on many attempts to research this phenomena (Sterman, Lee, Fransoo and Wouters, Burbidge, Stevens, Baljko), it is still has a lot of blind areas. The paper is focusing on Fast Moving Consumer Goods (FMCG) supply chains as there is a strong need of effective solutions for risks mitigation in this sector, level of competitiveness is very high and can cause not only some

tangible assets loss, but also reputation blemish on the market and supply chain disruption. The processes and supply chains structures along the sector are similar and can be identified and investigate in one research work.

Modern organizations have to deal with the challenges of satisfying the evolving patterns of consumer demand in a global environment under lean supply chains. The task is becoming even more difficult with every new market entrant. Ironically, greater competition for consumer preferences often leads many companies to be less efficient than they otherwise could have been through increased lead-times, unduly large inventories, and general supply chain mismanagement. Companies need to develop flexible supply chain, which would allow them to satisfy very specific consumer demand in good time and at reasonable prices.

Many researches devote to bullwhip effect investigation were held, but analysis of different factors impacting the bullwhip effect with focus on existing ERP solutions used on the market and studying potential solutions for existing problem in FMCG sector correspond to a research gap in this field of science.

Supply Chain Risk evaluation is definitely a multi-criteria decision-making problem with high level of uncertainty in specific environments. In order to tackle this problem, we need to identify, analyze and evaluate most important factors influencing competitiveness and effectiveness of companies in the market.

This paper is focusing in quantifying the bullwhip effect, which states that order variability grows as the orders go up the supply chain. Current estimation methods seem to assume that supply chains consist of a single retailer and a single manufacturer. This is an undue over-simplification, which disregards the network structure of supply chains. In particular, current models do not register for risk pooling effects, which have to be accounted for in quantifying the bullwhip effect. These effects are relevant for situations when order made to the manufacturer are correlated with a correlation coefficient less than one. This paper aims to demonstrate that simplistic modeling and risk pooling effects lead to overestimations of the bullwhip effect.

There are a number of important steps in supply chain risk mitigation. It is very important to possess adequate delivery lead-time information. This requirement, however, is largely hinged upon establishing a relationship of trust and transparency between actors of the process. It is perceived that complete implementation is therefore to a large degree unattainable in real life.

This data has to be plugged into a system to ensure adaptive mode functioning. The process has to be automatic. The adjustable parameters of the model need to allow for conservative operation of the model. This paper discusses new theories in the field and their evaluation through delivery process simulation.

Supply chain management aims to reduce production costs and to mitigate supply-side risks, which are enhanced by the bullwhip effect.

Most companies do not possess adequate demand forecast capacity. This is why they opt for precise delivery deadlines to their clients. Technological advances, economic growth, changing consumer demand patterns, globalization, exposure to global shocks and other factors only make demand forecasting and planning more difficult. Planning process calls for significant cooperation and information exchange between sales, marketing, planning and operations. Most companies find efficient cooperation between these units rather taxing, and thus their actual results often differ greatly from the planned or expected figures. This is to a large extent caused by the fact that the underlying goals of various company units might essentially be contradictory and often mutually exclusive. This implies completely different strategies and action plans for different units, which are difficult to reconcile. The key performance indicators for various units concern different metrics as well. As a result, this often leads to inefficient supply chain management leading to stock outs or unduly large inventories incurring extra costs on the company. These phenomena are associated with the bullwhip effect.

There has been some notable success in advancing supply chain management theories and implementing them in the real world. Many researchers have concentrated on evaluating the safety inventor level for various markets. Demand uncertainty and implied demand uncertainty are other very important research topics in supply chain management. For instance, Fisher (1997) has pointed out the correlation between implied demand uncertainty and various other parameters. Demand uncertainties can only be addressed by using truly agile and flexible supply chains, as submitted by Garber and Sarkar (2007). Flexible supplier management, simple transactions, efficient network designs and good supply chain connectivity are important for reducing cycle time. It is desirable to work towards uniting all actors in the supply chain into a single association albeit informal where all of supply chain is completely visible to all actors. Such a structure is known as extended enterprise.

The goal of the paper is to explore the most crucial solutions for risk mitigation in FMCG supply chain. FMCG companies face thousand risks daily and there are even more solutions and methodologies for risks minimization exist, but in this paper more emphasis is given to developing and managing processes of relevant risks identification, bullwhip effect investigation and finding best fit solution for optimizing supply chain volatility, which will help to reduce costs by decreasing stocks levels, ensure better information exchange and improve chain dynamics.

Research question of the paper: what the bullwhip effect impact on operating activities in supply chain and what solutions could be used to mitigate risks caused by the effect?

The key assumption for the purposes of this work is that all organizations in business are under pressure to stay competitive and make profit.

In order to reach the goal of the paper several crucial tasks were single out:

- To identify all relevant potential risks for supply chain for particular industry
- To investigate contemporary supply chain risks mitigation methodologies
- To identify the Bullwhip Effect impact on operating activities in supply chain
- To consider possible solutions to mitigate risks caused by Bullwhip Effect
- To investigate IT solutions for risk evaluation and mitigation (input data requirements
- To develop practice recommendation for a company and based on case and theoretical finding produce harmonized general recommendation for a single company in FMCG sector

Recommendations given help to identify current risks organizations are seeing in their supply chains as well as to examine what companies are doing now and in the future to avoid supply chain failures.

In this paper author considers FMCG sector with focus on Tobacco industry. Tobacco industry is limited industry with 4 major market players, which operate with absolutely the same environment starting common suppliers up to strong legislation changes dependency and market fluctuations. On the other hand Tobacco industry is classic

FMCG sector, with common for FMCGs companies' standardized processes, qualities and features, including some categories of risks that can be investigated.

The structure of the paper is as follows:

In first chapter main theoretical notions from Supply chain management, risk management, investigation of the bullwhip effect is presented.

The second is methodology used for phenomenon analysis.

In third chapter the case of BAT is developed and solutions and recommendations for risks mitigation are proposed, as well as all processes are described.

The research methodology used for investigation of the bullwhip effect is combination of case study and survey, which are used as complementary methodology. Case study will be used for generating assumptions, complex description of existing processes and relations, particularly for Supply chain investigation. The case study method has proved to be a useful tool in investigating the problems of ERP implementation as well. The SCOR model and a number of articles state that in order to make high quality research, all sections of supply chain should be analyzed.

There have been a number of researches investigating the bullwhip effect, but in this paper the bullwhip effect in an existing company and influence of different factors on the bullwhip effect focusing on existing ERP solutions used in the market are defined, potential solutions for the problem in the FMCG sector are stated.

Chapter 1. Supply Chain Risks Mitigation and Analysis: the Role of Bullwhip Effect in Supply Chain Risks Management

Globalization of supply chains pushing supply chains towards being lean and developing customer value in supply chains are probably the main trends over past 15-20 years. That makes supply chains more complex, expensive and risky.

Global competition is no longer a competition between companies, but between supply chains. Core competence is becoming hidden in supply chains.

SCM is young, but crucial research field. Many of researches have been done in past years however it has numerous unsolved problems. One of the most complicated problems is the problem of Bullwhip Effect identified in 1961 by Forrester and later proved by Wal-Mart as a significant problem from business perspective. Bullwhip Effect remains to be core problem of any supply chain, regardless on dozens of managerial tools, specialized software and practices. BE influence every aspect of the SC: risks, costs, customer service, etc

Supply Chain Risk evaluation and mitigation is complex decision-making problem with high level of uncertainty in specific environments. In order to tackle this problem, we need to identify, analyze and evaluate most important factors influencing competitiveness and effectiveness of companies in the market as well as to understand main processes in modern supply chains, study evolution and nature of the SCM concepts and their evolution

This chapter is important for understanding main concepts and processes within modern SCM in order to analyze existing solution and observe phenomena described in existing supply chain on the market.

§ 1.1. Supply Chain Management Evolution and its Role on Macro- and Microeconomic Level

Supply chain management is usually defined in several ways: as a philosophy, as an activity and as a set of management processes (Mentzer et.al 2001). General definition of SCM is following: “supply chain management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole” (Mentzer et.al 2001). It is important to define supply chain: “a

set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flow of products, services, finances, and/or information from a source to a customer". (Mentzer et. al. 2001). The basic difference between supply chain and SCM is that supply chains exist whenever they are managed or not. If the supply chain is managed, it is a SCM. Supply chain management concentrates on the best possible ways of designing and operating the supply chains. There are two main goals of managing the supply chain:

- To minimize total costs in a supply chain
- To maximize (or at least maintain on the same level) the customer service level

These are two contradicting goals and the art of supply chain management is to align them and increase customer value at the end. The basic problem of SCM are the stocks. As guru of Toyota production systems S. Shingo notes "the stock is an evil" (Shingo 1989). Probably, this statement is not very far from the reality. A big part of the costs is coming from necessity of keeping the stocks and following by this fact consequences: handling costs, costs on operations, stock obsolescence, etc. The stocks are the result of demand and supply variability and low predictability and inability to match supply a demand. The less accurate forecasts we have, the higher safety stocks level is required.

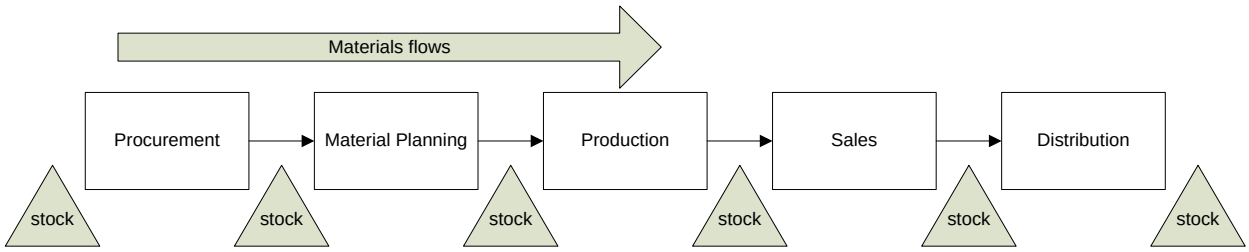


Figure 1. Supply chain

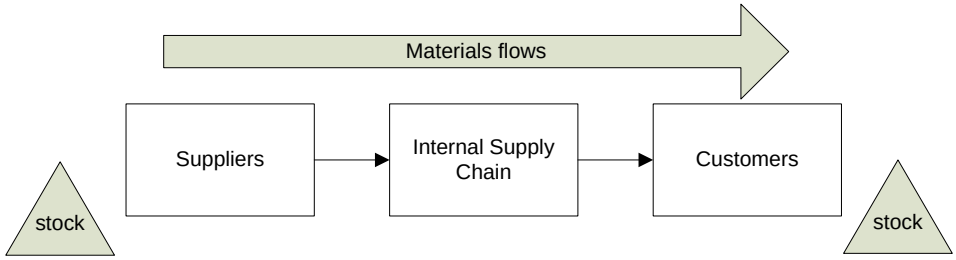


Figure 2. Supply chain management

When the company works in a supply chain with many partners (starting with ultimate supplier and ending with ultimate customer) the variability of demand and supply increases, because each partner in a supply chain makes its own decision basing on incomplete, different and sometimes contradicting information. Manufacturer rarely have a clear understanding of ultimate demand and makes its own forecasts and plans basing on the orders from distributor (that are not the same as ultimate demand and even not the same as the orders from retailer, etc.). This called a Bullwhip effect (see fig.3). Bullwhip effect is the core problem of SCM. The whole concept is build around approaches of how to deal with this problem. .

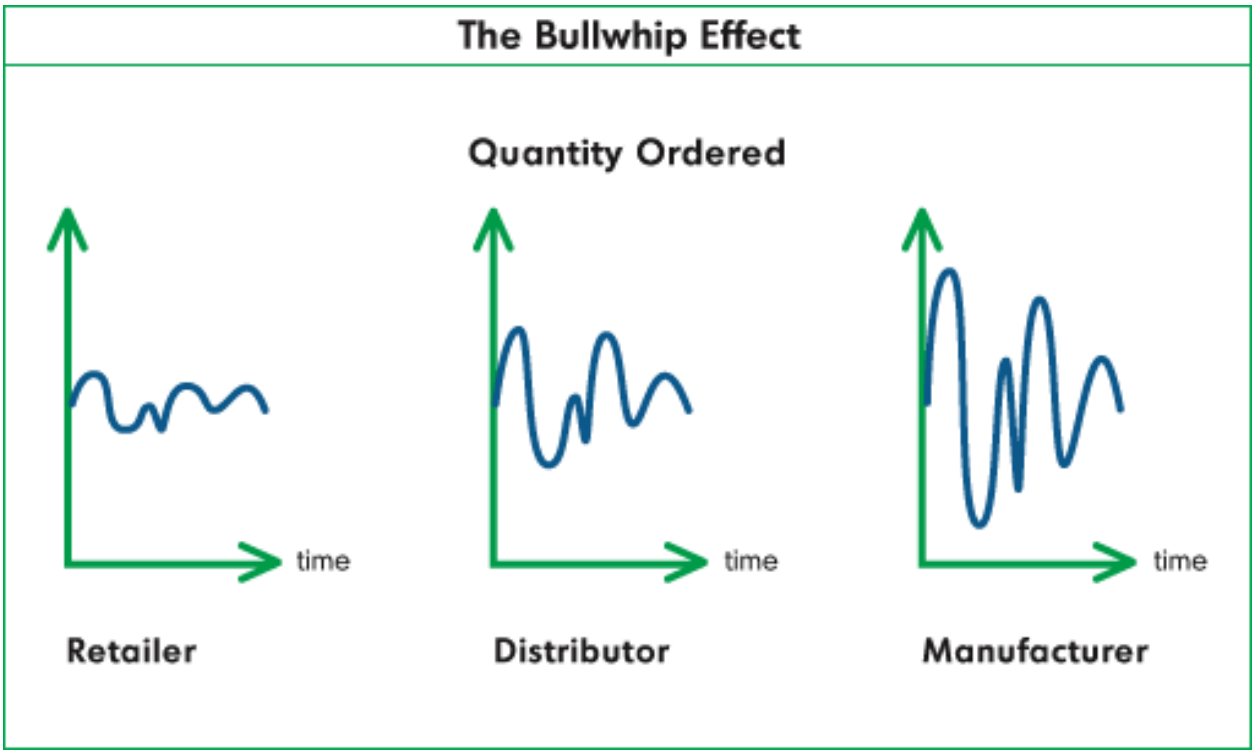


Figure 3. Bullwhip Effect in Supply chain

The evolution of supply chain management concept moves from easy to more complicate approached of collaborative relationships and stock (inventory) management. According to Krotov and Kiryukov there are four stages of SCM development (Krotov, Kiryukov 2007):

1. Supply chains are not allocated but first tendencies of concentration on core activities and logistics approaches appeared
2. Supply chains are considered as single logistics and information exchange area
3. Marketing oriented approach and classic complexion of supply chain appear.

Supply chain is considered as organization with whole spectrum of business processes

4. Introduction of information instruments and ERP solution for coordination and managing of information flows in Supply chain of different markets, marketing approach is developed.

The current supply chain management mastery itself, ironically, suggests higher risks for supply chain managers. Previously, when SCM was far less from perfect than it is now, corporate managers could afford local breakdowns and disruptions without too much overall effect on the value chain. The simpler the organism, the less fine-tuning it needs, and the less skill are required to maintain its stable operation. Simple force majeure responses such as switching suppliers produce more problems for managers than they ever used to. Many companies across the globe utilize lean and just in time production these days, and their internal systems are so fine that even minor disruptions in deliveries or insignificant cost fluctuations might result in their prices being driven into the uncompetitive zone losing consumer confidence and loyalty. It might be slightly over-stretching an argument, but still a fair one that modern companies are fine-tuned almost to the point of being fragile. The current global economic downturn exposed exactly this – companies and markets have become so complex that most managers do not fully appreciate the ways in which they operate and the supply chains have become so far outstretched that even minor bottlenecks in a number of locations coinciding result in significant production difficulties.

One of the major areas of change recently is undoubtedly inventory management. Naturally, maintaining significant stock volumes serves as a risk-mitigating factor against supply-side disruptions. However, the global competitive environment is driving companies into shorter production cycles and hence much more sensitive inventory management. Really competitive global companies never operate full stocks, they store just enough to carry on their production cycles, whilst they have to make certain reservation to mitigate potential supply risks. But even so, the costs of not being a lean producer are too high in the current world. The whole system of balancing one risk against another is complex. Supply chain managers have to compare risks of operating a single supplier who would be willing to be very flexible and protective of the company’s intellectual property against the risks of breakdowns and bottlenecks on behalf of this single supplier. Raman and DeHoratius point out that efficient inventory

management does not necessarily suggest keeping the inventories as low as possible. Inventory management is still a valid instrument for tackling supply-side risks. The idea is to balance the level of inventories against their costs and risks of non-renewal of stocks and to come up with the perfect storage volume optimizing storage space, labor costs, etc. In the end, it all falls down to maximizing customer satisfaction, and in this respect, cost optimization is very much akin to general pricing: companies can afford high prices if they provide superior quality and added value, but they cannot afford even very low prices if a significant proportion of that low price reflects excessive supply-side costs including running excessive inventories.

Supply Chain Management involves coordinating, scheduling and controlling procurement, production, inventories and deliveries of products and services to customers. Corporate managers are structuring their SCM policies so that consumer satisfaction is maximized at the lowest potential costs. As discussed above, they have to engage in a balancing exercise considering many potential trade-offs between various mutually contradictory factors, bearing in mind risk, return, and customer satisfaction.

Wider definition of a supply chain would be the linkage of all business activities from the point of extraction of raw materials to the point where it is replaced back. The chain linking all the nodes in the system is the supply chain, and supply chain management concentrates on the best possible ways of designing and operating the supply chains.

Therefore, it is appropriate to state at this stage that efficient supply chain management must fully endorse the strategic aspect of SCM, as pointed out by Mentzer (Mentzer 2001). It is important to note that even with picture-perfect planning and strategic sourcing managers are still thinking in terms of risk mitigation and contingency plans rather than risk-elimination, for it has become apparent that the latter is yet unattainable.

In 1996, two Boston-based consulting houses Pittiglio Rabin Todd & McGrath and AMR Research decided to standardize the approach to analyzing and describing all aspects of supply chain processes. As a result, they came with the Supply Chain Operations Reference (SCOR) model in the same year.

The SCOR model architecture provides for applicability in all industries, being a true cross-functional instrument employing strategic holistic approach envisaged by Mentzer. “The structure of supply chain is fundamentally a reflection of a firm’s business model.” (Supply chain Structure, 2004)

SCOR helps companies to address supply chain issues, measure performance, identify performance improvement objectives, and aids the development of SCM software. The model utilizes all applicable supply chain metrics, relevant formulae set and multiple references to best SCM practices and the technology enabling those practices.

§ 1.1.1 Competition of the Supply chains on the Global Market

The last several years have seen the increasing use of lean and Six Sigma approaches to reduce inventory and waste in the supply network. However, as firms increasingly want to retain cost competitiveness; global sourcing has become the norm. The increased variability because of global sourcing—in the form of longer or more variable lead times, or more variable product quality, for example—combined with more lean supply chains has left many companies more exposed to supply chain disruptions. Alternatively, it has forced them to combat variability with more inventories, negating many of the expected cost benefits of global sourcing. Understanding and managing the portfolio of risks facing supply networks today is critical to maximizing business performance.

Monczka and Morgan investigate the environment impact of all procurement operations. They identify six areas that will drive development of supply chains in future decades:

The critical Six Strategic issues (Monczka and Morgan 2000, p 50-53):

1. Networking approach for management
2. Increasing efficiency requirements
3. Strategic cost management
4. Integration and Consolidation
5. Insourcing and outsourcings processes
6. Information technology role increase

Production systems tend to view flexibility as capability of decision makers to adapt to changing environments. Decision makers have to be able to evaluate their environments correctly, to have clear vision of desirable state of affairs and to be able to influence the course of affairs in a way that enables the system to reach the desired characteristics. Flexibility has to be seen as a management criterion independent of performance or result indicators. This allows for the managers to devote time to developing flexible systems, which is desirable in the long run, rather than concentrating on short-term performance goals.

Customer satisfaction is of course the cornerstone to all supply chain management activities conducted worldwide. The global competitive economic environment forces corporation to fight for their customers globally, often dealing with hurdles of local tax regimes, economic conditions, legal environment, local monopolies and so on – and under these circumstances corporation cannot afford not to be lean. They might not be concentrating necessarily on offering the lowest prices in the world, but they cannot afford situations when their prices reflect their supply-side inefficiency. In order to achieve customer satisfaction, companies can only demand higher prices in exchange for added consumer value. This idea studied by Hines is echoed by Raman who pointed out the recent growth in marked-down items, as companies produce too much of what they cannot sell and too little of what they can. This assertion by a Harvard Business School Professor highlights customer satisfaction and demand-side issues as key to understanding and developing truly efficient supply chain management.

§ 1.1.2 Global Sourcing

All supply chains companies were put into ever-intensifying competitive conditions in the past decades. This has led them to improving the quality of their produce and reducing their production costs. Steep competition implies that global sourcing might be an attractive measure aimed at tackling costs. Indeed, many Asian and Eastern European countries boast relatively cheap and fairly qualified workforce. According to Frear (1992), Minahan (1996) and Mankiw (1999), global sourcing has allowed for 10% to 40% cost saving. Global sourcing and its role in the successes of American companies are further discussed by Birou and Fawcett (1992), Frear (1992), Gaines and Writer (1999), Gooley (1998), Gregory (1999), Moncszka and Giunipero (1984), Moncszka and Trent (1991, 1992). According to the US Bureau of the Census, the amount of money spent on procurement form abroad has risen from USD 250 billion in 1980 to USD 937 billion in 19999. In addition, types of products procured have changed as well from raw materials to finished goods.

It is important to mention that global sourcing from one hand leads to minimization of costs and diversification of suppliers' basket and on the other hand provokes potential risks leading to supply chain network complexity.

Potential pitfalls awaiting those embarking on global sourcing could be classified as follows: logistics, cultural misunderstanding and legislative environment.

Czinkota and Ronkainen (1993) point out the importance of timely movement of goods and materials from, to and through an international corporation. Logistics is aimed at reducing costs whilst maintaining an appropriate level of service quality.

Naturally, international logistics network encompass longer travel distances than domestic transportation. Therefore, whenever international transportation dimension is applied, managers generally expect longer lead-times. In addition, international logistics creates extra risks for businesses, as many some services might not be as reliable or flexible abroad as at home. This might have adverse effects on stock level management, as uncertainty and additional risks force managers to inflate their inventories to prepare for potential extended delays. Boyce (1999), Bradley (1998), Birou and Fawcett (1993), Min and Galle (1991), and Monczka and Giunipero (1984) acknowledge that logistics is the most critical problems faced by companies in global sourcing.

Cultural differences or, rather, lack of appreciation of cultural differences is another common reason behind problematic global sourcing, as noted by Garten (1998), Eadosevich (1999), Schneider (1998), Smith (1999). Czinkota and Ronjainen (1993) point to behavioral aspects of culture, where behavioral patterns date back to custom, tradition, religion and so forth. It is conceivable that the globalized world calls for uniform processes and approaches globally, which, however, is not true in the real world. In reality, there are countries, which attach great significance to context of communications, and the setting and context might mean just as much as the actual words in these countries. In other countries it is common to express thoughts and suggestions directly and through the medium of words. Language barriers also fall under the broad category of language differences. Obviously companies can resort to outsourcing translations and language work to linguistics experts, but still, even the most skilled translator might not be able to convey the full gamut of meaning of what is being said, and subtleties might be lost in translation.

Local trade regulations and trade barriers might also affect international sourcing and global processes within Supply chain. The most conspicuous examples are clearly trade tariffs and quotas applied by local governments to imported materials and products for two main reasons: to raise extra revenue and to create an un-level playing field at home in order to make local goods and services more attractive than imported produce and thus protect domestic market from foreign expansionism. Customs inspections and

border control impose significant delays on international trade and might complicate international logistics. Currency regulations only add to the overwhelming pile of potential international sourcing issues.

Global sourcing experience and demographic aspects of company top-management might affect global sourcing practices and the ways of dealing with the potential problems. For instance, companies with wide international trade experience will probably find international logistics far less puzzling than companies only considering international sourcing. Ironically, companies that have already conducted international business will be more likely to do it again, as more experience in the field implies less costs in future. In addition, according to Monczka and Giunipero, North American companies might find it easier to purchase goods and services from Germany and the United Kingdom than from South East Asia due to shorter distances, similar technology standards and shared culture.

However, in spite of the trend outlined above, global sourcing becomes one of the most important competitive factors as it enables obtaining materials and products of highest possible quality and lowest possible prices.

There is a number of scholarly works pointing to the positive effects of global sourcing on company costs, product quality and availability.

It has been pointed out that low cost is in fact not the only reason why companies switch to global sourcing. Often particular materials or products are simply unavailable in the domestic market. For instance, Monczka and Giunipero (1984) discovered that global sourcing in the chemical industry is almost entirely availability-driven. Ironically, reliance of global sourcing for availability matters can drive domestic supply out of the market, which was the case with children clothing in the United States. Having lost competition to foreign sourcing on labor costs, domestic child clothing production disappeared. It could, therefore, be deduced that sometimes global sourcing will be a self-fulfilling prophecy. However, it is certainly plausible that only the most efficient productions should survive on the market, and if that requires child clothing production being completely unavailable in the US, then it is only fair that it should not exist.

Carter and Narasimhan (1990), and Monczka and Trent (1991) point out that reducing product development time is another important reason behind global sourcing. Other potential reasons include improving company image, as stated by Frear (1992); satisfying local conditions, as per Birou and Fawcett (1992), Frear (1992), and Monczka

and Giunipero (1984); reducing delivery times, as suggested by Frear (1992), Min and Galle (1991), Monczka and Trent (1991, 1992); and boosting international competitiveness, as per Birou and Fawcett (1993), Monczka and Giunipero (1984).

Traditionally, companies have chosen to source globally in search of lower costs. The emphasis changed in the 1990s, when Min and Galle (1991) named quality the decisive factor in global sourcing. Birou and Fawcett followed suite in 1993.

Even though there has been a number of surveys and studies into global sourcing performed by leading scholars worldwide, these studies often lack detailed analysis of what companies get what benefits. This work contends that the magnitude of benefit from global sourcing and it type are independent from:

- Company size;
- Production type;
- Import volumes;
- Proportion of imports;
- Global sourcing experience;
- Sourcing regions.

Even though global sourcing is becoming more and more common every year, some problems identified with this process are still left unresolved.

Therefore, global sourcing is very important as an efficiency-boosting initiative, however, it often remains challenged due to political and economic instability and other factors beyond the scope of supply chain management. However, there are managerial techniques in place to make best use of the given global situations employing various legal and economic regimes in obtaining the most efficient supply chain possible.

§ 1.1.3 Lean Production

Globalization processes in global companies causes pushes companies to tight costs and increase efficiency and effectiveness of all processes. The new notion Lean Production was formed and most of biggest FMCG chains have transformed their production according to Lean production principles.

The system of lean production has its origins in the Japanese auto industry. Labor side policies define the differences between lean and other companies. Lean companies outsource significant parts of their work to places with low labor costs, very little job

security and complete capacity utilization. Lean production also assumes easy product-making: simple designs, fewer parts, quick assemblies, etc. Labor itself is becoming more intense, as workers face longer hours, tighter work cycles, regimented work and so on. In addition, Womack (1991) points out that the highly-praised supply side flexibility sometimes means the ability of management to direct their workers in any way conceivable. On the other hand, production is being constantly reorganized, as produces look for ever-falling costs, wider product ranges, better diversification, less defects, and so forth. As a result, there is more work-related stress and hence more sickness and absenteeism.

The concept of lean production can be applied to services as well as to production of tangible goods. Basically, this means that services are decomposed to basic elements, which are then performed by different service workers. Such arrangements might prove extremely stressful for the workers, and particularly in the labor-intensive services sector. Lean production might also leave a few customers complaining about the service they received since service provides concentrate on satisfying the standardized client. It is conceivable that labor-intensive services might prove to be more stressful to workers than capital-intensive productions.

Modern ideologies, which have led to development of the lean production concept, have subdued labor to business interests. The budget cuts have led to the businesses gaining even more influence over their employees, which implies longer hours, more irregular job, more hostile working conditions, lower pay and so forth for the latter.

SCM has transformed intensely last decades, influenced by globalization processes and speeding up of information exchange.

The competition become more and more intense, new concepts appear and companies stressed by tangible failures can meet irreversible consequences.

§ 1.2 Supply Chain Risks overview and classification

Supply chain risks have been a popular study field for many scholars recently. For instance, Sodhi and Lee (2007) discussed risk management conducted at Samsung Elecronics, Ojala and Hallikas (2006) concentrated on supply chain risks in electronics and metals, Nagali (2008) studied the methods and processes employed to tackle supply chain risks at Hewlett-Packard. Schoenherr illustrated a case of a company selecting sources of provision of consumer goods to the United States to name but a

few. Furthermore, Khan (2008) described a study of risk management in clothing and fashion markets, Berry and Collier (2007) and Blackhurst (2008) focused on the automobile market, Ritchie and Brindley (2007) discussed these issues in relation to agricultural equipment, Zsidisin and Smith (2005) and Vanderbok (2007) devised a case for aerospace engineering. However, these examples are only illustrative, as there are many more convincing studies of risk management in various industries suggesting different models and solutions.

Supply risk was defined by Zsidisin in 2003 as the probability of an incident associated with inbound supply from individual supplier failures or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety (Zsidisin, 2003).Risk is the possibility of suffering harm or loss and born of uncertainty. Supply chain risk refers to uncertainty or unpredictable event affecting one or more of the parties within the supply chain or its business setting, which can influence the achievement of your own business objectives (Fischoff, 1984)

The definitions of supply risks, provided by Mentzer is following “supply risk is the distribution of outcomes related to adverse events in inbound supply that affect the ability of the focal firm to meet customer demand (in terms of both quantity and quality) within anticipated costs and time, or causes threats to customer life and safety” (Mentzer, 2008)

What most definitions of risk have in common are the three dimensions (Ritchi , 2007):

1. likelihood of occurrence of a particular event or outcome;
2. consequences of the particular event or outcome occurring; and
3. causal pathway leading to the event.

Supply chains might have both primary and secondary levels. Primary level assumes direct participation in supply of goods and materials, whilst secondary usually implies indirect cooperation (like providing goods and services to vendors who are contracted by the recipient company). Primary cooperation is more clearly defined and is usually more transparent, as it is governed by direct contracts. Common risk factors range from general ones like industry or business environment issues to specific partner communication or particular supply chain failure.

External risk factors include things like wars or global financial crises, which affect all economic actors. Particular industry-geared supply chains might be less prone to risk factors than others. For instance, local groceries will not be affected too strongly by restriction on importing particular produce from abroad due to health and safety concerns than huge grocery chains selling this produce. Specific supply chain characteristics might be a source of risk themselves. Same applies to business partner relations: clearly, the more unstable the business partner is, the more exposure to risk there is for a supply chain. Lastly, there are risks emerging from internal company arrangement and procedures, which could be limited through improved employee training and better control processes.

Supply chain failure can be revealed disruptions, delays, system breakdown, Forecast inconsistency, Intellectual Property issue, Capacity problem etc.

Classification of risks in supply chain (Finch, 2004):

- External risks can be driven by upstream or downstream in the supply chain
- Demand unpredictable or misunderstood customer or end-customer demand.
- Supply risks of flow of product within your supply chain.
- Environment shocks outside the supply chain.
- Business suppliers' financial or management stability.
- Physical condition of a supplier's physical facilities.
- Internal risks related to companies control:
- Manufacturing disruptions of internal operations or processes.
- Business changes in key personnel, management, reporting structures, or business processes.
- Planning and control risks caused by inadequate assessment and planning, and ineffective management.
- Mitigation and contingency risks caused by not putting in place contingencies.

The classification of risks proposed by Ghoshal (1987):

- Macroeconomic risks

- Policy risks (political risks)
- Competition risks
- Resource risks in overseas markets.

Unfortunately, risks are unavoidable feature of supply chains. The dichotomy of external and internal supply risks was introduced by Cucchiella and Gastaldi in 2006. Kleindorfer and Saad (2005) followed the same lines, pointing out the risks associated with supply and demand (internal) and some disruption risks (external). There are a number of methods and tools to be used for risk mitigation, and successful risk management strategies aim to ensure good stable deliveries and client satisfaction.

Mentzer and Firman (1994) assert that what cannot be quantified cannot be managed, and what is measured erroneously will be mismanaged. These points to the necessity of good performance metrics that would allow managers to make informed decisions on their policies. This paper will not propose new performance metrics for use by practitioners. However, it points out that there is a lot of room for improvement in this field for scholars and practitioners.

The author of the paper identifies most crucial for FMCG supply chain risks as following:

- Out of material stock
- Out of stock of finished goods (FMCG products)
- Very high stock (that lead to indirect losses)
- Undelivery of products (lost of reputation, market share, loyalty etc)
- Inconsistency of processes and shared information
- Break relations with supplier or bankruptcy of the supplier
- Higher price (delivery price, production prices) tangible costs increase
- Bad quality of final goods
- Inefficiency of the processes

From the whole variety of risks classification it is important to identify suitable risks scale applicable for single industry in single environment.

Author assume that if all risks can be split into regular and non regular for the purpose of this paper it is reasonable to describe solutions for only regular risks in FMCG sector. As non-regular risks are unpredictable and very complex to systematize and mitigate. Author posses that mitigation of those risks lays out of scope of supply chain but becomes a responsibility of insurance companies.

§1.2.1 Risks mitigation solutions and instruments

«Global supply chain risk management is the identification and evaluation of risks and consequent losses in the global supply chain, and implementation of appropriate strategies through a coordinated approach among supply chain members with the objective of reducing one or more of the following – losses, probability, speed of event, speed of losses, the time for detection of the events, frequency, or exposure – for supply chain outcomes that in turn lead to close matching of actual cost savings and profitability with those desired.» Mentzer (2001)

Supply risk managers should consider complexity issues in their supply chains. The more complex the networks, the more prone to error they are.

Supply chain risk evaluation is an important part of supply chain risk management, where risk minimization is major objective.

The first step of supply chain risk evaluation is to identify the risks in supply chain - risk identification (discovering, defining, describing, documenting and communicating risks before they become problems and adversely affect the supply chain. In order to manage supply chain risks effectively and mitigate them to the most degree, the important thing is to know what they are.

We need to capture as many risks as possible and make sure that as less risks as possible will be missed out. As risk identification is a very subjective process, and to avoid the subjectivity the best solution is to involve - outsiders as well as people who are familiar with the business and know it well. In this paper author is going to accumulate all potential risks and range it and then provide companies with expertise and fresh viewpoint's for already existing solutions.

Many authors were describing option approach for risk management (Harland et al., 2003), which consists of following steps:

- Supply chain analysis
- Uncertainly sources
- Subsequent risk examination
- Risk management
- Selecting the most suitable real option
- Executing the chosen risk management approach

There are three steps to complete opportunity analysis: review and refine the assumptions and associated financial and service numbers; identify further validation resources for content as well as change management value, then to prioritize them.

When company operates in the environment of high uncertainty: purchase new material, try new supplier, launch new sub-process in purchasing process, and work on creating of totally new product for the market it can cause a number of problems.

Global companies usually concentrate on three key approaches that serve as the basis for supply and demand cooperation and disruption risk management strategies. These broad approaches are discussed below.

Supply chain design: design side methods include varying site location and size, product allocation, inventory location and logistics issues. In addition, supply chain design encompasses contracting advances that allow for better volume and risk management along the chain. Operation Management scholars and practitioners have been focusing on how to reduce cycle times and waste through redesigning activities encompassing removal of excess stocks, tools or facilities. Scholars are trying to find the answer to the central question of risk management, which is what the correct balance between leanness and robustness to disruptions is.

Contracting: innovations in traditional individual contracts between buyers and sellers and development of new B2B and B2C exchanges led to considerable revolution in contracting in supply chain management scholarship and practice. New market tools for contracting provide potential buyers and sellers with adequate information including price discovery thus reducing transaction costs. These internet-based tools certainly present a new opportunity to reduce supply chain risks through faster inflow of adequate information, less transaction costs, smoother standardized practices, shorter time periods required to conclude a sale and so forth.

Risk management systems: disruption risk analysis, quantification and management systems have also evolved considerable over the past thirty years. Typically risk analysis and management in the industry is described in terms of four integrated processes:

- Underlying risk sources identifications and devising the ways in which the aforementioned risks could come about;

- Quantifying the potential effect of these risks' materialization under different scenarios;
- Damage control and financing residual risks;
- Devising adequate rapid response and crisis management systems.

General Motors has developed classification of potential failures and organized all threats into four groups of vulnerabilities:

- Financial vulnerability
- Strategic vulnerability
- Operational vulnerability
- Natural disaster vulnerability

For the scope of the paper just two groups are relevant: financial and operational.

One of the best solutions for risk management is Modes and Effects Analysis (FMEA). It is a process utilized by product developers and operations managers to analyze potential failure modes, which are classified by likelihood of occurrence and potential severity of impact. FMEA uses past data for similar products and processes to identify potential failure modes. This prior knowledge of the potential pitfalls allows managers to keep the problematic areas out of the system at early stages with minimum effort, in short time, and at minimum cost. Traditionally, these approaches were utilized in manufacturing throughout the product life cycle, but now they are becoming more and more popular in the services industry as well. Failure modes are defined as any flaws or errors in the process, item or design, especially if they affect the customer. Failure modes can be potential or actual. Effects analysis denotes evaluating the potential impact of failures coming into play.

As mentioned above, FMEA processes classify failures according to frequency of occurrence, detection ease and impact severity. FMEA systems keep track of current knowledge and actions for dynamic improvement. FMEA prevents potential future failures at the design stage. In this case, it is sometimes referred to as DFMEA. At the later product development stages, FMEA is used for product control. In the best case scenario, FMEA has to be applied at the earliest conceptual stages and is then carried through along the life span of a product or service.

FMEA leads to taking measures to prevent, reduce likelihood or limit the impact of failures. As failures are prioritized from the most likely and severe ones down to the

more minor ones, so are the actions, and most important potential failures are tackled first. FMEA might be utilized to come up with risk management priorities to deal with established threat vulnerabilities. Ultimately, FMEA allows supply chain managers to come up with remedies for limiting effects of failures on the product cycle.

Accumulated table is presented as author is describing potential failures for FMCG sector:

A Severity rating is determinant of all failure modes based on the functional requirements and their effects, which are defined as the result of a failure mode on the function of the system as perceived by the user.

Each effect is given a severity index from 1 (not danger) to 5(critical)

1 – no effect
2 – minor effect
3 - tangible effect
4 - strong effect
5 – hazardous effect

Detection rating is determinant of appropriate actions efficiency, in other words how big the probability of failure to be identified or detected.

Each effect is given detection index from 1(certain) to 5(uncertainty)

1 – certain
2 – explicit
3 - moderate
4 - doubtful
5 – absolutely uncertain

All potential failures are gathered in one table:

Table 1: Failure modes and Affects analysis instrument:

Failure mode Effects	Seve-rity rating	Causes	Detec-tion rating	Impact for company	Current controls	Recommended actions
Out of material stock , Out of stock of finished goods, Obsolescence of inventories and stocks	5	Wrong forecasting, emergency issues, bullwhip effect, strong internal, external factors	3	Losses up to reputation loss	Stock level KPIs, delivery performance metrics	VMI, transparency of the ordering process, ERP data consistency and transparency
Very high stock	2	Wrong forecasting, demand decrease	3	Intangible losses	Stock level KPIs, delivery performance metrics	VMI, ordering process transparency
Inconsistency of shared information and inefficiency of existing processes	2	ERP and EDI errors, no driver of the process, no motivation for employees	1	Intangible losses	missing	Educational session, stakeholders engagements, data consistency KPIs in the company
Break relations with supplier or bankruptcy of the supplier	3	Economical and political factors, internal suppliers problems	2	Intangible losses, but can lead to harmful consequences	SRM activities	VMI, support for customer, SRM activities improvement
High price for material and services purchased as a part of sourcing failure	1	Wrong batching policy, inefficiency of the process, sourcing failure	2	Tangible losses hardly evaluated	Price forecast accuracy check	Complex analysis of prices and performance, sourcing policy double check
Bad quality of finished goods and services provided	4	Production failure, quality control function is missing	4	Tangible losses up to reputation and loyalty loss	Quality control, quality KPIs	Quality center and quality control on each step of production

The table shows how supply chain optimization crucial for avoidance some potential failures.

Supply chain optimization in industrial applications presents great challenges. Each supply chain has its own unique and complex features, which require creative modeling and solution techniques

There is technology in place to aid the supply manager's dilemma; however, IT systems alone cannot be expected to lift all the supply chain risks. Indeed, blind reliance on software application has led to significant financial losses for many companies. Modern supply chain management IT implementation requires holistic approach, much like SCM itself, as it has to incorporate adequate training for software operators and even more importantly process change, change of attitude and significant effort.

"All successful companies definitely have one thing in common; all of them use information technology (IT) for managing their supply chains. A seamless collaboration of SCM software with Enterprise Resource Planning (ERP) systems is mandatory." (Knolmayer et al. 2002)

These systems are often referred to generically as Enterprise Planning Systems or Enterprise Recourse planning (ERP). "The use of these systems has the potential to convert supply chains into demand chains in the sense that the system can now respond to known demand rather than having to anticipate that demand through forecast"

Due to large the large variety of components and the complexity of the production process, the production lead times are long, resulting in mismatches at the time of the actual customer commitment. (Logistics and supply chain management.Jing-Sheng SONG , 2002)

§1.2.3 Performance metrics for risks detection

Lonsdale and Cox (1998) make the assertion that performance and risk are linked and that any measure should reflect careful consideration of potential risks of strategy implementation. They argue that cost-benefit analysis should always be exercised in relation to risks, costs and benefits.

There are a number of ways to access company performance and to evaluate the risks, and these measures could be mutually contradictory. Various stakeholders might pursue different interests, carry different attitude to risks and have different expectations from the business in the short and in the long run. «Performance metrics are an

important determinant of the temporal perspective of managers» (Mentzer and Firman, 1994)

Major attributes of supply chain performance are defines as (Bolstroff, 2006):

1. Cost of supply chain
2. Efficiency of assets management
3. Delivery performance
4. Flexibility and responsiveness

Exemplars of risk management responses include risk insurance, information sharing, relationship development, agreed performance standards, regular joint reviews, joint training and development programmes, joint pro-active assessment and planning exercises, developing risk management awareness and skills, joint strategies, inter-partnership structures and relationship marketing initiatives.

The variety of solutions and latest tools for risk identification and mitigation is impressing. From the whole specter of existing methodologies, classifications and practices only the relevant risks should be detected and mitigated. It is important to take into account price of these solutions, as prevention of the potential failure should not be more expensive than real failure on its own

§1.3 Bullwhip effect as a key driver for supply chain risks

The bullwhip effect is a new term introduced by Lee (1997), which describes a long-known situation, which has been being discussed in literature over a number of decades now. This effect means that end consumer sales tend to fluctuate in a much more moderate way than supply orders. End consumer demand uncertainly in transferred up the supply chain with ever-increasing fluctuation magnitude, as each echelon receives even more distorted and inadequate information causing even more significant production and inventory mismanagement. This situation largely resembles the Forrester effect (Forrester, 1961); as the nature of both phenomena is amplification of inventory level fluctuation up the supply chain due to inadequate demand estimations. Common factors causing the bullwhip effect are non-zero lead times, demand signaling, price variations, rationing and gaming, and order batching. This paper purports to demonstrate that VMI might potentially help to minimize the adverse effects of each of these factors.

Traditional approach for inventory managing is when customers place orders on their customers and provide forecast. Suppliers are often faced with unexpected short-term demand for products which leads to changing in the production and distribution schedules and thus additional costs. In VMI approach customer shares information regarding actual usage of the material and sales with supplier, so supplier becomes responsible for having acceptable stocks. So win - win benefits for both parties are obvious: customer can significantly reduce inventory level while stocks risks re diminish and suppliers by having direct access to demand information can improve capacity utilization.

Previously, the term Forrester effect used to denote what we now call demand signal processing, as Forrester was the first to demonstrate this factor through Dynamo simulation. Behavioral psychology often resorts to the term bounded rationality implying sub-optimal but borderline rational decision making by actors. This is the term endorsed by Sterman (1989). Stalk and Hout (1990) provided insightful further analysis of this factor, giving way for the Boston Consulting Group to come up with a number of solutions for the problem through dynamic simulation.(see fig 3)

The drive to gain economies of scale sometimes backfires on its pursuers, as order batching or the Burbidge Effect (Burbidge, 1991) might also cause the bullwhip effect. Burbidge points out particular problems that this effect might cause shopkeepers unless duly watched. Towill (1997) proposed solutions for this problem through an integrated approach known as “Forridge”. The term is largely self-explanatory: Towill integrated and developed the ideas put forth by Forrester and Burbidge.

Stevens (1989) pointed out that the links, uniting suppliers, distributors, customers and so forth in a firm supply chain are downstream feed-forward materials flow and the upstream feedback information flow.

One of the key problems faced by each actor along the supply chain is known as the inventory control problem. All actors need to determine their level of output satisfying the next unit in the chain. Axsater (1985) pointed out the necessity of preparing coherent coordinated market plans as opposed to traditional approach of each actor deciding on inventory levels based on his/her sales in order to solve the inventory control problem. Traditionally, actors have wanted to stay in complete control of their assets and have not seen it necessary to spread information along the supply chain. In practice, supply chain echelons analyze demand, inventory level and order data on their

own in order to make their own independent decisions regarding the necessary production level. Sometimes, actors choose to act on their expertise or judgment rather than on mathematical modeling. Unfortunately, both traditional approaches assume that production levels depend solely on sales to next-in-line customers. In particular, such arrangements prevent suppliers from knowing what their immediate customers purchase in order to satisfy their own customer service level, and what the level of their consumer demand is, as illustrated by Kaipia (2002).

Inadequate demand knowledge certainly leads to distortions in production level estimations widely known as double-guessing culture. Often an actor would react to real demand fluctuations by ordering too much, which is then amplified all the way up the pipeline. This is commonly known as the Forrester effect. Cumulatively this leads to significant supply line distortions and inadequate inventory level estimations. Therefore, this paper would like to study these effects further and to examine the ways in which VMI might be helpful in limiting the magnitude of fluctuation through source-by-source approach.

Rationing and gaming are sometimes referred to as the Houlihan Effect after Houlihan (1987). This effect suggests that missed deliveries lead to higher safety stock levels and thus inflated orders. As more orders are made, the chain becomes more vulnerable to unreliable sources as reliable ones lack capacity to increase production instantly. All of this leads to bullwhip effect going up the supply chain with increasing magnitude. Houlihan described this process as the flywheel effect. Edghill (1988) demonstrated this phenomenon in action in the automotive sector. Price variation describes offering goods and services to consumers at lower prices through various promotions in order to boost immediate demand assuming elasticity.

Stock levels are usually lower at the bottom of the supply chain and higher at the top due to the bullwhip effect, as inadequate information and demand forecasts lead suppliers to be stocking more than direct retailers. Ironically, Lee submits that the bullwhip effect might be caused by rational decision-making of independent actors. Actors might be separate entities (inter-organizational echelons) or members of the same entity (intra-organizational echelons). Internal bullwhip effect is yet to be studied in more detail by scholars. Supply-side policies often revolve around postponement and speculation. Often companies would both hold a high stock level, which is known as

speculation, and sometimes – do the contrary, which would be known as postponement, in the incoming and outgoing material flows.

Therefore, the bullwhip effect is effectively caused by the lack of coordination along the supply chain. Supply chain management propagates holistic approach to business activities, which helps to limit the potential bullwhip effect. This work relies on the concepts of postponement (Alderson, 1950), speculation (Bucklin, 1965), the value chain concept (Porter, 1985) and the bullwhip effect (Lee, 1997) exploring them in more detail.

As outlined above, Sterman endorses the psychological element in supply chain management. He demonstrates how flawed information sharing and demand estimation inadequacies lead to human errors of judgment along the supply chain. Xu (2001) contends that cooperation is effective in reducing producer safety stocks when producer demand estimation errors are greater than those of retailer. Coordination might reduce the safety stock level and order release variance. It is important to note that application of this concept might vary depending on demand conditions: stationary demand might yield different results to non-stationary demand.

Many scholars have proposed measures tackling the bullwhip effect. The adverse consequences might be overcome through shared planning and forecasting, control over price fluctuations, review of reordering and reduced lead times. Most important works in this sphere are Lee and Billington, 1992; Towill, 1996; Fransoo and Wouters, 2000. The concept of information sharing and cooperation between supply chain actors is further endorsed by Baljko (1999), who goes on to note the importance of internet-based technologies in this respect. Lee's typology of causes and remedies of the bullwhip effect is underpinned by cooperation instruments such as knowledge transmission, channel alignment and better operational efficiency. Real demand data has to be passed up the supply chain in good time in order to reduce the bullwhip effect potential. Channel alignment suggests collaboration in transportation, ownership, pricing and inventory planning. Lower costs and shorter lead times might also be instrumental in mitigating the bullwhip effect.

The index is calculated thus: variance of goods produced over variance in consumer sales. It is important to note that both variances should be measured in same units and over the same time stretch. Clearly, this formula describes fluctuation growth from

consumer sales to production, whilst it can be modified to account for amplification between any supply chain echelons.

It is certainly intriguing a task to check whether concentration on the bullwhip effect index might help real-world managers to develop more efficient supply chain approaches. It has been demonstrated that low BE index figure is no safeguard from high costs and high inventory levels. Indeed, it makes sense that fluctuations would be the lowest if all supply chain echelons were holding significant stocks all the time. However, this contradicts the mission of supply chain management. BE index variations tend to yield different results under different supply chain strategies as far as costs and inventories are concerned.

There is a parameter of system reaction time, which is time it takes for information to pass along the chain and time it takes for material stock to pass down the chain

- Consumer demand forecast errors
- Increased security stocks due to flawed forecasting
- Ignorance of promotional activities (sales, advertising campaigns) leads to greater fluctuation magnitude
- Greater fluctuation magnitude due to minimum order size rules
- Greater fluctuation magnitude to heated demand during the out of stock period and frequent order cancelation following restocking
- Lack of general information on the chain conditions

In real life, events sometimes do not go according to plans, and hence the potential demand pattern deviations, which create significant problems for supply management systems. These deviations can be caused by a range of factors – from single events to whole sequences of coinciding outcomes. Many stakeholder groups – company employees, consumers, producers, etc. – have their own appreciation of what the level of real credible demand, and those estimations often differ greatly. Every interest group along the chain can affect the chain condition significantly through ordering various quantities, but each single one only covers a fraction of the system. The perceived asymmetry in the degree of influence and the share of input might lead to significant supply chain distortions if the actors do not cooperate efficiently.

The bullwhip effect might be caused by any actor along the supply chain and by external factors at any supply chain stage.

Unexpected demand spike on retailer side inevitable affects the distributor – and eventually – to the supplier. It is important to note that not only does the demand level deviation affect all actors along the chain but it also affects them with increasing magnitude at each new level. The deviations grow as they go up the chain leading to significant estimations flaws at different supply chain levels.

The bullwhip effect leads to excessive stock inventories, increased production costs and overheads, potential quality distortions, worse customer support, foregone sales, increased logistics costs and so on. It is vital to estimate the potential scope of bullwhip effect for smooth supply chain operation. However, it has been suggested that the bullwhip cannot be eliminated overall, since the supply chains might be affected by a whole host of unforeseeable external factors ranging from trade union activity to changes in political environment.

Though, bullwhip effect cannot be eliminated completely as there are other factors which are beyond the influence of suppliers and organizations like strikes, change in government policies, environmental factors, etc.

Real world supply chain management requires its practitioners to watch the relationship between their strategy of choice and the BE index. Unfortunately, concentrating on a low BE index figure does not yield the results that managers could rely on at all times. The world is complex and consumer demands are becoming more and more sophisticated every year. This work still argues that BE is a useful tool in making managers' lives easier, and BE index concentration might even produce desirable results under some strategies, even though, unfortunately keeping BE index low does not solve all tasks faced by supply chain managers.

Ultimately, the problem behind this is overestimation of required inventory levels in order to protect the company from demand spikes – and hence higher costs. This topic was addressed by Pete Sinisgalli of Mangattan Associates at the Atlanta CSCMP roundtable. He pointed out the link between inventory overestimation and the fact that global conditions are becoming more and more complicated daily, and hence the need for companies to protect themselves. He focused on several selected aspects of the problem:

- Globalization takes its tall resulting in higher number of global players, more actors, more time zones covered, more cultural aspects to be taken into account, less scope for hands-on management, and less controllable systems
- Outsourcing is not necessary always good, as it sometimes leads to releasing quality control over goods and services provided
- Ever-changing regulatory conditions
- Product life cycles are getting shorter and this also leads to excessive inventories
- Marketing channels are ultimately converging, as telemarketing, internet technologies and classic retailing are often combined
- Emerging technologies sometimes mean excess stocks and extra costs RFID, Voice Automation

“In 21st century most firms have increasingly come to rely on outsourcing: they have enhanced the cooperation with suppliers and they have reduces the number of vendors in the supply base.” (Supply Network Strategies)

Bullwhip effect identification is by no means a cure to supply chain variation problems, as the problem calls for amending core business processes and approaches. This usually encompasses IS-investment and extensive teaching and training. Metters (1997) points out that these measures do not come cheap, and therefore the positive effects of limiting the bullwhip effect have to be outlined in order to rationalize these investments. As per Cachon and Fisher (2000), and Carlsson and Fuller (2001), different anti-bullwhip effect approaches should be tested through various simulation models.

It is contended that supply chain collaboration should only encompass general broad functions such as warehousing, logistics, purchasing, outsourcing of business processes and functions and so forth. On the other hand, some scholars say that company-specific information need not be spread along the chain.

Analyzing the bullwhip effect in a multi-echelon supply-chain configuration, they used a moving average function as demand estimate, finding out that:

1. the smoother the demand forecasts, the smaller the increase in variability;
2. the longer the lead time, the more demand data the retailer must use in order to reduce the bullwhip effect;

3. the larger the demand autocorrelation coefficient, the smaller the increase in variability;
4. complete retailer demand information does not help to eliminate amplification upstream.

This last conclusion contradicts the suggestion of Lee et al. (1997) that complete information provided to stages, instead of downstream information, aids reduction of the bullwhip effect. Later, Croson and Donohue (2005) have argued that sharing downstream inventory information is more effective in reducing the bullwhip effect than sharing upstream information.

Many scholars have devoted their work to devising methods for mitigating the magnitude of variation. In particular, Geary (2006) has pointed out the necessity to reconstruct the mitigation principles. For instance, he concentrates on optimal minimum led time, calling this the time compression principle. This work would also discuss the information transparency principle, the synchronization principle, and the demand forecast principle. These principles purport to eliminate or minimize noise value along the supply chain and to make the ordering more efficient

Lee (1997) has pointed out that the magnitude of fluctuations along the supply chain depends upon four key factors: demand signal processing, order batching, price variations and strategic ordering behavior. Stationary stochastic demand processes deserve special attention, and Chen (2000) explored this territory discovering explanation of the variability elements.

Companies often decide whether to produce goods and services themselves or to purchase them externally based on short-term cost-benefit analysis. However, in the long term, opportunity costs have to be considered complimenting the short-term notion of avoiding bottlenecks through premium capacity. Mertens and Knolmayer (1998) offer a wide range of different techniques for evaluating outsourcing. At the moment, a lot of companies outsource ERP applications operation to third parties, and this trend is assumed to expand with Internet technologies development, as companies would share more knowledge and functions over the Internet.

Information sharing is one of the most obvious and common collaboration practices. Companies might opt to share there IS arrangements or implement new systems and solutions together. Cooperation in these activities might call for creating a separate joint entity or specific outsourcing.

Large companies sometimes resort to Business Information Warehouses (BW) in order to connect highly developed company-specific IS, which is difficult to merge otherwise. BW allow for quick knowledge sharing in SC management. Companies, which wish to participate in such an arrangement, have to devise common rules for semiotics, common data model, transfer of information from company software applications and rules for erasing unnecessary data. Information is uploaded into the warehouses from corporate ERP software in extracts for the matters of speed and storage efficiency.

Recently, companies have started outsourcing functions, which had previously been closely held and regarded as strategic. Traditionally, many companies outsourced support functions such as HR, legal advice, accounting and tax, and advertising. However, nowadays companies purport to use external specialists for development work due to the innovation advantages of mid-sized companies over large ones, and SC cooperation between actors during product development. Supply Chain brokerage might include coordination of sub-chains, and it is being debated whether companies should outsource large parts of their value chains to third parties.

It is traditionally perceived as advisable for companies to concentrate on their core competencies and outsource everything else to external experts. Supply Chain Management establishes competition between groups of companies united into Supply Chains rather than between individual companies. However, sometimes it is far from clear, which units some of the core competences should be transferred to.

Various core competency (CC) assigning categories could be CCs within a specific company, CCs of the SC, where functions are passed to Supply Chain partners, and external expertise, whereby functions are transferred to companies outside the scope of the Supply Chain. In addition, it must be evaluated whether companies should abolish functions that overlap with the Supply Chain at all, but it is worth pausing to consider that this approach is potentially problematic, especially if the Supply Chain is unstable. In a way, this is a reiteration of the earlier debate of outsourcing ‘strategic’ functions, which were closely held precisely for the reason of preserving stability.

Economic theory praises division of labor, however, it is not entirely clear how to establish optimal division of labor level for businesses. It is certainly true that division of labor might be instrumental for businesses in performing individual functions with more efficiency; however, these benefits could be offset by organizational structure detriment.

Anderson (2000) points out those forecasting methods should take account of the whole supply chain rather than looking into local costs only, as this might lead to companies relying on partners, which might have suffered from volatility earlier. Companies with supreme forecasting practices certainly bring less risk exposure to the Supply Chain. Customers might also use their own forecasting methods and thus reduce volatility faced by their suppliers. Baganha and Coher (1998) argue that sometimes the bullwhip effect might be reduced through holding stocks at the distribution center, as just in time policies might actually be damaging to companies as far as Supply Chain Management is concerned. Wilding (1998) alerts to the possibility of stocks and lead times reduction in one echelon of the chain leading to instability rather than efficiency at other stages of the chain. Therefore, it could be argued that Supply Chains require a balanced approach considering many factors in play.

Chen (1999) argues that downstream errors might have stronger adverse effect on the system than upstream mismanagement and that it is therefore desirable to transfer information lead-times upstream rather than downstream. It has been argued that supply chain managers do not implement a systematic approach, which limits the success of their policies, as they currently manage to achieve better ordering practices at best.

Lee's proposals in reducing the bullwhip effect might by summarized as follows:

- Access to POS data;
- Single replenishment control;
- Just in time supply and lead-time reduction;
- Vendor-Managed Inventory (VMI);
- Electronic Data Interchange (EDI) and Computer Assisted Ordering;
- Further logistics outsourcing, discounts on truckload;
- Regular delivery appointments;
- Less promotional sales and special deals distorting price and demand forecasts;
- Everyday low prices;
- Special purchase contracts;
- Allocation of short products based on past sales.

Sterman (1989) makes great use of the famous beer distribution game in order to highlight the importance of demand forecasting in supply chain management. He points

out that most players claim that their results could be improved with better demand knowledge, and that players are generally surprised that their own actions during the game cause the discrepancies they experience. This highlights the problems faced by real-world supply chain managers.

Chapter 2. Research Methodology

Investigation of the Bullwhip Effect and evaluation of its impact on various processes along the supply chain coupled with analysis and mitigation of risks contemplate complex study field, which requires utilization of different methodological techniques.

Creswell (1998) pointed out that if the phenomenon of interest is new, dynamic or complex, then relevant variables are not easily identified and extant theories are not available to explain the phenomenon.

Supply Chain Management is an exciting study field for both practicing managers and scholars since successful insights in this sphere can actually provide strong competitive advantages (Christopher, 1998; Gimenez and Ventura, 2003). It is perceived that this area still lacks practical implementation in the light of the growing body of scholarly knowledge.

§2.1 Case study research consideration

There are some guidelines on using case study research methodology in SCM and Logistics and Operations Management literature. Perhaps McCutcheon and Meredith (1993) are the first authors to be noted in this respect. Some scholars like Mentzer and Flint (1997) and Meredith (1998) provide useful insights into performing surveys. In addition, Mentzer and Kahn (1995) provide a valuable Logistics research framework. However, scholars do not provide combined approach to the issue integrating both case study and survey.

Meredith (1998) provides a useful explanation of what a case study is. To him, case study represents an empirical insight in a single environment allowing to account for temporal issues and context whilst observing information from a number of bodies collected via a number of qualitative and quantitative tools.

Survey implies data collection from respondents via mail, telephone conversations, interviews and so forth. Malhotra and Grover (1998) point out that surveying is a quantitative method utilizing standardized questioning techniques in order to gain representative data.

In the case, qualitative approach is preferred as it provides a deeper level of understanding of the new or complex phenomena.

Eisenhardt (1989) points out that case studies allow for accounting of context issues but limit the depth of analysis. Swamidass (1991) echoes this thought by arguing that case studies lead to establishing basic understanding of vague issues. Meredith (1989) adds that true potency of case study research is bounded by its ability to reflect conceptual developments without suggesting broad theories instantly, which is a view shared by Weick (1995) and Swamidass.

Yin (2003) asserts that the ability to apply very flexible research tactics borderlining on opportunistic is one of the key advantages of the case study method, whilst Stuart argues that it might at the same time be a significant weakness, which alerts the researcher to the importance of close attention to particular details of the research.

It is important to establish what insights can be derived from case studies. As mentioned above, case studies put real company data into context. Furthermore, Yin delineates between three types of case studies: exploratory, descriptive and explanatory. In addition, Yin argues for specific different case selection criteria: extreme or unique cases, typical or representative cases, revelatory cases, longitudinal cases and cases that work as pilots in multi-case settings. Eisenhardt argues that on the contrary multiple cases often utilize replication logic, which does not prevent them from being used to select suitable cases from certain domains.

Case studies and surveys have certain similarities as they are both field research methods. However, there are also some important differences including research purpose. Case studies are normally employed to explore new research areas and to generate assumptions and hypotheses, whilst surveys are brought into the game later on to test the hypotheses. Case studies are also useful for theory building, which encompasses establishing links between variables and discovering patterns in data. This is because case studies provide knowledge that cannot be derived directly from statistical analysis.

In general, case studies often emerge from existing contacts a researcher has in the industry. This is justifiable, as the researcher still needs to assess why these cases are useful and what the main purpose for researching them would be. This way, one central critique of case study research (that it lacks the rigor of other approaches) could be avoided or at least mitigated.

According to Gimenez (2005, p. 327) case study methodology has the following Advantages and Disadvantages:

Table 2: Advantages and Disadvantages of the Case Study Methodology

Advantages	Disadvantages
Provided complete information because the data collection was not constrained by the rigid limits of a questionnaire	It had high validity among practitioners
Led to new and creative insights	We were not able to generalize the results because of the reduced sample size
We were able to explore relation-ships	The case study method is usually criticized for its subjectivity. We reduced this limitation by triangulation
We obtained a good understanding of the relationships between the constructs object of study (integration and performance)	It was very time and money intensive (due to the need to travel around Spain to conduct personal interviews)
It increased our contact to real life	

As discussed in literature (e.g. Yin, 2003: 21), case selection often has to be op-portunistic and might be starting at a focal company. In the BAT case, focus was provided by the particular process studies. The study was performed with single company because it is difficult to compare two companies even in the same industry, as each company operates in a unique environment and conducts unique processes.

"Qualitative research question often start with "how" or "what" indicating the researcher's aim to describe a process" (Golicic et al., p. 22, 2005)

Research question of the paper is what the bullwhip effect impact on operating activities in supply chain is and what solutions could be used to mitigate risks caused by the effect?

In order to answer this question, the author needs to answer a number of other questions, as the Bullwhip Effect is a new phenomenon and classification and recognition of risks depends on time, environment, industry sector and every single company.

In order to answer the research questions we need to answer first what the bullwhip effect is and other related questions such as:

- What creates the bullwhip effect? (An answer to this question will help to identify the underlying reasons to aid tackling the issue of coordinating information and planning along the supply chain).
- How to identify the reasons behind the bullwhip effect and minimize its impact?

- Methods for containing the bullwhip effect
- Potential risks identification. In order to identify relevant risks effected or accentuated by the Bullwhip effect.
- What solutions can be found to tackle this impact and mitigate its effect?

This question contains solutions described in literature and well known in practice.

Answering this question enables us to answer the main question. Furthermore, it is important to trace these phenomena in existing company on the market in order to identify and deduce some recommendations and make some new conclusions based upon company case study and theoretical data review.

The research methodology used for investigation of the bullwhip effect is a combination of case study and survey, which are used as complementary methodology. Case study is used for generating assumptions, complex description of existing processes and relations, particularly for Supply chain investigation. The case study method has proved to be a useful tool in investigating the problems of ERP implementation as well. It is proved that case studies can be used as research methodology (Tsoukas, 1989, Parkhe 1993, Easton 1994, Yin 1994).

Many researchers stated that the best solution for research of is balanced approach study, which is used in this paper (Kotzab et al, 2005).

The SCOR model and a number of articles state that in order to make high quality research, all sections of supply chain should be analyzed.

An important distinction between case research and other empirical findings is that the variables of interest that explain the phenomena are not identified prior to the study. Both of the variables and the relationships between them emerge as the data is collected or analyzed.

This case study embedded case study British American Tobacco Eastern Europe where data was collected through a variety of methods, including semi-structured interviews mainly in-depth, meeting minutes, document review and participant observation, as well data analysis from ERP system SAP and other information sources.

These various techniques of data collection are beneficial in theory generation, as they provide multiple perspectives on an issue and can supply more information on emerging concepts (Orlikowski, 1993; Glaser & Strauss, 1967).

Therefore, as McPherson et al. (1993) and Sherif & Vinze (2003) proposed, a case study research method with grounded theory approach was used. The findings of the case study the so-called "derived theory" allowed the researcher to create a follow up questionnaire for a second investigation in similar settings with a wider spectrum.

The literature review took place mainly before, during, and after the project participation. As a result of the review and experiences of the participant observation, the research methodology decisions were finalized and formalized. The case study process included a research process focusing on data analysis based on the grounded theory approach by Straus & Corbin (1989) and Eisenhardt (1989).

It soon became clear that the initial concepts generated from the literature regarding risks identification and mitigation and forecast inaccuracy and its impact did not accommodate some of the findings emerging from the data. This ability to incorporate unique insights during the course study is one of the benefits of a grounded theory research approach, what Eisenhardt aptly described (1989).

Data collection and analysis involved in this grounded theory study included approximately 4 months of participant observation over the functioning of the supply chain in British American Tobacco Eastern Europe mostly in procurement department. More than 10 in-depth interviews were held with representatives from different department as well as more than 15 semi structured, attending group and cross functional meetings, document analysis, ERP data investigation and short interviews regarding forecast satisfaction were done. In-depth questionnaire in appendix

The content of these semi-structured interviews and in-depth interviews consisted of interpretation of incident of out of stock; reasons causing this out of stocks and analysis of the most potential causes, as well as analysis of potential risks that threaten the operations of the company.

An additional data source was the internal ERP system SAP, where information regarding all deliveries for 2010 and other external and internal BAT data was uploaded and analyzed.

The reason for using a quantitative instrument alongside the qualitative data was to provide an in-depth understanding of the Bullwhip Effect phenomenon from multiple angles.

§2.2 Data Analysis

Analysis of qualitative data was conducted in several iterations in order to determine the relationships between risks and processes in the company as well as to understand influence of Bullwhip effect on all these processes and issue with out of stock analysis.

Data analysis instruments used in the paper, based on internal BAT data:

- Kraljic Grid method was used for analysis of suppliers' portfolio. It helps investigate imbalance in suppliers' basket of BAT and provide reasons for recommendation regarding sourcing process in BAT
- In-depth interviews analysis: all interview results were investigated and studied and results are described in out of stock route cause case analysis and in recommendations provided in chapter.
- Plan versus actual analysis was held for forecasting accuracy evaluation: demand accuracy planning, production accuracy planning and price accuracy planning. (appendix 1)
- Year company plan analysis showed how the process of planning done and how order batching in our case influences the price some materials categories as well as shows how assumptions made for next period were proved or rejected.
- SAP internal database were studies and all KPIs of suppliers were calculated, see next chapter
- Failure modes analyses. The table help to summarize all risks, risks detection and mitigation solution together.(see chapter 1)

In the end of the paper, data is accumulated and analysis of existing methodology of risks mitigation is held, and recommendations for the company are developed.

The work starts with desk research of Supply chain risks solutions, then the findings for specific FMCG conditions are adapted and finally comprehensive approach to tobacco industry evaluation is designed.

The author considers flawed demand forecasting as a major tobacco industry efficiency threat. Demand forecasting influences material supplies and final goods and materials stock levels.

On the other hand, limited number of software solutions in this sphere also increases the role of the human factor and causes significant problems of cooperation between stakeholders of the process. Stakeholder engaging might also prove to be somewhat

problematic. Poor information flows (non-transparency of processes, unclear division of responsibilities, low quality of handovers and fast turnover of staff within the company and between the companies in FMCG) provide additional problems.

Chapter 3. Case of Risks Analysis and Mitigation in Supply Chain British American Tobacco Eastern Europe

British American Tobacco (BAT) in one of the leading international Fast Moving Consumer Goods (FMCG) companies within Tobacco Industry with portfolio of more than 200 brands all over the world. In 2010, BAT group produced over 13 billion cigarettes and showed 7% market growth. Main global brands are: Dunhill, Kent, Lucky Strike, Pall Mall, Vogue and Viceroy, forming broadly balanced brand mix between premium, mid-price and low-price segments. Much of the growth of BAT leading brands is driven by innovation: from filters, contained crushable capsule to flavors and packaging to cigarette formats. Main competitors of BAT worldwide and in Eastern Europe are Japan Tobacco, Philip Morris International and Imperial Tobacco.

BAT Eastern Europe (BAT EE) is one of the major clusters with 5 factories in the region located in Samarkand (Uzbekistan), Prilucky (Ukraine), St.Petersburg (Russia), Moscow (Russia) and Saratov (Russia) with head office in Moscow. Region operates with more than 90 Suppliers, buying more than 2800 SKU's per month in stock and producing 31 commodities yearly. From 1 January 2011 the number of regions in BAT management structure changed from five to four and a new region was formed - Eastern Europe, Middle East & Africa (EEMEA), that mean that Eastern Europe was consolidated and became a part of larger region.

As analysis for this paper is provided using data from 2010 operation year, Eastern Europe region will be considered as a separate region and independent cluster for the purposes of transparency of processes within the region. The process of transformation to new EEMEA region started in 2011 and is out of scope this paper. EEMEA was formed from all the previous Africa & Middle East (AME) Business Units plus Russia, Ukraine, Moldova, Belarus, Caucasus and Central Asia, including Uzbekistan.

Tobacco industry is FMCG Category Companies, so it inherits a lot of common for FMCGs qualities and features, including some categories of risks; on the other hand tobacco industry is unique industry in Global economy where the main driver is market and it regulations: health warnings, advertising, sales regulations etc. Companies have standardized processes globally; companies are working with the same suppliers, are buying almost the same products, and operate in the same environment, perceive the same market fluctuations, but choose different solutions and contingency solutions.

British American Tobacco is one of the leading companies in FMCG sector, operating successfully recently has met a number of serious issues, related to Bullwhip Effect caused out of stock in summer 2010 and a number of supply chain failures, such as process inefficiencies and overestimated prices for purchased materials and services, by reason of wrong forecasting and inconsistent order batching.

Bullwhip effect seems to be one of the most crucial topics in FMCG sector in Eastern Europe as presents of the effects causes real losses for the companies.

§3.1 BAT Eastern Europe Team Structure, Roles and Responsibilities

BAT Eastern Europe has Matrix structure with elements of Functional structure, official structure end 2010 in the Appendix 2. The whole chain is concentrated in the hands of Demand Chain Director. The main operating units are procurement department, material planning department, productions pants, IT support unit, product center and logistics department.

BAT supply chain has classic chain structure:

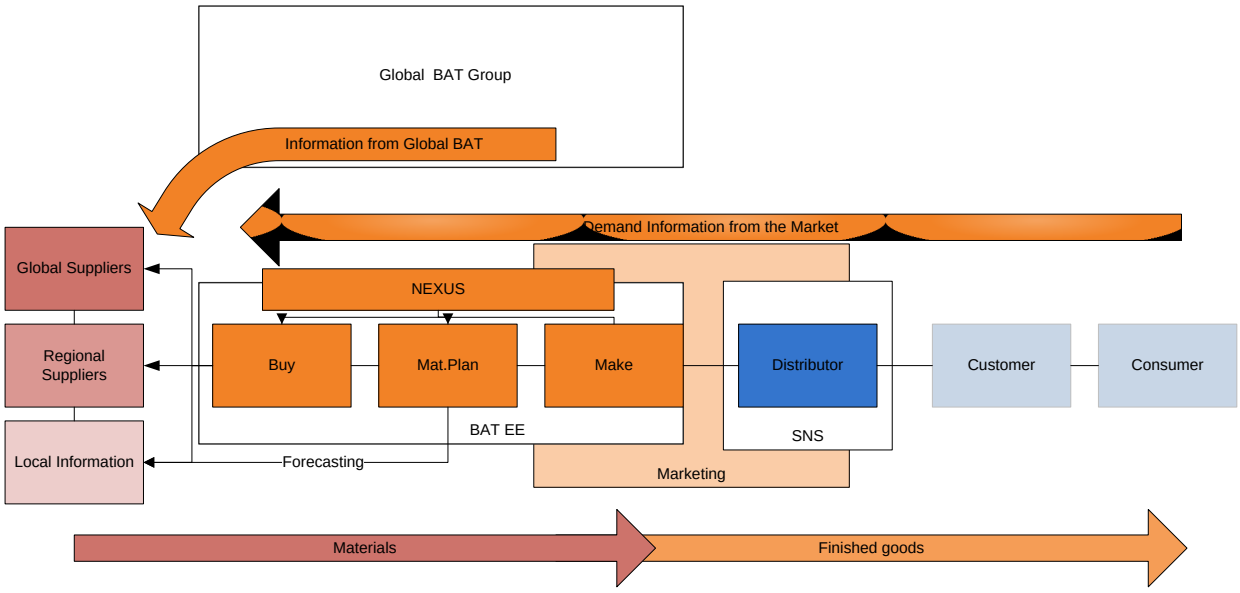


Figure 4. BAT Eastern Europe supply chain

In order to understand all the processes within BAT Eastern Europe it is very important to understand the structure and role of all units (departments of BAT):

- **Buy (procurement).** All BAT commodities supply can be roughly split in two groups: direct and indirect materials. Direct materials include all materials

participating in production of finished goods: Blanks, Tow, Crushable Capsule, Inner Bundling, Tipping, Cigarette Paper, Film, Adhesive, Inks etc. - so called wrapping materials (WMs). It is precisely the group of materials that is affected by potential risks of supply chain and has critical importance for supply chain efficient functioning. The paper concerns WMS group as a major materials group for investigating the bullwhip effect and a field for research. As tobacco strategy is approved all over the world in BAT group, tobacco and flavors are not considered as direct materials and are out of this paper's scope. This paper assumes that supply of this material is stable. Another group is formed by indirect materials: all material, services and goods that are out of scope of WMS and tobacco: from machinery and equipment for factories to office accessories for head office and promo materials for marketing. These two subgroups are managed differently, have different processes, information systems and KPI on supplying these materials. It is a responsibility of procurement to organize the sourcing process, to negotiate prices and conditions of delivery, as well as to solve major operational issues and approve development strategy with suppliers. All WMS suppliers are considered differently according to suppliers' categorization and actions for every suppliers group based on BAT policies. Agrega, which is a global procurement network to provide collaborative procurement management services, one of the leading procurement out tasking, has taken a big scope of procurement at BAT: not only noncore commodities and activities, but also some direct materials like shipping cases. Agrega covers all non-industry specific materials and services and includes Category Management, Strategic Sourcing and Supplier Performance Management. Outsourcing to Agrega is a strategic decision made by BAT directors because Agrega group can provide intelligence sourcing with strategic sourcing process, can negotiate with potential suppliers better conditions for procurement (prices, payment terms etc) by accumulating volumes of procurement (volumes of BAT and some companies from breweries FMCG). Agrega has established some new processes not only in Agrega but in BAT including e-sourcing process, new methodology of negotiating and risk assessment process.

The processes of outsourcing gain more and more power in last year. BAT actively outsourced not only noncore functions, but also some procurement activities. Off course these cooperation lead to potential risks and arise such

problems, as effective control instruments development, risks detection and mitigations tools and performance metrics development.

- **Material Planning Department.** Department of materials planning is responsible for material planning and purchasing (purchase orders and bill of material creation), materials availability check, forecasting provision to suppliers. The structure is similar to procurement structure and can be divided into two groups: WMs planning, leaf planning, machinery planning and production planning. The process of material planning and purchasing is very complicated and will be partly described in section devoting to ERP systems and forecasting process in BAT.
- **Make (Production).** As it was mentioned previously BAT EE contained 5 factories. Make function consists not only factories but also presents oneself a driver of production process including several product centers and quality centers provides quality assurance. Product centers are places where new product and material tests are taking place and quality department is controlling quality issues on the factory as well as uploading information regarding rejects and complains on material in special information system Matquis.
- **Marketing.** Marketing is a primary BAT function. Other functions are supportive businesses for marketing. Major role of Marketing is development of brands as well as organization of marketing researches. Marketing department actively cooperates with distributors, but distribution function is mostly outsourced and organized through SNS Company. SNS is one of the leading distributors in sphere of FMCG and provides services to several major players on the market.

  The Marketing department is responsible for demand forecasting and data accumulation from the marker: commercial promo activities, BTL, merchandising and launching new products on the market. The latest project is introduction of Kent Convertibles on EE Market, which was a new product including crushable mint capsule in filter, – the most significant breakthrough innovation in tobacco industry in last decade.

  Marketing departments is developing marketing strategies and brands, but technical implementation and coordination of NPIs is scope of NEXUS department.

- **NEXUS**. This department should be described very briefly. The project management team deserves particular attention, as it is responsible for launching innovations on the market, realization of new design, new materials new products for finished goods, their scope starts after marketing decision was done regarding some brands activities. This department is responsible for coordinating new projects within BAT and organizing intercommunication between stakeholders: procurement, production, product center etc., and organization of innovation support. Usually nexus's main function is initiating tests of new materials. Each month Nexus organizes so called Nexus meeting, where all stakeholders are present and split of responsibilities, process stages and deadlines on each project are clarified.

§3.1.1 Supplier's Categorization

BAT is a multinational company; it has many suppliers that should be managed differently: different processes and procedures are applied. Supplier play very important role in a number of processes in BAT, as internal BAT supply chain is cooperating with suppliers and taking into account suppliers' internal processes and activities. Offcourse depending on suppliers BAT group is developing the number of solutions to control and more effectively cooperate with supplier. As it was mentioned in theoretical part, global chains usually operate with different suppliers, implement global sourcing and manage suppliers according special internal classification or categorization.

All BAT suppliers can be roughly split into 3 groups:

- **Global suppliers** which operate in several regions of BAT. These are unique producers operating specifically for tobacco industry. BAT organizes consolidated sourcing for this group of suppliers, so all conditions and prices become a part of global negotiation and escalate top down to end markets.
- **Regional suppliers** cover one region or several countries in region and usually are sourced by region procurement team in order to accumulate volumes and gain savings.
- **Local suppliers** are chosen from the local region for easily reproducible, non-crucial commodities. these suppliers usually are managed by exception, sourcing is held locally.

It is very important to mention that BAT is very open for developing suppliers from local to global in case of fruitful cooperation and positive performance and this split is made according to market capabilities without consideration of commodity for ex, suppliers of shipping cases can be present in each group.

In BAT EE all direct material suppliers are divided in several groups:

- **Strategic suppliers**. Group of suppliers with materials of high complexity and products supplied, high spend and big quantity of delivered materials. Usually print and tow producers, which are very critical for wrapping production and for marketing success of BAT on the market. Plenty of activities are held with these suppliers starting from business review meetings, operation meetings, KPIs tracking, contingency planning, financial stability check, VMI introduction and other activities, which can be considered as activities aiming at suppliers' partnerships creation.
- **Performance measurable suppliers**. This category of suppliers is also important for Eastern Europe cluster and can be identified as group of suppliers actively cooperating with BAT, providing material of high complexity and cooperating based on unique conditions of cooperation, including special prices, information exchange, interrelations between companies and supplier relation management. Activities with PM suppliers: KPIs tracking, operations review, performance tracking and active cooperation, all global suppliers regarding BAT internal policy are present in this group
- **Non-monitored / managed by exception**. Not crucial suppliers for BAT, with irregular deliveries, usually just security check and framework contract.

In order to evaluate BAT Eastern Europe Portfolio of suppliers categorizing the purchase area within a frame, Kraljic grid was applied. The analysis was done considering several parameters:

- Commodity spend (GBP)
- Number of alternative products/services
- Several qualified supplier sources. It mean that commodity can be delivered by different suppliers from different regions
- Goods/services readily available

- Functions involvement can significantly impact price It mean that order batch is influencing the pricing and big volumes of purchasing can impact price significantly
- Design to quality is critical. This criteria mean that production with usage of following material is very complex and required special quality characteristics for example: smoothness of paper
- Complex specification It mean that material provided by supplier has unique design or is hard to reproduce.
- New technology or untested process involved in provision of the product/service (need for tests) for example crushable capsule in filters (Kent Convertibles)

Commodity supplier's position. Kraljik Grid shows suppliers portfolio of the region from different prospective. Balanced Portfolio should include supplier in all 4 quadrants, but as it is shown in Figure 2 the distribution of supplier along the grid is not even.

All materials groups are situated in Bottle neck zone, some in Routine, print suppliers in Strategic and non – Leverage. This grid show that suppliers portfolio is not diverse enough and cause some significant problems in case of unpredicted market volatility or some other political or economical effects for example can cause out of stock of finished goods in case of undelivery of products. For example unusual customs queues can cause out of stocks material delivered from outside the country. This issue is critical for Eastern Europe as logistics and transportation issues arise very often. To conclude this grid represents that suppliers portfolio is unbalance and taking into account instability of research region portfolio should be revises and the suppliers sourcing policy should be reviewed.

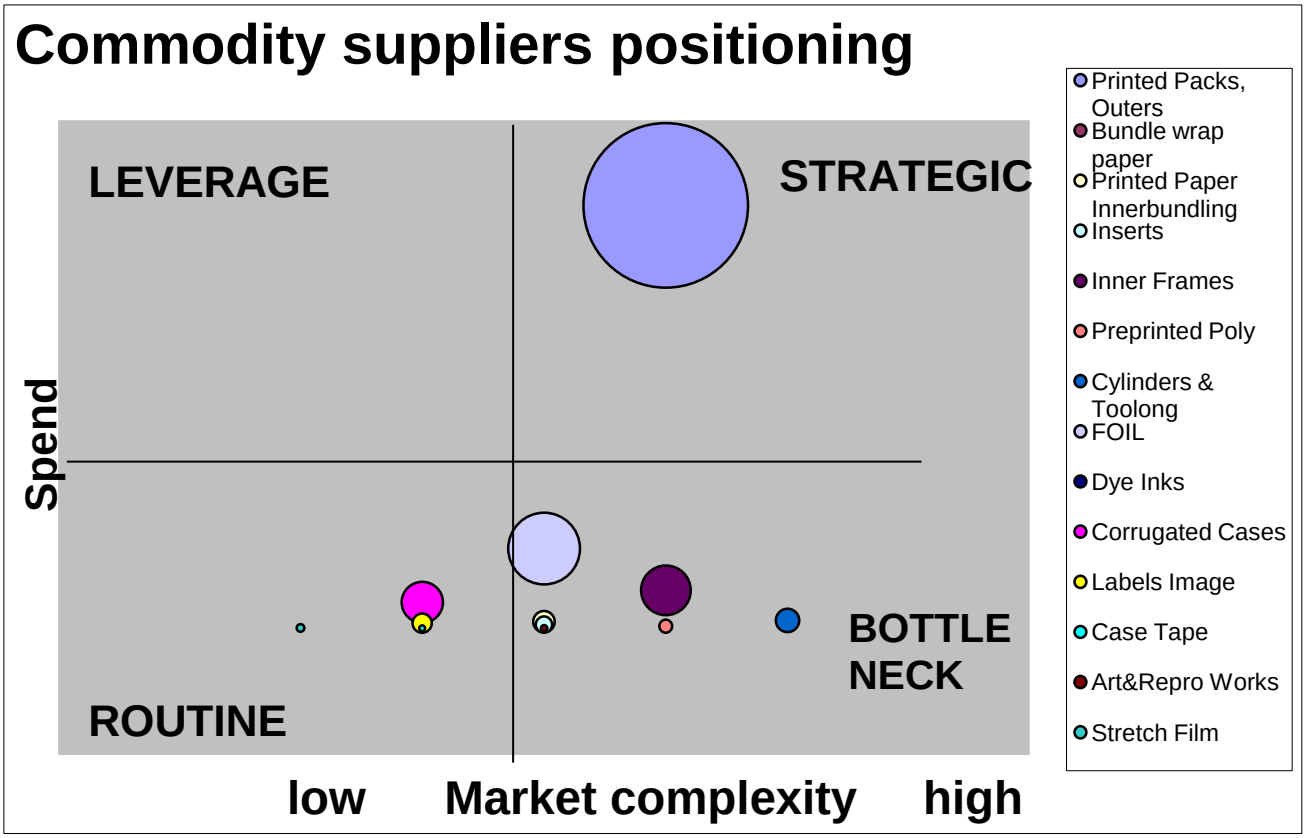


Figure 5 Kraljik Grid

For all commodities several suppliers are chosen and contingency plans are prepared. The number of replacement suppliers depends on material complexity and average lead time for the group of materials. For all materials of finished goods production see Appendix 3

§3.1.2 Eastern Europe BAT Functions and KPIs

According to BAT policy, all functions (departments) within BAT groups have KPIs, which shows compliance with requirements of the company and instrument for measuring effectiveness and efficiency of processes. Functions split was described in previous chapter .The marketing department has KPIs related share of the market and sales increase (%).

Quality – quality of finished goods and rejects % to total production, Material planning department – Stock durations, and stock quantity by the end of each month, Oder batching etc.

Procurement department has Savings KPIs: the volume of saving, that was achieved by reason of negotiations with suppliers regarding prices, or launching of new material or technology leads to cost decrease, or specification change and etc.

One of the most important KPIs is performance of suppliers that helps organizing control over suppliers. For Eastern Europe BAT general metrics was developed.

KPIs - Key Performance Indicators (KPIs) – supplier performance criteria measured and reviewed regularly to track individual supplier performance and define areas of improvement and set corrective actions.

BAT uses for direct materials:

- OTIF
- adherence to contract
- communication and response time
- quality index

Supplier performance evaluation is measured on an on-going basis as a part of constantly-maintained recording system.

OTIF On Time In Full – Key Performance indicator shows actual delivery date and quantity delivered versus ordered delivery and planned date.

OTIF(%) = OnTime*InFull is calculated on monthly basis with usage of internal ERP system SAP R3, designed especially for BAT needs. , where In full (%) = Actual quantity/ordered quantity and On Time = Number of deliveries purchased on Time / all deliveries per month

Supplier performance evaluation is measured on an on-going basis as a part of constantly-maintained recording system.

The author analyzed all company direct materials suppliers' performance. For research purposes, the paper concentrates only on OTIF measurements.

BAT methodology: In full (%) is calculated as Actual quantity/ordered quantity.

On Time delivered date – planned date (planned date usually is agreed upon with suppliers and takes into account lead time). If this difference is more 2 days for import supplier and 1 day for local suppliers for every concrete delivery, then On Time = 0, if less = 100, final On Time is number of deliveries purchased on Time / all deliveries per month

OTIF(%) = OnTime*InFull is calculated on monthly basis with usage o internal ERP system SAP R3, constructed specially for BAT needs.

Table 3. Results of Eastern Europe suppliers' portfolio performance 2010

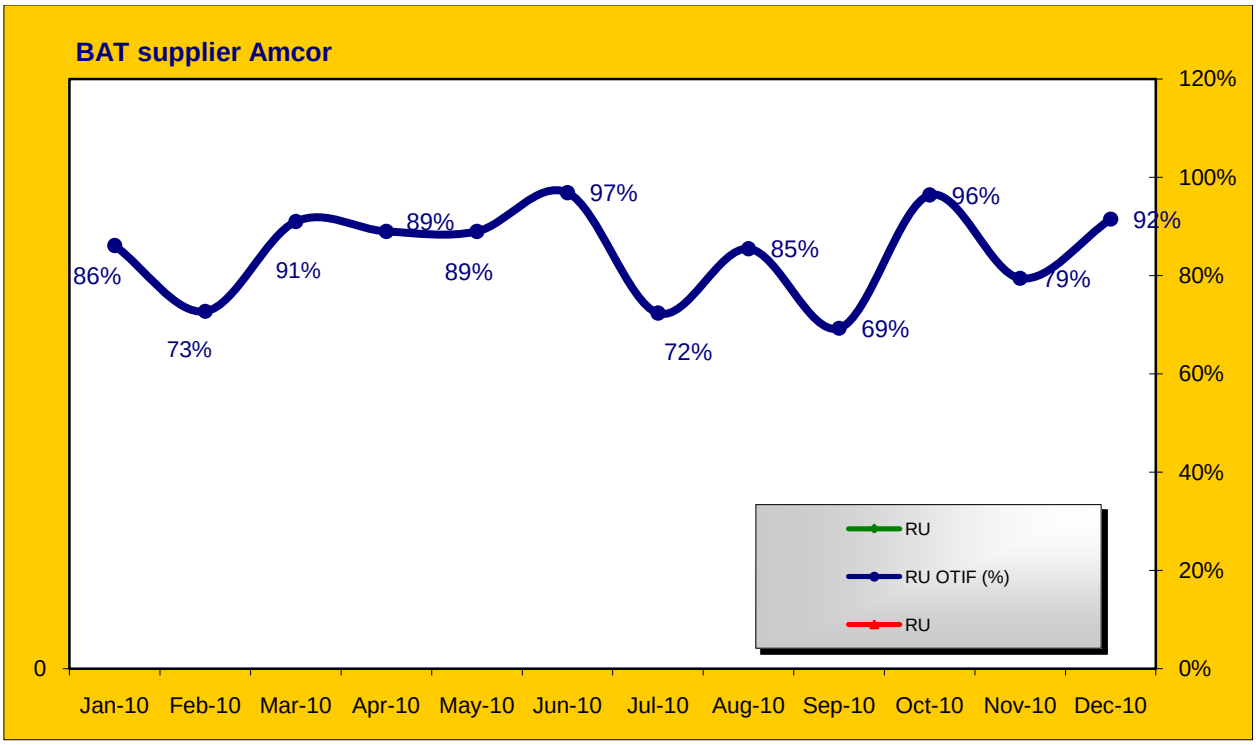
Month	OTIF			
	RU	UA	UZ	EE
January	87%	88%	61%	86%
February	83%	77%	73%	81%
March	87%	77%	37%	80%
April	88%	99%	55%	86%
May	86%	98%	62%	85%
June	91%	100%	55%	89%
July	86%	95%	63%	83%
August	85%	82%	55%	72%
September	88%	95%	43%	83%
October	89%	98%	38%	84%
November	86%	91%	70%	85%
December	92%	93%	84%	91%
	87%	**91%**	**58%**	**84%**

This results show total Otif for 12 months for the whole Eastern Europe cluster of BAT including Russia, Ukraine and Uzbekistan. File with all calculations is attached attached.

This table shows the total trend per country: Uzbekistan delivery performance is very poor, but it can be explained by problems with national currency in the country and logistics problems, general performance in Eastern Europe is reasonable.

After year end, the author can make a conclusion that bad performance by some suppliers does not correlate with actual problems of suppliers.

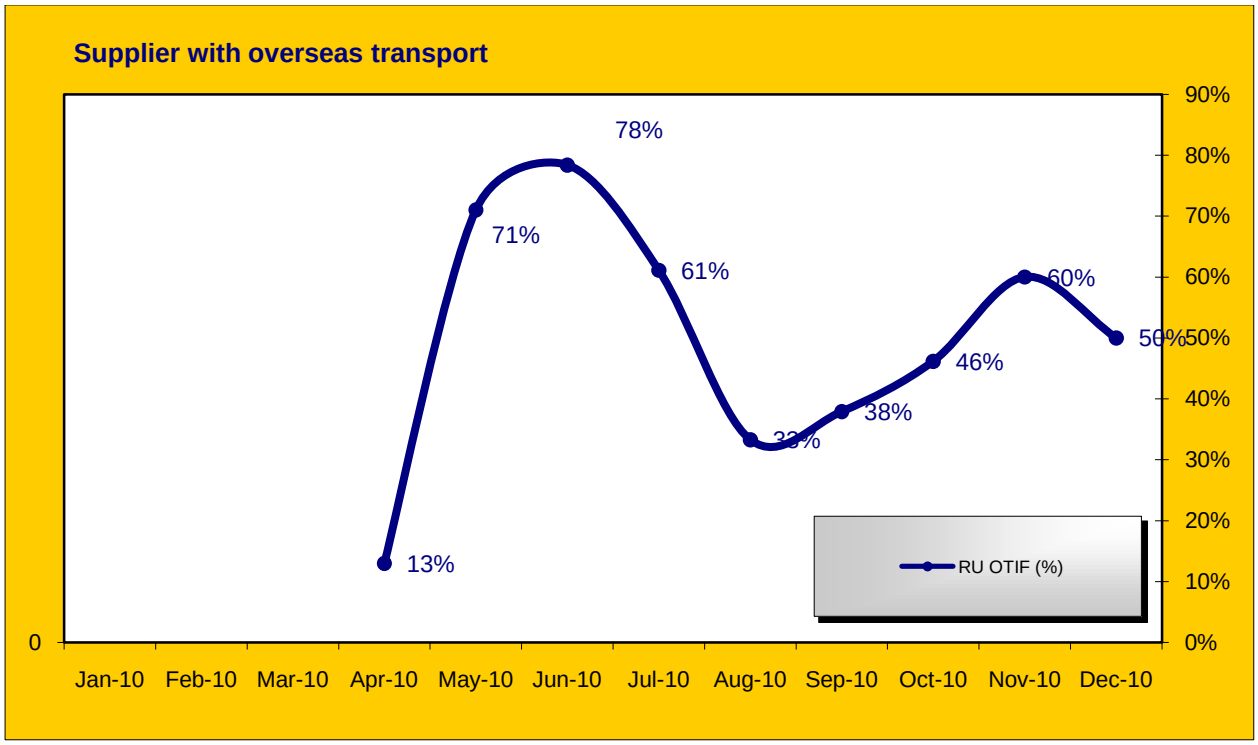
Figure 5. BAT supplier from case



This is performance of Amcor Company – biggest strategic regional supplier, which purchasing printing production for BAT EE. (more information regarding supplier in next chapter)

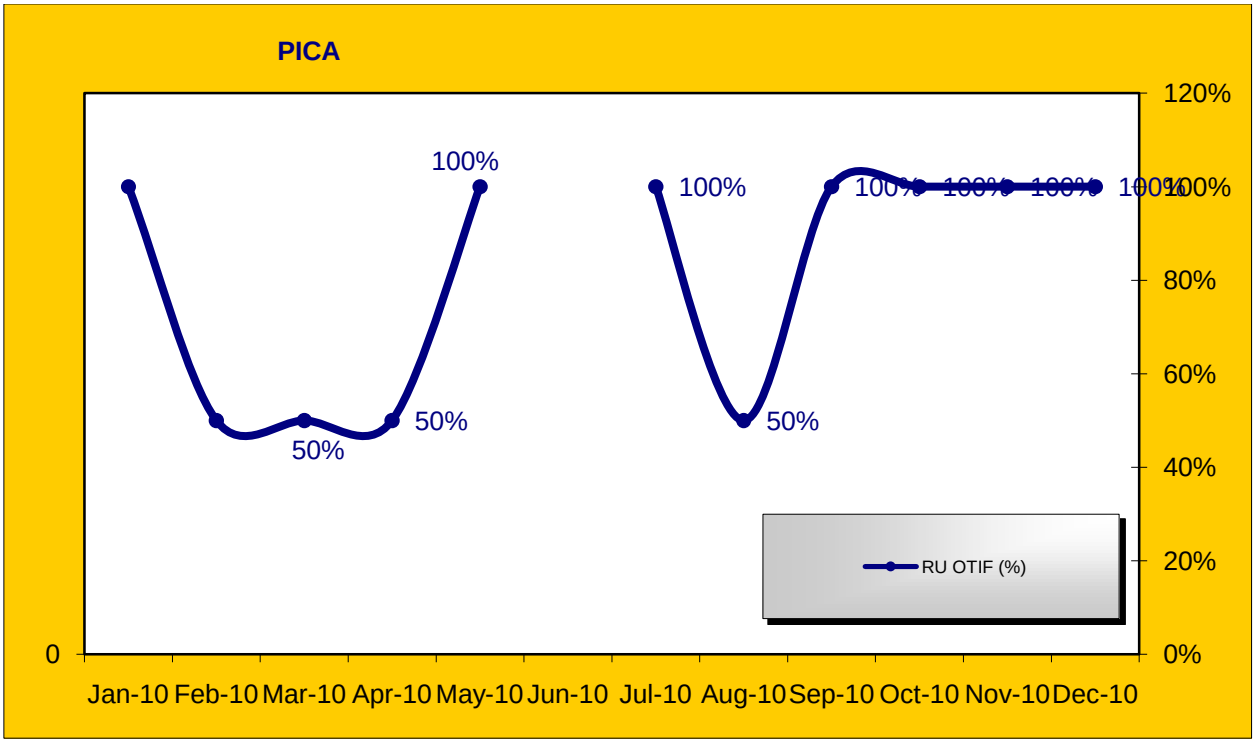
As it is seeing from the chart the performance for 2010 is stable, but empirical analysis of year 2010 showed that that these supplier couldn't meet demand of BAT in September, that lead to out of stock of material and out of stock of finished goods in East of Russia, where the transportation of finished goods takes more than a week.

Figure 6. Supplier with overseas transport



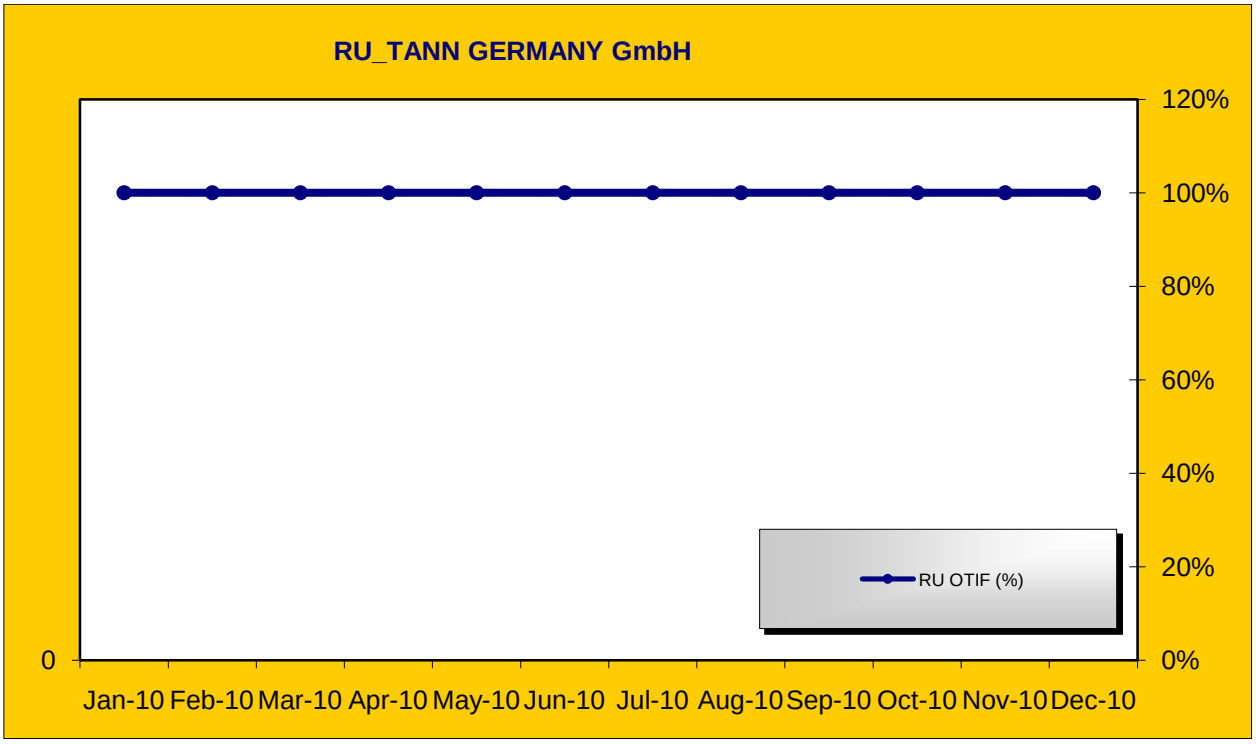
This chart represents performance of supplier with overseas deliveries: producer of TOW from Japan with lead time = 79 days. The performance is very poor but doesn't reflect real supplier's performance. This is the problem of existing methodology used in BAT. The date of delivery presents itself the date of invoice in Harbor. But usually ships are waiting for the document up to 7 days that is automatically lies out of BAT deliveries tolerance.

Figure 7. Supplier with 2 deliveries per month



These chart represents suppliers with two deliveries per month, so even if one delivery was late for 1 day it considers as 50% OTIF; the weight of one delivery is heavy, so these evaluation is no representing real supplier's performance

Figure 8. Supplier with absolute performance



This chart represent the ideal picture, this is producer of cigarette paper from Germany with absolute performance. The case from the absolute performance category shows that metrics for evaluation is applicable and good KPIs are achievable.

For some suppliers with inadequate performance, a stock of material was always on certain level, and supplier that had the biggest issue during the year has very stable performance.

On the one hand, it is problem of existing methodology, as it does not take into account means of transport (ship deliveries are harder to predict), lead times of suppliers (supplier is more flexible if lead time is shorter), it does not rank number of deliveries. For example, if supplier had just 2 deliveries on OTIF and one was not, he gets a final mark of 50% (even if delay was 1 day and did not influence stocks); another supplier had 100 deliveries, 25 of which were not on time, his final score would be 75%, even if those 25 un purchased on time deliveries were very crucial and led to out of stock.

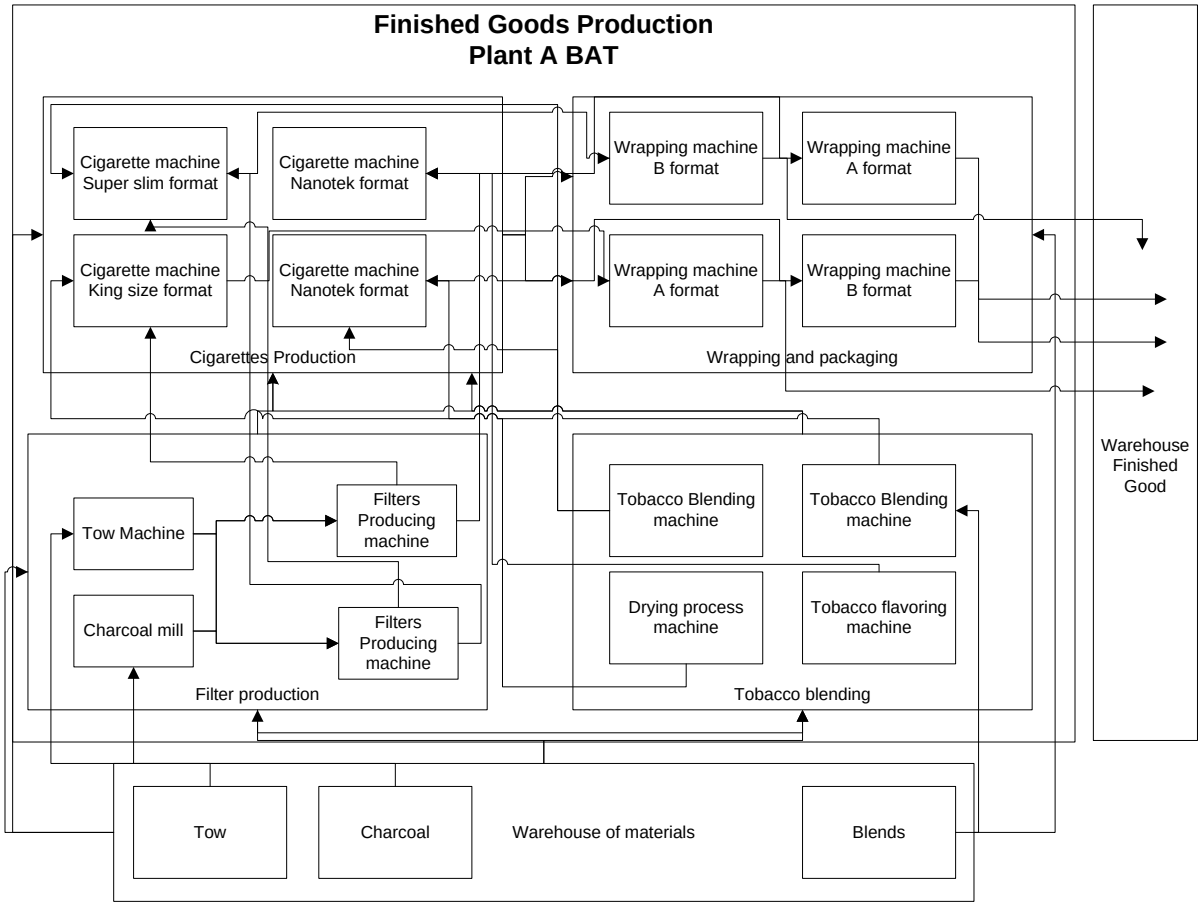
On the other hand supplier's evaluation is based on assumption that ERP system contains consistent data. The author sees a significant gap here. Data contained in SAP is inconsistent, because employees are so overloaded that they "can't find extra five minutes for checking all data in SAP". In this case, based on existing methodology and situation in the company suppliers evaluation process and tracking of all KPIs can't help to prevent and notice potential risks from suppliers side until the dramatic decrease of KPIs.

§3.2 Eastern Europe BAT Process Workflow

The variety of processes in and out of BAT is extensive. For present research purposes we consider risks analysis and the main processes related to mitigation of risks. First we will consider the process of finished goods production in brief in order to understand its sophistication: scheme A shows the common process of Finished goods production: from preparation of tobacco blend to wrapping and packaging.

The machinery park of common BAT factory is more than 20 items.

Figure 9 Finished goods production plant scheme.



This chart represents compliance of production process, especially if company introduces new to the world or to BAT material or new supplier or new process. All material should be tested on every single machine, as all the machines have different unique characteristic: capacity, volumes etc.

The next important process that should be described is company plan creation.

This important process covers all functions of supply chain and covers creation of Company Plan and its revision that can be called Quarter Plan Revision (QPR) it can be divided into 4 periods:

The process is initiated by supply chain financial function, where frame and format for Company plan is prepared, then material planning department is filling in planned forecasting quantity of materials to be delivered and then, based on the volumes, procurement employees negotiate and finalize prices for all materials. As a result, the supply chain materials flow overview is ready and reviewed quarterly.

One of the research steps was to analyze forecast of material and prices during the year cycle. Company plan at the end 2009 with all assumptions for 2010 with forecasted prices and volumes was compared with actual prices and delivered volumes. (see Appendix 4, 6)

As a result, volatility for some materials goes up to 300% which means that forecasting was wrong or made on wrong assumption. Bad forecasting automatically means losses: losses related to delivery problems, losses with Order Batch policy, causing losses of over 700 000 GBP per year only for print materials for Eastern Europe cluster, and this loss does not include losses relating to speeding up some deliveries under the threat of out of stock and air trucks.

What is interesting is that total picture for Print materials volatility is 13 % Actual VS Planned. It happened because some fluctuations were smoothed by others. Moreover, total year forecasting usually is not influenced by the bullwhip effect and showed that total production is forecasted more or less correctly, whilst the material group and supplier's deliveries are planned inadequately. It is very important to mention that BAT introduced multi-suppliers supply and substitutes some materials and suppliers by other in case of contingency. This analysis showed that forecast of all print materials were done with acceptable volatility but the forecasting of all materials separately requires improvements. As well as planned prices are different from the actual prices from month to month causing big losses, which are very difficult to prevent. (Appendix 4 6,)

The process of forecasting (Material plan view)

The process of forecasting at BAT is a complicated multifunction process engaging all departments/ functions of supply chain.

The forecasting started and initiated by marketing department through the major distributor SNS in real time mode. All merchandisers from BAT accumulated data from the market in Real time and uploaded their reports to SAP. After recalculation and analysis of factors influencing the future demand, the information from Marketing flows to Production, where real demand is analyzed and production plan is reviewed for 2 weeks in advance. After this, material planning team uploads this information once per week and prepares updated forecasting to suppliers. As a result, all material suppliers receive forecasting update.

The conditions of contracts consist of information regarding timings of forecasting not volatility limits of forecasting. Each supplier should receive forecasting update once per month for two months in advance.

Supply Planning refers to a collection of business processes aimed at ensuring that BAT supply capabilities are effectively organized so to best meet demand. The Supply Planning project aims to standardize and improve these processes and ensure that the relevant technology exists to support them. The technology that has been selected, is an SAP-APO module called - Supply Network Planning

The Supply Planning project comprises of several business processes, each of which is aimed at answering a specific question:

- Inventory Planning
- Distribution Requirements Planning
- Production Planning
- Materials Planning

By moving to above market planning level BAT can use the strength of global supply chain to improve service levels and reduce costs.

BAT operates a number of different replenishment models that vary by region and end market. Each model will have a slightly different impact upon the Supply Planning. The "Make To Stock" and "Make To Order" replenishment models are the most widely used planning strategies.

«Made To Order» is the customer triggers procurement by placing a customer order. This order is registered in R/3 as a Sales Order. Supply planning starts based on the customer order. The pure «Made To Order» process is characterized by longer customer service response time comparing to products planned with «Made To Stock» model. BAT «Made To Order» process is a combination of forecast and customer demand. On a long term horizon demand is forecasted with independent requirements, on the short term horizon (defined by stock transfer horizon) the demand is equal to real customer demand.

«Made To Stock» is replenishment decision is based primarily on forecast, with incoming customer orders coming from R/3 consuming forecast. The products are planned to the stock and all incoming orders are covered from available stock. «Made

To Stock» planning strategy is characterized by high service level and short customer service response time.

Supply Network Planning is a rough planning tool that is designed to work in a mid to long term horizon. The main task for SNP is to define the production and distribution along the whole supply chain. The smallest possible bucket for planning is one day.

For SNP tools the starting point for calculation is the market Demand. Demand Planning usually supplies data for a long term horizon of 12 months and more. The nearest few months could be evenly split into daily and weekly buckets to allow smooth demand for SNP planning buckets. Forecast is released to SNP in the form of planned independent requirements.

Supply Network Planning is a bucketed, medium-term; cross-location planning process for planning production outside the SNP fixed production horizon and procurement outside the stock transfer horizon.

Detailed production planning with scheduling is made in short-term horizon, inside the SNP production horizon.

Deployment and the Transport Load Builder are the tools within SNP for short-term replenishment planning to adjust stock transfers to short-term changes in demand or supply.

SNP calculates the total order quantity per period. A period lasts at least one day. SNP aggregates all requirements for a period and generates receipts for all requirements in this period.

In Scheduling, the duration of activity is determined using resource load that generates the order quantity. The lager the quantity to be produced, the longer the duration of the activity.

The schedule in SNP is determined using the buckets. An activity can have duration of one week and a resource load of one hour. The capacity load is determined down to the second.

Above market supply planning allows to meet our demand and supply parts within a whole network, utilizing the strength of our entire supply chain, taking into account most critical capacities, material availability and lead times.

Supply planning goal is to meet our market's demand with our capabilities. Each element of demand has to define and answer at least the following: What (product)? When (timing)? How many (quantity)? Where (location)?

SNP tales place over the medium- to long-term horizon, that is, outside the production frozen horizon. The demand on Distribution Centers and Hubs should be met by production plants and suppliers in of the whole network. SNP planning is based on time bucket, it creates a rough quantity based cross-location production and distribution plan with individual simplified (comparing to R/3's) production structure.

The SNP ensures that the correct quantity is available on the correct day without overloading critical resources. The smallest unit for scheduling is one day. The goal of SNP is to provide a feasible supply plan to complement the unconstrained demand plan that was planned by the Sales and Marketing teams. Demands are aggregated for a defined bucket, for example, a week. Order sequences with their exact times do not play a role in Supply Network Planning.

The Production is covering 4 stages

- Collect and evaluate impact of production plan related factors
- Review MRP
- Produce Production Plan for handover to the factory schedulers
- Produce Deployment Plan

Different "demand" categories may have different degree of certainty.

Since both demand and supply parts have uncertainty, BAT plans some "safety" stock with "inventory planning" process to cope with uncertainties.

Once the market demand and safety stock requirements are known planning team prepars "distribution" and "production" plans.

Production plan for finished goods (FG) is a starting point for filters and wrapping materials plan. Filters are the semi-finished goods (SFG). For filters the demand comes from FG production from either the same plant (dependent demand) or from distant plant (distribution demand). In addition, some filters could be produced on a "make to order" basis being forecasted and sold to other regions. Still other filters could be imported for production from other regions. Both production and external procurement could be a source of filters.

Wrapping materials (WMs) are the materials that are bought from external suppliers. To cope with uncertainty at supplier side some safety stock demand should be maintained in addition to dependent demand from production.

This process is combined with Materials Requirements Planning

Materials Requirements Planning (MRP) is a material planning methodology developed in the 1970's making use of computer technology.

The main features of MRP:

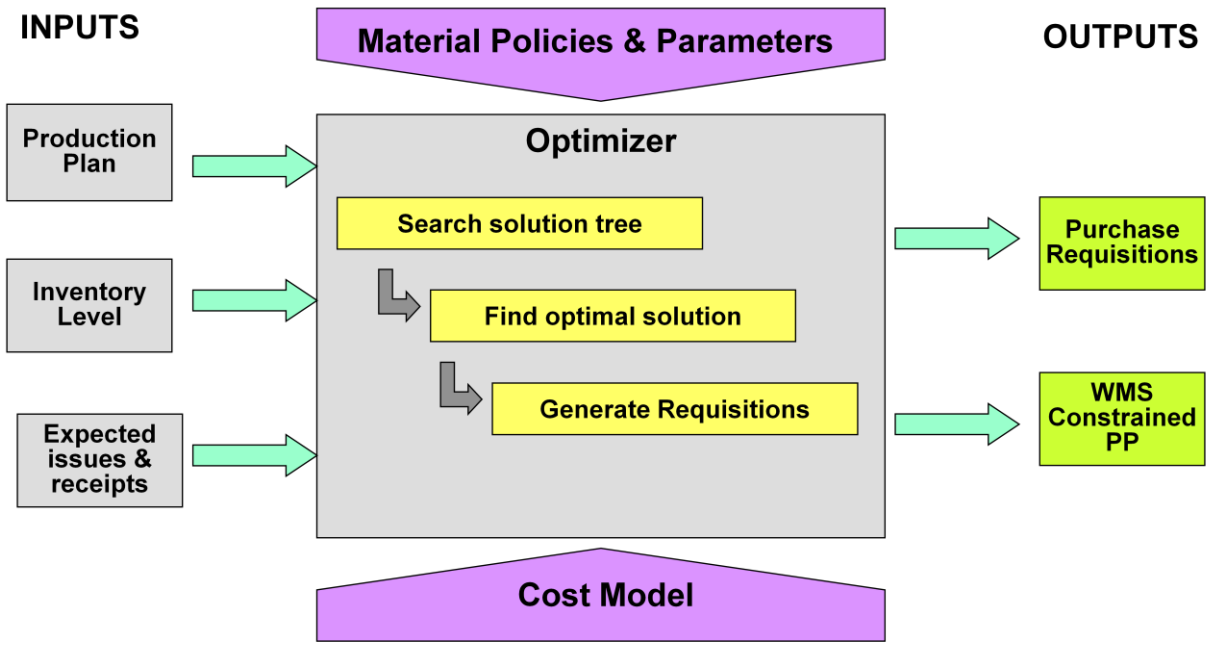
- ✓ creation of material requirements via exploding the bills of material
- ✓ time-phasing of requirements using posted average lead times.

  The MRP process explodes the bills of material, usually overnight or on weekends, and develops the requirements for materials

  Objectives of MRP:
- ✓ Ensure materials and products are available for production and delivery to customers;
- ✓ Maintain the lowest possible level of inventory;
- ✓ Plan manufacturing activities, delivery schedules and purchasing activities.

MRP provides answers for questions what items, how many and when should be delivered.

Figure 10 MRP Process



This process is influenced by internal BAT policies and procedures:

Target Stock for material planning team is the level of stock the system “brings to” according to settings (Target Stock is a sum of Safety Stock and Order Batch size)

Team should order PR’s planned considering building full trucks and constrained by WM’s availability on LT horizon.

The analysis of lead times was done and average lead times for EE suppliers were calculated. The average Lead time for Uzbekistan is 83, Ukraine – 36, Russia – 26, which are quite long and influence procurement activities increasingly.

§3.2.1 Risk evaluation and risk mitigation process in BAT

As BAT is operating on the market, it is very important to consider BAT internal policies, procedures and already historically approved principles to understand how one of the biggest world FMCG leaders mitigates its risks.

Existing solutions applied in BAT for risk minimization:

- **Framework contracts.** BAT has established common BAT framework contract, including information regarding deliveries’ accuracy, specification, requirements for materials and timings of deliveries, payments terms and conditions of cooperation with BAT-supplier.

  This contract is renewed annually and adjusted for the region and local conditions and for specific suppliers.

  The simplest suppliers have non-monitored suppliers, strategic suppliers have a lot of appendixes and extra conditions and similarly to framework.

  After exploiting recent contract base the author can conclude that more attention should be devoted to materials specification clauses, probably some samples and certain metrics for some materials and grades should be attached.
- **Contingency planning.** Contingency plans are prepared by sourcing managers on local, regional and global level once a year and updated constantly, mostly quarterly.

  For each supplier and commodity groups, there are extra solutions and contingency options chosen.

  You can find an example of contingency plans for global materials, provided by global sourcing team of BAT in the appendix.

The author thinks that the contingency policy is addressing all latest market requirements. The problem is that design for some brands is changing once a quarter and it automatically means that requirements for materials or even material should be changed quarterly especially for print materials (packs design). The contingency should be reviewed and new contingency materials should be tested on the factories.

It is important to mention here (see Production of finished goods picture) that all machinery of BAT even in one region has different characteristics and each material should be tested on some machines. This means that it is impossible to use materials with some specifications on every machine in the region. Moreover, country specification for electro technical equipment is also influencing the process to a greater degree.

To conclude, it is very time consuming and expensive to test new solutions for contingency plans, moreover, the procedure of testing and approving should still be improved.

- **Suppliers KPIs tracking.** As it was mentioned before, BAT considers suppliers according to their categorization groups and in order to track their performance introduced common process of suppliers evaluation. KPIs will be considered in more detail under section KPIs and functions.
- **Suppliers segmentations and different activities: audit, suppliers collaboration** (business and operational communication). BAT is developing framework for supplier's relations management; best world practices are included and examined. All these processes can be very helpful for mitigating risks and improving the process, but one crucial question arise: efficiency, effectiveness versus time consumption plus outcome.
- **Forecast accuracy**. Consistent regular forecasting can improve the planning of inventories, materials and all processes, increase effectiveness and development of contingencies and preparations for unexpectedness.

  Unfortunately the accuracy in forecasting should be improved (See Appendix 5) as it is the major source for potential risks in BAT Eastern Europe. Forecast inaccuracy was one of the major reasons for out of stock in the factory from the case.

- **Software (join information systems).** BAT implemented best latest software solutions for tracing information flows, exchange information, speed up all evaluation processes, all information stored in ERP system – SAP R3, all material flows are planned in SAP optimizer, all KPIs and other metrics stored in SCTT.

  The portfolio of information systems solution is available for BAT employees and is aimed to make all information sharing processes more efficient, on the other hand it cause many problems including inconsistency of data in system, technical issues and mistakes is programs, non-acquaintance with software by employees etc

§3.2.2 Information systems

The flow of products and information between supply chain members' organizations is crucial for so big international company as BAT. Information systems and technologies are helpful to coordinates the activities and to manage all process of BAT supply chain; information flows plays a crucial role in strategic planning.

All processes and intercommunication between stakeholders in the company are done through different technological solutions.

The main role in managing Supply chain gets ERP system – SAP.The system landscape for SAP SCM solution includes the following systems:

1. R/3 - OLTP (Online Transaction Processing) system
2. APO - Advanced Planning and Optimization system

For paper purpose the description of the systems is combined with description of planning and forecasting processes in BAT.

Data transfer between the R/3 and SCM system is defined and controlled using the Core Interface that selects those objects that should be transferred to APO via the integration models. Only planning relevant data is transferred in APO not the whole data set.

APO stands for Advanced Planning and Optimizer. It is a set of supply chain planning tools which help to balance demand and supply across a network. It is the solution launched for above market planning.

APO consists of three modules:

1. Demand Planner, which collects demand, allows manipulation of this demand and contains advanced forecasting capabilities.
2. Supply Network Planner, which balances demand with supply constraints across the network.
3. Production Planner takes demand and supply data within a factory to determine production planning and detailed scheduling activities.-

Planning is consists of 3 processes

- Forecast updated in DP (released to SNP automatically) on a monthly basis,
- Inventory Planning policy for MTS SKUs updated,
- Weekly Cycle

The main objective of the Weekly planning process is to increase flexibility, reduce working capital, enhance operations capability to respond to changes and challenges in the end markets in a repeatable / sustainable manner.

The Weekly Control Cycle aims to establish an effective & efficient communication and governance structure across the weekly execution cycle. The overall task of Weekly Control Cycle is to collect reviewed demand, evaluate all constrains and deliver Supply plans for the horizon:

1. Evaluate updated demand and agree changes.
2. Review Inventory and DRP

Core Interface consists of several Integration Models (IM), each of them defines objects to be transferred to APO. The division of data exchange process into small models allows flexible transfer scope management. The Integration Models are set up to identify objects by defined selection criteria and during scheduled night's reactivation they pick up all new objects (according to selections) and transfer them to APO.

The CIF interface transfers transaction data relevant for planning, such as warehouse stock, sales or production orders etc., from SAP R/3 Enterprise to SAP APO.

The CIF interface also transfers the results of the planning in SAP APO to SAP R/3 for execution. This process is known as "Publication".

Supply chain tracking tool (SCTT) – is information systems, where all internal KPIs and targets are stored starting from savings initiatives up to average stock duration. All

employees engaged in the process have access to the system and upload the required information. It is possible to accumulate data from all regions and prepare analysis about different processes and company and functions performance.

Supplier's relation management (SRM) is a software product developed specially to support supplier's relations activities by force of materials catalogs, which enables materials and conditions comparison together with faster and more efficient purchasing process. It is used for indirect materials and out of scope this paper.

Matquis is the internal BAT quality and supply chain information system designed

Innovative and flexible solution for accumulating data regarding quality issues within supply chain of British American tobacco worldwide. Quality departments of all BAT factories worldwide upload information regarding quality issues there: rejects for all material types for all factories, invoices

All these software solution enable clearance and transparency data flows through all clusters within big BAT group.

It is very importation to mention that according to BAT policies all processes and procedures should be standardized and be similar all across the region, so from one hand it leads to transparency of all processes within region, on the other hand it leads to slowing-down of all new processes introduction.

§3.3 Out of stock. Reasons and factors causing the out of stock.

In June and July 2010 main strategic regional supplier Amcor could not meet BAT demand and did not deliver a significant volume of Blanks; and, as a result, out of material stock happened on the St.-Petersburg Factory in September 2010, and out of stock of finished goods in the Eastern part of Russia, where transporting lead time for finished goods is more than a week.

Reasons:

Analysis of in depth interviews and internal databases and information systems indicates that out of stock was caused by a sequence of different accidents and failures:

- In June and July, the factory in St. Petersburg was shut down as a part of a decision made after finished goods stocks evaluation. BAT has accumulated large stocks of finished goods before April 2010 when new Health-warnings for

packs were introduced. According to marketing department research, packs with new design should have been perceived worse than the old ones.

- As wrong forecast was made, inconsistent information got to one of the main BAT suppliers- Amcor. Having accumulated large stocks, BAT has informed all regional and global suppliers about the short shut down of one of the factories and assured that no deliveries were required during summer 2010, as it was supposed to be enough stock for the rest of the summer. After revision of all forecasts it appeared that forecasting was inconsistent.
- Supplier Amcor based on forecast from BAT (their major client) reduced their capacities by discharging the employees. As a result Amcor couldn't meet the growing demand from BAT later.
- Complex structure of Amcor . One of the factors influencing this issue is internal Amcor structure: 4 sales managers who work for Amcor are trying to sell as much as possible without considering capacity of the company and future implementation and realization of orders. When news about radical changes in BAT forecast came, it was too late for Amcor to change anything, as Amcor has already covered its capacity by orders from other companies, including competitors of BAT.
- Complex design, cylinders' breakage one by one. Production of blanks is a complex process, which requires high quality machinery. As BAT required offset printing on the blanks, some special cylinders were bought for a single design. The breakage of cylinders requires creation of a new one and a long process of tests and adjustment. In summer 2010, several cylinders broke one by one.
- Contingency Fail, KPIs tracking Fail. When Amcor failed to meet BAT demand, it turned out that BAT contingency plans could not be implemented and required long lasting tests of substitutive materials and KPIs tracked by BAT did not show the real picture of supplier's performance.
- Internal problems of BAT. This summer period matched with internal transition period within BAT, the new splits of responsibilities were implemented and new activities were launched.
- High turnover of designs: once in 2-3 months. As tobacco industry is very competitive. Marketing takes a major role in BAT. In order to stay competitive on the market and to extend market share, BAT introduces new pack design once every 2-3 months. This design changes require tests of new material and make

contingencies development unjustifiably expensive as every new material on the market requires a contingence substitute, which should be tested as well.

- Problems with machinery (high coefficient of friction). As mentioned above, all machinery in BAT requires special tests and special material characteristics. If new material is launched successfully on one of the machines, this material can hardly be used on another machine in an event of a breakdown.
- Contingency did not work. Contingency plans are required for all materials, but as mentioned before tests are not always held for the reason of expensiveness. Usually contingency is a number of actions and processes that should be started in case of emergency. In summer 2010, substitutes of the undelivered products could not be used, as there were no tests done by that time.
- One of the most risky factors that influence stocks level are KPIs introduced in Material Department: "*Stock level by end of the month should be min => that causes carrying over of the deliveries to the beginning of the months. As this KPI is introduced in most of FMCG companies, problems with customs arise every beginning of the month" (SRM BAT Galina Antipova)*
- Long lead time. As it was mentioned previously average lead action time is over 30 days, which makes reaction in emergency slower and more complex.
- Bullwhip effect. As all suppliers of BAT already identified inconsistency of forecast provided by BAT team, and do understand that forecasting might not represent the real picture, they planned their capacities without consideration changing forecasting of BAT.

It is important to mention, that all processes and failures occurred were strongly influenced by the Bullwhip effect, which means that wrong forecasting in the beginning of the summer lea to inconvertible consequences.

Decision made by BAT:

Top management decided to deliver the missing Vogue blanks from France and Poland, which caused the price to increase by 30%,

§3.4 Recommendations based on materials overview

Analysis of internal data, business processes, existing methodology for risk identification and management suggests that BAT should improve some processes and procedures in order to find solution for risk mitigation and prevention.

- More attention should be devoted to data consistency in ERP, EDI and other systems, as forecasting is made automatically by APO on data in the system. Suppliers' performance and performance of all functions is also calculated based on data in ERP system. In order to produce forecasting and achieve reliability of KPIs, all data stored in systems should be checked and reviewed.
- Bugs-tracing IT support o project group aims to improve existing transactions in SAP should be initiated. There are a lot of bugs in the system, and the producers of SAP are no longer responsible for modification of the ERP system after company has purchased the package of utilities. As supply chain is modified according to market modification and by influence of environment, ERP system should be changed simultaneously.
- The complexity of all processes should be avoided. The most crucial processes should be revised and improved: weekly planning cycle should be organized with more accuracy, tests of new materials and introduction of innovations should be managed more efficiently.
- Forecasting improvement should be initiated and responsible project team is appointed. Analysis done in 3 chapter showed that improvement of forecasting can save company more 700 KGBP per year.
- Bad performance by some suppliers does not correlate with the actual problems of suppliers, as all deliveries should be weighted according to their importance, as well as materials. For some suppliers with inadequate performance, a stock of material was always on certain level, and supplier who had the biggest issue during the year had very stable performance. KPIs system should be balanced and revised.

Problem of existing methodology,

- do not take into account means of transport (ship deliveries are more difficult to predict)
- lead times of suppliers (supplier is more flexible if lead time is shorter)
- no rankings of suppliers : number of deliveries.
- Employees "can't find extra five minutes for checking all data in SAP" –should be priored.

In order to produce a more harmonized system all the factors mentioned above should be taken into account.

- VMI approach should be developed with strategic suppliers, and a project team responsible for driving the process should be named. VMI is one of the best solutions for mitigating the Bullwhip effect at the moment.
- In spite of high design turnover and price all contingency plans should be qualified. Potential losses in case of disruption will exceed these sum multiply. Contingency plans required expensive tests as it was mentioned in previously. The author of the paper suggests that costs for these test can be shared with potential contingency suppliers.
- Transparency of all processes should be available for all members of supply chains, higher level of collaboration should be gained. All employees should be engaged in improvement of existing processes as well as support knowledge sharing and experience accumulation. It seems that recently knowledge sharing and accumulation are not primary goals of BAT

§3.5 General recommendation for FMCG companies in Eastern Europe

Based on analysis of theoretical data and the case of British American Tobacco, several general recommendations for risk mitigation, focusing on reduction of the Bullwhip Effect, can be proposed.

- First of all, information sharing and cooperation between supply chain actors is crucial for global FMCGs. Every interest group along the chain can affect the chain condition significantly through sharing information and providing feedbacks, but each single group should have easy to use and transparent access to all information required in and outside the company. Especially when we speak about forecasting, each element of the chain should understand, coordinate and operate according to the real demand on the market, and the demand of the upper link in the chain: sharing downstream inventory information is as effective in reducing the bullwhip effect and mitigating certain risks as sharing upstream information.

  Information sharing is one of the most obvious and common collaboration practices, but not many companies devote significant attention to methods and instruments for this information exchange. The latest ERP solutions and

information systems and Electronic Data Interchange aimed to store and exchange information can definitely improve these processes. But real picture shows that not much attention is devoted to data consistency in these systems and suitability of all applications of ERP and IS for chain needs as well as usage of Electronic Data Interchange is still an open question for the reason of information overflows.

- ERP solutions and Computer Assisted Ordering aimed to reduce or minimize certain risks within supply chain as demonstrated in the BAT example sometimes cause significant problems by itself and expose operation of supply chain to risks. Unfortunately it happens for a number of reasons: all important ERP systems launched to serve big corporations and chains have a lot of bugs and usually it is very expensive and time-consuming to fix and to modify ERP systems according to changes in the supply chain. Producers of ERP solutions usually do not provide support services for these systems. Some mistakes in using these systems and their functionality are caused by internal employees' mistakes and lack of skills in this sphere. Author argues that it is very important to devote extra attention to all processes connected to ERP systems as well as pay more attention to education of employees in using these systems and applications. On the other hand, decision makers of the chains should devote more attention, time and money to choosing better ERP solutions for their chains' needs.
- Supply chain collaboration should be mentioned separately from other recommendations.

  Collaboration can lead to improved coordination along the supply chain. Lack of collaboration seems to be a very urgent issue recently, for instance companies are often hold high stock levels, which is known as speculation, and sometimes they do the contrary, known as postponement, in the incoming and outgoing material flows. Some scholars insist that supply chain collaboration should only encompass general broad functions such as warehousing, logistics, purchasing, outsourcing of business processes and functions and so forth. On the other hand, some scholars say that company-specific information need not be spread along the chain. Channel alignment suggests collaboration in transportation, ownership, pricing and inventory planning. At any rate, improvement of collaboration between the function will lead to transparency of all processes and

mitigation of potential risks. The system should be well balanced, no contradiction should exist. The BAT case demonstrates that wrong methodology of KPIs calculation and assignment and contradicting KPIs for different departments can lead to gathering of unrepresentative data and conflicts of interest in supply chain, which can lead to supply chain failures.

- Forecast quality improvement can help companies to mitigate the number of risks; it can lead to improvement of stocks coordination and all processes, as company and employees will be prepared to all changes in demand. Anderson (2000) points out that forecasting methods should take account of the whole supply chain rather than look into local costs only, as this might lead to companies relying on partners, which might have suffered from volatility earlier.
- VMI might be helpful in limiting the magnitude of fluctuation through source-by-source approach. It is a well known practice aimed at mitigating the bullwhip effect, reducing stocks levels and reducing costs between stakeholders. It can be implemented and will be very helpful in case of data consistency in ERPs and engagement of all stakeholders. Once again, accountable and responsible driver of the process should be introduced from both sides.
- Risks detection and operational improvements: Risk registers and accountable and responsible team, who will support and drive the risk mitigation processes, is a useful modern practice. Orientation on constant improvement should be present in the company: all employees should be motivated to support all improvements activities in the company. Risk register should be developed; all relevant risks should be identified and a responsible person for risk limitation should be selected. It seems that recently risk identification and prevention are not treated like primary activities, and the author of this paper argues that simple solutions and actions, aimed at risk prevention can save the company significant volume of time and money. Some simple operation solutions can be pointed out: strategic ordering behavior, reduction of lead times and balanced KPIs systems can help to mitigate and detect some harmful consequences

The bullwhip effect cannot be eliminated completely, as there are other factors, which are beyond the influence of suppliers and organizations like strikes, change in government policies, environmental factors, etc. However, it is possible to analyze and avoid most dangerous regular risks as well as prevent emergence of others and alleviate Bullwhip effect through a number of not very expensive and time consuming

solutions. All processes within Supply chain should be structured and well designed; information flows should easily run up and down the chain.

Three principles should be considered: the information transparency principle, the synchronization principle, and the demand forecast improvement principle. These principles purport to eliminate or minimize noise value along the supply chain and to make the operating more efficient.

Conclusion

The problem of risk mitigation is very important for supply chain management in Fast Moving Consumer Goods (FMCG) taking into account high market volatility and various economic and political processes, which might affect the usual course of events and create yet more risks and volatility. Therefore, it is conceivable that FMCG companies might be more prone to certain risks and dangers than companies in other sectors of the economy.

The author of this paper focused on analysis of different factors causing the Bullwhip effect and potential risks relevant for FMCG.

During research all relevant risks for FMCG companies focusing tobacco industry were identified. It was stated that every single industry risks combination is influenced by different internal and external factors particular for industrial sector. For tobacco sector the role of global sourcing in generating threats is primary, as number of unique materials is used in the production and these unique commodities are provided by limited number of suppliers.

There is a strong need of effective solutions for risks mitigation in this sector, as the level of competitiveness is very high and undue exposure to risks might result in significant reputational damage and supply chain disruption in addition to tangible financial losses. Modern organizations have to deal with the challenges of satisfying the evolving patterns of consumer demand in a global environment under lean supply chains.

Different supply chain risks mitigation methodologies are exist in the market including valid contingency planning, failure modes detection and risks registering as well as performance of operational activities tracking and KPIs figuring. It is important to note

that no standardized solution for mitigations of all risks exists, but from all variety of those it becomes possible to find solution and adapt it for a company needs.

In this paper, all potential risks are described, and some classification of those risks is provided. For the purposes of this paper, there was a unique failure modes table formed in addition to descriptions of the latest concepts and practices in the area. It is certainly very important to identify the most relevant and most dangerous risks from the multitude of potential pitfalls, to propose recommendations for its mitigation and to develop solutions for tracking and detecting potential issues.

This paper presents overview of researches investigating the bullwhip effect and analysis of different factors impacting the bullwhip effect with focus on existing ERP solutions used in the market. There are a lot of ERP solutions for supply chain needs, but results of the paper showed the number of unsolved questions related to the topic.

Practically the structure of competitive supply chains is changing rapidly with regards to volatile market needs. These changes should be supported with changes in ERP structures and updates in transactional support of the system. Unfortunately frequently decisions makers do not devote much attention to this important issue, resulting in unfortunate consequences and causing risks threat reinforcement.

The first chapter describes development of supply chain management theory from a retrospective point of view covering the key latest trends in supply chain management scholarship. SCM provides a great study field as it is a very important current topic with plenty of undiscovered and undescribed phenomena. This paper identifies a significant research gap in contemporary supply chain management scholarship, which is investigation of the bullwhip effect, its routes and causes and its potential impact on operational activities in an existing company in a single environment.

One of the main results of the paper is recommendation assignment for British American Tobacco Company and for other Supply Chains from FMCG sector including requirement for information exchange along the supply chains, transparency and efficiency of all processes.

Recommendations given will help to identify current risks that organizations are seeing in their supply chains as well as to examine what companies are doing now and what they will be doing in the future to manage and mitigate their risks. These recommendations are applicable for companies in the FMCG sector. Applicability of

these recommendations to companies operating in other sectors of the economy might be taxing, as the recommendations are specifically tailored to accommodate the underlying specific characteristics of the FMCG sector.

This paper relies on using different methodological instruments, ranging from secondary data analysis to in depth interviews and internal databases investigations for developing practical recommendations for a company.

The third chapter describes the case of British American Tobacco. BAT Eastern Europe is one of the most successful clusters of BAT group, which, in turn, is one of the leading FMCG companies in the region.

BAT has implemented some of the latest practices and trends that exist on the market. It launches the best ERP and EDI solutions to try to manage all operational processes in the company in the most efficient manner. In 2010, the company faced out of stocks of material, which, in turn, led to out of stock of finished goods. The author has identified a number of reasons behind the supply chain failure and produced recommendations for BAT Eastern Europe, which will hopefully be considered by the company. The bullwhip effect phenomenon occurred in BAT despite the fact that the company used the best ERP solution for mitigating this effect – the APO optimizer. This paper concluded that low-grade usage of the systems, irresponsibility of employees and inconsistency of data in ER system can cause supply chain failures.

In the course of research, in-depth interviews with employees were held, and suppliers' base was analyzed from different perspectives, existing methodology was explored, some major gaps in different spheres of chain processing were identified, and specific solutions were proposed. Implementation of recommendations contained in this paper might help in the company to achieve transparency of all processes and increase efficiency along the whole supply chain.

As mentioned above, supply chain risk evaluation is a multi-criteria decision-making problem with high level of uncertainty in specific environments. In order to achieve successful results, one is to analyze and evaluate the most important factors influencing competitiveness and efficiency of companies in the market.

FMCG companies face thousands risks every day and there are even more solutions and methodologies available for risks minimization, but this paper puts more emphasis on developing and managing processes of relevant risks identification, investigating the

bullwhip effect and finding best fit solutions for optimizing supply chain volatility in order to reduce costs by reducing stocks levels, to ensure better information exchange and to improve chain dynamics, based on existing ERP solutions.

Appendix 1. Questions for in-depth interviews

1. Method for stock calculation
2. What is Material planning process from your department prospective?
3. What factors influence stock levels of material/final goods?

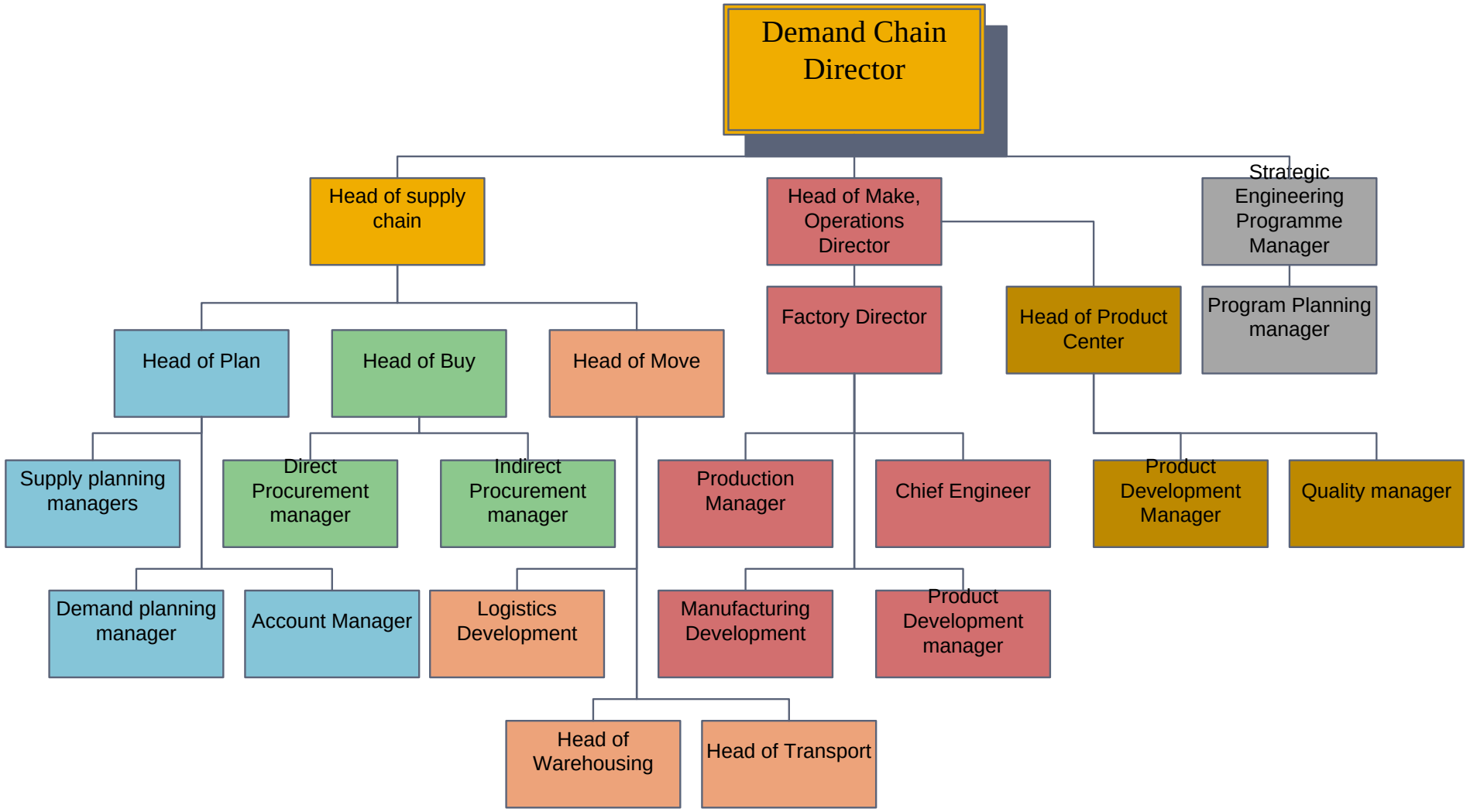
- Suppliers lead times calculation methodology
- Is it possible to reduce lead time for some suppliers?

4. Methodology for risk evaluation and mitigation
5. Company performance evaluation
6. Feedback from suppliers regarding forecast accuracy
7. NPI process within BAT
8. ERP system in BAT

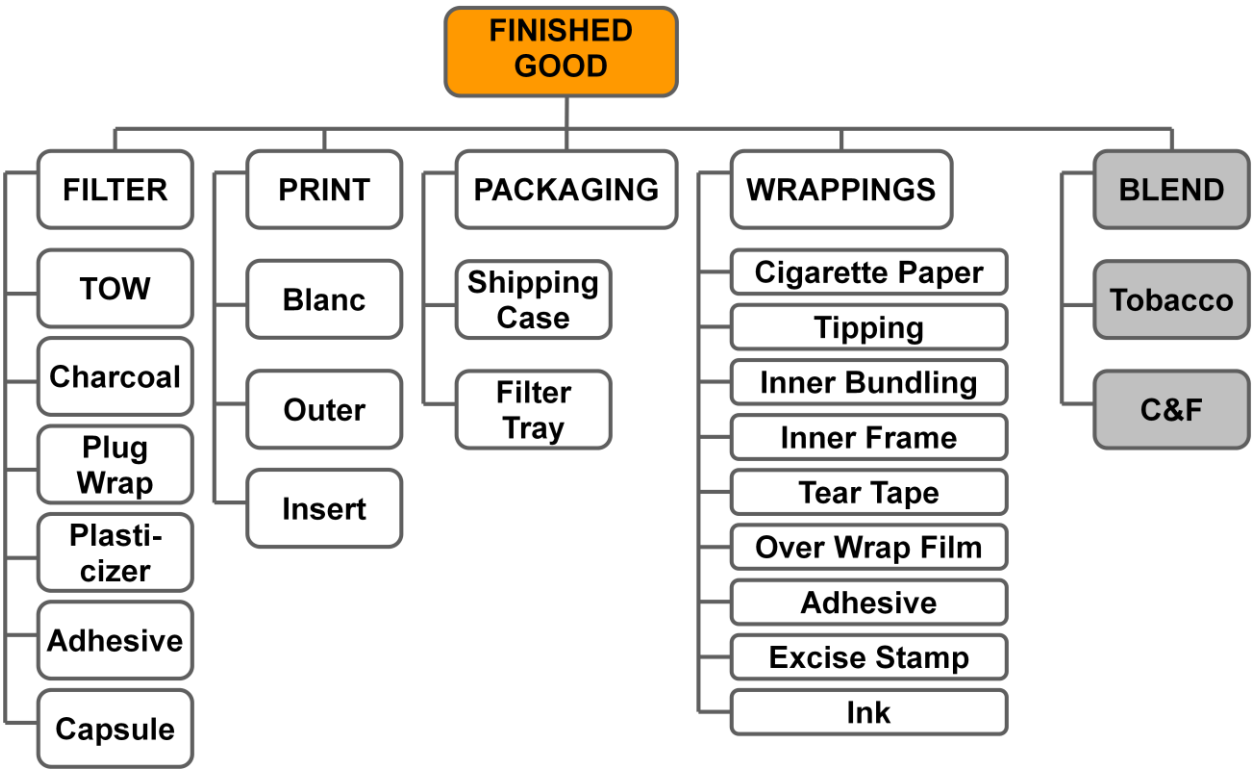
- SAP R3
- SRM
- Advantages and main projects

9. Last case of out of stock material, why did it happen? Reasons for that out of stock How did you manage to get through the situation? Losses from the disruption.
10. Factors and reasons lead to supply chain disruption within BAT.
11. Contingency plans; contingency process, test etc

Appendix 2. BAT Eastern Europe official structure 2010.



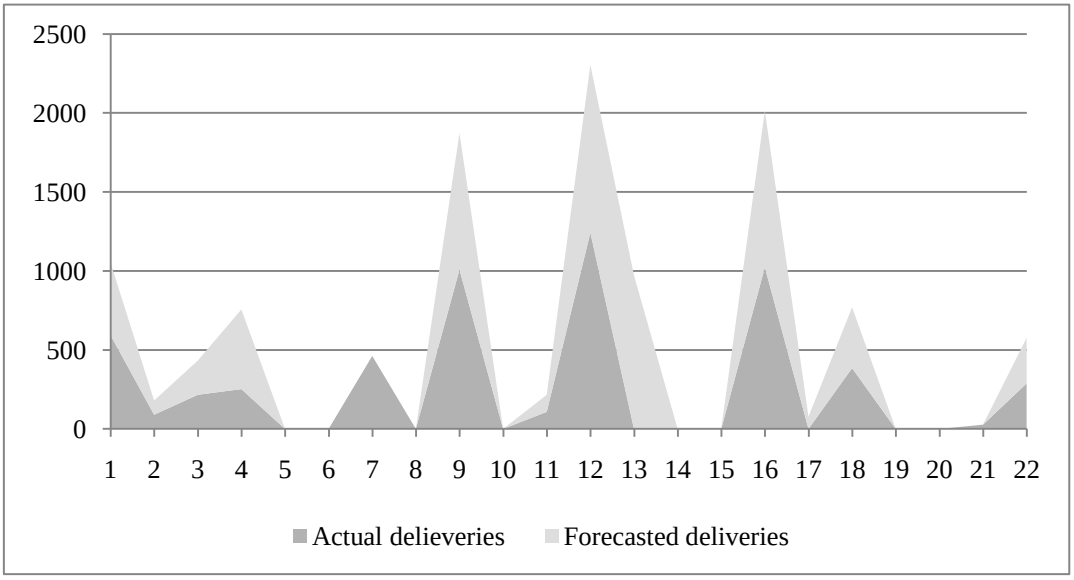
Appendix 3 Materials, participating in Finished goods production- Directs Materials.

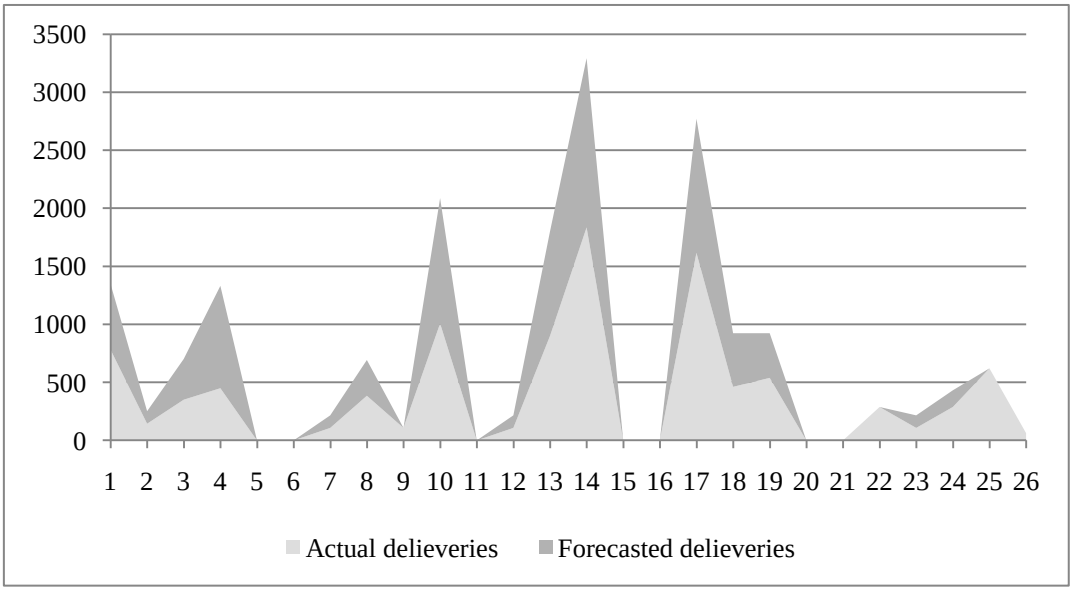


Appendix 4. CoPlan versus Year End Analysis

	CoPlan			Actual				
	2010 Base	2011(%)	mKGB	RU	UZ	UA	EE (%)	2011(mKGB)
TOW	£40	2,0%	£0,8	6,7%	6,1%	5,9%	6,6%	£2,6
Board	£26	0,8%	£0,2	1,7%	-1,2%	1,7%	1,4%	£0,4
Paper	£7	3,5%	£0,2	2,7%	11,6%	2,7%	9,0%	£0,6
Rods	£1	1,4%	£0,0	0,0%			0,0%	£0,0
Charcoal	£2	2,0%	£0,0	0,0%	2,4%		0,3%	£0,0
Triacetin	£1	2,0%	£0,0	4,3%	2,4%	6,7%	4,5%	£0,0
Cig paper	£9	9,0%	£0,8	9,3%	3,1%	7,8%	8,4%	£0,8
PPW	£3	9,0%	£0,3	5,1%	4,3%	7,9%	5,3%	£0,2
Tipping	£16	4,5%	£0,7	5,3%	9,0%	12,7%	6,8%	£1,1
Tear Tape	£2	2,6%	£0,1	1%	4%	2%	2,4%	£0,0
Film	£9	2,5%	£0,2	-2%	-1%	-3%	-2,1%	-£0,2
Adhesives	£6	1,3%	£0,1	1%	13%	5%	2,6%	£0,2
Reloc Label	£1	0,0%	£0,0	-20%			-20,0%	-£0,2
Reloc Liner	£1	-4,1%	£0,0	0%			0,0%	£0,0
Capsule	£13	-20,0%	-£2,6	-24%			-23,7%	-£3,0
Global w/o Capsule	£124	2,8%	£3,5	4%	4%	4%	4,4%	£5,5
Printing	£38	0,0%	£0,0	-1,4%	25%	1%	0,0%	£0,0
Innerbudling	£8	3,0%	£0,2	5%		6%	5,3%	£0,4
Other	£4	11,3%	£0,5	33%	29%	10%	29,2%	£1,2
Regional	£50	1,4%	£0,7	2%	21%	2%	2,0%	£1,6
Total	**£174**	**2,4%**	**£4,2**	**3,6%**	**8,0%**	**4,0%**	**3,9%**	**£7,1**

Appendix 5. Forecast inaccuracy reports



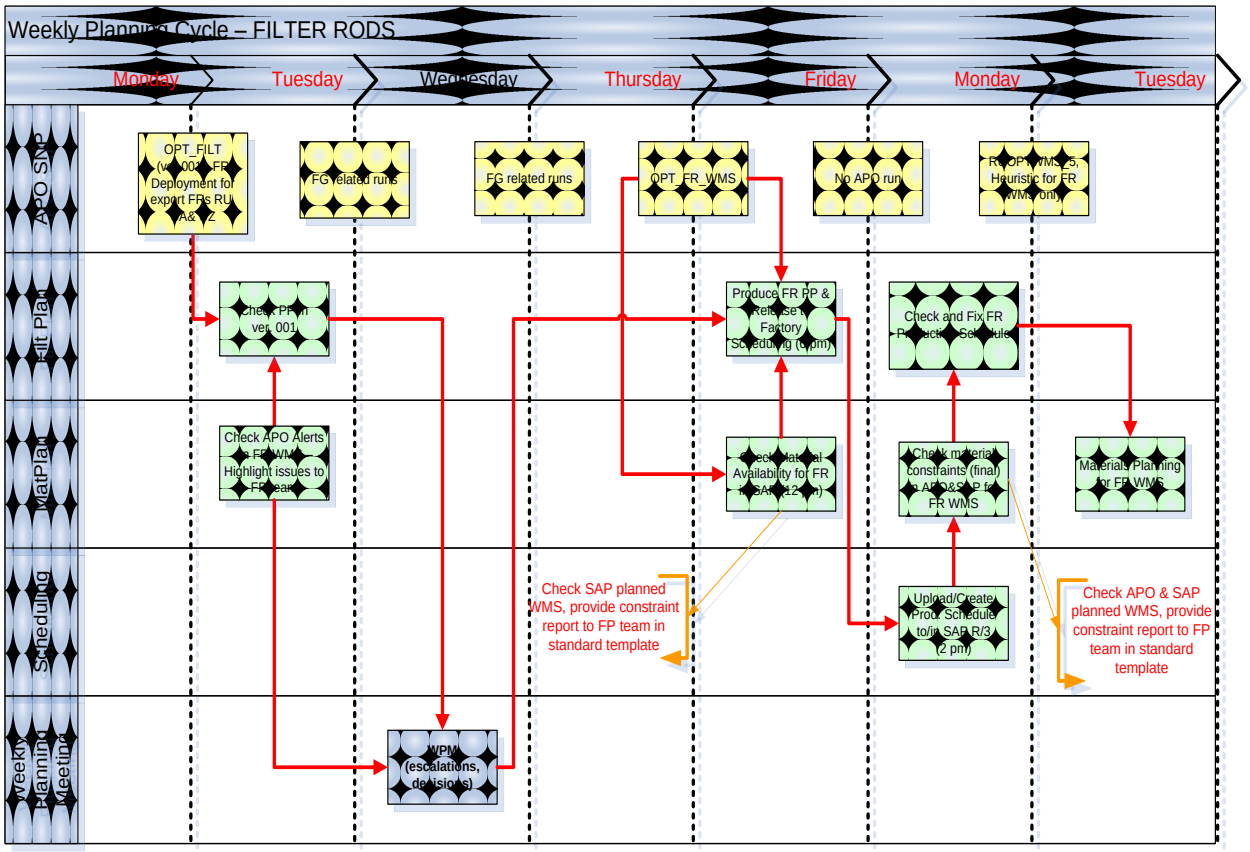


Appendix 6. CoPlan versus Year End Analysis

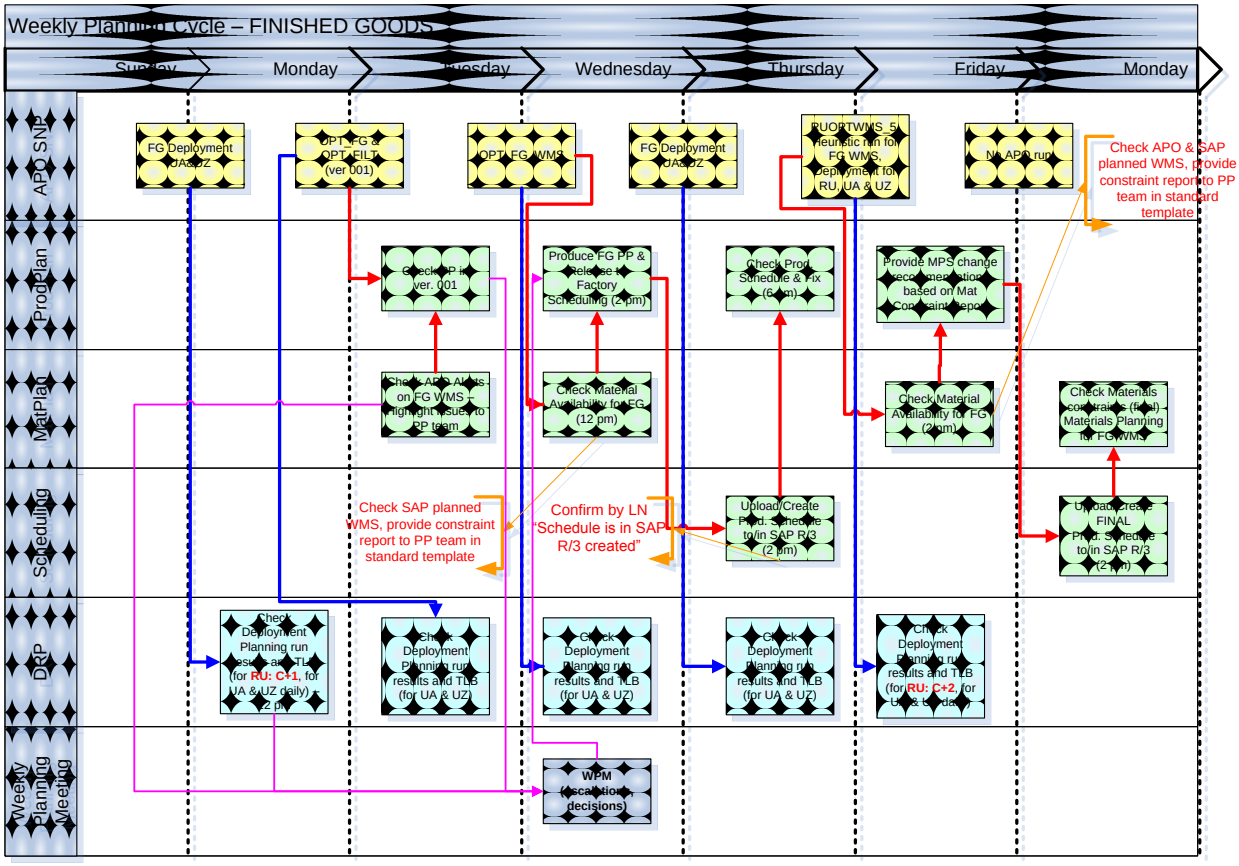
			Actual	Actual		CoPlan	CoPlan		
Vendor		Units	Qty delivered	GBP Value	Material	Qty delivered	GBP Value	% Qty Act/CoPlan	%Value Act/CoPlan
48955	RU	RL	72 222,00	944 668,53	IFR	65448	988169	110%	96%
48973	RU	TH	12 965,25	379 076,96	HLB+BOT	34698	867373	37%	44%
50518	RU	TH	1 869 056,86	24 725 896,34	HLB+BOT	1925308	21730039	97%	114%
50698	RU	RL	69 772,00	2 305 407,68	IFR	95320	3066343	73%	75%
50698	RU	TH	40 851,58	302 833,14	INS	2425	24512	1685%	1235%
50760	RU	TH	1 874 800,55	20 135 448,42	HLB+BOT	1572455	17475104	119%	115%
52046	RU	RL	5 233,00	302 682,81	FIL	46	11587	11376%	2612%
52046	RU	TH	124 641,00	307 983,92	HLB	238200	692755	52%	44%
64640	RU	TH	115 355,56	281 275,59	Inserts				
75633	RU	RL	30 991,00	791 983,45	IFR				
75633	RU	TH	28 810,25	262 843,54	Labels				
75633	RU	RL	2,00	561,40	PIB	192	6150	1%	9%
232770	RU	RL	6 353,00	101 975,82	IFR	7128	144595	89%	71%
48930	UA	TH	37 584,00	336 024,00	HLB	59802	640264	63%	52%
48973	UA	TH	18 072,25	98 494,83	HLB	8910	199734	203%	49%
50760	UA	TH	176 349,75	1 903 206,80	HLB	121486	1320952	145%	144%
76127	UA	TH	68 613,22	1 056 767,40	HLB	55400	810661	124%	130%
230667	UA	RL	3 079,00	135 178,93	IFR	7261	275143	42%	49%
230667	UA	TH	32 711,55	79 707,71	Inserts				
					BWP	105	11699	0%	0%
230980	UA	TH	526 014,00	3 969 890,27	HLB	464450	3749639	113%	106%
231588	UA	RL	35 440,00	391 531,23	IFR	30400	351774	117%	111%
261980	UA	TH	112,25	7 581,80	HLB	4725	140201	2%	5%
267236	UA	RL	1 388,00	47 360,31	IFR	320	11765	434%	403%

48955	UZ	KG	144 591,00	141 683,16	?	0	0		
48973	UZ	TH	640,50	54 999,26	HLB	1080	56274	59%	98%
50698	UZ	RL	15,00	1 222,50	IFR	0	0		
262685	UZ	TH	887,25	24 888,59	HLB	0	0		
265036	UZ	PC	45,00	0,71	HLB	182457	1844003	0%	0%
265036	UZ	RL	17 022,00	514 473,34	PPIB	18660	626346	91%	82%
265036	UZ	TH	705 233,23	10 342 733,08	HLB	422671	7454516	167%	139%
265037	UZ	KG	4 179,45	8 511,56	Bundle strap				
265037	UZ	RL	26 218,00	1 096 772,81	IFR	26298	997502	100%	110%
265037	UZ	RL	14 928,00	505 007,89	PPIB	12200	484278	122%	104%
284995	UZ	RL	882,00	105 476,37	PPP				

Appendix 7. Weekly Planning Cycle – Filter Rods example



Appendix 8. Weekly Planning Cycle. Finished Goods



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