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Mediterranean Conference on Information Systems (MCIS)

9-2017

Proposing A Supply Chain Analytics Reference Model As Performance Enabler

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PROPOSING A SUPPLY CHAIN ANALYTICS REFERENCE MODEL AS PERFORMANCE ENABLER

Research full-length paper

Track N° 1: Big Data and Business Analytics Ecosystems

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Abstract

Nowadays firms have to react quickly to changing markets creating a need for accurate forecasts of demand and supply. In a data-rich environment as it is within the field of supply chain management, much information needs to be stored, processed, and transformed for decision making. To deal with the increasing amounts of data, firms must be aware of chances in supply chain management such as supply chain analytic capabilities to stay agile, flexible, and make use of (complex) data. Supply chain analytics can predict patterns and trends, even in high velocity markets in real-time supporting decision making by using supply chain analytic tools based on data. The benefits of successfully implementing supply chain analytic processes are enormous and result in competitive advantages for companies such as lowering costs while increasing revenues. As many companies fail to apply supply chain analytic processes and tools, this paper examines the challenges, benefits, and factors for the introduction of supply chain analytics using the input-output model.

Keywords: Supply Chain Analytics, Big Data, Success Factors, Supply Chain Analytics Model.

1 Introduction

Supply chain management aims to realize profits and gain superior advantage against market competitors by introducing new supply chains processes supported by information systems. In specific, firms with a superior advantage make use of supply chain analytics using big data as base for the analysis (Ketchen and Hult, 2007, Wamba and Akter, 2015). Therefore, in order to be competitive, firms need to develop supply chain analytic capabilities enhancing and improving supply chain processes such as the supply and demand planning.

Supply chain analytics can be seen as a hybrid construct, which requires big data (analytic) competencies to store, manage, and govern data. In addition, well founded analytic process knowledge capabilities are needed for running supply chain analytic processes. Hence, supply chain data specialists must have a broad knowledge of supply chain processes and an understanding of entities within the supply chain to properly utilize supply chain analytic tools and methods (Waller and Fawcett, 2013). Further, the organization itself must be willing to implement and integrate supply chain analytics processes. Moreover, supply chain partners should have the same knowledge and capabilities about information management and supply chain analytic processes. Using supply chain analytics helps supply chain partners to establish efficient interactions resulting in mutual performance gains (Mohd Yusoff et al., 2016).

According to McAfee et al. (2012), firms that implement a supply chain analytic approach on the decision-making level gain more revenues resulting in a better performance than rival companies. For example, the implementation of supply chain analytic tools allows firms to realize a better accuracy of forecasts in order to improve decision making positively affecting costs and revenues. Further, firms can lower transfer costs or optimize route planning by using algorithms to predict patterns for purchasing or transportation of material (Feki et al., 2016). In addition, firms perform analysis on their supply chains resulting in superior planning and supply chain processes compared to their competitors by making use of multiple data and information (Chen et al., 2015). In consequence, supply chain analytics affects all areas within supply chain management such as "[…] sourcing, purchasing, production, distribution and customer service" (Khan, 2013).

However, realizing performance gains requires firms to be able to process big data from internal and external sources, transform it into meaningful information, and to consider and respect factors that affect supply chain analytic processes (Khan, 2013). This claims the need for the analysis of supply chain analytic processes, the impact of internal and external driving and resisting factors, and the evaluation for the need to adapt IT-systems (Khan, 2013). Therefore, we analyze the different aspects with relation to supply chain analytics proposing an intermediary step towards a supply chain analytics reference model consisting of inter-organizational prerequisites, processing & IT-Infrastructure and results being influenced by six environmental factors. Hence, the model allows users to align the external influences enabling an effective and efficient analytics process.

The rest of the paper is structured as follows: First, we provide the theoretical background on supply chain analytics, its benefits and challenges, and a brief overview of supply chain analytics reference models. This is followed by explaining the applied research method. In the fourth chapter, we develop the supply chain analytics model. Next, we discuss the model being followed by the limitations and future research chapter. Finally, we draw a conclusion.

2 Theoretical Background

The theoretical background provides on overview on supply chain analytics and its existing benefits and challenges, as well as on reference models within the area of supply chain management being related to analytics.

2.1 Supply Chain Analytics

To identify the more and more important role of Supply chain analytics, prior literature (Feki et al., 2016, Wang et al., 2016) classifies supply chain analytics in three major approaches. Descriptive methods are used to turn big data into valuable records. The information about stock, storage and the facility of goods is tracked via GPS or RFID. The resulting information is recorded and shared within an organization in a short period. Therefore, employees in charge can regulate timetables and production planning. Methods such as online analytical processing (OLAP) or drill downs are performed to seek out challenges and chances in the recent supply chain environment, thus measures can be taken to a decision- making level. The descriptive approach relates to past and current events.

A prescriptive approach is used to optimize real-time operations and enhance their efficiency to provide better satisfaction for buyers. These methods are performed to find out what the right strategy might be and is the base of future operation planning. As one of the results, the performance of the whole organization can be improved due to “multi- criteria decision-making, optimization and simulation” of the supply chain.

A predictive approach contributes answers to things that will happen in the future and why they are happening. The methodologies used to get forecasts are “data mining, machine learning and social network analytics”. To analyze social networks in matter of supply chain management, various mining algorithms are executed to foresee future trends and changes. “Clustering” and intelligent algorithms are used to learn from past habits and predict those future events. As a result, the accuracy of scheduling increases and the performance of the supply chain improves.

Predictive and prescriptive approaches are crucial for every business, in order to increase its future strategy. To make the right decision and address issues like *“What are the key-factors to successfully perform supply chain analytics?” and” how are the factors interrelated?”*, the following section examines and interprets prior literature to answer these questions.

In general, to successfully perform well, all supply chain partners have to be on the same level of knowledge. All partners must be aware of each other and cooperate to deal with changing market issues. Thus, *commitment of all supply chain partners* is identified as one of the important input factors. Inter-organizational understanding of the logistic chain as a complete construct is necessary to avoid the often-mentioned bullwhip effect. As a prerequisite to commitment, *trust* is another key-factor to ensure compliance. (Chen et al., 2004, Mohd Yusoff et al., 2016). These two influences come together as supply chain management needs to react quickly and flexible to changing customer demands. Supply chain partners should formulate a *shared business strategy of all supply chain-partners* to reach business goals (Biswas and Sen, 2016). The last of the organizational factors is the use of big data as “dynamic capability”. *Big data capabilities* deliver the competence to avoid making mistakes by visualization opportunities. This supports the management to react in an appropriate way to unpredictable events (Chen et al., 2015).

As organizational input, all employees and people involved in supply chain management should work in an strategic oriented and fully committed environment. The effect of an organized, structured and fully committed working area results in greater planning capabilities and enables firms to develop best practices. Thus, as a processing factor *organizational culture* and *strategic orientation of employees* play crucial roles in supply chain analytics projects (Ireland and Webb, 2007, Fawcett et al., 2008, Mohd Yusoff et al., 2016). The general success of big data analytics is not achieved by purchasing a universal hardware, application or IT Infrastructure in general to perform data analysis. Every company needs to modify its information technology infrastructure for own purposes and find the solution that fits best for its strategy. Employees need to work with the firms *individual IT- architecture* (Sicular, 2012). To support the performance of supply chains and enable organizations to perform analytics, a globally *shared network* through all suppliers is highly recommended to optimize processes and enhance the quality of products and services (Biswas and Sen, 2016). Big data analytics in general must be grounded on high quality data. Incompatible data from any source of the supply chain has huge impacts on the outcome of analytic methods. The accuracy of information, thus *data quality* must be ensured (Nemati and Barko, 2003, Dhavachelvan et al., 2006, Amudhavel et al., 2015). Another topic is the storage of data, with huge amounts of information from large supply chains, early awareness is the key to not make false friends with huge investments in hardware. Common used storages like databases are not built for the high volume of big data. To tackle this issue, new technologies which fit to the required circumstances have to be found and utilized, thus a *flexible storage* is needed to ensure scalability (Gao et al., 2015, Cuzzocrea et al., 2011). As outcomes of the applied supply chain analytics, increased prediction, analyzation and evaluation of risks are more accurate and current. Information about current supply chain influence factors such as natural catastrophes, human influences like war or rebellions and political circumstances can be analyzed more quickly. Supply chain analytics provides opportunities to create early awareness of most of the risks, which have impact on the supply chain. Thus, the big data enabled, *advanced risk management* can classify risks before they affect business and solutions can be found at an early stage of impact (He et al., 2014). In addition, companies are able to improve their accuracy of scheduling. Even though more data has to be processed, a firm's capability to process data more quickly increases. On the base of analytic prediction patterns, production schedules, resource planning and delivery can be scheduled more accurately and increase not only the revenues, but also customer satisfaction. A commonly used quote in supply chain management states: "information replaces inventory". If companies successfully apply supply chain analytics, *more accurate scheduling* is the solution to this supply chain management rule. When information flows are enabled to be faster, managers are able to make decisions even before market changes happen. *Enhanced decision making* results in huge *cost savings,* because predictive methods can identify changes before they happen and complex supply chain data can be processed in a more useful way. (Chen et al., 2015, Wang and Wei, 2007, Engel et al., 2014).

In the table below, a summary of all identified factors is provided. All factors are related and built on each other. A reference model can be developed and will be proposed in the section purposing a *Supply chain analytics model.*

Input Factors	*Processing Factors*	*Outcome Factors*
- Trust	- Organizational culture	- Advanced Risk Management
- Commitment of all suppliers	- Strategic orientation of employees	- More accurate scheduling
- Shared business strategy of all supply chain- Partners	- Individual IT- Architecture	- Enhanced decision making
- Big Data capabilities	- Shared Network	- Cost savings
- Data quality	- Flexible storage	

Table 1. Success factors for supply chain analytics.

2.2 Benefits and Challenges of Supply Chain Analytics

Supply chain analytics (SCA) are enablers to successfully plan and adjust a corporate's business strategy. It starts from the logistics network planning and spans multiple activities such as production planning, financial planning, SC-risk management, managing of products, decision making in management levels, and many more. Supply chain analytics can bring huge benefits and opportunities for manufacturers. (Wang et al., 2016). As companies intend to serve international markets with their products, the data has to be more complex, thus more than just a single information such as locations of goods have to be recorded. Furthermore, information consists for example of time of selling, inventory level at time or other specific data. The access to data such as inventory levels have to be accessible at several points in a global operating supply chains due to more efficient planning. Big Data provides lots of opportunities for supply chain management, such as more comprehensive forecasting, more accurate tracking of goods and raw materials and as a result supporting decision making on supply chain management level. The performance of supply chains increases with big data analytics. For instance algorithms predict patterns for purchasing and transporting material, thus optimize route planning and lower transfer costs, affecting the whole supply chain's and furthermore the company's performance (Feki et al., 2016). (Engel et al., 2014) provided a possible method to increase the customer's satisfaction with a more accurate tracking application for distribution logistic companies. In general, the model exploits big data in real-time to obtain customer specific appointments for optimizing delivery scheduling of packages. Customers are able to access the time of delivery through their app-enabled phone. The personal customer location data is gathered through RFID on the parcel in combination with traffic and weather data, to calculate the estimated arrival time and make an appointment in the customers schedule on the smartphone. This concept brings great benefit for companies and customers. Not only that customers are able to get an accurate delivery time, furthermore they will stay customer, because of the reliability. Companies on the other hand gain CRM data and can increase their market share. As business analytics gained more awareness over the last few years, (Chen et al., 2015) stated that SCM is one of the highly relevant fields for application. Furthermore, the exploitation of big data analytics can improve supply chains' performance. The used KPI asset productivity is seen as one of the common KPIs to evaluate the performance of supply chains. In their research, they were able proof that the use of big data analytics has a positive effect on this KPI, thus on the supply chains overall performance. Supply chain analytics can be used to identify and select the right supplier to adapt the existing logistic flow. The suppliers can be assessed through information about supply chain activities in real-time and offer companies more bargaining power. The process of moving goods, thus the SC-flow can be virtually executed to sense and prevent failures by exploiting big data information. This offers firms new opportunities to react more quickly and take the right measures (Sanders, 2014). Furthermore, Supply chain analytics can provide opportunities to find potentials in production optimization and existing processes. Data quality improves with big data driven approaches and with more and quicker data analyzation supply chain's overall effectiveness improves (Amudhavel et al., 2015).

As Topic of big data management brings great advantages on companies, there are many challenges firms have to deal with before benefiting from the use of supply chain analytics. (Bange et al., 2013) stated that the costs to fully implement and use big- data- driven approaches are enormous. Besides IT- related investments, experts on the field of business analytics and business intelligence are required. Most companies hesitate to take the risk of fail with SCA-projects, because of the possible loss of profits. (Kynast and Marjanovic, 2016). The required experts have to be hybrid data scientists with analytical and statistical skills. Also, this issue requires founded knowledge about big data and business intelligence. Employees have to be able to perform methods like data mining, ect. and they should understand business problems and be able to solve them. However, to successfully integrate and maintain SCA, rarely existing and skilled staff is necessary for a good performance in supply chains. A text mining study for work ads (Debortoli et al., 2014) pointed out that business intelligence and big data are two capacities which should not be seen as the same. These two areas have connections in between, but require different skills and built on each other's results. Companies must be aware of the changing environment and have to hire broadly educated employees for both areas to process and transform huge amounts of data with the right tools and in real-time to meaningful information for the decision-making level. The required experts to tackle this issue are a new generation of IT- scientists, which have a profound understanding of analytical methods and are able to detect and solve information related business problems (Waller and Fawcett, 2013).

2.3 Supply Chain Analytics Reference Models

Biswas and Sen (2016) contributed a possible "cloud- based architecture" for big data analytics in supply chain management. This framework contributes "[…] storage management, analytics and visualization of big data" for every level of supply chains. Several "[…] sensors, actuators, RFID tag enabled objects, camera connected objects" provide information and can be located at all time. Modern techniques such as "cloud-computing", "parallel processing", "intelligent algorithms" and high- speed hardware could enable the resulting system to process big data in short amounts of time. As the cloud takes place as an inexpensive and flexible memory solution, inbound information can be stored easily. A "Data Bus" gathers requested data from the cloud and transfers it to the "Data Storage and Management System". At this point data is being prepared for further processing in the "Data Analytics Engine", where the information transforms into significant analytics data. The last phase of the process visualizes the data for analytic and predictive evaluation. This theoretical system would be able to provide data in real- time to any supplier in the supply chain and could make forecasting more accurate to improve the performance of a company's logistic network.

To continue the work of Nemati and Barko (2003), Nemati and Udiavar (2012) expanded the former work to identify relevant factors for supply chain analytics projects. In their model, they identified requirements for data, infrastructure, technical and non- technical aspects and organizational strategy as success criteria for SCA. They claimed that the supply chain area is a data chaos and organizations have to deal with the issue to get good quality of data for further use in their systems. Another challenge is to access data from all the supply chain partners and integrate them into their own system. To tackle this critical topic an appropriate infrastructure which enables the company to perform analytics of the data is required. The technical and non-technical factors are a major key to get the right performance out of IT. To successfully perform SCA and get useful results the employees must have necessarily a technical and organizational understanding of their environment. As last part of their model, the "organizational culture and strategy" are named. Managers have to be aware of the changing environment and that companies have to transform in order to deal with the increasing amount of data. Sooner or later supply chain analytics will play an important role for a company's success.

To pick up on their work and evolve their business model, this paper contributes a next level model. The used model to depict the success factors for SC-analytics, a simple input- output model was adopted and configured. For reference, the used model was adopted from (Kielhofner and Burke, 1980). The model is one of the best ways to describe the factors and prerequisites. The model depicts the resources a company has to invest and what organizational fundamentals are needed. The throughput usually shows production factors or raw materials necessary, to process. A combination of all listed processes, materials or factors, value is being created for the output. In the outcomes section of the model, a user can find finished goods or services, which bring revenues or benefits for the company. It generally depicts a process in a simple way and that's why the model without a doubt fits for supply chain analytics. It describes a possible process firms can deduct to successfully implement supply chain analytics. In a complex environment, such as supply chain analytics or big data in general, most of the contribution gets lost in the complexity. By utilizing this model towards a supply chain analytics approach, firms can use the adaptation – being described in chapter four – for the implementation of SCA and realize new opportunities and thereby a better supply chain performance.

3 Research Method

As research method, we conducted a literature review according to the guidelines from Webster and Watson (2002) using major databases such as AISEL, EBSCOHost or ACM. Due to different search requirements, we structured the process in three streams: Google Scholar, EBSCOHost, and ACM/AISEL. Figure 1 provides details on our literature review process adopted from Heininger et al. (2012).

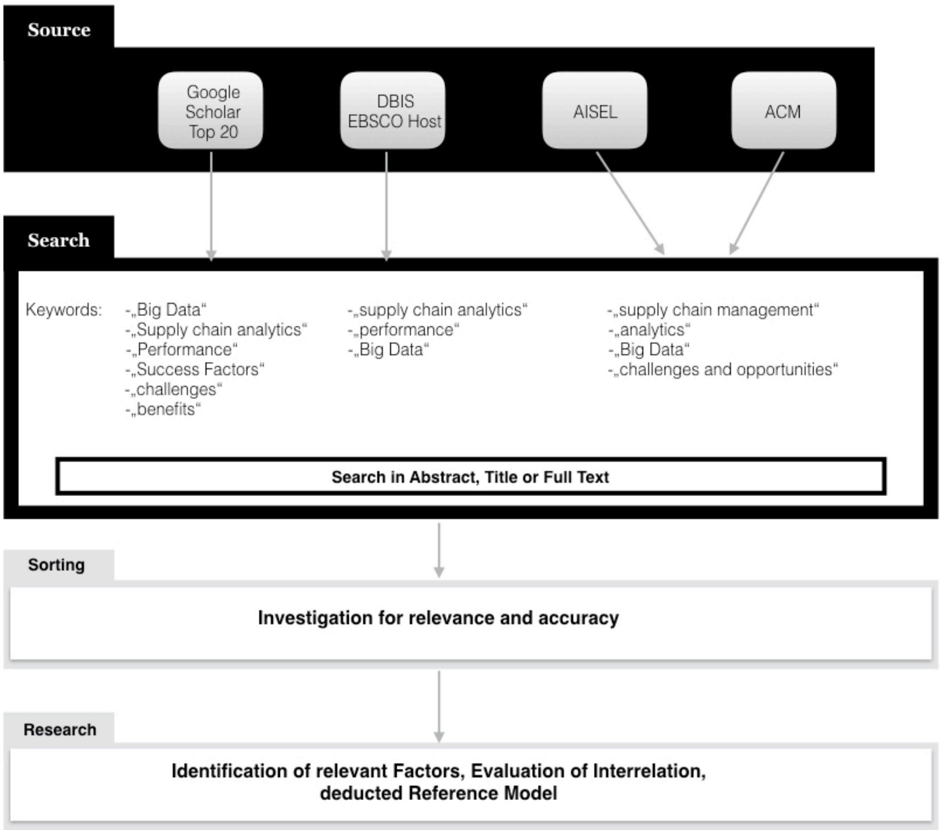

Figure 1. Literature review process.

The used keywords in Google Scholar “supply chain analytics” and “performance” and “enablers” resulted in more than 100 results (as Google does a full text search). The next step was to add the keywords “success factors” and “big data”. In addition, the timeframe was limited to papers being published since 2011, which resulted in 11 papers. However, no publication was relevant for the topic. Therefore, the key-words were changed to "supply chain management" and "business analytics" and "big data" and "success factors", which resulted in 16 relevant results. Within the EBSCO Host data-base, we have not found any results by using the following key words: "supply chain analytics" and "performance" and "big data”. Most of the papers used for this work appeared in the “AISEL” and “ACM” data base with several combinations of “supply chain management” or “supply chain analyt-ics”, “analytics”, “Big Data” and “challenges and opportunities”. The search was particularly managed with filters like title or abstract search for combinations of the key-words. The 8 articles found were analyzed. Several more sources were identified through backward and forward search. The results reach from articles in journals to conference papers and cover the topic supply chain analytics and big data in supply chain management widely.

4 Proposing a supply chain analytics model

As we aim to propose a first step towards a supply chain analytics reference model that consolidates existing research on supply chain analytics, we adopt the input-output model that allows to identify, describe, analyze, and discuss pre-requisites for the supply chain analytic processes as well as ante-cedents affecting the results of supply chain analytics. In addition, the model provides firms with a comprehensive view of the necessities for a successful application of supply chain analytics enabling them to increase performance.

This supply chain analytics model was built on the input-output model. The SC- analytics model consists of three major sections: The Inter-organizational prerequisites (Input), Processing & IT-Infrastructure (Throughput) and Outcomes & Results (Output). The Input and Throughput sections are connected by the operationalization of supply chain analytics. The Throughput section and the Output section are linked with each other through the performance resulting from Processing & IT Infrastructure. The environmental factors in the supply chain analytics field consist of Innovation & New Technologies, Changing Markets, Supply Chain Risks, New Dominant Players, Competitors, Increasing Amount of Data. Figure 2 visualizes the model.

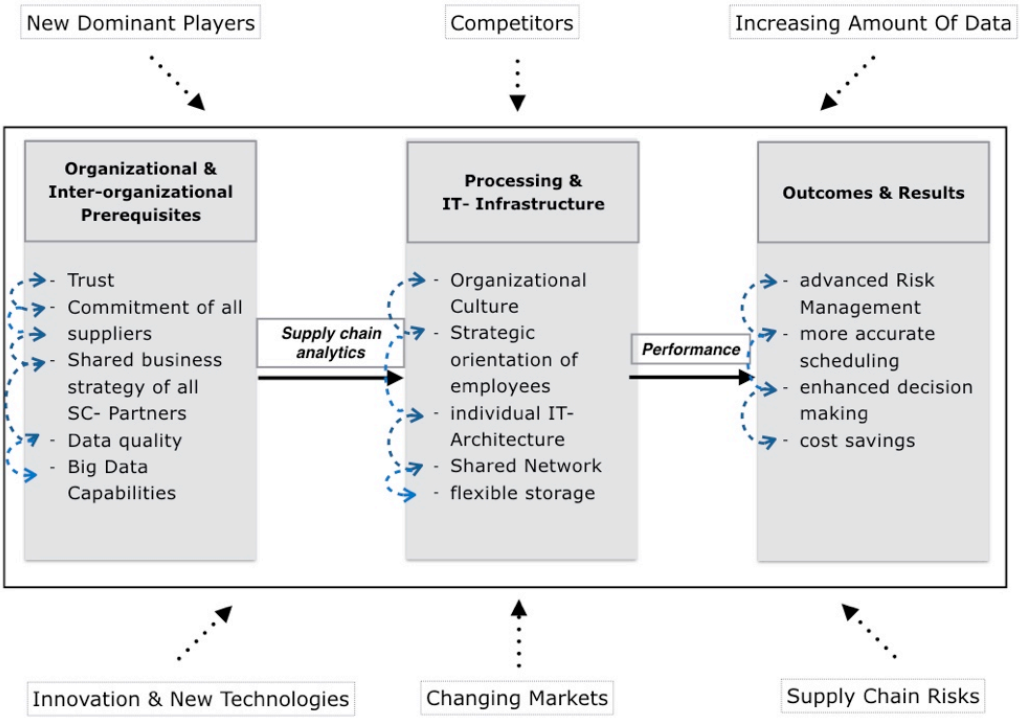

Figure 1. *Supply chain analytics model. (Dotted lines from the outside: environmental factors; dotted lines inside: inter-relation of factors; arrows inside the box: supply chain analytics process from the Input section towards the Output section.)*

As organizational and inter-organizational factors that a company has to be capable of to successfully perform supply chain analytics, trust among the internal and external people involved is the first thing necessary. Without trust, there is no willingness to share any important data through suppliers to get the basic data to work with (Fawcett et al., 2008). Building on trust, all partners of a firm must be aware that mutual commitment is the key to ensure the essential speed of communication, otherwise it could be too late to react to high velocity markets. It is fundamental to develop a supply chains business strategy with all members of the supply chain in order to collaborate and exchange data (Engel, 2015). Goals and agreements can be written down to ensure compliance. Data quality must be ensured in order to avoid miscalculations and support the analytics methods. False data could end in huge processing times of big data or failure. The last of the input factors is big data. A firm must be aware that their IT-systems are capable of processing and perform big data analytics.

If all these prerequisites are given, supply chain analytics can be applied successful. When it comes to the processing and IT- Infrastructure section, many factors have to be considered. First of all, an organization has to be capable to adopt changes to their corporate strategy. The change management must be organized well and every employee involved in the task has to follow strategic guidelines to ensure highest performance. A strategy and project plan has to be formulated and workload has to be distributed to the departments. To organize the supply chain information and ensure the analytical success the organization must develop an individual IT- architecture. The requirements for the different markets and demands differ from segment to segment. The appropriate information technology has to be applied. To exchange current and relevant data a firm should establish a shared network with all suppliers along the chain. Indeed, this might be a difficult task for internationally operating firm, but information about stock, shipping, customer demands and much more is essential to make the right decisions. The storage of received data and the classifying of data may be the most formidable task. Scalability is the approach to tackle the issue of storage. A corporates IT- Infrastructure needs to be able to "breathe", thus flexible storage technologies have to be explored and applied.

The benefits for companies by using this model are concluded in outcomes and results. By executing supply chain analytics methods, data from public media can be extracted and analyzed. In doing so, risk management can predict and evaluate any conditions that affect the supply chain. Natural catastrophes and people affected circumstances can early be noticed and evaluated. Timely awareness of disruption causes prevents shortfalls of supply and customer demands can be satisfied. The advanced risk management and communication support the daily business and ensures its consistency. By the early detection of risks, management departments can plan more accurately. Safety stocks, thus unnecessary costs for stock can be prevented and production capacity can be scheduled more accurately. Delivery patterns can also be analyzed and routes can be optimized. Because the flexibility of the whole logistics has increased, decisions on the development of future products and services are easier for managers. As last and most important outcome of this model, an organization is able to save enormous amounts of their profit by being more flexible. The cost savings reach from cost for inventory and stock, IT- costs, better prevention of risks and more accurate scheduling of sourcing, production, delivery to better quality of products, thus less returns and increased customer satisfaction.

The environmental factors influence every business that uses big data analytics in supply chain. Nowadays new dominant players could take over the market, because of their unique products or services. Competitors could take over suppliers and disrupt the well-established and big data enabled supply chain. The markets in which firms operate are changing more quickly from year to year and can cause huge losses on profits, because of false planning. New innovative technologies could give competitors the opportunity to take over a company's core competency and take over the market. By the continuous increasing amount of data, IT- infrastructures and data warehouses will be outdated very quickly. With ongoing wars and riots in several countries and natural tragedies suppliers can be affected and devastated.

5 Discussion, Limitations, and Future Research

In this paper, a model for implementing supply chain analytics was developed. The paper aims to contribute a guideline for companies to prepare SCA-adoption. The utilization of big data analytics in combination with a deducted process form the proposed model shall ensure the success of the project. This model picks up on the work of Nemati and Udiavar (2012) and provides a different approach. The input- output model was used to expand the exiting model to a more practical use. If a process can be deducted from the model may be questionable, but it's very likely. The simple design makes it easy to understand the phases and can open new business opportunities. Any similar model was either too complicated or did not cover all areas of supply chain analytics. Indeed, this construct may not cover the complete topic of SC-analytics, but it is a simple approach for firms to develop their own strategy for the topic from this scheme. The simple differentiation in technical, organizational and data may be too theoretical. A practical use as described in this model may be easier to adopt into a company's system. To ensure the success of the developed model, all factors should be provided. Due to the interrelation and the fact that all factors built on each other, the adoption could be tough. Some of the mentioned aspects are not simple to control. Human factors like the compliance with strategic orientation or the willingness for the implementation to succeed are hardly measurable. The environmental factors of this model are probably soon outdated or inaccurate for specific areas, thus each company has to analyze and evaluate possible factors by itself. The priority of the environmental influencers also shifts from business to business and therefore environmental factors in this model are only listed in general. The input-output model was the base for this new approach. The fundamentals of this structure were deducted from many different sources and did not only use SCA-literature. The research for this paper involved many different areas such as supply chain management, business performance, big data in general and logistics. Adoptions to the model were made based on the analyzation and evaluation of prior literature. The scientific value of some of the used papers should be re-evaluated, because some of the used sources did not merge with their headline, were questionable or not found. Most of the provided papers did only cover theoretical knowledge and approaches for the use of supply chain analytics.

This model is the first step to suggest a possible adoption guideline. The limitations of this work include issues like specific markets. To cover a broad demand of firms, all identified factors may be very theoretical and non-specific for some companies. Another topic is that the model may not cover the depth of the big data aspect. Big data requirements are hard to determine. Staff must have the right education to deal with the combination from big data analytics and business intelligence. Advanced trainings for the development of data scientists, who can perform analytical methods, but also have the knowledge to solve business problems, should be offered by companies. This also addresses university and IT-trainings, to update their education schedule and teach the necessary skills. The reason is that prerequisites for this very daunting issue are changing with the amount of information provided. It is possible, that firms implement a supply chain analytics infrastructure and it might be out-of-date within a few years. The simple structure also may make it look too easy for an complex like big data analytics in supply chain management. This model can only be a base for practical implementation and execution. A more precise and extended version of this work may support SCA-projects. The architecture can be used to set scopes for SCA-developments and cover endeavours for success.

As research on this complex topic is rare and the literature research is difficult, future work should evaluate the identified factors and relations of the SCA-model in quantitative settings such as simulations, experiments, or surveys, and develop and use prototypes to ensure practical applicability of the model. This will ensure that the model contributes to practice by identifying further external as well as internal inter-relations between the identified aspects. Further, the impact of the environmental factors might vary. Therefore, the model is just a first step towards mastering supply chain analytics. Aligning the proposed supply chain analytics model with existing inter-relations will allow firms to implement specific supply chain analytics solutions enabling firms to increase their overall performance.

6 Conclusion

The upcoming topic supply chain analytics, thus big data analytics use in supply chains unites many aspects and has an immense complexity. To tackle this issue and provide a possible fundament for the implementation of SC-analytics, the proposed model can be expanded, customized and applied. The changing environment of supply chain management in a data rich environment needs to be faced with simple solutions to support progress and evolution. Firms need to optimize and tailor their strategy and architecture to deal with upcoming changes. The use of analytic methods brings great benefits and may result in significant advantages against competitors. To achieve these superior competencies, globally operating firms need to utilize innovative information processing opportunities like supply chain analytics. Not only the high velocity markets, furthermore all markets can be taken over by applying flexible and agile methods and processes being key aspects a firm need to develop and maintain. By applying the supply chain analytics model, all areas of the firm would profit and overall performance will be enhanced significantly.

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