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EDITOR'S NOTE **VOL 7, NO 2 (2017)**

How companies work and fail to work with business intelligence

Most papers in this issue deal with different sides of business intelligence systems. Empirical data from a number of countries and companies are gathered to illustrate how companies work and fail to work with competitive intelligence.

The paper by Alnoukari and Hanano, entitled "Integration of business intelligence with corporate strategic management," deals with the relationships between business intelligence and strategic management. The paper proposes a BSC-BI framework that facilitates the integration of business intelligence with the balanced scorecard methodology using an example of a case from the telecom industry.

The paper by Jürgens, "Patent bibliometrics and its use for technology watch," is on the topic of technology watch and statistical analysis of patent information and proposes patent indicators for technology watch activities, which are classified into four categories: performance, technology, patent value and collaboration indicators. The case of nanotechnology for a whole country is applied as example.

The paper by Søilen, "Why care about competitive intelligence and market intelligence? The case of Ericsson and Swedish Cellulose Company (SCA)," tries to answer that question with an example of two Swedish companies. The history of the intelligence function in private companies is compared to that of state and military organizations. The most interesting question turns out to be why more companies don't pay attention to CI and MI when so many arguments speak to their advantages.

The paper by Gauzelin and Benz is entitled "An examination of the impact of business intelligence systems on organizational decision making and performance: The case of France". This empirical study examines the impact of business intelligence systems on organizational decision-making and performance. They found that when BI systems are deployed in SMEs, they facilitate timely decision making, improve organizational efficiency, enable a company to meet client's needs appropriately and lead to more satisfied employees.

The paper by Langlois and Chauvel is entitled "The impact of supply chain management on business intelligence". The authors argue for why it makes sense to see the BI function as an extension of supply chain management, but moreover they show how difficult it has become to separate BI from other IT intensive processes in the organization.

As always, we would above all like to thank the authors for their contributions to this issue of JISIB. Thanks to Dr. Allison Perrigo for reviewing English grammar and helping with layout design for all articles and to the Swedish Research Council for continuous financial support.

On behalf of the Editorial Board,

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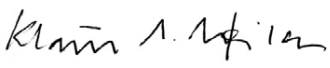

Prof. Dr. Klaus Solberg Søilen
Halmstad University, Sweden
Editor-in-chief

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Integration of business intelligence with corporate strategic management

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ABSTRACT Integration of business intelligence and corporate strategic management has a direct impact on modern and flexible organizations. This integration helps decision makers to implement their corporate strategies, adapt easily to changes in the environment, and gain competitive advantages. This paper extends the studies in this domain, and clarifies the relationships between business intelligence and strategic management. It highlights also the role of business intelligence in corporate performance management and strategic intelligence. This paper proposes a BSC-BI framework that facilitates the integration of business intelligence with a balanced scorecard methodology. The BSC-BI framework implementation is demonstrated using a case study on the telecom field.

KEYWORDS Balanced scorecard, business intelligence, competitive intelligence, corporate performance management, corporate strategic management, strategic intelligence

1. INTRODUCTION

Dresner introduced business intelligence in the year 1989, as an umbrella term that "describe a set of concepts and methods to improve business decision making by using fact-based support systems" (Power, 2007). Business intelligence is an environment in which 'marrying' business knowledge and data mining provides great results (Anand, Bell, and Hughes, 1995; Cody, Kreulen, Krishna, and Spangler, 2002; Weiss, Buckley, Kapoor, and Damgaard, 2003; Graco, Semenova, and Dubossarsky, 2007). Alnoukari considers business intelligence as "a framework that helps organizations managing, developing and communicating their information and knowledge. Thus, it can be considered as an imperative framework in the current knowledge-based economy arena" (Alnoukari, 2012). Other researchers consider business intelligence as an umbrella that combines: architectures, tools, data bases, applications, practices, and methodologies (Turban, Aronson, Liang, & Sharda, 2007; Cody, Kreulen, Krishna, & Spangler, 2002; Rouhani, Asgari, & Mirhosseini, 2012). Weiss et al. 2003 define business intelligence as the "combination of data mining, data warehousing, knowledge management, and traditional decision support systems" (Weiss, Buckley, Kapoor, & Damgaard, 2003). Business intelligence systems can have multiple benefits including: faster access to information, particularly big data complexes, increasing revenue, better customer satisfaction and generating or improving competitiveness of enterprises (Brinkmann, 2015).

Knowledge management emerges in part from the thinking of the "intelligence approach" to business (Marren, 2004). Dedijer thinks that "intelligence" is more descriptive than knowledge. "Knowledge is static, intelligence is dynamic" (Marren, 2004). Intelligence is "the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal"

(Alnoukari, 2012). The main challenge in any business intelligence solution is in its intelligence ability. This can be found in the post data mining phase where the system has to interpret its data mining results using a visual environment (Alnoukari, 2012). The capability of any business intelligence (BI) solution can be measured by its ability to derive knowledge from data (Azevedo & Santos, 2009). The challenge in any BI solution is to meet with the ability to identify patterns, trends, rules, and relationships from volumes of information which are too large to be processed by human analysis alone (Alnoukari, 2012). In summary, BI is "the use of all the organization's resources: data, applications, people and processes in order to increase its knowledge, implement and achieve its strategy, and adapt to the environment's dynamism" (Alnoukari et al., 2008). Competitive advantage has shifted from companies that focus on implementing new technologies to those that employ technology to share, manage, and increase the level of knowledge inside the organization (Brinkmann, 2015). BI and analytics evolution started by DBMS-based and structured content, evolved into web-based and unstructured content, and currently is based on mobile and sensor contents (Chen, Chiang, & Storey, 2012).

The business intelligence solution has three layers (Azvine, Cui, & Nauck, 2005; Baars, & Kemper, 2007; Shariat, & Hightower, 2007). Each data layer is responsible for storing structured and unstructured data for decision support purposes. Structured data are usually stored in operational data stores (ODS), data warehouses (DW), and data marts (DM). Unstructured data are handled using content and document management systems. Data are extracted from operational data sources, e.g. SCM, ERP, CRM, or from external data sources, e.g. market research data. Data are extracted from data sources that are transformed and loaded into DW by ETL (extract, transform and load) tools. The analytics layer provides functionality to analyze data and provide knowledge. This includes: OLAP, data mining, and aggregations. Data mining is a core component of this layer. Data mining is the search for relationships and distinct patterns that exist in a set of data, but they are "hidden" among the huge amount of data (Jermol, Lavrac, and Urbancic, 2003; Turban, Aronson, Liang, & Sharda, 2007). The data mining application has important results in many areas (Alnoukari, and Alhussan, 2008; Watson, Wixom, Hoffer, Anderson-Lehman, and Reynolds, 2006) including: marketing (direct mail, cross-selling, customer acquisition and retention), fraud detection, financial services (Srivastava, & Cooley, 2003), inventory control, fault diagnosis, credit scoring (Shi, Peng, Kou, & Chen, 2005), network management, scheduling, medical diagnosis and prognosis. There are two main sets of tools used for data mining (Corbitt, 2003; Baars & Kemper, 2007): discovery tools (Wixom, 2004; Chung, Chen, & Nunamaker jr, 2005), and verification tools (Grigori, Casati, Castellanos, Dayal, Sayal, & Shan, 2004). Discovery tools include data visualization, neural networks, cluster analysis and factor analysis. Verification tools include regression analysis, correlations, and predictions. Knowledge discovered from data mining can enhance and improve an organization's decision making capabilities (Kerdprasop, & Kerdprasop, 2007). The third layer is the visualization layer realized by BI applications or portals.

Strategic management is a framework for decisions and actions that results in the formulation and implementation of plans to achieve a company's objectives and setting long term directions (Kruger, 2010; Fries, 2006). Porter (1979) summarizes strategic management basic elements as: strategy process, strategy content and strategy context. These elements provide four essential steps for strategic management. Environmental scanning includes both internal and external scanning. Strategy formulation includes corporate's vision and mission, corporate objectives, strategies and policies. Strategy implementation drives the strategy into action, and finally strategy evaluation and control lead monitor actual performance against desired performance, and the needed corrective actions (Porter, 1979). A strategy is a fundamental framework through which an organization can maintain its continuity in the market, and maintain its adaptability to environment changes to gain competitive advantages (Fries, 2006; Porter, 1996). Traditionally, strategy can be seen as a coherent and integrative view for decision making, or long term objectives with action plans and priorities for the corporate resource allocation. It can also be seen as a response to external opportunities and threats and internal weaknesses and strengths as well as a logical system that differentiates between managerial tasks at the corporate different

levels: corporate, business and functional (Global Intelligence Alliance, 2004).

Lastly, different research tackles the use and importance of business intelligence in the strategy development process, and its effect in improving corporate performance in order to gain strategic capabilities (Brinkmann, 2015; Zoumpatianos, Palpanas, & Mylopoulos, 2013; Seitovirta, 2011; Alnoukari, 2009; Bogdana, Felicia, & Delia, 2009; Albescu, Pugna, & Paraschiv, 2008; Elbashir, Collier, & Michael, 2008; Pirttimaki, 2007; Fries, 2006; Viitanen & Pirttimaki, 2006).

One of the new terms that best describes the alignment between strategic management and business intelligence is strategic intelligence. It can be defined as "a systematic and continuous process of producing needed intelligence of strategic value in an actionable form to facilitate long-term decision making" (Global Intelligence Alliance, 2004). Strategic intelligence focuses mainly on supporting strategic decision making by introducing intelligence to the strategic values. It provides a big picture about the business environment and benchmarks corporate operations. Strategic intelligence can contribute in strategic management by collecting, analyzing and distributing of information (Seitovirta, 2011). Kruger considered strategic intelligence as a combination (in terms of information) between business intelligence, competitive intelligence, and knowledge management and it acts as a powerful input to strategic management. Strategic management can assist in identifying opportunities, and add value to the organization's decision making capabilities (Kruger, 2010).

Strategic management requires many in-depth analyses including: impact analysis, what-if analysis, business driver analysis, and critical strategic themes analysis. Different roles were identified for strategic management, such as defining and providing a forecast for the competitive environment, underlying management assumptions which may impact strategic thinking, identifying and assessing the company weaknesses against the market opportunities and threats, implementing and adjusting the strategy in response to the changes in the competitive environment, and determining when the strategy is no longer sustainable (Global Intelligence Alliance, 2004). Thus, strategic intelligence covers many concepts from business intelligence, competitive intelligence and competitor intelligence.

The aim of this paper is to make a significant contribution to the research in this domain. First, it extends previous business intelligence studies by providing a framework that can integrate research solution with strategic management using an exploratory approach. Our systemic overview builds on prior research within this domain, but recognizes the evolution of business intelligence to include analysis and strategic management. This study builds on previous research that highlights the use of business intelligence solutions for achieving organizational strategies (Alnoukari, 2009).

2. THE INTEGRATION BETWEEN BUSINESS INTELLIGENCE AND STRATEGIC MANAGEMENT

Business intelligence as a strategic framework is becoming increasingly important in strategic management and in supporting business strategies. It can be considered as one of the most important technologies that allows managers and end users to convert masses of non-transparent data into useful information that provide companies with huge capabilities. These technologies help coordinating projects, and schedules, and provide the roadmap to align with the corporate strategy. Business intelligence as an analytical tool changes internal and external data into an appropriate knowledge that supports the decision making process. Business intelligence combines operational data with the analytical tools to provide corporate planners and managers with competitive information. For this reason reserachers consider business intelligence as a competitive differentiator (Brinkmann, 2015). Strategic management addresses the IT role in the strategy formulation and implementation processes (Tang & Walters, 2006; Shadid, 2012; Zoumpatianos, Palpanas, & Mylopoulos, 2013). Strategic management theories are largely geared towards gaining competitive advantages. Porter proposed a five-forces model of competition, value chain and generic competitive strategies between many of very influential strategic analysis models (Porter, 1979).

Flexible organization is based on IT alignment with business strategy. As a result of acceleration in the rate of innovation and technological changes, markets evolve rapidly, products' life cycles get shorter and innovation becomes the main source of competitive advantage (Järvinen, 2014). IT alignment with the business strategy to enhance corporate

strategy was highlighted by many researchers (Boddy, Boonstra, & Kennedy, 2005; Sabherwal & Chan, 2001). The strategic alignment model was one of the first models that described in an explicit way the relationship between business strategies and IT strategies (Grembergen, Haes, & Guldentops, 2004). The strategic alignment model is based on the strategic fit that recognizes the need to position the firm in an external marketplace where growth can take place, and the functional integration, which addresses how to best structure internal systems to execute the business strategy of the firm (Katz, 2002). IT alignment is not only formulating IT strategy to fit business strategy. It has to consider external forces and the environmental uncertainty. Therefore, organizations seek flexibility to meet market demands. Flexibility-based perspectives were evolved from Schumpeter's concept of creative destruction (Drnevich, Hahn, & Shanley, 2006). Operationalization of these perspectives in strategic management can be achieved through dynamic capabilities and real option views. A dynamic capabilities view refers to a firm's abilities to maintain and adapt its internal resources to environmental changes to maintain sustainability of the competitive advantages. It refers to the capability of acquiring new modes of competitive advantage. It involves continuous searching, innovation and adaptation of firm resources and capabilities to uncover and tape new sources of competitive advantages. The real options view is effective in dealing with issues of uncertainty. It allows the firm to defer investment decisions until uncertainties are resolved (Drnevich, Hahn, & Shanley, 2006).

Business intelligence facilitates the transition into flexible organizations as it is becoming a source of competitive advantages and differentiation (Herring, 1988; Pérez-Valls, Ortega-Egea, & Úbeda, 2006). There are many reasons for organization to adopt business intelligence in order to improve organizational strategy. It is considered as an extension to corporate strategy activities (Herring, 1988; Viitanen & Pirttimaki, 2006). Zoumpatianos et al. (2013) argue that a complete business intelligence problem begins with the modeling and analysis of corporate strategies and objectives (Zoumpatianos, Palpanas, & Mylopoulos, 2013). Business intelligence dashboards and reports can easily provide strategic management with important strategic information such as trends, production evolution over time, historical evolution of market share, demads forecast, and market segmentation (Fries, 2006). Data analytics and data mining could be used effectively to build future business strategy, and could reveal hidden reasons for some deficiencies as well as possible high-yielding new investments. Corporations need to be sure that they are receiving the right information related to their long-term strategy. In conclusion, business intelligence helps organizations in supporting their strategic decision making process, including corporation SWOT analysis and strategic planning (Herring, 1988; Zoumpatianos, Palpanas, & Mylopoulos, 2013). All the mentioned benefits should provide organizations with sustainable competitive advantages.

Zoumpatianos et al. (2013) propose an integrated system based on SWOT analysis findings and a query engin that can monitor and evaluate the corporate strategic objectives and goals. A data warehouse based query is used to coninously monitor the corporate strategic acheivement. This system can provide answers to a trend query like the following: "Will the current sales trend that we observe up to now, within a time window W, in the market segment S help us to achieve the goal of increasing our market share by 5%?" Zoumpatianos et al. (2013) argue that this system is able to find objectives trends and monitor the expected and unexpected threats and opprtunities in the data warehouse as well as their causes (Zoumpatianos, Palpanas, & Mylopoulos, 2013).

Corporate performance management is considered as one of the strategic management tool that includes: planning, measurement and analysis steps. Business intelligence contributes to corporate performance management and especially to measurement and analysis practices by enhancing access to performance information, and supports decision making in each step of the corporate performance management cycle. The effectiveness of business intelligence implementation would affect the effectiveness of corporate performance management related planning and analytic practices (Richards, Yeoh, Chong, & Popovič, 2014). Bogdana et. Al (2009) propose a framework for integrating corporate performance management with business intelligence. The framework integrates corporate objectives using scorecards and dashboards using business intelligence tools at a strategic level, with the

aim to support business measurement at the tactical and operational level (Bogdana, Felicia, & Delia, 2009). Corporate performance management is thus considered as the combination of business intelligence, scorecards, and profiling.

Vuksic et al. (2013) demonstrated using a case study on the Croatian telecommunications industry the importance of implementing corporate performance management and business intelligence initiatives together in order to achieve better firm performance. They demonstrated the importance of the alignment between corporate performance management and business intelligence initiatives in order to resolve any data problems by creating one integrated data architecture; which would make business more effective (Vuksica, Bacha, & Popovic, 2013).

Business intelligence tools could be integrated into an operational process, or monitor the output of a process or series of processes (Elbashir, Collier, & Davern, 2008). Business process outputs are often linked to business objectives that are usually aligned with an organization's strategy. The main role of business intelligence is to provide the information on the accomplishment of the corporate objectives, thus allowing the managers to analyze performance gaps, and improve their understandings of organizational outcomes (Watson, et al. 2006). According to the performance gaps, managers can take corrective actions. They might update the related objectives, or take special steps to improve the processes to better achieve the objective. In conclusion, business intelligence could be integrated in some situations into a process to automate certain type of decisions, or could be used in other situations to provide the needed information to monitor the output of a process (Elbashir, Collier, & Davern, 2008).

Business process management and business intelligence are highly connected for the purpose of improving corporate performance (Vuksica, Bacha, & Popovic, 2013). Although business process management focuses mainly on business process while business intelligence focuses on business performance, they can together provide better results for corporate performance management. Business intelligence improves corporate effectiveness by focusing mainly on sales, marketing and customer information, while business process management improves corporate effectiveness by focusing mainly on improving corporate processes as they generate most of the cost of any business. Business intelligence provides the business process management with the detailed data needed for information consistency and data quality. Thus the integration of business intelligence and business process management initiatives are vital for improving corporate effectiveness (Vuksica, Bacha, & Popovic, 2013).

The most important component for the success of any modern organization is its ability to take the benefits of all the available information, internally and externally, using structured data management systems (business intelligence) or unstructured content management systems (knowledge management). Both hybrid technologies, business intelligence and knowledge management, are widely known as competitive intelligence (Albescu, Pugna, & Paraschiv, 2008). Competitive intelligence is the analytical process of collecting, selecting, and interpreting all the information related to business competitors in order to emphasis their positions, capabilities, performances and results and in the market. The Society of Competitive Intelligence Professionals defines competitive intelligence as:

> "timely and fact-based data on which management may rely on decision-making and strategy development. It is carried out through industry analysis, which means understanding the players in an industry; competitive analysis, which means understanding the strengths and weaknesses of competitors; and benchmarking i.e. the analysis of individual business process of competitors" (Olszak, 2014)

The core advantage of any competitive intelligence system is to extract the knowledge needed about competitors' opportunities and threats. In this context, competitive intelligence provides external environment scanning, whereas business intelligence provides internal environment scanning. The cross analysis of information provided can be used efficiently in many strategic analysis tools including: SWOT analysis, industry analysis, and competitor analysis (Albescu, Pugna, & Paraschiv, 2008). Different types of tools can be used to build competitive intelligence including: data mining, text mining, web mining, dashboards, balanced score cards and others (Olszak, 2014).

The integration of business intelligence and competitive intelligence can be used to formulate a corporate mission, long term objectives, strategies and policies. Business intelligence technology can be used effectively to provide corporate performance results (Figure 3). Corporate performance management is used to evaluate program or project evolution, and also to monitor and control them.

3. BSC-BI: A FRAMEWORK FOR BUSINESS INTELLIGENCE INTEGRATION WITH STRATEGIC MANAGEMENT

Balanced scorecard is an important managerial tool that helps organizations to articulate their strategy into actionable initiatives and projects. In addition, it provides the roadmap for strategy implementation, execution, monitoring and control (Olszak, 2014). Balanced scorecard is an important tool that helps top management to indicate the right strategic decisions to take. Balanced scorecard translates corporate vision and strategy into action, information, and intelligence (Fries, 2006). Balanced scorecard considers that corporations have four main perspectives: financial, customer, internal business processes, and learning and growth. Financial measurements are the most important driving factors for top management to evaluate the company's position in the market. Customer measurements such as customer focus and satisfaction are used to evaluate the company image. Internal business process measurements allow managers to monitor and evaluate business processes whether they cover all required and predefined customer needs. Employee learning and growth measurements are mainly used to evaluate the company commitment to its long term strategy in terms of its human resources. Knowledge management is the main pillar in building such corporate capacity. Business intelligence reports can track the number of relevant trainings undertaken by each worker. Results of such reports can be matched with the predefined corporate objectives via balanced scorecard (Fries, 2006).

Most strategic analysis tools, such as scenario analysis, SWOT analysis and demands forecasts, can be easily supported by a combination of data mining tools such as regression analysis, decision trees, and neural networks. Many types of analysis such as customers' buying behaviors, inventory slow turn, and product market share could support discovering internal strengths and weaknesses. Data mining helps detect new customers or competitors. Such data provide inputs for opportunities and threats. In conclusion, business intelligence, and especially data mining can reveal important inputs to SWOT analysis. OLAP (Online Analytical Processing) functionalities facilitate detecting problem areas, and focus more on the problem's root causes. Neural networks could detect the relationship between trends and huge amount of external data. Forecasting can be more accurate to define more possible scenarios. Decision trees could classify relevant future situations in order to be able to calculate the risk of any scenario. All these business intelligence tools, techniques and applications could contribute efficiently to the design of a scenario analysis. They can specify the realistic and relevant scenarios in many cases. Business intelligence results should be matched against predefined and measurable objectives. KPIs (key performance indicators) are used for the analysis of reaching goals and objectives (Fries, 2006). Business intelligence reporting tools and OLAPs contribute to strategic management as they measure the organization's performance. Balanced scorecard can be introduced to indicate weather business intelligence reporting matches critical performance indicators.

Figure 1 presents an overview of the corporate challenges of an organization on the basis of its business strategy using the four strategic themes, based on the balanced scorecard methodology. Although strategy plays an important role in modern organizations, it is a process in nature and has become more customer-focus. Modern organizations are seen as knowledge-based enterprises in which proactive knowledge management and strategic business intelligence are important for competitiveness (Brinkmann, 2015). Strategic business intelligence technologies support or change the enterprise's strategy in which they are utilized to increase the reaction time to environmental changes and to assist the company to achieve its capability (Alnoukari, 2009).

Business intelligence integrates information utilities and a decision support system that can help organizations to manage, develop, and communicate their intangible assets such as information and knowledge. Thus, it can be considered as an imperative framework in the current knowledge-based

economy arena (Alnoukari, 2009). Business intelligence implementation and enhancement will evolve as the organization becomes more competent in process and technology. Changes in the positioning in the market and the organization's strategy will be implemented more effectively in such flexible and modern organizations (Brinkmann, 2015). Business intelligence should be embedded within the organization and its objectives and strategies, and their benefits should be clarified and communicated.

The BSC-BI framework clarified in Figure 1 is based on previously suggested frameworks (Brinkmann 2015; Gonzales 2011, Albescu et al. 2000). It combines and integrates an organization's success factors in order to maximize both its users' and corporate performance. The framework incorporates different types of business intelligence techniques including: planning, predictive, explorative, and standard applications in order to provide the main requirement and installation to back up an efficient strategic and operational reporting. Business intelligence excellence can be achieved when organizations properly define their strategies, implement learning for their people, put their processes in track, and provide the needed technologies. Business intelligence excellence would have significant results on business impact, value and effectiveness (Brinkmann, 2015).

BSC-BI effectively integrates business intelligence technologies into the strategy development process. The main strategic

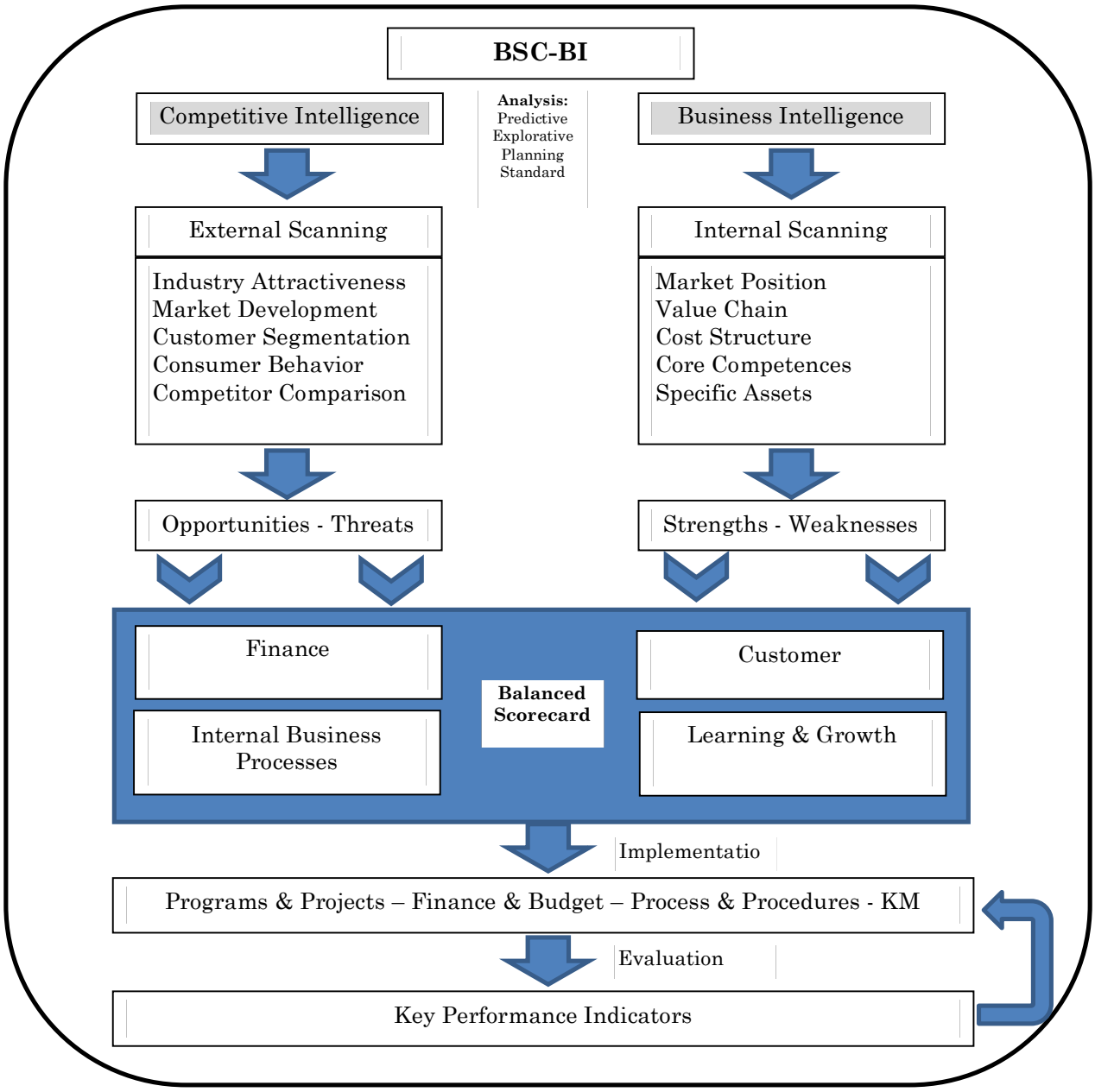

Figure 1 BSC-BI Framework, the integration of strategic intelligence with balanced scorecard methodology

themes are incorporated and improved in order to strengthen the organization's long term success. This could be achieved when the strategic themes tend to deliver greater value to customers at lower cost. When these themes are properly implemented, organizations increase their profitability results. Therefore, strategic themes could be used to observe markets and competitors, and enable top management to continuously adjust their strategies when the environment changes.

The use of business intelligence for corporate objective-setting is based on the tools that provide historical data that directly inform the setting of objectives for subsequent planning periods. Business intelligence tools conduct internal environmental scanning activities, whereas competitive intelligence tools are used to conduct external environmental scanning activities as part of the planning practices. The BSC-BI framework is able to test past activities against planned results and use the findings for setting objectives. Cause-effect analysis tools help to find the processes that most significantly impact organizational outcomes, thus allowing for process improvement.

4. BSC-BI FRAMEWORK IMPLEMENTATION – SYRIATEL CASE STUDY

Syriatel is one of the largest telecommunications companies in Syria. The company started using the balanced scorecard approach in 2008. The company relies on setting general goals approved by the board of directors, to construct its strategic objectives. These objectives are created to achieve sustainability, excellence in services, optimal performance, and building people. The strategic objectives are linked to the corporate objectives, then build up the unit objectives at each department, then cascading them to the employee-objective level.

Most successful companies seek to change their strategies to move from the current position in the market to a better one. This transition usually requires taking administrative procedures. It is customary to take these procedures after the measurement and evaluation. The evaluation process is based on answering several questions, including:

- What is the current position of the company in the market?
- What daily operations are implemented to achieve the desired goals?
- What is the future plan to achieve more of the desired goals?

The corporate strategic plan is built according to the organizational structure. Syriatel strategic objectives are managed using a system named the Objectives Cascading Management System (OCMS).

The company's departments share most of its corporate objectives, each department has a set of units, and each unit comprises sections that include a group of staff objectives. The strategic plan is built on a set of objectives to

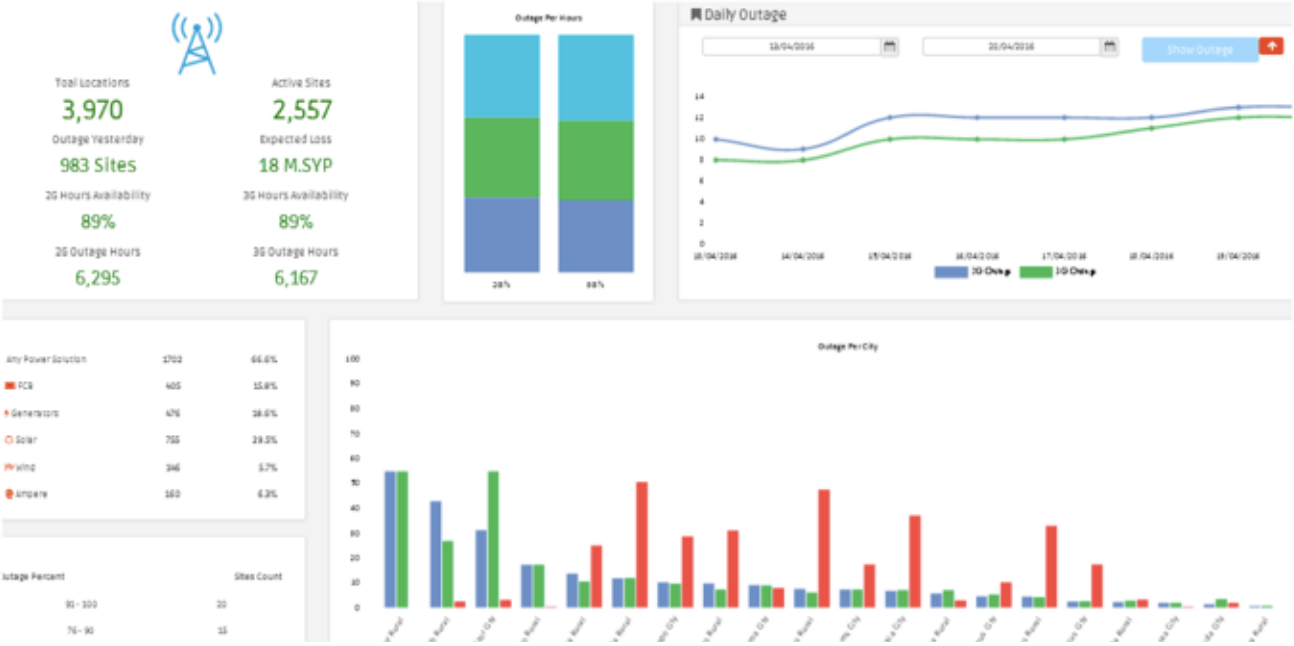

Figure 2 BI dashboard for the power source losses in all sites.

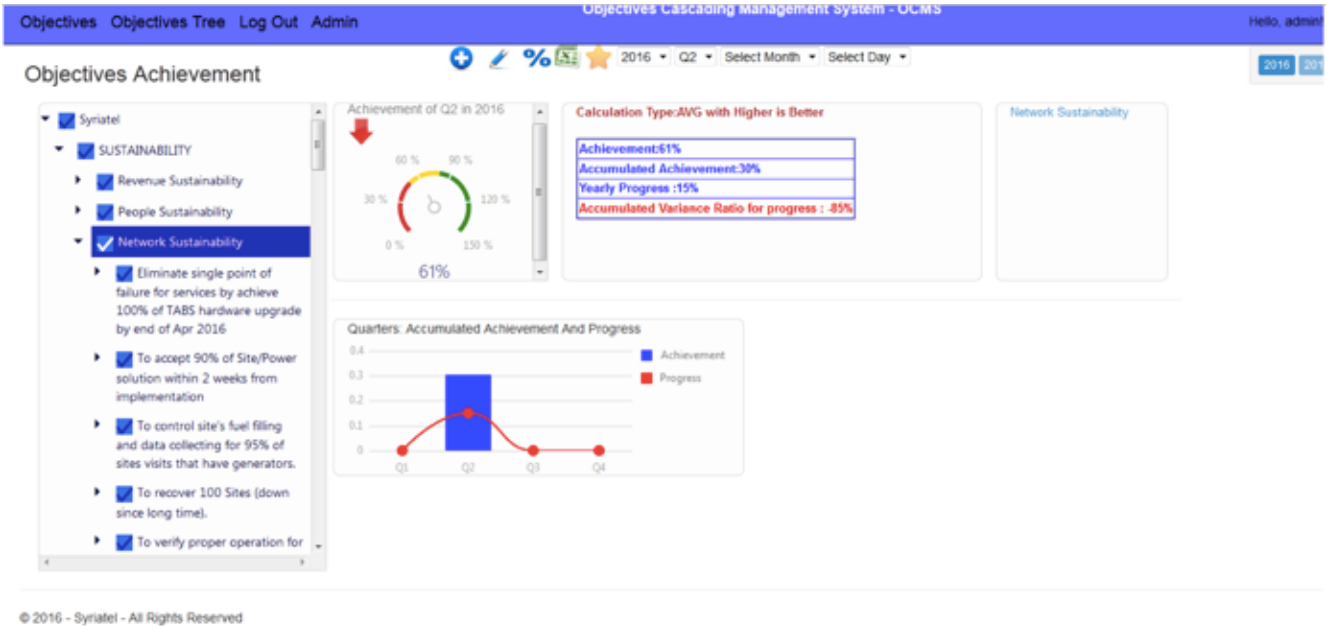

Figure 3 Corporate objective created using the BSC-BI framework.

be achieved at all levels. These objectives are SMART, this means that the set of objectives should be specific, measurable, achievable, realistic, and set within a specific time. Each department sets its objectives, which are combined with the objectives of its units, and achieve hierarchically the goals of all subdivisions. Key Performance Indicators (KPIs) are used to measure objective performance.

Business intelligence is a crucial system in the company. It helps to identify problems and weaknesses. Applying the BSC-BI framework provides the company with the capability to integrate between business intelligence and its strategic management system (OCMS). One of the fruitful results of this integration is identifying the losses that result from the interruption of electric current for each of the company sites, and the alternative solutions used to reduce this interruption (Figure 2). The system registers the sites where frequent feeding breaks occur, and exceeds the predefined number of hours, then classifies it as a new weakness point at the corporate level according to predefined performance indicators.

Then, the system registers a set of actions to follow up in order to achieve the goals that have been generated, and monitor them periodically. In addition, it identifies the KPIs to help monitor the level of performance until achieving the set objectives completely (Figure 3).

As a results of applying a BSC-BI framework, the number of stop hours decreased in all sites from 59,000 hours during February 2016 to less than 3,000 hours during August 2016. This decrease helps in achieving the company's "network sustainability" KPI.

5. CONCLUSION

Business intelligence activities and their intentional use are considered to constitute a relatively young discipline. They have connections with several functions in organizations, especially finance, marketing, and strategic management.

It was clear that business intelligence has does much more than simply refining raw data into reports and dashboards that could be provided to top management with the ability to take the right decisions. Information and knowledge provided could have a direct impact on several factors related to intangible assets such as know-how, innovativeness, and market properties. Business intelligence tends to provide the basis for continuous and proactive control, and for the optimization of a company's short- and long-term success in a dynamically changing business environment.

Business intelligence has a direct impact on business strategies, and provides top management in modern and flexible organizations with the needed tools and technologies to formulate corporate strategies, implement, and monitor them using corporate performance management tools.

In this article, we explored the relationships between business intelligence, competitive intelligence, and strategic management. Then we explained the impact of business intelligence on corporate performance

management, operational business process, and strategic intelligence.

We proposed a new framework "BSC-BI" that uses business intelligence and competitive intelligence capabilities to build corporate SWOT analysis, and develop corporate objectives using the balanced scorecards methodology.

Validating the BSC-BI framework was done using a case study on one of the biggest mobile telecom company in Syria. Direct results were achieved using this framework that integrates business intelligence tools with a balanced scorecard methodology used for strategic planning.

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Patent bibliometrics and its use for technology watch

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ABSTRACT Technology watch is a methodology for organisations to systematically analyze technical information in a continuous way in order to gain insight and competitive advantage in a specific technical domain and is based mainly on statistical analysis of patent information. Patent statistics are commonly based on bibliographic data and generated with bibliometric techniques. In this paper we describe the differences between patent bibliometrics and classic bibliometrics and propose several patent indicators for technology watch activities which we classified into four categories: performance, technology, patent value and collaboration indicators. In a case study we undertook a bibliometric patent analysis using the described groups of indicators in order to generate a technology watch of nanotechnology for the domain of a whole country (Spain) and explained the different data visualizations we used in order to represent the indicators. We conclude that statistical analysis of patent information and its visualization is a powerful methodology for any competitive intelligence activity centred on technology but there are also some limitations to bear in mind when undertaking technology watch activities using patent information discussed in terms of its timeliness, patentability criteria, sector dependence, quantity vs. quality.

KEYWORDS Competitive intelligence, nanotechnology, patent bibliometrics, patent indicators, patent information, patent statistics, patents, Spain, technology intelligence, technology monitoring, technology watch

1. INTRODUCTION

Technology watch, also known as "technology intelligence", "technology monitoring" or "patent intelligence", is a methodology for organisations to systematically analyze technical information in a continuous way in order to gain insight and competitive advantage in a specific technical domain. Technology watch is a part of the broader concept of "competitive intelligence" (CI) which can be defined as a methodology for gathering, analyzing and managing external information that can affect the organisation's plans, decisions and operations (Negash 2004, Miller 2001). Especially high tech corporations or research intensive companies need to be able to anticipate technology trends, since a wrong choice can result in low profits and obsolete products and can have a major impact on the financial performance for many years (Hodgson 2008).

Technology watch is based mainly on statistical analysis of patent information[1]. Translating patent information into

[1]In fewer cases also other technological sources are included in the technology watch process (like funded R&D project abstracts or profiles from technology transfer platforms) although this data is less structured than patent data and has much lover coverage over countries and/or sectors.

competitive intelligence allows to measure the current technical competitiveness and to forecast technological trends of specific sectors (Fleisher 2003). As an example we can mention the works of Salvador who analyzed the plastics industry (2012) and additive manufacturing technologies (2014), or the study from Deshpande et al. (2016) who looked into relatively new fields with R&D activity like energy efficiency in cloud data centres.

Patents are publicly available documents that describe, in a structured and unified way, a technical invention which, once granted by a government or regional patent office gives the owner the monopoly to commercially exploit the invention in a specific country.

Nowadays, with currently more than 95 million open access patent documents[2], patent information is a powerful source to conduct technology watch of specific technological domains. As patents cover mainly technical inventions, they are a rich source of data reflecting technical change and in technology fields with high research and development activities. Especially in emerging sectors like nanotechnology or biotechnology, patent data can reveal the intermediate stages of innovation activities and can offer a basis for analysis where other data is lacking (Zuniga, 2009).

Patent statistics have been used to monitor and evaluate science and technology activities from the 1960s with the work of Schmookler (1966), who was one of the first to use patent counts as indicators of technological change in particular industries. Taking advantage of its structured format, patent statistics are commonly based on its bibliographic data and therefore generated with bibliometric techniques. This is why it is also known as patent bibliometrics, first introduced by Narin (1994).

Table 1 Scientific literature vs. patent literature. From Lloyd (2015) and own research.

	Scientific publications	**Patent publications**
Content	Mainly basic research findings	Technical solutions to a problem
Access	Paid access or open access or depending on the journal	Open access via public patent databases
Quality filter	Peer review	Patent examination process
Indexing	Scientific papers can have inconsistent bibliographical details, meaning that they can be hard to index.	Patent publications have a (more or less) standardised numbering system, meaning that it is possible to fully index them.
Subject categorization	Core journals by subject field	Patent classifications by technology field
Reason to publish	Scientific recognition	Economic (gain commercial monopoly, licensing, etc.)
Who publishes	Research entities (mainly universities)	Companies and to a lesser degree research entities and private persons (inventors)
Cost	Sometimes fee based and others for free (depending on journal prestige)	Fee based (depending on patent office and coverage)
Content duplicity	No (the article can only be published in one single journal)	Yes (as patents are territorial, the same invention can generate several different patent documents for each country)
Timeliness	Article publishing depends on the efficiency of the peer review process of the journal	Patent is not published before 18 month after filing

[2]Source: https://www.epo.org/searching-for-patents/technical/espacenet.html

Table 2 Performance indicators.

Indicator	Metrics	Description
Top country applicants (per patent family)	Patent family counts per applicant	Indicate the company/institutions which have most inventions in a field or topic.
Top country applicants (per patent publication)	Patent document counts (published) per applicant	Indicate the top company/institutions which have most patents in a field or topic.
Patent counts by the applicant over years	Patents filed (priority) / applicant / year	Measure the level of R&D efforts. A variation can be interpreted as a change in their R&D strategy.
Patent internationalisation rate of applicants	Patent document counts (published) per applicant / Patent family counts per applicant	Indicate the applicants with the highest ratio of generated patents of their invention portfolio.
Top country inventors (patent family)	Patent family counts per inventor	Indicate the inventors which have most inventions in a field or topic.
Top country inventors (patent publication)	Patent document counts (published) per inventor	Indicate the inventors which have most patents in a field or topic.
Patent internationalisation rate of inventors	Patent document counts (published) per inventor / Patent family counts per inventor	Indicate the inventors with the highest ratio of generated patents of their invention portfolio.

2. PATENT BIBLIOMETRICS VS. CLASSIC BIBLIOMETRICS

Bibliometrics was first mentioned in 1969 by Pritchard, who defined it as "*the application of mathematical and statistical methods to books and other media of communication*" (Pritchard, 1969). The general properties of classic bibliometrics which analyze scientific publications and patent bibliometrics which analyze patent publications are very similar (Narin, 1994) but we have to be careful when comparing both types of analyzed documents since they have some substantial differences. In Table 1 we sum up the main distinctions regarding several aspects such as their content, access, and indexing.

Table 3 Technology indicators.

Indicator	Metrics	Description
Technology evolution (per patent family)	Patent family counts in technology field / year	Forecasts the technological trend on the number of inventions.
Technology evolution (per patent publication)	Patent document counts (published) in technology field / year	Forecasts the technological trend on the number of patents.
Technological distribution	Patents filed (priority) / Classification	Identifies the core technologies of the analyzed technology.
Technological networks (macro level)	CPC level 4 / CPC level 4 IPC level 4 / IPC level 4	Relationships between technological domains
Technological networks (micro level)	CPC level 7 / CPC level 7 IPC level 7 / IPC level 7	Relationships between specific technologies
Applicant technology network	CPC level 7 / applicant IPC level 7 / applicant	Relationships between company/Institution and technological domains (macro and micro level)
Inventor technology network	CPC level 7 / inventor IPC level 7 / inventor CPC level 4 / inventor IPC level 4 / inventor	Relationships between inventor/researcher and technological domains (macro and micro level)

Table 4 Patent value indicators.

Indicator	Metrics	Description
Publications per patent office	Patent application published / patent authority	Indicate which are the most important markets for patents from the analyzed technological domain.
Family size	Patents application published / family members	Reflects the intention to produce or commercialize globally the products related to the invention.
Top applicants geographic coverage	Ratio patent application published / family size	Indicates the grade of internationalization of applicants patent portfolio.
Top inventors geographic coverage	Ratio patent application published / family size	Indicates the grade of internationalization of an inventors patent portfolio.
Family network	Patent authority / patent authority	Indicates which markets are co-protected and identifies the essential markets where protection is sought together.
Top patents with backward citations	Number of cited patents / patent	Helps to identify technical complementarities or substitutes or prior art patents.
Top forward cited patents	Number of citing patents / patent	Reflects the technological impact of the patented invention and helps to identify key patents which influenced other patents.

3. PATENT INDICATORS FOR TECHNOLOGY WATCH

In patent bibliometrics we can distinguish two main types of analysis: single field analysis and multiple field analysis (E-IPR 2013). The single field analysis, widely used also in classic bibliometrics, is a one field analysis based on lists or rankings and is conducted on a set of bibliographic patent references. Multiple field analysis, also known as cross reference analysis, combines different types of bibliographic fields via matrices. This is the basis for data visualization via collaboration networks that can reveal valuable information for a technology watch activity.

With these types of analysis we can generate several patent indicators for technology watch activities which we propose to classify in the following four categories that will be explained subsequently:

- Performance indicators
- Technology indicators
- Patent value indicators
- Collaboration indicators

3.1 Performance Indicators

We considered performance indicators to be patent indicators that deal with the patent output of the analysed entities (inventors or applicants) and that are used to monitor the technological performance of company / institutions and inventors / researchers and to track their technological leadership in a given technology over time (Zuniga, 2009).

In Table 2 we describe various typical patent indicators of this type.

3.2 Technology indicators

Technology indicators analyze patent classifications and are another very valuable indicator for technology watch activities since every patent is classified with one or more classes according to its technological field. With single and multiple field analysis of the classification we can reveal the technological focal points of an organisation, the research fields of inventors, the evolution of a technology sector and the relationships between technological domains (Table 3).

Macro and micro vision of the technology field can be distinguished in some cases by analyzing the patent classes in different hierarchy levels. For instance a more general vision of the technology landscape (macro vision) can be obtained by aggregating to a 4-digit classification level ("level 4" till subclass hierarchy) and for a more detailed technology perspective (macro vision) the 7-digit classification level ("level 7" till sub group hierarchy) can be used.

3.3 Patent value indicators

Patent value indicators can give us an idea about the economical value of a patent by looking at several factors (Table 4). First of all, the size of the patent family and the geographic

coverage are important indicators. Patents provide protection on a country level and can be extended to other countries in the 12 months of priority since its first filing. In this sense, the more countries a patent is extended, the broader is their protection and the invention can be considered as economically more promising since the applicant is willing to assume the correspondent high costs of the patent extensions (Hullmann, 2003). In this context another indicator is the ratio of the family size and total invention output compared, which can be used to measure the grade of internationalization of an inventor's or applicant's patent portfolio.

Apart from the quantitative measure of patent families, specific patent types or countries are also used as patent indicators. Patenting in certain countries can be considered as more important than in others (Palmberg, 2009). For example a European Patent (EP) or PCT patent application is considered of special relevance, and if a invention is filed as a Japanese, US and European Patent by the same applicant or inventor the patent is given a special importance since it covers the three most important patenting authorities worldwide (the so called Triadic patent family).

Patent citations are another important indicator related to patent value and to identify knowledge flows from company to company, or from other sectors, e.g. research institutes and academia to companies (Meyer, 2002). Similar to citations in scientific articles, in patents you can distinguish forward and backward citations. Backward citations are the references in a patent document to earlier documents whereas forward citations are more recent documents that cite the patent. As a difference from scientific articles, in patent citation we can distinguish citations from the inventor and citations from the patent examiner. Citations from the inventor are the references that the inventor provides in the patent to describe the state of the art and to give evidence for the novelty of the patent. Citations from the patent examiner on the other hand are the documents that the patent examiner references in the patent examination procedure. In most countries before a patent gets granted, in order to measure the novelty of the invention the patent office appoints an examiner who is ideally an expert in the particular technical field and who searches for documents in the scientific and technical literature that are related to the particular invention and were published before the date of filing of the application.

In both cases citations in patents can be used to:

- trace the information sources on which the invention was built,
- illustrate the relations with other inventions
- and reveal geographical and technological linkages.

Citation indicators have to be handled with care since one must consider that new patents rarely earn many forward citations because it takes time for a patent to be cited by newer patent documents and therefore a strict forward citation analysis will favour older patents. Furthermore, with the obligation to cite all possible prior art, patent applicants tend to cite many more references than needed, leading to patent references where the cited patent is not of particular relevance. This is the case especially in US patents since, contrary to the European patent system, in the US both the applicant and every other involved party (e.g. the patent attorney), must include any possible prior art of an invention in order to minimize the risk of the application being rejected, which leads to the fact that US patents on average include far more citations than European ones (Azagra-Caro 2009, Alcacer Gittelman 2006).

3.4 Collaboration indicators

These type of indicators provide information about collaboration patterns of the entities. They are generated with multiple field analysis and can be visualized with network maps. Similar to traditional bibliometrics, in patent bibliometrics the most important collaboration indicators are related to co-authorship (Glänzel et al., 2003), although their interpretation slightly differs as outlined in Table 5.

4. CASE STUDY: TECHNOLOGY WATCH OF NANOTECHNOLOGY IN SPAIN

In the framework of a funded project (see Acknowledgements) a bibliometric patent analysis study was done using the described groups of indicators in order to generate a technology watch of nanotechnology for the country of Spain (Jürgens 2016).

Table 5 Collaboration indicators.

Indicator	Metrics	Description
Applicant collaboration network	Applicant / applicant	Collaboration between organisations: Connect entities that share the ownership of a patent and contrary to co-inventions can point to a shared interest in utilising a patented invention.
Inventor co-authorship collaboration network	Inventor / inventor	Research collaborations: Identifies individuals (inventors or researchers) who generated the technology in a common undertaking and can be considerate as most closely related to the co-authorships in scientific publications.
Applicant collaboration by country	Applicant country / applicant country	Identifies international collaboration on an institutional level.
Inventor co-authorship by country	Inventor country / inventor country	Identifies international collaboration on a research level.

In Spain competitive intelligence and technology watch as a discipline was first brought to a wider audience by the work from Palop & Vicente (1999). Nowadays, it is an established methodology for fostering the competitiveness of organisations and even has its own certification scheme within the Spanish certification entity AENOR (García & Velasco 2006). Although it is applied by many Spanish multinational companies from a diversity of sectors, e.g. Telefónica and Repsol, there is still a knowledge gap amongst the small and medium enterprises which is why many regional development agencies have initiated it to provide technology watch services to fill this gap (Jürgens, Herrero-Solana, 2011).

In the case of nanotechnology in Spain only one study was identified (Andaluz & Sanchez, 2006) centred more in information analysis of the R&D output than patents. This apparent lack of patent analysis in this sector in Spain led to the project of this case study where we analyzed the nanotechnology patent publications of Spanish applicants of the years 2004 till 2014.

Regarding the search strategy, relevant nanotechnology patent classifications were identified (Jürgens, Herrero-Solana, 2016) and combined with an established lexical query for nanotechnology (Magrebi et al 2010). As a data source the database *Espacenet-Worldwide* from the European Patent Office was used since it provided the best data coverage for the purpose of the study (Jürgens, Herrero-Solana 2015).

The search process retrieved more than 3400 patent records with Spanish authorship and after an exhaustive data harmonization process a bibliometric patent analysis was performed using the software tool *Matheo Patent*. For a patent/paper comparison, furthermore, scientific article data was retrieved from the database *Scopus*.

Subsequently several indicators were generated according to the groups described earlier and were presented via data visualization techniques.

Apart from graph and pie charts, which were used for many single field indicators (e.g. numbers of nanotech patent publications over time), we used choropleth maps containing patent data aggregated over predefined regions with colour ranges representing the data ranges in order to visualize the geographical "hot spots" of nanotechnology patenting in Spain (Figure 1).

Scattergraphs were used in the study to compare the patent and scientific publication outputs of the most important nanotechnology players in Spain, segmented in colour by their type of institution (e.g. company, university) (Figure 2).

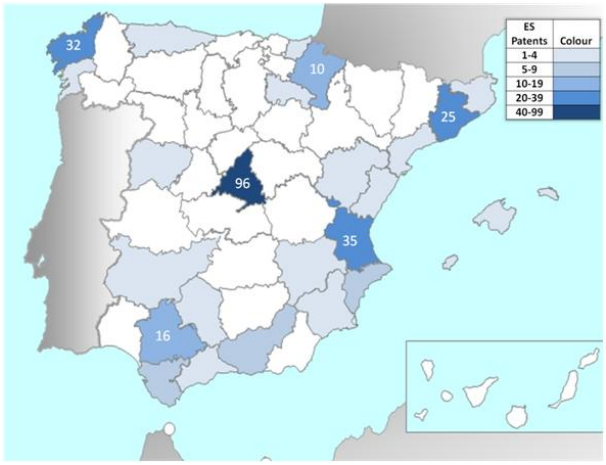

Figure 1 Geographical patent hotspot map (the darker the more nanotech patents were published).

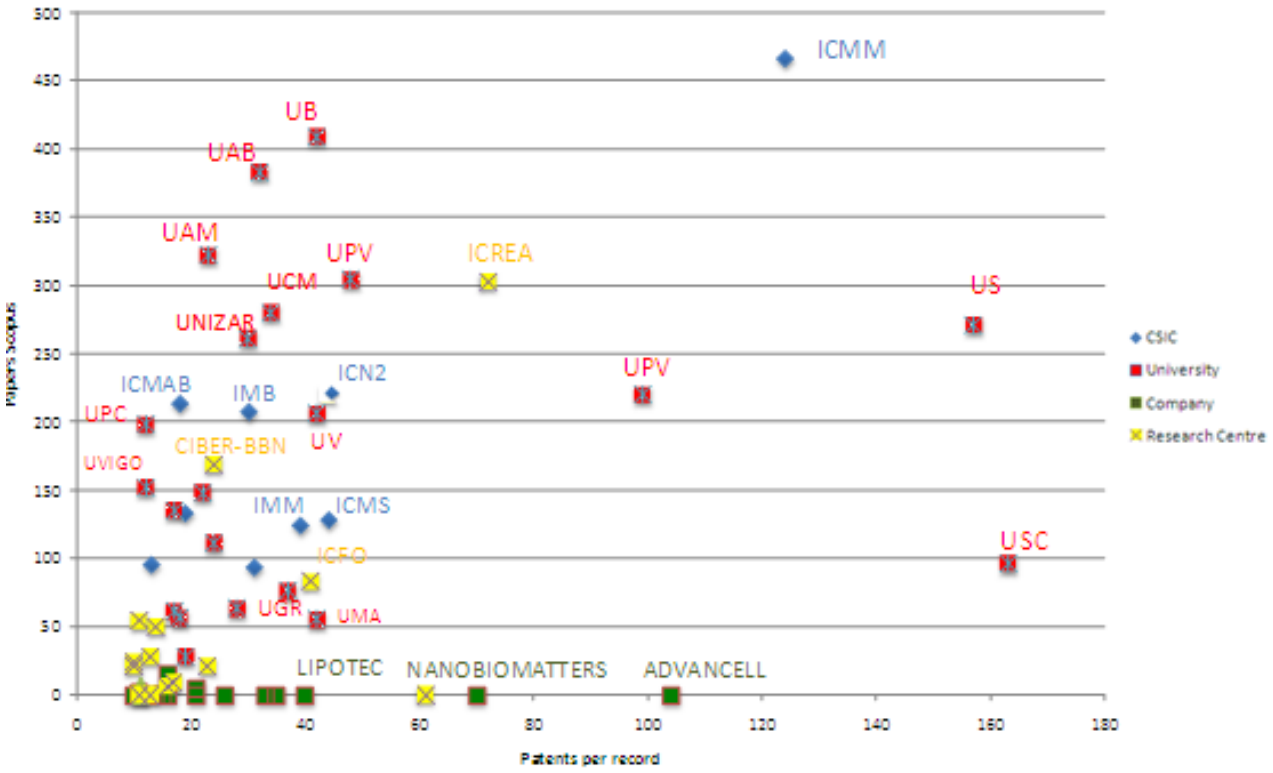

Figure 2 Comparison of patent and scientific papers output revealing which institution/company has more focus on basic (papers => Y axis) or aplied research (patents => X axis).

Furthermore, network maps were used extensively as they are intuitive to read since entities are connected to each other in the form of a node and link diagram. In the case study we used network maps to visualize several types of indicators, as shown in the examples in Figures 3-5.

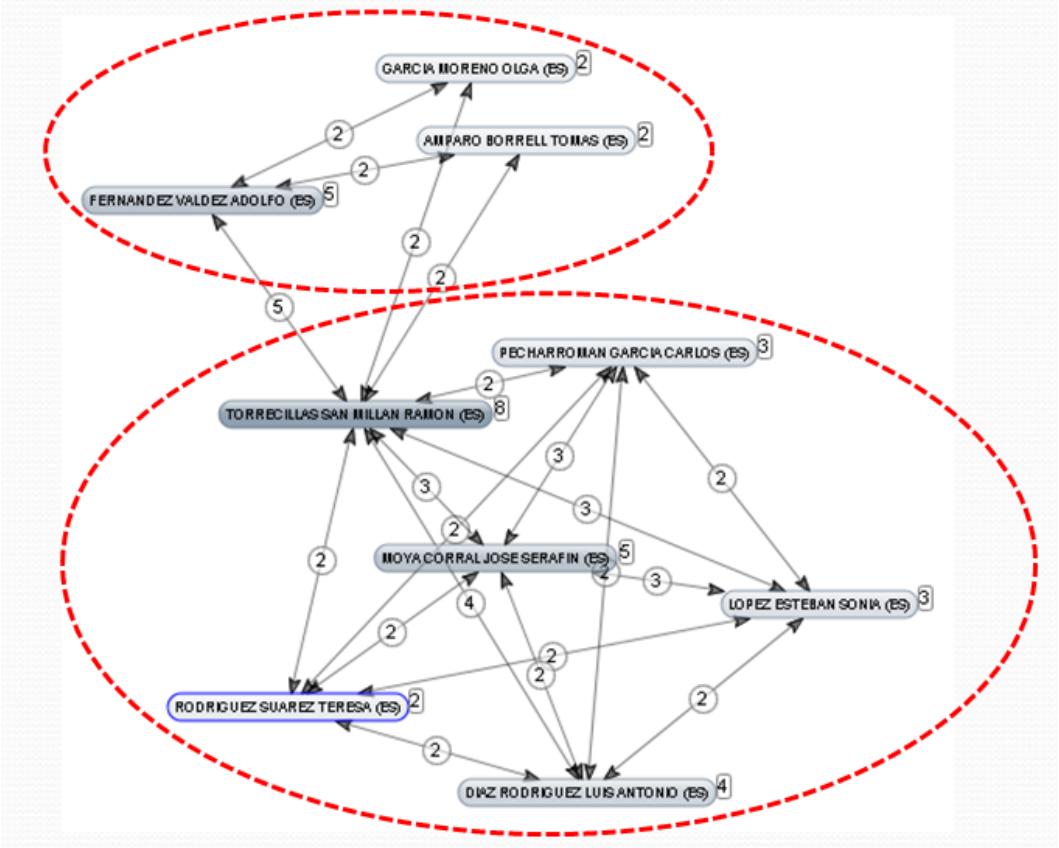

Figure 3 Coauthorship network revealing collaboration patterns of two research groups (red circles) and showing their leaders in terms of publications (in dark grey).

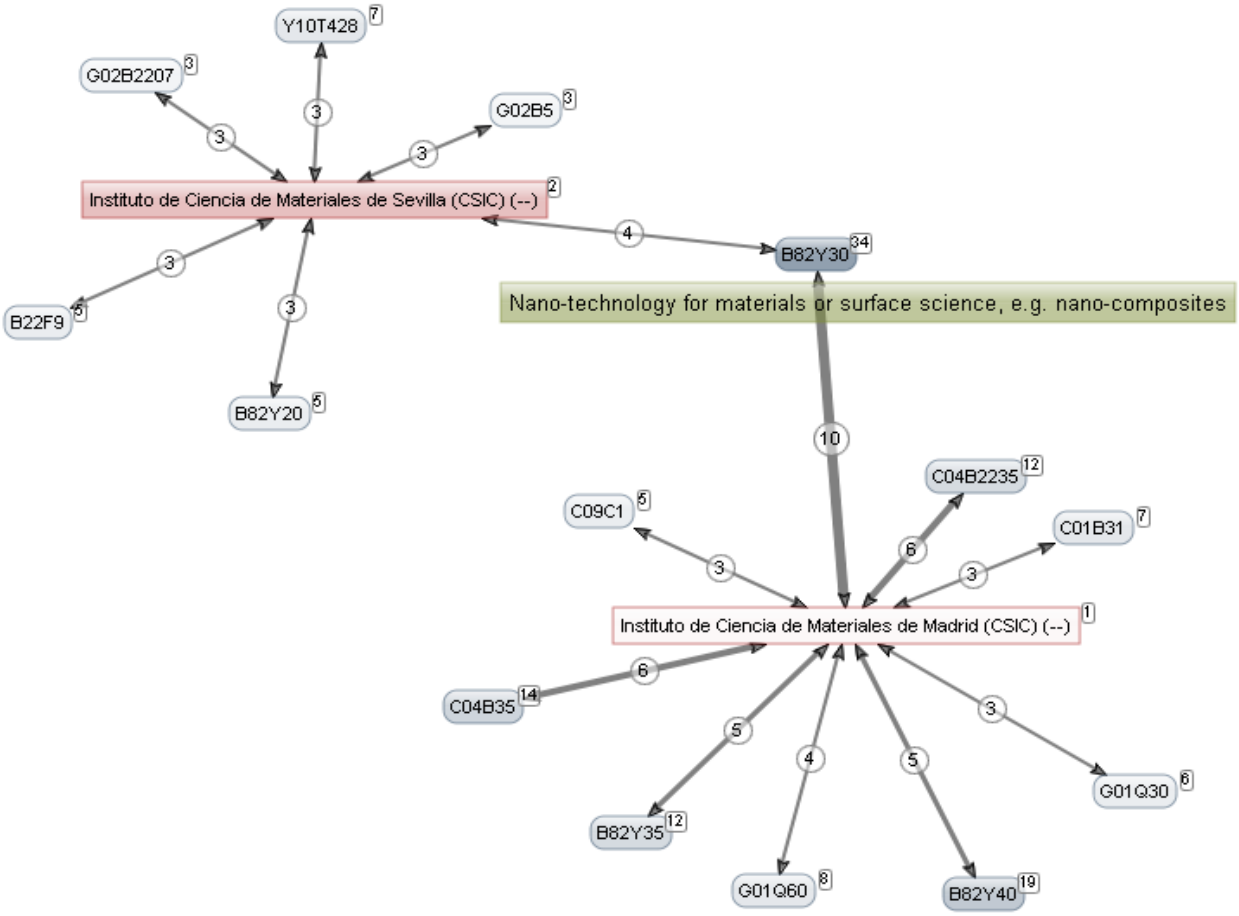

Figure 4 Technology network map revealing a common technology focus (in green) of two Spanish nanotech institutions (in red and light red).

5. LIMITATIONS OF PATENT BIBLIOMETRICS AND CONCLUSIONS

There are also some limitations to take in mind when undertaking technology watch activities using patent information. First of all, the timeliness. The patent system of most patent offices worldwide establishes that a patent is not divulged by the patent office until 18 months have passed. Only then the patent office publishes the application via its patents office bulletins and patent databases. This means that patent indicators have a considerable delay of a minimum 18 months.

Second, not all innovative activity is patented or even patentable and therefore cannot be captured in a patent analysis. This can be due to the following reasons:

- the costs a patent process incurs are too high for the inventor/researcher
- the necessary public disclosure of the invention is not wanted by the inventor/researcher and it is preferred to keep the invention secret instead of patenting
- the invention itself is not patentable because it does not fulfil the patentability criteria (e.g. in most countries scientific theories, mathematical methods, plant or animal varieties or commercial methods are not patentable)
- the invention is not patented due to strategic decisions

Third, when comparing patent data between technological sectors it has to be taken in mind that patenting activity tends to vary significantly across different industries (Pavitt, 1985).

Finally, most patent indicators are quantity based and do not measure quality of the patents. It has to be taken in mind that not every patent has the same value and the distribution of the value of patents is skewed as only a few patents turn out to be commercially successful (and therefore are of substantial value) whereas many patents do not reach the market. Further research in this specific aspect would be of interest.

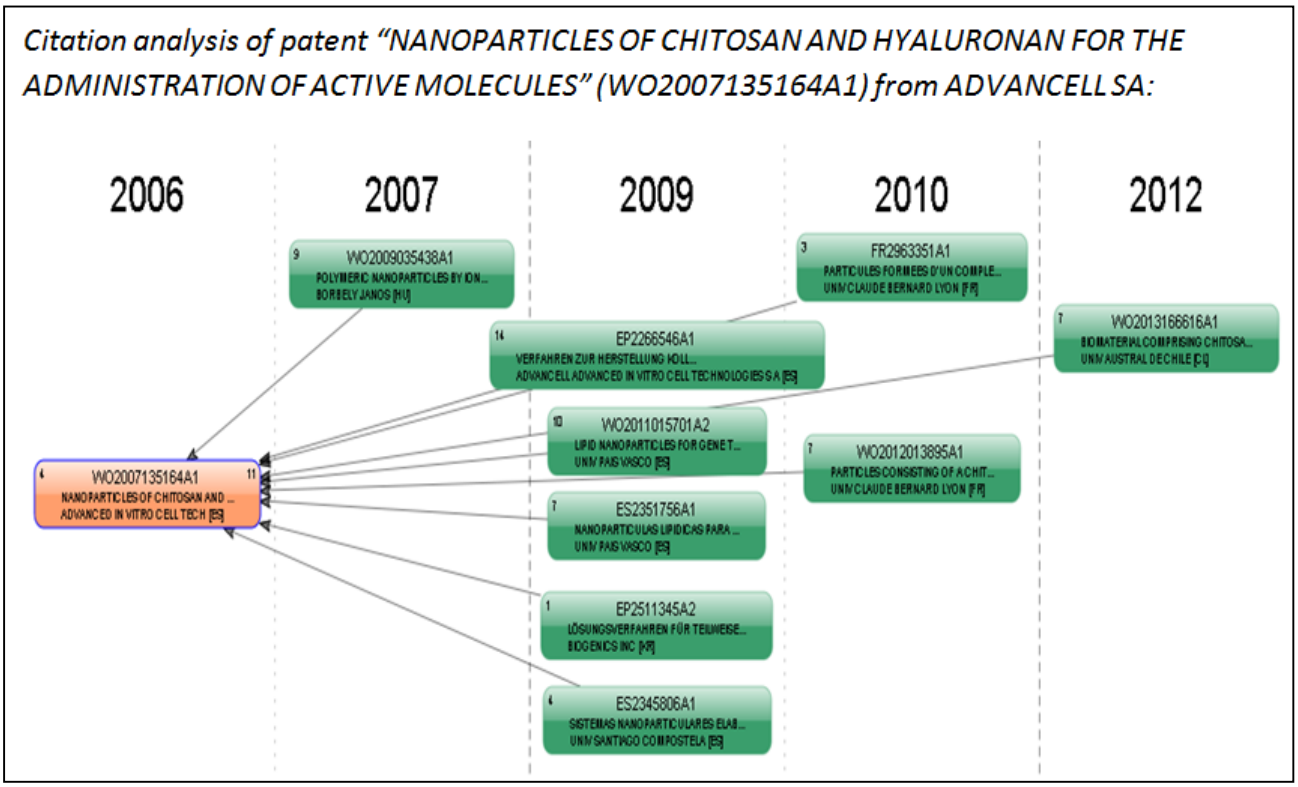

Figure 5 Citation node map of a Spanish nanotech patent (orange box) reveals who was influenced by the technology (green boxes).

Nevertheless, we can conclude that statistical analysis of patent information and its visualization is a powerful and successful methodology for any competitive intelligence activity centred on technology, since it can be effectively used to monitor and evaluate technology activities. This can be observed by the increasing numbers of studies which use this type of analysis, although we would recommend to take in mind the afore mentioned limitations when doing this kind of analysis.

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Why care about competitive intelligence and market intelligence? The case of Ericsson and the Swedish Cellulose Company

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ABSTRACT This article tries to show the importance of the competitive intelligence (CI) and market intelligence (MI) function by describing developments in two quite different Swedish multinational companies. We see how top management can become the problem when the company is struggling to compete and how this affects the intelligence function. In the analysis we compare the intelligence function in private companies with those of state and military organizations and draw historical parallels. Moreover, the cases show what an important role competitive and market intelligence continue to play in the age of information, especially during the past decade.

KEYWORDS Competitive intelligence, defensive position of top manager in distress theory, high salary theory argument of top managers, market intelligence, organizational theory

1. INTRODUCTION

Why should anyone working in a private company care about competitive intelligence (CI) or market intelligence (MI)? Why is it that these areas of study are not more widespread in companies today, despite the fact that the literature has existed for almost 60 years? (Alden[1], 1959; Keegan, 1974; Dedijer, 1975; Porter, 1980). Were the ideas a failure or were they underestimated for a long time?

Other management practices and bodies of literature, such as strategy or leadership, are more established both as a practice in companies and as theory in the academic literature. Why is that? Is it because competitive intelligence and market intelligence work is being done by others whose job descriptions have other names, such as marketing research, business intelligence or strategy? Or is it the haunting association to espionage that so many have been trying to disassociate from competitive intelligence? These questions are frequently raised at CI and MI conferences, especially by professionals who work in the field.

In this article I try to find an answer to these questions with the help of two cases, looking at CI and MI practices at two Swedish multinational companies: Ericsson, a Swedish multinational networking and telecommunications equipment company with more than 100,000 employees and the Swedish Cellulose Company (SCA), a Swedish consumer goods company and pulp and paper manufacturer with 44 000 employees worldwide.

During the past decade I have been able to study Ericsson from different perspectives, mapping the company's value chain (Søilen et

[1] Alden studied under Professor Georges Frederic Doriot at Harvard, a Frenchman who later founded INSEAD. Doriot like Stevan Dedijer, who was 12 years younger, fought for the US Army during the Second World War.

al., 2012) and their innovation benchmarking (Søilen and Tontini, 2013). In an article from 2010, I describe seven organizational placement models for CI, where Ericsson was the model for one of them: the special department model of intelligence. A decade ago the company placed the CI function as an advisory function to top management. The advisor had the title of "director" in Swedish meaning he was a part of the top management. He was a senior staffer who enjoyed considerable trust and authority in the company. In the other companies I looked at the CI function was placed differently. The other models described are the special department model of intelligence, the professional model of intelligence, the top-down model of intelligence, the integrated intelligence model, the down-up model of intelligence and the departmental model of intelligence. Ericsson chose the advisory model of intelligence as a direct response to problems with the special department model of intelligence:

> "The major problem with this model is isolation and its consequences. Special intelligence departments tend to close themselves in and develop projects they think but do not know will be useful for the company. Their more or less self-initiated projects will only be useful to the extent that the special department know exactly what intelligence is needed. If they do not communicate well with top managers their work will build too much on guess work, and the output will be less relevant." p. 54 Søilen (2010)

Six years later CI work at Ericsson does not fit into any of the above mentioned organizational models. A new diagnostic is needed. This raises some further questions, like what has happened in Ericsson in general and with the intelligence function in particular? Why did they leave the previous model and choose the current one?

Another Swedish multinational company, the Swedish Cellulose Company (SCA) has organized their CI activities around the special department model of intelligence. It has worked in this way for more than a decade and a half without any drastic changes. The CI function at SCA has today about ten employees and regular and formalized contact with top management, much as described in earlier research. How come these companies, who in part have the same owners, think so differently when it comes to CI and MI work?

2. METHOD

The research strategy is a case study. The purpose of the research has been exploratory, but concentrated around the initial questions. The extent of researcher interference has been minimal as I try to keep my own opinions back and let the other person speak to the very end. The study setting is non-contrived, meaning the people were interviewed in their normal environment, either coming out of work for a lunch or meeting at a conference. The unit of analysis is individuals. The data collection method is interviews and the analysis is qualitative.

To answer the research questions I use interviews conducted with key employees in Ericsson over a fifteen year period, some of whom have become acquaintances over the years. Most of the twenty-six employees interviewed at Ericsson have had key roles in CI. Others have worked with technical intelligence and with value chain and marketing issues. Some of them worked in the previous organization Sony-Ericsson and at Ericsson Mobile Platforms (EMP), which ceased operations in 2009. The time horizon for the research can therefore be said to be longitudinal.

For the current research a new set of interviews were conducted between November 2016 and March 2017. Five key employees engaged in different sides of CI and MI work in the company were interviewed for about half an hour informally (over lunch), separately and independently, meaning they had no knowledge that colleagues were interviewed on the same topic.

Conversations with SCA employees are more recent and serve here first of all as a comparison to current practices at Ericsson. Two employees were interviewed. One is the head of the CI unit and the second is a top manager who is a receiver of CI and MI products.

Conclusions are not drawn directly from what any one employee has said, but are the result of analysis of conversations with multiple people over time. In the analysis I compare the development of the CI and MI fields to other business studies. A historical analysis is attempted and a comparison between the private and the public sector intelligence carried out.

3. THEORY

In the theory part we are interested in the kinds of literature, cases and examples from the companies SCA and Ericsson (1) and theory about the problems raised in the article (2). We shall start with the first.

There are no cases on SCA and CI published as scientific material to my knowledge. Practically all papers related to SCA are on natural science topics, like storing, transport and processing for a forest-fuel supplier and pulp products. As I will not discuss these papers I am not going to cite them. The number of case studies on Ericsson are numerous but less relevant here, so not cited either. What is relevant are articles were Ericsson is used as an example for CI and MI.

The first is an article by Doz et al. (2001), where Ericsson is mentioned as one of the companies threatening American industry, "companies as Nokia and Ericsson, with roots on the edge of the Arctic". It is the realization that competitive advantage is primarily based on knowledge and that that knowledge can be found anywhere. The perspective is that "Tomorrow's winners will be companies that create value by searching out and mobilizing untapped pockets of technology and market intelligence that are scattered across the globe".

The same year there was an article by Rouach and Santi (2001) where Ericsson is mentioned as the first example of companies with a warrior attitude who take an offensive stance in the market; "The intelligence analyst is very pro-active in managing the competitive intelligence process, and continuously on the look-out for opportunities".

The year after, Herring (1992) wrote a case about business intelligence in Japan and Sweden. He criticized senior managers in the US for not taking business intelligence seriously, for "not adopted intelligence as a strategic management discipline". Japan and Sweden are mentioned as examples of countries that do take this discipline seriously. Ericsson is mentioned as a primary example.

Crane (2005) told the story of how Ericsson was a victim of industrial espionage in 2002 related to products for the aircraft industry: "The events of the industrial espionage case centered on the alleged leaking of company information from Ericsson to a foreign intelligence service". Two Ericsson employees were caught and suspended and two Russian diplomats accused of being involved were expelled.

In 2011 Gilad criticized executives for not focusing on CI. He argues that they see it simply as competitor-watching and therefore of no real value to executives. This has left their companies vulnerable to disastrous blindsiding, he concludes.

As for the second type of theory related to specific problems addressed in this paper, it is discussed in connection with each issue or argument as they appear below.

4. EMPIRICAL

Today five CI people at Ericsson work more or less independently from each other in different parts of the world. They work on different projects, many of their own choosing, and have only occasional contact with each other. There is no list of specific reports that they turn in at regular times of the year, but some types of demands are reoccurring and more frequent. It is a combination of push and pull intelligence. I shall call this *the consultancy model of CI* as it enjoys independence, freedom and autonomy but as the function and job is uncertain. Efforts have been made to bring CI staffers together, but this has taken more effort and time than is expected. The status of the employees' positions in the company is not given and they continuously have to defend the value they bring to the company and to higher management. Access to higher management is not a given but is decided on a case by case basis. Sometimes their reports receive attention and are read by top management and passed along, sometimes and more often the are not. CI work in Ericsson deals with convincing top management of the value of CI. MI is a term used to a lesser degree at present. A first conclusion is that the work is more about social intelligence, not in the sense that Stevan Dedijer gave it in the 1970s, but in the sense of 'social skills'. It is about selling CI to top management, about trying to present CI in a way that is appealing to top management. Another way to say this is that it is more about how than about what is being delivered.

As an example, one staffer found that it is much easier to be heard and kept in the loop when he asks questions instead of providing answers to specific problems. When he provided specific answers in the past he found that he was often being questioned. The more specific he was in his answers the more critical they tended to be. Top managers reacted particularly negatively towards receiving exact numbers. They often thought they knew better. This would lead to arguments and

disagreement. As a consequence the staffer soon felt excluded and the importance of his function or contribution was weak. At a certain point in time he started asking questions instead, so instead of saying "the market in Brazil looks to weaken by 15% annually over the next three years", he would ask "how confident are we about increased sales volumes in the Brazilian market over the next three years?" The new CI focus was on defining the problem area, but not the actual problem. He was now part of the analysis, but left the answers to top management. The latter approach opened the way for influence in the organization. The next question then is why didn't the managers appreciate the more accurate answers?

One reason suggested by staffers is that top managers feel threatened by exact numbers. The reasons for this may be two; for one it is often assumed that managers know best. Top managers in private companies are paid very high salaries for their knowledge and decision making skills. These decisions basically consist of two parts, one is the information set or the intelligence at hand, the other is the analytical abilities of the manager. If the actual intelligence for a decision is provided by another party, this only leaves the decision making part to the manager. In theory both parts could be made transparent, that is, it is possible to show clearly the most important pieces of intelligence needed to make a decision and it would be possible to show the analyses used for making the decision, for example a SWOT or PEST. If both elements are transparent it is possible to go back and evaluate decisions and the decision making process of each manager in a way that is not done today. It would then be possible to see which pieces of intelligence were not used or used incorrectly and it would be possible to point to mistakes in the analyses or critique could be raised as to the analysis that was selected for the given data and the problem at hand. In other words the managers' abilities and performance would be stripped naked in a way that is rare in organizations today. Owners would better be able to see what they are paying for. They could then discover which top managers are overpaid. The argument is that this is not something that the manager wants so he (it is often a he) does everything to keep the process hidden or muddled. If this is true it becomes obvious that effective CI and MI procedures can only be imposed by the owners, not by top management itself. These observations though do not explain why CI work is so different in SCA and Ericsson.

The second reason is that when the company is under considerable financial pressure due to heavy competition, like the case is today in Ericsson with Huawei continuously breathing down their neck and potential new entrants in the IP technology sector threatening to disrupt the industry, employees in general and managers in particular become more concerned about keeping their jobs. This means that they become risk adverse about their own position and more concerned with showing that any success or progress made in the company is their own doing. Top managers who find themselves in this situation do not want to admit that someone under them, a subordinate like a CI staffer, knows more about what is going on than they do themselves. As a result they become more defensive towards subordinates who think they know better. This is a confirmation of another problem: that CI deals directly with knowledge and as we know knowledge is power. By asking questions instead of delivering answers the CI staffer becomes less of a threat. The top manager can then take the information given and the credit for the decision to show that he has the knowledge needed for the job, that he is indispensable.

This view of organizational life based in critical theory is not pessimistic, but realistic and can be found in the writings of Alvesson on organizational culture (Alvesson , 2012; Alvesson, & Sveningsson, 2015). It is a view that is opposed to instrumentalist and constructionist contribution in organizational theory, as developed in the neoclassic paradigm.

I will call the first reason for lack of CI efforts *the high salary theory argument of top managers*. The second argument I will *call the defensive position of top manager in distress theory*. In Ericsson both phenomena are making the work of CI and MI less efficient and more difficult.

What was then the reason why Ericsson left their previous model of CI, according to CI staffers, one may ask? For decisions or changes of roles and functions in large knowledge intensive organizations we expect good reasons. For the question why Ericsson left the advisory model of intelligence and adapted what I have called the consultancy model of CI there does not seem to be any clear answer, at least not when CI staffers are asked. From the

interviews it seems the advisory model was left when the person who filled that position left the company and retired. No clear effort to continue the function seems to have been made. CI staffers currently at Ericsson do not remember the previous model or how they worked, nor do all remember the person who used to head it, even though he was well-known in the company only ten years ago and had worked there for more than two decades. Part of the reason may be that most CI staffers today have held the role for less than five years and came from other functions and other countries and markets before they entered into their current positions working with CI and MI. In many respects we see that current CI staffers started CI work from scratch, organically, seeing an opportunity for CI assignments and taking them, only then realizing it is a developed academic field. Knowledge of CI and MI was not passed on from one employee to another.

Is this then a defeat of the professionalization of CI, or just a new more flexible version and model? It seems clear that Ericsson has been losing competitive strength for a number of years. The failure of Sony-Ericsson was just a step in this development. The growth and strength of its competitor, Huawei, continues. In addition the threat of new entrants is becoming ever more likely in what could be a technology shift. Ericsson used to be the preferred partner in Western countries for security reasons (as they are not Chinese), but also this advantage has disappeared it seems everywhere except for in the US market (where Huawei is still blocked from major infrastructure projects).

It is a contradiction of organizational life that companies in trouble perform worse exactly at a time when they need to perform better. I shall call this *the contradictory organizational theory of companies in trouble,* but not pretending that I am the first observe such a phenomenon in organizational life.

There is also some strength to the existing consultancy model at Ericsson. It appears to be more flexible and can easily be adapted anywhere and everywhere in the organization. It is easy to set up and to dismantle, builds on continuous evaluations and it invites the use of external consultants or anyone with the right knowledge. As such it could be a CI model for companies in trouble.

From a methodological perspective the question is if we are measuring the actual importance of the CI function as such or if we are seeing a CI model in a company struggling to survive in a very competitive market. In other words, is the CI model at Ericsson a result of the situation they are in, or is the situation they are in a result, at least in part, of the way they have set up the CI function? Comparisons to other companies like the SCA suggest that it could be the latter case as the Ericsson model of CI deviates from practice in other Swedish multinational enterprises (MNEs), but more studies are needed.

SCA is a company in rapid expansion and growth, partly through new acquisitions, but also though reorganization. None of this has altered the CI function in the company, which follow an old established model. A few years ago the CI department had to cut staff by two employees, but increased efficiency in the department has led to even higher output and more professional standards. The structure of the CI department is the same and they deliver the same standard reports each year more or less. Their work is defined by regularity, stability and mutual trust.

The question for the analysis is: is the consultancy model a good choice for Ericsson in their current situation? Should Ericsson and other companies put more emphasis on CI? In other words, does CI matter?

5. ANALYSIS

Companies in difficult situations tend to be a bit like mediaeval rulers, who will decide to execute the messenger. This resembles the role of the CI specialist in Ericsson. By changing his role from one of being a bringer of facts to one who asks questions instead the CI specialist managed to save his life, but only to find himself turned into another medieval figure, the court jester. The court jester is focused on pleasing his superiors, not on delivering need to know information and telling the truth.

When a company is in a difficult situation the organization tends to becomes more political, and therefore less concerned with facts. Managers become occupied primarily with defending their own positions and existing perks rather than with keeping the company alive. If everything goes wrong financially managers can jump ship and find another company to work for. With the high salaries they are given they can afford to take their time when looking for new opportunities. As long as they do not make any outright mistakes that lead to disasters for the company they will be able to leave the company with

good references. Those who stand to lose the most in this are the owners. Thus it is in the interest of the owners, more than the managers, that a good CI function is put in place. The problem is that this is not a decision normally made by owners, but by the managers. This then is a catch 22 situation in management theory, a problematic situation for which the only solution is denied by a circumstance inherent in the problem. Owners could realize this and play a more active role, for example by giving directions from the board, making the company implement an active and extensive CI model in the organization, given that it can be made to lead to better decisions.

5.1 Managers' unrealistic expectations of the intelligence function

Another problem that was raised in the conversations with Ericsson employees is that managers often have expectations of the CI function that are too high. They expect to be able to "see into the future", what unfortunately is promised in much of the academic literature, for example on the topic of "foresight" and by consultants eager to sell business intelligence solutions. As Agrell (1998) reminds us, there is much talk about breakthroughs in this area, but it is still much about guessing and making mistakes (p. 118). Not much has changed in this area. It does not mean that studies of CI are useless. On the contrary, what we have developed in the study of the scientific method in the social sciences gives us more information than if we did not do any analysis at all. This then should be the first insight. Instead of waiting for the next management guru, managers should assure that their analysts are well trained on the topic of science and the scientific method and not duped by promises of theoretical revolutions in other disciplines.

Managers often take in consultants when they want to make changes but do not want to stand for the consequences. For example, sacking employees is then the result of an external report and "was not what the management wanted", it is argued. In somewhat the same way management gurus are brought in to spread uplifting ideas in any area where enthusiasm is needed regardless of whether it's true or not. Instead these services are often a simulacrum of doing something or of looking like the organization and top management are up to the task. Managers take in CI specialists to talk about the future and what will happen in the future, thinking that by talking about it the organization stands a better chance at an actual prediction.

Predictions of the future can be correct when the future is a close function of the past and current events, when there is a pattern and a clear logic to follow, but not when there is a break with normal logic. We can classify different types of differences that break with this logic and therefore are almost unpredictable; innovation is one example (1). A sudden unexpected innovation that leads to a new product like the touchscreen on mobile phones was what drove Sony-Ericsson out of business. Another group of changes is disinformation (2), when we chose to believe something that is put out there that is willingly and misleadingly false; as when companies stack great piles of empty boxes in front of a store to signal that they are successful. A third type is natural catastrophes (3). Trends are less of a game changer as they are easier to predict. For example, duffel coats seem to come back in fashion every 5 to 7 years. We can often tell a year in advance, but the logic here is commercial: the time it takes a consumer to throw away his old coat.

So, are there no advances when it comes to foresight since Agrell made his observations? Yes, there are, but not in the field of management or the social sciences. With the development of big data, data mining and business intelligence application companies are now able to make better predictions that can be derived from historic data. For organizations who own very large sets of information like Amazon, Google or Facebook, data mining can reveal detailed patterns about our behavior and general preferences. However, artificial intelligence (AI) as discussed today, mainly builds on the historical method, assuming the customer will do as he has done. This method is far from perfected today. As an example Amazon can still not guess what I will buy next, even though they are trying very hard to do so (basically assuming that I want more of the same or combining it with something I wrote in an email or searched for). The internet giants know what my interests are and when I type 'Malaga' in the browser or somewhere it can access or exchange data with, but they assume I want to go there and offer a rental car, which is a fair guess, but wrong (I was just corresponding with a colleague at the university there). And still, these new

intelligence techniques built on what I type are more useful when it comes to questions of customer purchases than what will happen in world politics. The technology works fine for selling targeted or tailor made advertising, but will not answer our question about what Ericsson should do in the Brazilian market in the next three years. Another problem for Ericsson and all companies that are not in the big data business is that they do not have access to this kind of information, as it is not shared by the internet giants. Our behavior becomes their property which they do not share with others, not even with us. Our data becomes their currency; what we pay them with when we access their services "for free". Instead of money we have given them pieces of our lives, even our private photos.

For business intelligence software to be valuable, larger amounts of data are needed. Companies like Ericsson can buy a lot of data or rent it, for example with Data As a Service (DaaS), but it will not come cheap. Consequently, the results of the exercise of implementing these systems for companies, even for larger companies, are often a disappointment when it comes to the broader questions, which are relevant for the CI function. Another problem is that managers tend to be uncritical towards the answers coming out of or from these systems. In other words, there is an over-belief that foresight is possible with new technology, a view that is pushed forward by managers and consultants alike of reasons I have tried to show.

5.2 The problem of the CI job description

Participants at CI and MI conferences often complain that intelligence work is not defined as a proper position in the company. They would like it to be so, or are even promised that it will be so by their superiors, but end up doing a whole range of other tasks in the company instead or in addition, like more general marketing and sales. So those interested in CI work often express a feeling of disappointment vis-à-vis the specialization. This has been the case for the past 17 years that I have participated at conferences and probably much longer. The question we must ask is if it is a failure of CI and MI that it does not correspond to a proper full time job description.

The two cases give little insight into this question as employees at both Ericsson and SCA are labeled something with "CI". In the case of Ericsson the CI specialists have job descriptions that say CI specialists or similar, for example "director of competitive intelligence". This is also the case at SCA and in numerous larger Swedish MNEs. However, in most companies employee's engaged in CI have different titles, liker sales manager, director of HRM or key account manager. CI is not a major part of their job description and does not occupy most of their time at work. There is no indication that companies who do not have full CI positions perform any worse. It seems, at least in Sweden, to be more a question of the size of the company. Performance seems to be more related to how they work with CI, but future studies should look at this.

There is a wish by many CI professional and larger companies to develop departments of intelligence. Those working with CI at Ericsson for example seem to favor this. In SCA this is already the case. In Ericsson such a department was never developed, as they followed another model, but it has existed at companies like SEB for more than 100 years. So, established CI functions are far from a new idea and far from uncommon.

Part of the reason why employees focus on positions is the way we think of departments. Most disciplines in business started from the perspective of departments that exist in companies. There is a human resource department, so there must be a study of human resources or human resource management (HRM). In the same way there is an accounting department and there is a marketing and sales department and we study those fields with their proper subjects and courses. There may also be a finance department or employees working with finance and controlling. Managers deal with strategy, leadership and decision making, so those are other well-developed areas of study but without a proper department. Then there is the sociological perspective as in the study of organizational behavior, a sort of from-outside-perspective by sociologists or academic outsiders. CI can be its own department, but it can also be something mangers do, just like leadership or strategy. CI and MI as a working process are not typical for any one department, but may occur in different areas such as finance or in marketing. This may also explain why organizations must reach a certain size before it makes sense to turn the CI or MI function into a proper department or position. It does not mean that these functions are any less relevant than accounting or HRM. It will be suggested next

that it means that the intelligence function in private organizations is lagging behind its equivalent in the public sector.

5.3 The intelligence function in private and state organizations

We have entered a new phase of the information age when the average private organization can access the amount of data and information that was previously only available to state and military organizations. We easily find facts with Google, Facebook or LinkedIn. We study detailed geographical images with details for buildings and trucks on Google Maps or use GPS tracking devices. We leave reviews on TripAdvisor and set up cameras for surveillance that are linked to face recognition. In addition we now all publish and we can read what others publish, for example on Twitter. This leaves an abundance of information about everyone and everything which resembles the capabilities that only states used to have. What used to be accessible to state intelligence is today within the reach of everyone with some basic internet resources.

The notion of competitive advantage builds on knowledge and knowledge in turn builds on reliable information, facts or intelligence about the world and all the things in it. A private organization today with a small intelligence department can gather more data than what the state could do only a decade ago. Thus the idea of a professional intelligence model in private organizations has never been more convincing.

Strategy builds on the assumption that managers today have or know how to find information needed to make good decisions. This assumption must be questioned. Managers in the private sector, unlike their counterparts in the public sector—such as generals, ministers or heads of states—get most of the information they need themselves, either by what they know, by whom they know and can ask or from reports they buy and read. The logic in private organizations is that it is assumed managers are well informed and make the right decisions without much assistance because that is what they are paid to do. In the running of the state, where pay is considerably lower, ministers are surrounded by advisors, special departments that can do research, and call in the best experts. Besides they have a large intelligence organization at their disposal for both internal and external information.

It has been suggested in this article that the high pay is a reason why the manager does not like to listen to advice, especially not that given by people further down the hierarchy. What we have to ask is why the situation for ministers or generals is so different? Why is it that generals are dependent upon support and value and appreciate intelligence and the help from the intelligence department while most managers do not?

When we look at history we find that the generals were in the same situation as managers are today. During the Napoleonic wars the general ruled all by himself, as he was considered a military genius, he simply knew what to do. He had spies out looking for what was happening in different directions, but no intelligence unit helping with coordination and processing information to make decisions. Instead he stood on a hill a bit away from where the main action was taking place and sent out his orders. When the army won everyone thought he was brilliant and he would ride down from his hill and make a spectacular entrance into the city like a Roman military leader. In some sense the practice of management today is not that different. When managers succeed they are rewarded with salaries that are many hundreds of times higher than those of an average worker, they get bonuses and their portrait on the front page of Fortune magazine.

It was first later with the development of the Prussian and Russian military command that a second department was formed, one engaged with special responsibility not for engaging in war - that was the responsibility of the first department of “the general command” - but of strategy and intelligence. In this way a superior army was produced and the organizational model soon copied by other nations. From then on intelligence organizations became standard in the military and have been so ever since. Sometimes the army will experiment with mixed, shared or integrated models of intelligence, but so far these versions have not been convincing. As an example, in Sweden it is accepted by many that the air force has the best intelligence organization because they have been organized in their own separate department for a longer time and have more experience as specialists.

In the next stage the military intelligence model became a standard for the way the state was run, to assist ministers and heads of states. The logic was that if the military can make better decision with an intelligence

organization so can the state. Later this function was again divided into a domestic and a foreign branch, which made sense as these are two very different specialties or domains.

It's easy to forget that the professionalization of the intelligence functions in the military and the state is less than a century old. The CIA was mostly built up around the experience the US had working with the British during the Second World War. The NSA was mainly built as a response to the failure of Pearl Harbor. The number of intelligence personnel working for the state today runs into the millions. No one in the military and no heads of state today will seriously question the importance of having an intelligence organization or department. It is more a question of its size, efficiency and what priorities the organization should have. The question we have to ask is if the private sector is so fundamentally different that it can ignore these developments? Is business life not also basically about gathering information and about decision making in a race for a competitive advantage and ultimately for the survival of the firm?

After we entered what is called the Information Age the answer seem to be clear, especially when we consider how information and the internet has come together during the past decade. Just like the 1980s and 1990s were about logistics with IKEA, Dell and Walmart, the early 21st century is about data. Facebook is not about friends and Amazon is not about books. They are both about reaching as many potential customers as possible to gather as much data as possible. The basic human need for friends just happens to be a way to achieve that. Amazon started to grow by selling books, but soon discovered that they can now sell almost anything. Their data centers are not that different from those of the NSA or equivalents in other countries, gathering data about people 24/7.

Both the public and private sector are run according to the principle of competitive advantage. States need annual increases in GDP to guarantee their citizens a higher standard of living, so they compete economically with other nations. A failure to bring about economic growth on a continuous basis will lead to a weakening of the state when compared to other states. For their citizens, this means a lower standard of living. Economically weak states are prone to social instability and poverty, and in the end to dictatorship and revolutions as we have seen several times in modern European history and which we will see again.

We remember that the modern study of economics started with the notion of competitive advantage with Adam Smith in 1776. The question was what makes a state prosper. CEOs are concerned with the same question, how they can compete with other organizations, and eventually how they can make enough money to satisfy investors and owners. Right now Ericsson is wondering how they can compete with Huawei. If they fail to achieve this, Ericsson employees will lose their jobs, and in the worst case the company will go bankrupt or cease to exist, like ST Ericsson, its daughter company, did.

Like states, companies today have to take advantage of the great amount of information available to them. The existing business literature and the study of economics in particular have not drawn the right conclusions from this paradigm shift.

On one side the amount of data available for making good decisions has increased beyond the wildest expectation. On the other side the costs of this information have become so low that it's available to almost any company and any person with some data equipment and an internet connection. Competitive advantage today is to a large extent defined by how companies access this information and what conclusions they draw from it. This is an impossible task for a manager to succeed with by himself. He does not have time to read and digest the amount of information needed, in many cases he does not even know where to start looking. This is a situation that resembles that which the state and military organizations found themselves in not much more than a century and a half ago.

Good information or intelligence has been assumed in the study of economics and later in business studies and the management literature. There is also the assumption given by vendors in particular that computers will do it all for us, that it's enough for the manager to buy the right software (business intelligence) and the machine will give the answer. Instead, as we have seen, the software is only as good or helpful in decision making as the quality of information we put into it, according to the formula garbage-in-garbage-out (GIGO). Consultants today say they have an answer to this problem with DaaS, the idea that if you do not have the data to put in to the machine yourself then you can buy it, or rent it, but today this mainly works for certain questions

and problems, what we could call "library questions", where the clue is to look up something (Søilen, 2016). For more typical intelligence questions, of things we do not know, dealing with future scenarios, we need data input that comes through a comparison of current events with a broad reading (not so much management literature as literature, history and philosophy) and extensive travelling (understanding other cultures, which includes learning other languages). This you can only get through a good general education, extensive reading and experience. Our computers are not there yet. Instead computer systems are good at delivering one kind of data (Søilen, 2016).

New technology is also a threat to companies. Today every individual is a potential spy. Corporate espionage has become a big problem, its consequences still underestimated. Hackers can easily be hired to break into competitors' data systems and security systems are often weak. Companies are closing their eyes to encryption afraid that it will make business communication more cumbersome. Those industries that are being hacked, like banks, keep quiet about their losses and do not report about the hackers successful entries into their systems afraid that it will scare customers to withdraw their money and move to another bank.

The next development in technology will be perfect voice recognition which will make counterintelligence an even a bigger problem. A competitor can then call an employee pretending to be someone from his work. This technology has again triggered new counterintelligence technology, like programs that can detect if the voice is real or not, but adaptation of such systems will lag behind for a long time.

With internet technology corporate espionage has become massive as it has become easier and less risky to break in to corporations and steal assets such as money or intelligence. Private organizations are facing many of the same threats that used to be the problem only for states and military organizations. This is yet another indication of how relevant the intelligence parallel is for both worlds. To deal with these new threats companies need to catch up and start to think of themselves more as intelligence driven organizations. They are already living in an intelligence reality but they are lagging behind in its implementation.

One reason companies do not think of themselves as such is that they use other terms for the same activities. For one thing we say information instead of intelligence even though all organizations make a distinction about the quality of the information gathered. For Facebook the information that a customer opens the application is less valuable than actually clicking on specific posts and some posts give more valuable information than others, for example a customer clicking on a specific advertisement. Another example of the use of different terms is human intelligence (HUMINT), gathering information from people we talk to in person. It is such a natural way of doing business that business people hardly ever think much about it as such. Sending out agents to gather information on customers and markets is not spying but what the marketing department does when it talks about market research. We do not talk about interrogations but deep interviews. Sometimes the notion of an agent is used in theory, but it is rare.

The relationship between the intelligence provider and the decision maker, or the CI person and the manager can be understood with the help of principle agent theory. The relationship between the agent and the principal is one of mutual dependency, where the principal is best served by the ordering and delivering of good information over time, slowly. The agent must learn what kind of information is needed and the principal must learn to trust the agent and the information that is given. It should be a professional relation built on mutual trust and as such the logic is quite similar in the public and private spheres. These are just some examples. Avoiding the intelligence lingo is a deliberate effort by companies to avoid the stamp of being brutal, aggressive, or of being spies, with all the negative associations that brings. The ethical dimensions within the phenomena are very similar. The separate sets of terms may in part explain the reason why CI and MI have been late to develop in private organizations.

In Ericsson the CI function is lacking today. The company may still survive and prosper as most measures of success are not related to this question. The current CI model in Ericsson may also be part of a transitional phase, but it is more likely to be a symptom of an organization that is struggling uphill, a company losing its competitive advantage. It is symptomatic that the organization does not remember how the company used to do CI only a decade ago, who the people who worked there were, to say nothing about how they worked. What is worse, Ericsson seems to have limited

knowledge about their competitors. CI people have not even been to Schenzhen to study their biggest competitor and are more often than not unfamiliar with Chinese culture. As such they remind me of Western students in Sweden who prefer to stay in town and party when there is a school break, while as the Chinese students hire a cheap car, fill it with staple food and drive to the North Cape. Competitive advantage is just as much a question of mentality.

The CI problem is not solved by throwing lots of money at it either. Expensive CI is not the same as good CI. Few American companies put more emphasis on CI than Motorola Inc. The company failed and it all happened quickly, as it did for ST-Ericsson. In the case of Motorola Inc. the company's production costs were too high and overestimated the value of their high end products. Ironically it was later bought by a Chinese counterpart and continues as Motorola Mobility. As competition intensifies the speed by which huge companies are brought down surprises everyone.

These examples are not exclusive to private organizations, but are also familiar to nation states. In June 1967 the Egyptian army was knocked out by a superior Israeli air force and, as they had no information about what was going on at the front, the war ended abruptly. Stasi, the intelligence organization of Eastern Germany, was known for knowing everything about everyone in the DDR. Still they were taken by surprise when the revolution broke out in 1989. Over a few nights there was no Stasi, not even a DDR.

From a theoretical perspective it is the social sciences that are failing (Søilen, 2017). The social sciences are still in their infancy, struggling to find their guiding paradigm and a common project. As such they in the same positionas the study of biology was at the start of the 19th century: highly fragmented and rather unscientific (Mayr, 1942). The discipline of intelligence studies in business is a part of an attempt to change the focus and paradigm for the socials sciences by trying to study a phenomenon that is relevant in a way that is relevant (method). Until it gets more recognition it is a discipline and a profession that will have to accept a place in the background. It does not mean that these areas and the people and what they do are less relevant, on the contrary.

6. CONCLUSION

In this article we started with the question of why anyone should care about CI and MI by looking at theory and practices in two Swedish multinationals, Ericsson and SCA. The short answer is that data or intelligence is the future of success for all companies that rely on computers systems as part of their business idea or model, not just big data, data mining and business intelligence but CI and MI. This is something companies have known for a long time, but which few have been able to implement. So, the interesting question is not why it is important or why anyone should care, but why it has not happened. This then is the real question which this paper tries to answer.

When SEB started its intelligence unit more than 100 years ago in 1903 the head of the bank Markus Wallenberg Sr. sent a young lawyer by the name of Richard Julien out to travel and to read, to learn French and figure out how the French banks managed to be competitive. When he came home Julien established an intelligence unit within the bank, camouflaged as "the statistical department". It basically dealt with what we should call financial intelligence today, trying to understand different industries and the creditworthiness of specific customers. Since then many Swedish MNEs have followed and have developed formal CI functions within their organization.

SCA has a well-oiled, well proven and systematic CI function today. The way they are organized fits with what is called the intelligence department model. About ten CI specialists work to produce mostly standard and timely CI reports. The CI unit is now also involved in the upcoming splitting of the company into two independent units each with their own CI capabilities. SCA follows more closely a typical CI and MI development than does Ericsson.

CI work at Ericsson seems to be effected by the difficult competitive position the company is in. To describe the current intelligence model used in the organization we could not use any of the existing models, but defined a new one: the consultancy model. This model does not have to be inferior to the other models in terms of performance and efficiency, but CI function is struggling. The company does not seem to understand its competitors. Employees seem more concerned about job security than finding out what needs to be done. CI staffers use much time to try to sell their analyses to top management. Instead of leading to necessary changes in competitive, the current crisis in Ericsson has led to the organization and its

managers to become more political. Employees are putting their own interests above those of the company. In times of crisis when the demand for intelligence is the greatest the company is not succeeding with CI.

A decade and half ago there were serious discussions in Ericsson as to where to put the intelligence function. Ericsson was following in the footstep of other great Swedish companies who understood the value of good intelligence, like SEB. Today's CI staffers in Ericsson do not remember that process, or the names of the people who led it or how they used to do it. This does not mean that CI staffers do not do a good job, but the conditions have deteriorated.

SEB and Ericsson have more or less the same owner, the Wallenberg family. The family is the largest single owner of SEB with about 20% and of Ericsson with about 22% of shares. The second largest owner of Ericsson is the Lundberg family, who controls Industrivaerden AB. SCA is a minority owner of the same investment company. The companies that the Wallenberg family control seem to follow quite different CI practices, but future research needs to confirm this. One reason may be that the owners are less involved with CI questions.

I have argued that management theory and practices are living in a Napoleonic logic where the manager is seen as a genius, much like the military genius. It was an idea that developed in the 1980s. I argue that this is harmful for the interest of the company, as Napoleon was harmful for the state. I also try to show how the private organization can learn much from state and military organization when it comes to intelligence work. It is the status of genius or guru that allows the manager to claim such a high salary or special perks—remunerations that are many times higher than what is accepted in the public sector. An efficient intelligence system could make the job of the top manager more transparent. How the manager gathers intelligence, and makes decisions as a result of concrete analyses can show what contribution he actually makes to the organization. Further studies are needed to look specifically at how these processes unfold. The whole problem should be interesting to study from a psychological perspective. It will be argued that management theory has not been sufficiently critical when it comes to the managers' contributions to the organization. It shows that intelligence studies in business and other areas of studies have an important role to play to uncover the mechanisms that lie behind good decisions. Another way to say this is that much management theory builds on a wrong assumption, that of the all-knowing manager.

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An examination of the impact of business intelligence systems on organizational decision making and performance: The case of France

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ABSTRACT Turbulent times are a part of modern-day business, and the way a company handles disruptive events determines its success. Various technological tools have been developed to help businesses overcome unforeseen and anticipated events that may impact the business. One such technological tool is business intelligent systems, which help to gather data regarding business operations and environment turning it into information that can be clearly understood. Large companies have adopted the use of these big data analytic systems, but most small and medium sized enterprises (SMEs) lag behind. There is little information on how business intelligence systems impact SME businesses. This study examined the impact of business intelligence systems on organizational decision-making and performance. The study consists of an empirical qualitative research that was carried out with interviews of 200 members of 10 selected SMEs. The study found out that when BI systems are deployed in SMEs, they facilitate timely decision making, improves organizational efficiency, enable a company to meet client's needs appropriately and lead to more satisfied employees.

KEYWORDS Business intelligence systems, competitive advantage, customer satisfaction, employee satisfaction, organization, SMEs

1. INTRODUCTION

Today, businesses face various unforeseen events that normally have a detrimental impact on their progress and performance. Business intelligence systems are currently perceived as a solution to such disruptive events that hit the businesses unexpectedly, irrespective of whether it is a large or small business enterprises (Fourati-Jamoussi & Niamba, 2016: Jenster & Søilen, 2013). Business intelligence systems refer to those computerized methods and processes that turn data into information, which is then converted into business knowledge (Popovič et al., 2012). These systems offer technological solutions that provide analytical capabilities as well as data integration services that can provide valuable information for business stakeholders. However, assessing the success of business intelligence systems is a problem as they cover entire organizations and their benefits can only be long-term (Popovič et al., 2012). Additionally, small and medium enterprises (SMEs) are perceived as laggards when it comes to implementation of technological systems. This is because they lack the financial capacity as well as the required expertise to implement and manage big data systems. On the topic of business intelligence, most researchers have focused on large companies and therefore neglect SMEs despite BI tools being essential for all businesses. Therefore, there is a lack of sufficient information on the impact that BI systems have on SMEs. This empirical research provides the results of a study that

examined the impact of the business intelligence systems in SMEs by collecting and analyzing data on how organizational members perceive these big data analytical systems. The purpose of the study was to determine whether and how business intelligence systems facilitates timely organizational decision making and other impacts in SMEs and also to examine how organizational members perceive business intelligence systems.

2. BUSINESS INTELLIGENCE AND BUSINESS INTELLIGENCE SYSTEMS

The term business intelligence (BI) has become increasing popular in the last few decades. According to Sabanovic, & Søilen, (2012), business intelligence is a multifaceted term that encompasses techniques, processes, and tools that facilitates faster and more effective decision making in business enterprises. This definition agrees well with the definition of Popovič et al., (2012) of business intelligence, which is a composition of computerized processes and methods that help to turn data into information then into knowledge that aid in business decision making. Business intelligence systems provide essential tools that help in effective reporting and analyzing business information so as to understand the organizational internal and external environments (Fourati-Jamoussi and Niamba, 2016: Søilen, 2015). This gives the managers essential data that is used in decision-making processes.

A business enterprise can use one or more types of business intelligence systems so as to boost its decision-making processes. There are four major business intelligence systems that are used in a business, namely: reporting, analysis, monitoring, and prediction tools (Sabanovic, 2008). The reporting intelligence business systems focus on the development of business documents that contain valuable information on what has happened. These provide the businesses with information about the company activities within a given time span. The intelligence business analysis systems provide information on why an event happened (Vesset & McDonough 2007). This is a crucial part of the business because the provision of data without analysis is useless. The intelligence business analysis systems collect and analyze data before presenting it which makes it easy for business leaders to understand and interpret it. The tools that are commonly used under these types of systems include the following: spread sheet analysis, ad-hoc query, and visualization tools (Sabanovic, 2008: Sabanovic, & Søilen, 2012). The spreadsheet analysis tools analyze data that are contained in spreadsheets and help to evaluate the entire organization or a specific unit of performance. For instance, spreadsheet analysis tools can be used in tracking the number of hours that the employees have worked. The ad-hoc query tool is software that allows companies to develop specific data queries such as the creation of query of the number of items that have been sold within a specific period (Vesset & McDonough, 2007). The visualization tools, on the other hand, are software that accepts raw data and creates visualizations that business leaders can read and understand (Negash & Gray, 2008). An example is a tool that can create a graph comparing methods by which customers have been contracted within a specific and given time. The third type of business intelligence systems is monitoring tools. This allows businesses to monitor information and data in real time. Snapshots can be taken at any time to get reports thatcan assist in timely decision making. Tools under this form of business intelligence systems include the following: dashboards, key performance indicators and business performance management (Sabanovic, & Søilen, 2012). According to Eckerson (2010), the dashboard tools provide a central location whereby actionable and useful metrics are contained and represented graphically, making it easy for users. The key performance indicators (KPIs), on the other hand, measure the performance of a given specific project within a company, for example, return on investment. The business performance management tools refer to the system that ensures that the organization meets the set performance goals. It is therefore designed to deliver results on whether the performance goals are met or not. Lastly, the prediction business tool helps those businesses that are keen on predicting what may happen to their business based on the data that they have on business trends. Vesset & McDonough (2007) note that the prediction business intelligence systems are more complex and therefore most businesses contact third parties to provide the services while others use software that automates the entire processes. These systems are comprised of data mining and predictive modeling tools. The data mining tools work by finding patterns and relations that exist between large data sets and

transform them into understandable information for the companies. The predictive modeling tools, on the other hand, uses modeling techniques to predict an outcome of a given event or its probability (Vesset & McDonough 2007).

3. THE ROLE OF BUSINESS INTELLIGENCE SYSTEMS IN ORGANIZATIONS

Business intelligence systems are an important part of organizations as they can be used to determine their performances. From the definition of business intelligence, it is clear they enhance decision-making (Sabanovic & Søilen, 2012: Popovič et al., 2012). According to Popovič et al., (2012) business intelligence provides quality information to organizations which are essential in the process of decision making. This is because it equips the knowledge workers with an opportunity to timely access of information, analyze it effectively and intuitively present the right information. Such an opportunity enables an organization to make the right decision and take the right action. Therefore, business intelligence should be understood as the ability of an entity to think, plan, predict and solve the problem in an innovative manner (Popovič et al., 2012). Business intelligence emphasizes abstract thinking and innovative ways of solving problems in a timely manner because appropriate actions are taken so as to advance business goals and overcome any looming business disruption event. This is only possible when the right business systems are implemented.

Apart from helping a business organization in making proper decisions regarding their functions, business intelligence has other benefits. Sabanovic, & Søilen (2012) argue that business intelligence systems (BIS) do not only help in making better and more efficient decisions but also impact the entire organization to improve its return on investment, gain new customers and suppliers and also recruit the best employees and enhance their satisfaction. Business intelligence systems bring greater visibility into business by allowing the leaders to have an entire understanding of the company and the environment that it operates in (Sabanovic, & Søilen, 2012). This is possible because BIS lead to the gathering of the information that is used in strategic planning. The strategic plans of an organization touch on different areas that give an organization a competitive advantage. These plans allow a company to target consumers in a better manner, attract top employees, have the best suppliers and as such a return on investment will be realized.

These systems are also important in determining the strategic decision of a business. When BIS are implemented, misunderstanding the goals of an organization can be avoided. This is vital in ensuring that all organizational members and their actions are going to the same direction (Sabanovic, & Søilen, 2012). Business intelligence can be used to gain competitive intelligence which is vital in shaping the strategy of a company. According to Jenster & Søilen (2013), competitive intelligence encompasses the following processes: defining, gathering, analysis and distributing information that is used in decision making. The competitive intelligence gathered, therefore, facilitates strategic planning in an organization. Thus, a BIS leads to the accumulation of competitive intelligence, which is used in making strategic decisions for a given firm.

BIS also have a role in providing businesses with information for marketing functions. One of the platforms for marketing of a company is through trade shows. Søilen (2010) argues that, for the longest time trade shows have been neglected in the arenas of marketing research. They have not been considered to be important parts of market information because marketing strongly focused on customers rather than competitors and other market influencers. However, currently trade shows are becoming important in not only selling company products but also marketing the company and confirming the company presence in the market (Søilen, 2010). At trade shows a company meets different customers who provide important marketing information. Nevertheless, the knowledge transfers in trade shows occur through face to face communication despite being extensive. The marketing information can be obtained by using BIS during these trade shows. This is what can be termed an intelligent gathering of information that can be used in integrated marketing functions. Therefore, Søilen (2010) affirms that BIS can be used in gathering information for use during marketing and related function.

Lastly, BIS have an impact on the performance of a company. The major objective of adopting business intelligence is to enhance the overall performance of a company. However, there are some complications in

determining the actual outcome of these business systems. Although it is difficult to measure the outcome of any intelligent system that is implemented by a company, the overall outcome can be used to determine its effectiveness (Amara, Søilen, & Vriens, 2012). According to Jenster & Søilen (2013) BIS lead to the collection of competitive intelligence that is used in strategic decision making. This helps to shape the operations of an organization. Jenster & Søilen (2013) further argue that strategic planning has an impact on company performance. Therefore, BIS are vital in shaping the overall performance of an organization.

4. BUSINESS INTELLIGENCE SYSTEMS AND SMALL AND MEDIUM ENTERPRISES

SMEs have been lagging behind in the adoption of intelligent business systems. They only consider these systems to be effective for large companies which invest highly in technologies. The large organizations have the required resources to install, maintain and hire highly skilled personnel to work on the BIS. This is like SMEs which operate on meager resources. The expensiveness of these technologies renders them economically unfeasible for small-scale businesses (Lueg & Lu 2013). However, SMEs can utilize those BIS which are not complex and do not require high levels of expertise to manage. One of the economically feasible BIS for SMEs is the spreadsheets for simple data. According to Lueg & Lu (2013), SMEs can use spreadsheets to store data and for financial analysis. The spreadsheets offer applications such as cell modeling and holistic spreadsheet modeling that help to gain important information.

BIS are important tools in the management of the clients in SMEs. Søilen (2012) who carried out research on small business enterprises in Sweden found that SMEs use BIS to manage clients and also consolidate information in an easy and quick way. Therefore, BIS are important tools for SMEs because they help them manage their customers. Clients form one of the important pillars of SMEs, and therefore the BIS can help businesses to maintain a positive relationship with its customers. Further, Søilen (2012) notes that these organization's views on BIS depend on how they solve the information needs. Additionally, the decision on the intelligence systems to be adopted depends on the experience that a person has had in another company. There is a research gap here in looking at SMEs outside of Sweden and comparing the results.

Small business can use BIS to increase their efficiency in budgeting. The budget is an important document in a small business enterprise because it provides a print on how to balance different goals by maximizing the limited resources that are available. Budgeting problems among SMEs are due to the lack of understanding of the budgeting process, simplicity and also user-friendly IT systems. The lack of systems to validate the data used in budgeting also leads to errors in the final budget. The outcome of this is wastage of company resources. According to (Lueg & Lu, 2013), business intelligence can be used to drive budgeting efficiency. This is because business intelligence increases transparency, user friendliness, and simplicity, which are essential in enhancing data validation and thus driving budgeting efficiency.

Further, business intelligence can help small businesses in dealing with competition. Today, businesses operate in a dynamic environment whereby competition seems to drive all the strategic plans of the business. It is a challenge that SMEs grapple with on a daily basis. An SME should, therefore, learn to deal and cope with these competition challenges. This can be achieved by turning a small business to be proactive and agile in its decision-making processes. Ponis & Christou (2013) argue that competitive intelligence adoption is one of the ways in which small business enterprises can deal with competition successfully. This is because competitive intelligence involves a process through which organizations gather information about competitors and use it in decision making and planning process so as to improve its performance. Competitive intelligence is part of business intelligence, and therefore it can be of help for a small-scale business enterprise (Ponis & Christou, 2013). Therefore, business intelligence can help SMEs to achieve a competitive advantage. Guarda et al. (2013) affirm this by stating that those small business enterprises which embraced business intelligence have an upper hand in the market as they compete more effectively. This is because they have additional information about their competitors as well as customers. The information that an SME obtains from business intelligence can be used for future strategic planning which can help to avert any looming competition (Guarda et al., 2013).

Lastly, those who claim that BIS cannot be applied for SMEs should reconsider their stance. This is because small businesses are dealing with increased volumes of data and use of business intelligence can help them derive a logical meaning from it. The only factor the SMEs should consider is making the appropriate choice for the best business intelligence that is in line with their strategy. This will allow the SMEs to have a competitive advantage.

5. METHOD

This study was based on a qualitative descriptive approach. Semi-structured interviews were conducted on organizational members of SMEs to collect data on issues regarding BIS (Shields & Rangarjan, 2013). Emerging themes from these interviews are then discussed. The study started by recruiting 200 research participants who were categorized into SME managers and SME junior employees. The participants were drawn from 10 SMEs located in France. From each SME, 5 managers and 15 junior employees were randomly selected. Therefore, the study ended up with 50 SME managers and 150 junior employees. A semi-structured interview (see Appendix I and II) that consisted of questions regarding various aspects of business intelligence was given to each participant. All participants completed the study. The results from the interview were then coded and analyzed, and the emerging themes are discussed as portrayed in the following sections.

Table 1 A summary of SME managers' responses on various aspects of BIS.

BIS Aspects Tested Through Mangers Interviews	**% Yes**	**% No**
Deployment of BIS	45	55
Usage of BIS at all organizational levels	19	81
Complexity of the BIS deployed	39	61
Availability of skilled employees for manage BIS	25	75
BIS assistance in decision making	89	11
Other impacts of BIS other than helping in decision making	95	5
Perception on continuation of the use of BIS	96	4

6. RESEARCH RESULTS

This research shows the results of interviews regarding the top management in small business enterprises. Tables 1 and 2 and Figures 1 and 2 show a summary of SME manager's responses on several aspects of BI systems and also how junior employees perceived BI systems within SMEs.

Table 2 Table showing a summary of SME junior employees' responses to various aspects of business intelligence systems.

Business intelligence systems aspects tested through junior employee interviews	% Yes	% No
Usage of BIS in the company	15	85
Knowledge of BIS	20	80
BIS impact on employee productivity and performance	70	30
BIS impact on business performance	69	31
Views on continuation of BIS use	85	15

7. ANALYSIS

7.1 BIS Deployment and Usage

One of the themes that emerged from the results is concerned with BIS deployment and usage in SMEs. From the results that were obtained by interviewing both the junior employees and managers of SMEs, it is clear that the majority of SMEs have not deployed BIS. Among the 50 top management employees who were interviewed, only 45% accepted that their SMEs had implemented BIS. The junior employees, on the other hand, seemed not to be sure on whether the SMEs they work for have implemented BIS or not, as only 15% agreed that they use these systems. Further, 19% of the top managers confirmed that they use BI throughout the organizational levels. This shows that SMEs are yet to fully embraced the deployment and usage of BIS. These results agree with Lueg & Lu (2013) who found that small businesses lag behind when it comes to adoption of BIS. According to Lueg & Lu (2013), the intelligence systems are so expensive for businesses and therefore they are economically unfeasible for SMEs. The high cost of BIS is, therefore, one of the barriers that keeps SMEs at bay when they try to adopt these tools. This is because SMEs operate on a tight budget and therefore they believe that investing in BIS is tantamount to straining their meager resources. Secondly, the lack of

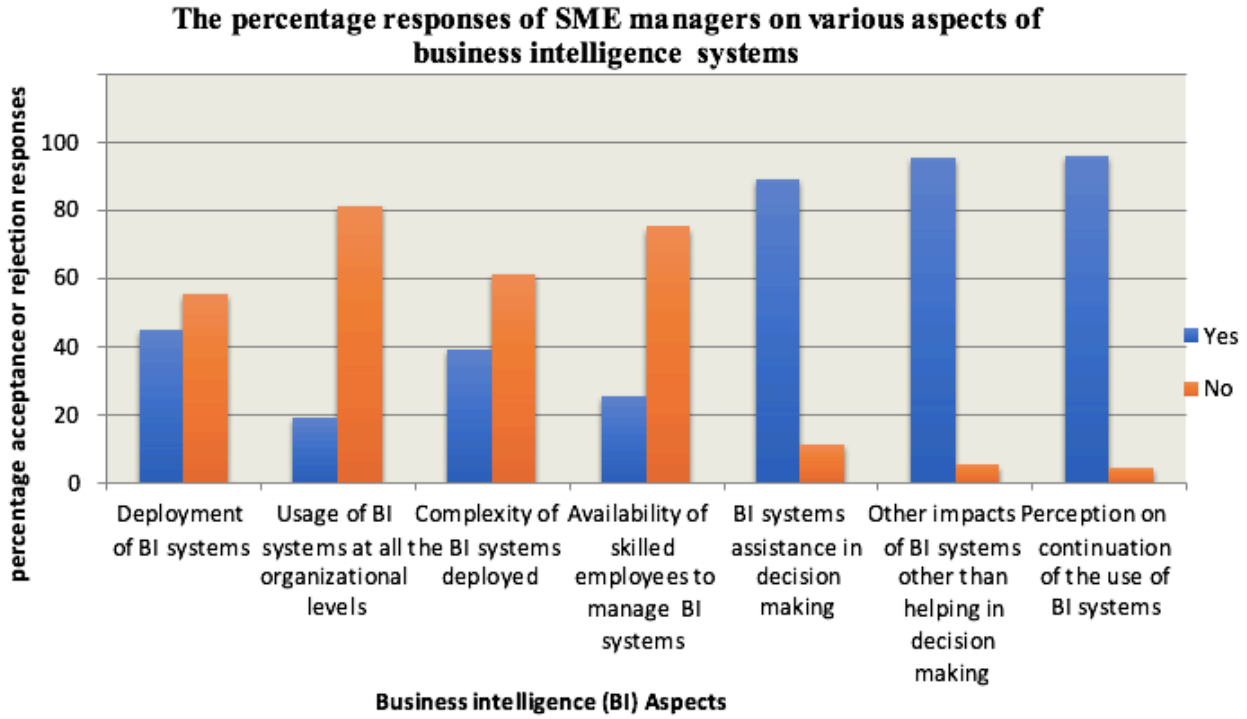

Figure 1 Graph showing the responses of SME managers to the various aspects of business intelligence systems.

proper information technology systems in SMEs is also a barrier towards the adoption of BIS (Puklavec, Oliveira, & Popovic, 2014). Olszak, & Ziemba (2012), found out that small business enterprises do not have sufficient computer equipment to host BIS. This computer equipment is capital intensive, and this is why most of the SMEs opt not to invest in them as a cost saving strategy. These decisions, therefore, limit the small firms in the opportunities that come with having computer systems. Yeboah-Boateng and Essandoh, (2014) affirm that SMEs lack appropriate computer system installations and also do not have trust in any business function hosted online for security reasons. Some of the business intelligence functions are hosted online through cloud-based services, and therefore the lack of trust and security associated with online services is a major factor that keeps SMEs from adopting BIS.

7.2 BIS Complexity and Availability of Skilled BI Maintenance Personnel

The second theme that emerged in this study is the complexity of BIS and availability of skilled BIS maintenance personnel. Among the interviewed managers, a 61% majority agreed that the BIS implemented in their small companies are complex and only 39% claimed that they have simple BI tools in their companies. Despite the majority confirming that their SMEs have deployed complex BIS, the results show that most of the companies lack the required personnel to manage these systems. According to the results, only 25% of the managers agreed that their companies have skilled employees who can handle BIS. The results of the interview conducted on the managers are consistent with those which were carried out by employees. The interview conducted on the employees demonstrates that only 20% of the employees have knowledge of BIS. From these results, it is apparent that those SMEs that have embraced BIS use the complex one. According to Boonsiritomachai, McGrath & Burgess, (2014) complexity alludes to the extent in which a given innovation is perceived or seen to pose usage or understanding difficulties. Complexity remains one of the barriers to the adoption of any innovation or technology. This is because those technologies which are less complex are highly likely to be adopted unlike those that are highly complex: they indeed result in a higherrate of adoption (Boonsiritomachai, 2014). The complexity of BIS is about the fact that they include mathematical functions that are vital in predicting a particular phenomenon in a firm so as to bring a given solution. IT skills are also vital when dealing with BIS (Boonsiritomachai, McGrath & Burgess, 2014). As portrayed in the interviews, most employees lack knowledge on BIS, and this could be affected by the deficit in IT skills.

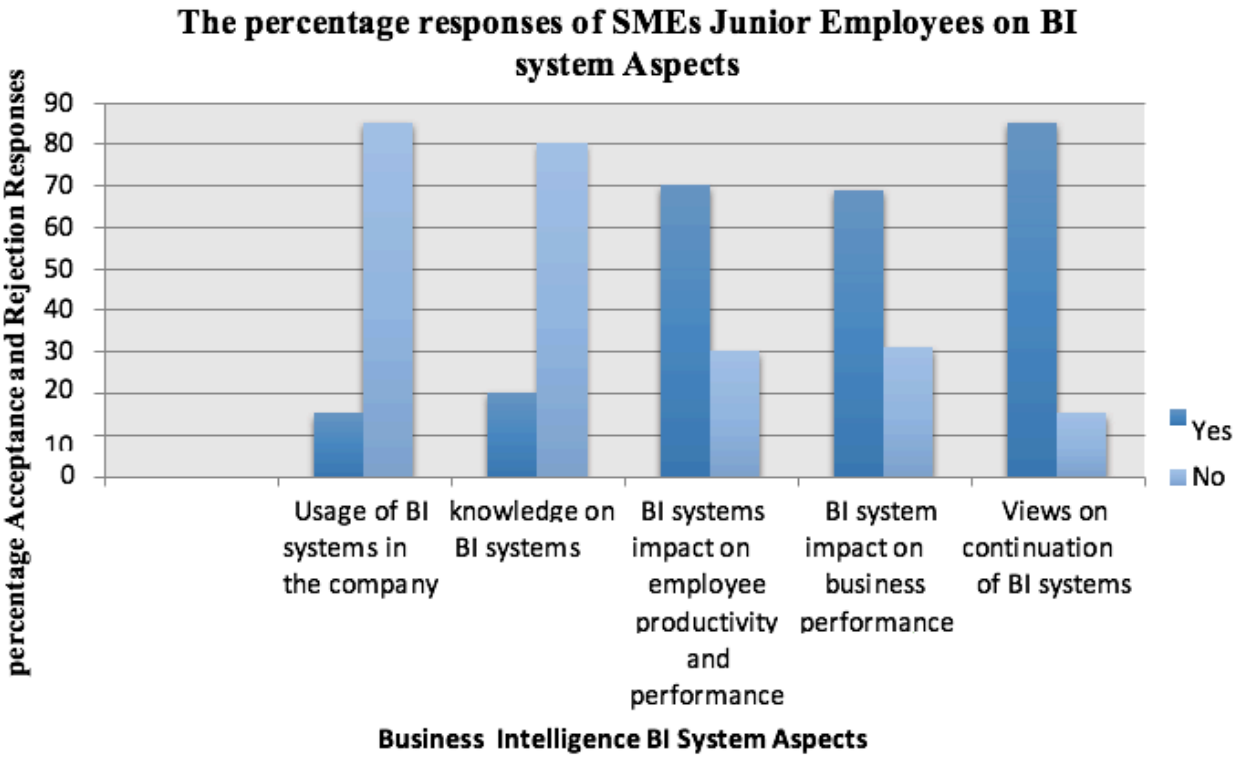

Figure 2 Graph showing the responses of SMEs junior employees on the various aspects of business intelligence (BI) systems.

Additionally, employees may have poor mathematical skills, which may make them view BIS as complex. Further, the lack of resources in SMEs may be a contributing factor towards the lack of quality personnel to manage BIS that are implemented. Lueg & Lu (2013) argues that SMEs have limited resources that may even curtail their adoption of BIS. Therefore, SMEs fail to attract highly qualified personnel to manage their BIS because they lack resources that can be used to pay experts.

7.3 The Impact of BIS on SMEs

The third theme that emerged in this study was the impact of BIS on SMEs. According to the interview, 89% of the managers accepted that BIS facilitate decision making in their companies. One of the business managers said that:

> "Our company, though categorized as a SME has deployed business intelligence systems which provide real-time data. This information is essential because it allows us to make a timely decision. For instance, I remember, there was a time we were registering a low number of sales, but the business intelligence system we use was able to show that our product was pretty expensive and that could perhaps be the reason for the low number of sales. This was real-time information from market intelligence that allowed the company to resolve to adjust the price of the product, which led to improved sales afterward". *Translated from French.*

This form of confession response shows that BIS provide important technological tools that enable firms to make decisions based on a reliable knowledge. The market trends remain highly uncertain and competitive and as such provisions of valuable information in a timely manner is of the essence. BIS bring efficiency to the businesses because they provide vital information that is used in timely decision-making processes. According to Wieder & Ossimitz, (2015), apart from providing information in a timely manner, BIS leads to the generation of quality data. The information generated is of high quality as it is free of errors and highly analyzed: the only job that is left for the business leaders is to interpret the results. Therefore, BIS are important because they give a business the capability to scan the market and forecast events.

The market analysis function of a BIS is also important because it allows an organization to identify changing trends and emerging threats in good time so that the appropriate steps can be taken. One of the respondents attested that "In our company, we rely on business intelligent solely for market scanning so as to

get the most recent changes." This is in line with Davenport, (2010) who argues a company needs to constantly be provided with information on consumer behavior and how their preferences are changing. BIS, therefore, provide a business with timely and complete information that is vital for decision making (Vizgaitytė & Rimvydas, 2012). Thus, it is apparent that BIS are important in helping business leaders to make timely decisions. BIS, thus, help front-line employees and company executives make informed decisions. They combine both historical data and real-time data that are available to the business leaders whenever needed. Therefore, they empower the business managers to make decisions quickly and with a high level of confidence because the information that is provided is highly reliable. These business analytics do not only generate information based on what happened in the past as they also consider the current situation, and also they incorporate the anticipated changes (Davenport, 2010). BIS extract data that is full of facts from a large pool of unstructured data and then transform it into meaningful information, which is also actionable. This is vital for making informed decisions in organizations whether large or small. Therefore, businesses depend on BIS as a rich source of reliable data to make informed and strategic decisions.

Apart from providing reliable information that is used for timely decision making, BIS have other benefits. According to the results of the interview, 95% of the managers agreed that BIS brings many benefits other than just timely decision making. One of the manager participants attested that:

> "Business intelligence is not just about timely decision making as it helps the businesses in other ways. For example, in our company, which is an SME, the business intelligence software has been able to provide vital information that has been used to reduce errors in production and therefore allowing the company to realize operational efficiency." *Translated from French.*

Therefore, one of the benefits of BIS that came out in this study was the increased organizational efficiency and productivity. This is in line with the argument of Poleto, Carvalho & Costa (2015) that informed strategic decisions that are made courtesy of BIS are vital in driving operational efficiency as well as business productivity. For instance, BIS can analyze customers' emails and chats with the company and be able to determine the characteristics of such customers as well as their demands. This makes a company strategize as to address customer needs and improve its operations so as to retain its competitive edge and achieve the set goals. Therefore, the result shows that BIS provides vital and accurate information that is used to inform the company on how to improve its efficiency and productivity as well.

Further, the results demonstrated that BIS had an impact on the return on investments. According to Wieder, Chamoni, & Ossimitz (2012), business intelligence gives companies opportunities to reduce cost, increase their revenues and increase their profit margins. Business intelligence has an impact on return on investment because it offers a cost effective method of gathering information regarding the business. Traditionally businesses have channelled huge amounts of cash to carry out market research that can gain important information on how to increase a company's efficiency. The business intelligence provides a cost and time-saving strategy of gathering business information. Therefore, money that would have otherwise been used to carry out market research will be directed to other important functions of a firm. Additionally, the return on investment is impacted by business intelligence because employee productivity is enhanced (Wieder, Chamoni, & Ossimitz, 2012). The interview shows that 70% of the employees agreed that business intelligence helps to foster their performance and productivity at work which in return leads to improved performance in a company. This is affirmed by one of the junior employee participants who said that:

> "Our company has made the use of business intelligence systems a norm in all its operations. At first, when they were implemented we thought the company wanted to tame us, but it was not the case. Instead, the managers use it to determine the productivity of each employee. This is vital because the low performing employees are empowered further through training and offered other supportive services to increase their efficiency. The report is also used to guide the managers and supervisors on how to motivate them and increase their performance. I thus find business intelligence systems crucial to my

performance and productivity." *Translated from French.*

Therefore, from the junior employees' responses, it is apparent that business intelligence helps to foster employees' productivity as well as performance. This comes because the reports that are provided by BIS are vital in giving company leaders information on how to motivate the employees (Wieder, Chamoni, & Ossimitz, 2012). Employee motivation is vital as it leads to the satisfaction that is essential in maintaining the loyalty of the workers.

8. PERCEPTION OF ORGANIZATIONAL MEMBERS ON THE USE OF BI SYSTEMS BY SMEs

The result of the study indicates that both the managers and junior employees of the SMEs interviewed are positive about the use of BIS in their companies. According to the results of the interviews conducted on the managers, 96% of them accepted that their companies should continue using BIS. On the other hand, the interviews that were conducted with junior employees indicate that a majority of 85% accepted that BIS use should be continued in the companies they work for. These positive responses could be attributed to the benefits that come with BIS. The BI tools have the following advantages to a company whether large or small: improved timely and strategic decision making, increased customer satisfaction and highly motivated and satisfied work force (Elbashir, Collier & Davern, 2008). All these benefits are compounded by the enhanced overall organizational performance.

9. CONCLUSION

The result of this study affirms that BIS have a far-reaching impact on the operations of SMEs. First, BIS facilitate the process of decision-making at the managerial level by providing quality, timely and accurate data. The data generated also consider the past, present and future events and therefore allow business leaders to make informed decisions for the SMEs. Additionally, the impact of deploying BIS in SMEs extends beyond facilitation of decision making, to have an effect on employees, customers and other functions of the firms. This is because they make the operation efficient, allow an organization to meet customer needs appropriately and provide information on how to improve employees' individual performances through the needed support and motivation. The overall results of all these impacts of BIS are improved company performance, as portrayed by the study. These findings are similar to those found about Swedish SMEs, so we can argue for certain universal observations of behavior when it comes to SMEs.

Lastly, the improved performance of SMEs courtesy of BI tools as underscored by this study can be used as a measurement indicator of the outcomes of BIS. Measurement of the outcomes of BIS is one of the challenges that businesses struggle with. However, it is vital in monitoring the performance of an organization (Elbashir, Collier & Davern, 2008). The performance is determined by comparing goals and the outcomes. When determining the performance of BIS in SMEs, it is important to consider the following dimensions: financial, operational and overall effectiveness. According to Ramsey & Bahia (2013), these dimensions should be determined both subjectively and objectively. This shows that the determinant of the impact of BIS should be carried out holistically by determining the overall outcome of the organization, which ranges from financial performance, to the satisfaction of employees as well as the customers (Henri, 2004).

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Appendix I: The interview questions for SME managers

a) Has your company deployed business intelligent systems? Yes/No.
b) Are the business intelligent systems used at all levels of organizational department? If not which departments use business intelligent systems? Yes/No
c) Are they complex or simple business intelligence systems? Yes/No
d) Do you have skilled employees to run these systems? Yes/No
e) Does the information that is generated by the business intelligence system help in making timely decision making? If yes, how? Yes/No/Space to explain
f) Other than helping in prompt decision making are there other impacts of business intelligence systems in your company? If yes, how? Yes/No/Space to explain
g) Do you feel the company should continue using business intelligent systems, why? Yes/No/Space to explain

Appendix II: The interview questions for junior organizational members in SMEs

a) Does your company use business intelligent systems? Yes/No
b) Are you conversant with the uses of business intelligent tools? Yes/No
c) Do you feel that the business intelligent tools intelligent tools help you to improve your productivity and business performance? If yes, how? Yes/No/Space to explain
d) Do you think that the business intelligent systems help to improve overall organizational performance? If yes, how? Yes/No/Space to explain
e) Should the company continue using business intelligent systems? if yes, how? Yes/No/Space to explain

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The impact of supply chain management on business intelligence

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ABSTRACT This conceptual paper investigates the impact of the supply chain on business intelligence (BI) in private companies. The article focuses on these two subjects in order to broadly understand the concept of business intelligence, supply chain and characteristics implement such as OLAP, data warehouse or data mining. It looks at the joint advantages of the business intelligence and supply chain concepts and revisits the traditional BI concept. We found that the supply chain includes many data samples collected from the first supplier to the last customer, which have to be analysed by the company in order to be more efficient. Based on these observations the authors argue for why it makes sense to see the BI function as an extension of supply chain management, but moreover they show how difficult it has become to separate BI from other IT intensive processes in the organization.

KEYWORDS Business intelligence, information systems, real-time business intelligence, supply chain management

1. INTRODUCTION

Customers' demand for high quality products and services is rising. They want the right product at the right place and on time. Modern companies have to be more efficient to match customers' needs while reducing the time and cost of the production process. Thus, a company can't be viewed as a single entity, but as a part of the supply chain if they want to gain a competitive advantage. As Christopher (1998) says, a supply chain "is a network of organizations that are involved, through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hand of the ultimate consumer". Additionally, supply chain management is viewed as the best way to reduce costs and to increase the optimization of the production process. Yet, since the early 2000s, technologies have increased and the collection of data has deeply changed. For example, "Wal-Mart handles more than a million customer transactions each hour and imports those into databases estimated to contain more than 2.5 petabytes of data." (Ittmann, 2015). Today, as companies are drowned in information which doubles every two to three years, they have to find the best way to understand it and gain a competitive advantage. It is more important to know what information the company needs, how and when to match the customer needs. Therefore, software has been created in order to answer these questions.

One of the most used practice is business intelligence (BI) which integrates and analyses various software. BI provides a set of technologies and products for supplying users with the information they need to answer business questions, and make tactical and strategic business decisions (Stefanovic et al., 2006). The BI field is growing over the years because as said by Gartner (2012), "the global spending on BI systems, including analytics and performance management applications,

has risen from $10.5 to $12.2 billion in 2011". Given the increase in data, competition and customers requirement, it is vital for a company to have rapid access to its information in order to take the best decision and reduce its cost. BI, consequently, is also appropriate for supply chain management (SCM) which needs to be functional. Thus, it can provide real-time data of this supply chain. Before using BI in the supply chain it is important to understand and to know how to use it. In this respect, some questions must be asked:

- What is business intelligence?
- Why do supply chains need business intelligence?
- What is the impact of the business intelligence on the supply chain?

A supply chain provides information from the supplier to the client and has to be processed. More information means more competition. In the age of the information explosion, executives, managers, professionals, and workers all need to be able to deliver their product on time and make better decisions faster. Because now, more than ever, "time is money" (Reinschmidt and Francoise, 2000). The creation of BI revolutionized business and is bringing a new way for business to thrive and manage its supply chain at reduced cost. However, it was often difficult to understand and very expensive, so much so that companies don't really used it. It is only for a few years that its uses have been facilitated and its cost is now lower. Today, BI is an important factor for a company's success. However, no articles that we found discuss the relationship with supply chain (research gap).

2. EMPIRICAL FINDINGS: A LITERATURE REVIEW

2.1 Business intelligence, data gathering, competitive intelligence

The importance of a good intelligence systems has become increasingly apparent during the past few decades for two reasons, the abundance of information now available due to new technologies, and, as a consequence, the need to be able to distinguish between "need to know" and "nice to know" (Soilen, 2012). Businesses collect enormous amounts of data every day: information about orders, inventory, accounts payable, point-of-sale transactions, and of course, customers. Businesses also acquire data, such as demographics and mailing lists, from outside sources. Unfortunately, based on a recent survey, over 93% of corporate data is not usable in the business decision-making process today (Reinschmidt & Francoise, 2000). To put order in all these data, some companies use business intelligence. It is difficult to give a clear definition of BI when many of them can be used. Business intelligence is seen as a concept of conscious, organized, continuous, legal and legitimate gathering, analysing and using data and information for strategic and tactical marketing decisions according to Šerić et al. (2014). Adelman et al. (2002) describe BI as a term that "encompasses a broad range of analytical software and solutions for gathering, consolidating, analysing and providing access to information in a way that is supposed to let an enterprise's users make better business decisions". Malhotra (2000) points out that BI benefits facilitate the connections in the new-form organization, bringing real-time information to centralized repositories and support analytics that can be exploited at every horizontal and vertical level within and outside the firm. According to Partrige (2013), BI is the use of computing technologies for the identification, discovery, and analysis of business data such as sales revenue, products, costs, and incomes. However, BI can also be viewed as more technical and integrate several software for extraction, transformation and loading (ETL), such as data warehouse (database where data is collected for the purpose of being analysed; it collects, organizes, and makes data available for the purpose of analysis), database query and reporting (Berson et al., 2002). We also find multidimensional/online analytical processing (OLAP) and data mining (used to solve different kinds of analytical problems, OLAP summarizes data and only makes forecasts, data mining discovers hidden patterns in data and operates at a detailed level instead of a summary level). BI is a system designed to support decision making, it finds information from many other systems (Figure 1).

Some of these terms have briefly been explained in order to understand the BI dimension. BI helps to create knowledge from a world of information, get the right data, discover its power, and share the value. BI transforms information into knowledge. (Reinschmidt & Francoise, 2000).

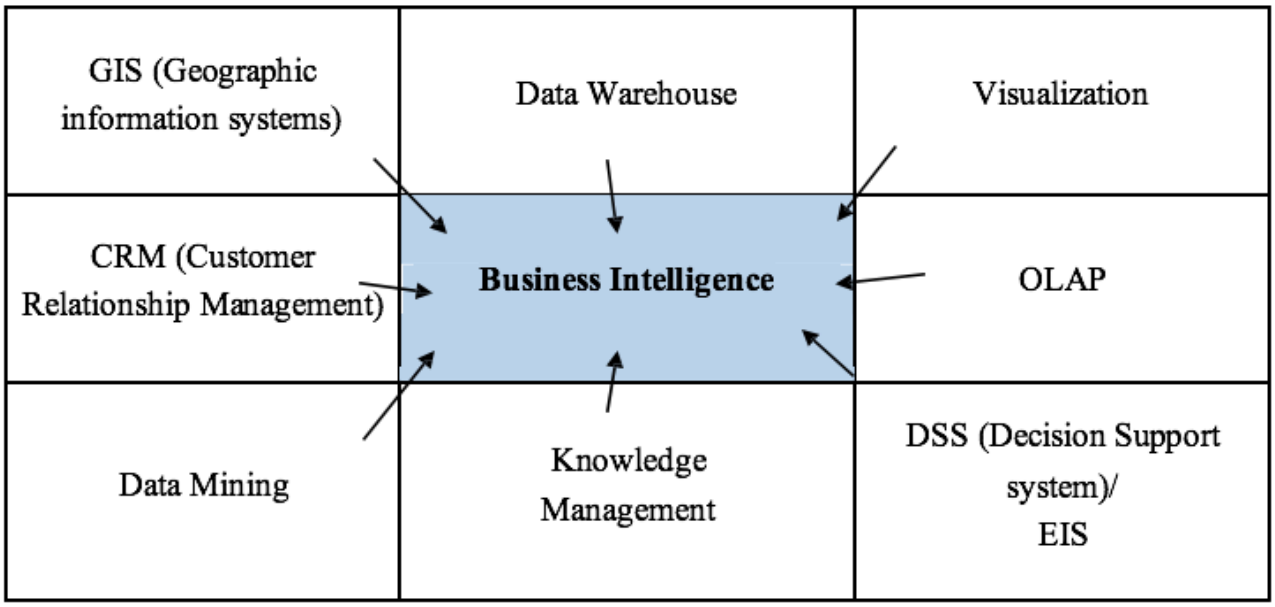

Figure 1 Information systems used by BI.

Consequently, BI is the application of putting the right information into the hands of the right user at the right time to support the decision-making process (Reinschmidt & Francoise, 2000). The business success factor for any enterprise is finding ways to bring the vast amounts of data that are flowing within and across the business processes together and making sense out of them (Sahay & Ranjan, 2008). For those reasons, BI is not business as usual. It's about making better decisions easier and making them more quickly (Reinschmidt & Francoise, 2000), thus improving the timeliness of input to the decision process, and facilitating managerial work (Negash, 2004).

In addition, BI gives an overview of the competitors thanks to competitive intelligence (CI), which could be defined as a special branch of the BI literature. CI is the process of ensuring your competitiveness in the marketplace through a greater understanding of your competitors and the overall competitive environment (Solomon Negash, 2004). In consequence, it's the practice of "defining, gathering, analysing and distributing need-to-know information to the organization's decision makers" (Soilen, 2013). Much of information obtained by CI comes from easy sources (Imhoff, 2003) such as Government websites and reports. For example, it could come from:

- Online databases, interviews or surveys,
- Special interest groups (such as academics, trade associations, and consumer groups),
- Private sector sources (such as competitors, suppliers, distributors, customer) or
- Media (journals, wire services, newspapers, and financial reports).

Soilen (2010) points out that trade shows represent another opportunity to gather information about competitors, whether for their products or services in order to obtain a competitive advantage. However, it is important to collect useful information, staff training has to be done in order to gather the right information by the team. Companies can also access books and articles in journals dedicated to these issues like this one or previous journals like the Journal of Competitive Intelligence and Management (JCIM) or the Competitive Intelligence Review (CIR) according to Soilen (2013).

2.2 Supply chain management, software and data creation through big data

First of all, it is important to have a clear definition of what logistics and supply chains are, as these two terms can often lead to confusion. Logistics is a term which has been used for many years, it has a military origin and was born during the preparations in anticipation of a battle, to make available the means of transport, the equipment or all that concerning the foodstuffs. According to dictionary.com, there are two definitions for the term logistic: "the branch of military science and operations dealing with the procurement, supply, and maintenance of

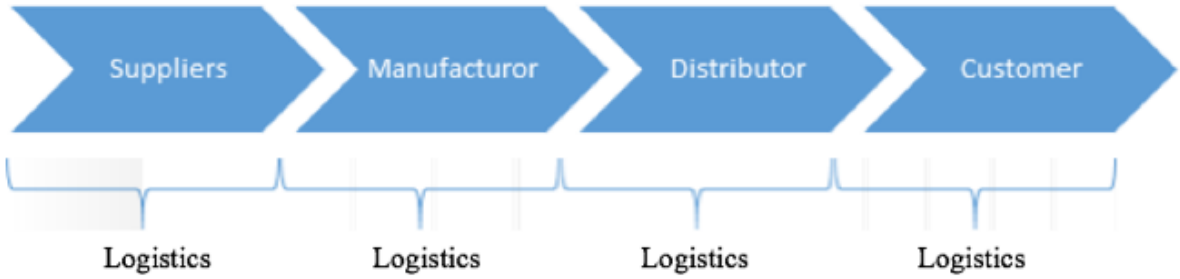

Figure 2 Logistics as part of every step in a supply chain.

equipment, with the movement, evacuation, and hospitalization of personnel, with the provision of facilities and services, and with related matters" and one definition based on the actual logistic: "Planning, execution, and control of the procurement, movement, and stationing of personnel, material, and other resources to achieve the objectives of a campaign, plan, project, or strategy. It may be defined as the 'management of inventory in motion and at rest". The concept of logistics is a rather recent and appeared in the 1960s. The concept of supply chain was born some time later, towards the 1990s. Supply chain could be explained by the logistics management corresponding to a part of the supply chain management that provides, sets up and controls upstream and downstream flows efficiently, storage, services and information exchanged between the actors of the chain from their point of departure to the final customers in order to satisfy them, in other words, logistics is only one (important) element of supply chain management (Figure 2).

As stated previously, Lambert et al. (1998) defines a supply chain as the alignment of firms that bring products or services to market. It is important to know that the final or end consumer is included as an element of the supply chain. Differentiated from the supply chain, supply chain management (SCM) is "the task of integrating organizational units along a supply chain and coordinating materials, information and financial flows in order to fulfil customer demands with the aim of improving competitiveness of the supply chain as whole" (Stadtler, 2005). The main objective of SCM is to meet the customer needs by sending the right product at the right place, time, and price. Besides, SCM is a multi-dimensional approach which integrates product development, manufacturing, logistic, customer service, performance measurement, and information sharing (Surbhi, 2015). Consequently, the supply chain is a part of the SCM, it transforms resources into a product and delivers it to a customer whereas the SCM is a broader area which aims to cut costs and to add a value for the customer and the shareholder. The supply chain is only a way to help the SCM to execute the operations. Nowadays, SCM is a factor of differentiation, especially for the competitors and for the customer service.

To make a SCM work efficiently, different types of software and actors are included in the process. Some software will be used for strategic planning, others for the execution. The software is classified according to the three different functions of the SCM: The first one is the SCP (supply chain planning), it is about planning the production, the distribution, the transport and realizing forecasts. The software related to SCP is an APS (advanced planning system), it analyses the capabilities of the resources in order to propose a detailed schedule for a better production (http://www.catlogistique.com/supply_chain.htm). The second function is the SCE (supply chain execution) and this function integrates the data related to the operational activities management of the supply chain. Software like TMS (transport management systems) and WMS (warehouse management systems) are associated with SCE. The last function is the SCEM: the supply chain event management. Another type of software to take into consideration is ERP (enterprise resource planning). It is a software that integrates all the functions of a company. It is constituted of several units named business objects (BO) (for example: supply, sell, production, finance, HR, or stock). These units share the same database, so it facilitates the control of the company (http://www.logistiqueconseil.org/Articles/New-tech/SCM.htm) even if "traditional ERP players are now facing competition from cloud providers" (Trebilcock, 2016), the leader in the ERP software market remains SAP with €2.67 billion in revenue in 2014. There are many

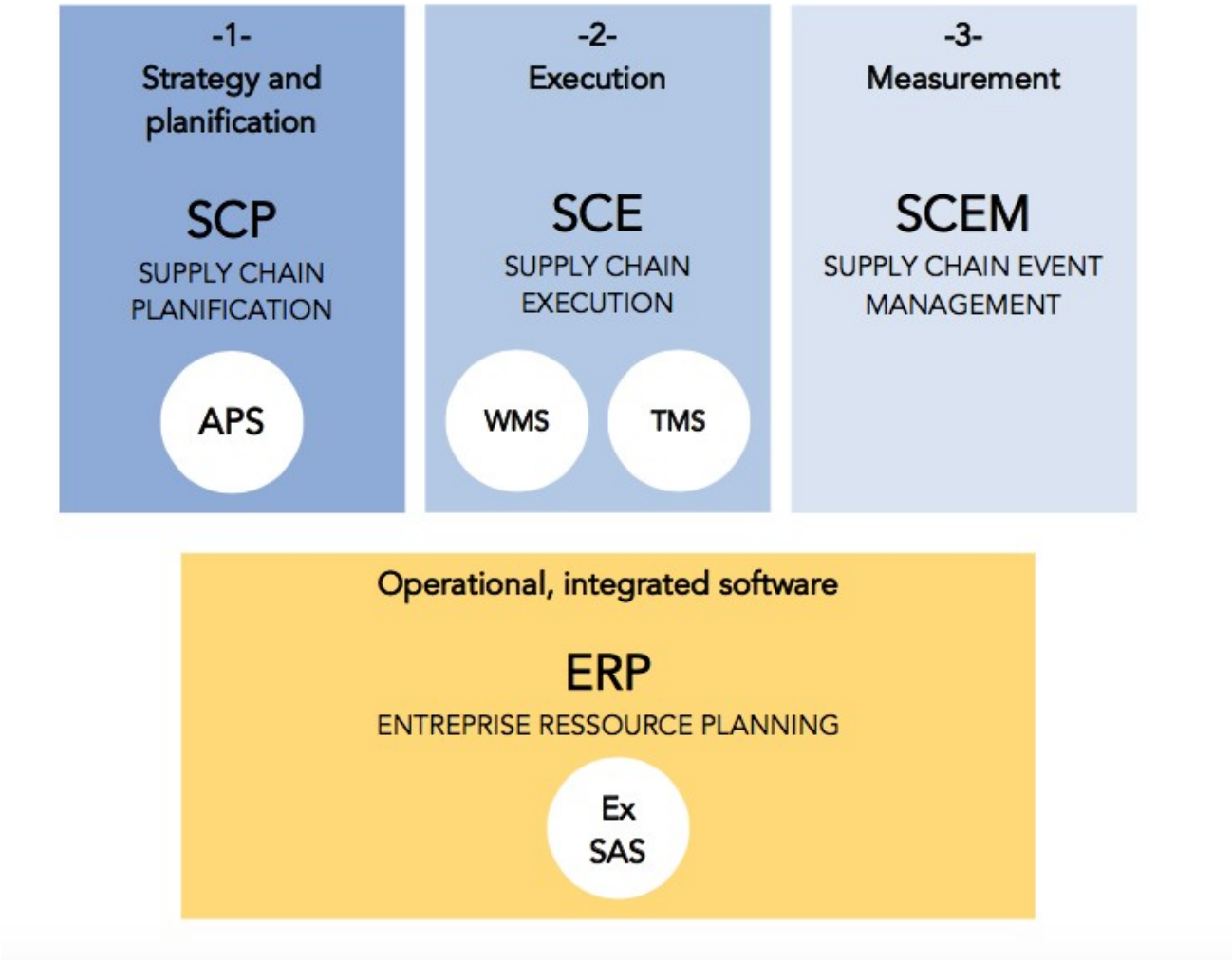

Figure 3 The different kinds of software.

actors participating with supply chain software, therefore it is important for companies "to find the system that best suits their business" (Nyblom, 2012) and they have to know what are the software and techniques used by the companies.

This software is generating tons of data which is called big data. In fact, "millions of shipments are tracked daily from origin to destination, indicating information such as the content, weight, size, location, route" (Watson et al., 2012). This huge amount of data is then exploited. With the enormous amount of data created every day, companies are under pressure to make smart use of the data, and take advantage of it. The nature of the SCM environment is changing, and two major trends will impact the SCM in the future: big data and analytics (Ittmann 2015). Ittmann is not the only one to argue this. Cooke (2013) points out that "the increased use of big data analytics is one of the three trends in SCM to watch" (Cooke, 2013).

Big data and analytics are becoming increasingly important for many reasons. First of all, storing data is becoming cheaper and data is available everywhere thanks to the anytime connectivity. Plus, the tools are easier to use because it is simpler to make the analysis, there are techniques to show and present huge volume of data, and the processing power is faster (Deloitte & MHI, 2014). In fact, extracting and analysing the values from big data can have a huge impact on businesses and help them to succeed.

Analytics, which is considered a subset of BI is defined as "the scientific process of transforming data into insights for making better decisions" (Ittmann, 2015). There are many ways to extract data in order to create business intelligence, for example "statistical and quantitative analysis, explanatory and predictive models" (Ittmann, 2015). Therefore, big data and analytics can directly be related to BI because it can help firms to make decisions and improve their businesses. As mentioned by Partridge (2013), "being able to find, understand, and use that data to make strategic decisions that improve supply chain effectiveness is crucial."

2.3 The importance of business intelligence strategy

When a company decides to take advantage of BI and use it for its own supply chain, it is important to set up a supply chain business intelligence strategy. Having a reliable strategy is essential for every business to succeed, the same holds true for the implementation of BI in a supply chain. As reported by Sangari and Razmi (2014), the supply chain BI competence is seen as a multidimensional construct competence. The company has to build a full strategy, including three competences: the managerial, technical and cultural competence. The managerial competence aims to relay the right information to the right people at the right time (Bose, 2009). The technical competence represents the tools and the technologies (like data warehousing) used to gather information in a supply chain in order to make business decisions. The cultural competence is defined as the ability to develop a strong BI culture, including the quality of the information and the quality of the communication flows. All of these three competences prove that having a strategy can have a positive impact on the performance of the supply chain, especially on the customer satisfaction and the cost reduction.

3. METHOD

This article is conceptual and built on a literature review. When reviewing a number of articles within BI that link with software, competitive intelligence, and strategic planning a gap was identified with supply chain management. The authors found definitions for the keywords, such as business intelligence, logistic, supply chain, supply chain management, and competitive intelligence. Afterward, they extracted key elements from the articles in order to analyze and compare content. The last part of the research was conceptualization and synthesis, building models to sum up the analysis.

4. ANALYSIS

4.1 Business intelligence in SCM

The concept of supply chain and BI is nothing new, but, until recently, only few companies had these solutions at their disposal. As seen above, the supply chain allows a company to gain a competitive advantage on their competitors. However, it is not easy to lead a supply chain. It requires having a good relationship with suppliers and customers as the supply chain represents the chain of a product from the supplier to the final customer. This is done in order to be efficient and reduce costs. These can be procurement costs, production costs, financial capital and possession costs, transfer costs, breaking costs, product design costs and insurance costs. To reduce these costs, companies are used to employing supply chain management defined as the execution, the conception, the control of the supply chain activity in order to create value for the company, to achieve greater efficiency and gain a competitive advantage. Consequently, supply chain management is a priority and essential challenge for the company, in order to optimize its productivity. However, there are many steps before selling a product on the market; they concern purchases, inventory management, handling, storage, and transportation. Supply chain management aims to improve administrative management and thus reduce a significant number of errors. It contains many tools developed by companies in different fields:

- Planning (MRP, JIT, DRP, etc.).
- Manufacturing (OPT, CRP, etc.).
- Stock optimization: endogenous method (historical analysis) or exogenous (market research approach) etc.
- Transport and warehousing (RFID, Tracking, etc.).
- Information management (ERP, CRM, SRM, PLM, EDI, etc.).
- Quality (TQM, etc.).

All of these software collect data, so that companies can read them to have an overall view of the company and to make decision despite obstacles such as arrivals in disorder, and delays in organizing and interpreting data. Formerly, companies had to hire specific technical employees in order to read and understand this data. Today, companies use BI in order to collect data quickly, efficiently and to make it available immediately. It provides decision-making support to professionals through reports and dashboards to monitor both analytical and forward-looking business activities. BI collects data from ERP (enterprise resource planning), TMS, and CRM that it then stores in the data warehouse as a central data repository or in data marts via ETL (extraction, transformation and loading)

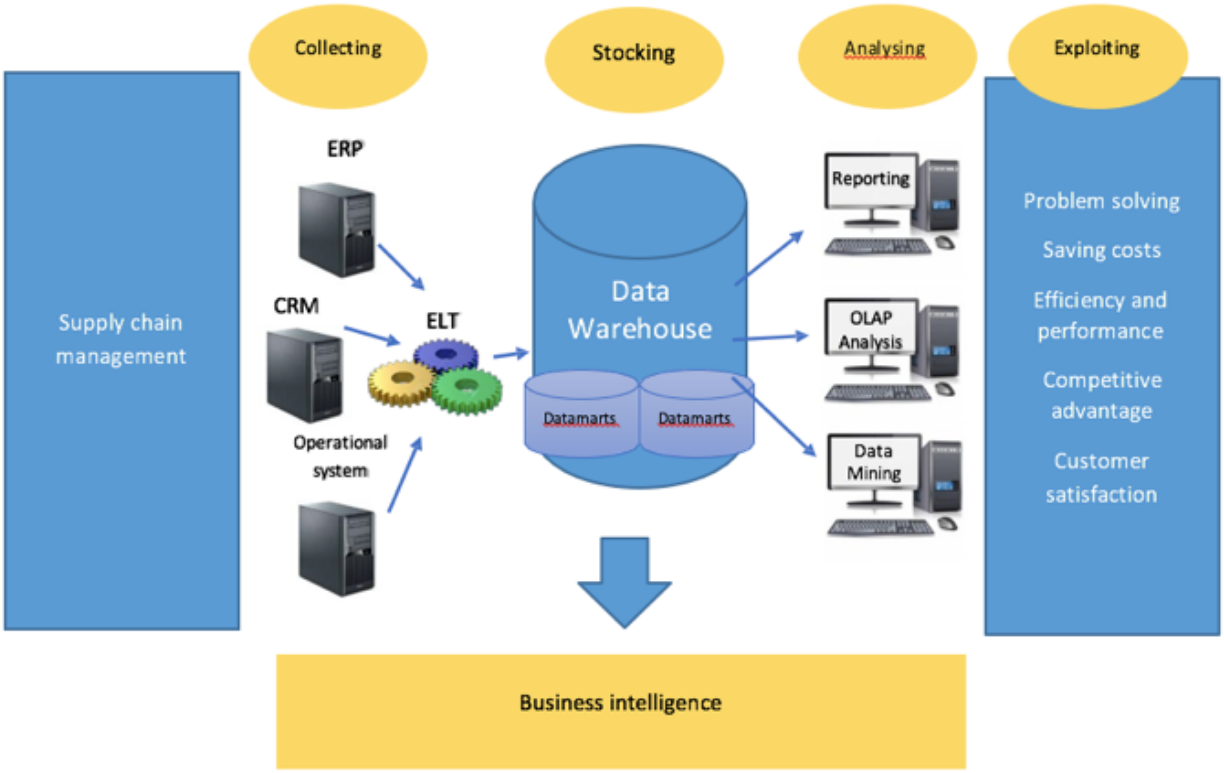

Figure 4 Creating business intelligence in the supply chain management.

processes which are responsible for retrieving data from all existing operational sources and loading them to the decision-making system.

Then BI distributes this data and finally analyses them through data mining, OLAP charts and reporting. As seen above, BI is made up of several components. The following are the major components: a *data warehouse* is a database dedicated to the storage of all the data used in decision making and decision analysis. The data warehouse is exclusively reserved for this purpose. *Data marts* are a smaller version of the data warehouse. They focus on a topic, a theme or a job. In *OLAP*, within an OLAP database, the data is stored according to a principle of dimensions closely corresponding to the user's search axes, its structure can be seen as a "cube". "OLAP provides multidimensional, summarized views of business data and is used for reporting, analysis, modelling and planning for optimizing the business" (Sahay and Ranjan, 2008). *Data mining* is able to find original structures and informal correlations between data. It allows us to better understand the links between apparently distinct phenomena and to anticipate trends that are not yet discernible.

As a consequence, BI is a part of business, it allows the company to make decisions clearly and quickly. The faster the stores send information about what customers buy, the faster the information can be passed on to manufacturers and designers, the faster the supply chain can react and contributes to the optimization of supply chains which are the issue in the search for competitive advantages. Stock reduction and optimization of the supply chain cannot be conceived without good information management. Beyond the traditional operational systems that automate processes, it is without doubt necessary to rely on an appropriate decision-making system like BI. The latter must be based on a data warehouse that integrates all internal and external logistics data and provides all stakeholders with the historical, operational, forecasting or simulation visions they need. Consequently, BI in management of SCM contributes to the differentiation of a business entity.

4.2 Real-time business intelligence

BI is important in order to make appropriate decisions. As part of this, the concept of real-time BI is starting to attract companies' attention. Real-time BI consists of reducing time and collect instantaneous data. It not only supports the traditional

strategic functions of data warehousing, but also provides tactical real-time support for generating corporate actions to respond immediately to events as they occur. Manh et al. (2005) propose an "event-driven IT

infrastructure to leverage BI applications that enable real-time analysis in all business-to-business processes, notify actionable recommendations, or trigger business operations automatically, and allow to effectively bridge the gap between BI systems and business processes." For example, if a company sells clothes online then the company's web site and the company's call centre representatives must have the same updated information on inventory levels, so that, if a customer makes an order and the size or colour is sold out, the customer can be notified and redirected to another similar item. Sahay and Ranjan (2008) point out the real-time BI system is to provide information on business operations with minimal latency. This means providing information a few seconds after the business event. While traditional BI presents historical information to users for analysis, real- time BI compares current business events with historical models to detect problems or opportunities automatically. Not all departments of a company need real time BI, because of the high cost compared to traditional BI, companies should use the real time BI only when it is necessary and needs to focus first on specific business needs.

4.3 Real time business intelligence in the supply chain

Traditional BI systems are used by several varied sectors like manufacturers, airlines telecommunication providers, retailers, financial services, health systems and hotels and consist of a back-end database, a front-end-user interface, software that processes the information to produce the BI itself, and a reporting system. It produces for these companies customer support, market research, segmenting, product profitability, statistical analysis, inventory and distribution analysis. However, BI requires a complex technology usable only to technical specialists. Moreover, BI takes a long time to yield correct analyses and companies want this analysis in real time for short-term projects. Traditional BI cannot do this and in consequence real time BI is seen as a rescue. Real time BI detects early situations for planning and coordination of logistics such as delay of freight, stocks alert, and failure of delivery. Real time BI reacts in near real time to changes in the business environment. It analyses data minute-to-minute in various time zones and helps firms move to what is called as "zero latency" or real time enterprise. According to Hackerthorn (2003), a business is operating with three latency periods: data latency, analysis latency and decision latency. The aim is to reduce the latency to the minimum to be more efficient and this is one of the purposes of real-time BI. Sahay and Ranjan (2008) noticed that it means "delivering information in a range from milliseconds to a few seconds after the business event". Take the example of Flixbus, a bus is stuck in the traffic jam, the real time BI automatically discovers the problem, analyses it before a decision is needed. From

there on the bus route will be adjusted or the customers will be notified of the shipment delay. According to Sahay and Ranjan (2008) A global real time data warehouse, real time data mart for storing historical and summary data at different levels is required, as well as an efficient OLAP interface with secure real time architecture for such efforts to succeed.

4.4 The impact of using BI in the supply chain management

After having explained how BI and SCM are related and how software help to create BI especially with the real-time BI, the focus here is on the benefits for companies to use BI in their supply chain. There are many positive consequences in each function of a supply chain (warehouse management, transportation management, marketing and sales, financial management) that can lead to the success of a company.

First of all, BI tools are helpful in the supply chain because they can help to detect and solve problems. Chen et al. (2012), "consider business intelligence and analytics as an important area of study and research to solve data-related problems in companies". If there is a problem with transportation, the idea is that BI will detect the problem first and it will help by changing the transportation route or the mode of transport, in order to reduce negative consequences. If there is a failure of delivery or a delay in the shipping, real time BI can directly send a message to customer and let them know about delay in shipping (Ramish Babu, 2010). Some software has a strong ability to monitor and predict low in-stock items in advance (Krupnik, 2013), this reduces the amount of incomplete shipments, reducing complaints from customers and avoiding new a problem. As an example, Amazon developed an algorithm to analyse clicks on the website to

solve the problem of stocks. This analytic tool helped Amazon track sales on many kinds of products allowing them to manage inventories (Ittmann, 2015).

When a firm succeeds in avoiding problems which could arise on any part of the SCM, it obviously saves costs. Tools help to reduce waste, they show which part of the supply chain is not efficient, and if managers are taking this into account, they will make changes to reduce and save costs. IBM optimized their supply chain by using analytics tools (Dietrich et al., 2014) and they implement a system which can detect problems earlier. As a consequence, the company increased productivity, revealing opportunities to cut costs and saved money.

Another positive consequence of BI is the efficiency and the performance of the supply chain, which is also a logical consequence of cost savings and problems solving. As mentioned previously, firms include mobile devices and barcode scanners to store the information for every item, such as location, stats, and method of transportation (Ramesh Babu, 2010). This way of tracking the information enhances monitoring and optimizes process flows. For example, GAP implemented ways to keep the supply chain as efficient as possible through BI solutions. They carried out the seamless inventory to improve its performance and they build the "reserve in store" on the e-commerce website. Moreover, all of the functions of the company are affected by BI, even the support functions such as human resources or financial management. For example, as for the human resources, reports can analyse the movement and the performance of staff, tools can measure the need of the workforce (Rao P. and Swarup, 2001). HR managers are able to know which employees are efficient, they also see how many people they need to hire for each new project or implementation. Concerning financial management, budgets can be analysed and financial viability can be assessed (profitability per kilometer of distance covered or labour cost, for example) through financial report or data warehousing. This helps take strategic decisions and directly participates to the efficiency and the performance of the firm.

Through the analysis of data, BI helps to find what is providing value. As mentioned by Soilen et al. (2010), "a value chain analysis focuses first on the firm's core competences from an inside perspective", and this analysis aims to identify the competitive advantage of the firm. In this sense, tracking the information and analysing it increases the efficiency and the performance of the supply chain but also provides a competitive advantage. Firms can be more competitive on the market. Firms can find a differentiation approach faster than usual. As stated by Sangari (2004), "Businesses are still struggling to achieve competitive advantage." Nowadays, organizations noticed that they need to use effective tools for decision making, in order to create BI. To prove that a company can be more competitive with data analysis, the example of a baseball player will be used. Lewis (2003) performed research on a baseball team and used data-based analysis on one of the players' performance. It turned the club into a very competitive team. Lidl is one of the many firms that used BI in their processes. They used the software SAP (an ERP software) to analyse a large amount of data, to understand and react to the customer behavior. This allowed them to have a better understanding of the customer and to target the right market. Targeting the right market also means they will have better chance to improve the success of the company.

All of the elements stated previously are participating together towards the common and final goal, customer satisfaction. Through profitability analysis of the services offered to the clients, firms are able to know what to offer to each customer. It allows them to provide more value-added services to exactly meet their needs. To sum up the ideas mentioned previously, a citation stated by Ngai et al. (2011) can be used:

> "supply chain agile capabilities help to sustain competitive advantage and improve performance through reducing manufacturing costs, enhancing customer satisfaction, and removing non-value-added activities."

5. CONCLUSION

Data has been used for critical decisions since the beginning of globalization. New opportunities and choices have been given for both consumers and companies. A competitive pressure has forced companies to lead their sourcing and manufacturing on a global scale resulting in a significant increase in product offerings. When a company grows, it needs a bigger and more sophisticated supply chain with tools that generate the insight that leads to smarter IT solutions. BI systems are part of this effort to provide technology in order to

collect information to improve business potency and give easy access to the information that partners, suppliers, and employees need to do their job. It facilitates scrutinizing every aspect of business operations to find new revenue or squeeze out additional cost savings by supplying decision support information. As such it has become increasingly difficult to separate BI from other IT intensive efforts, like the supply chain.

Robison (2002) points out that BI uses technology-related complexities and can be useful only with technically savvy specialists. Robinson argues that BI is expensive due to its complexity and that BI can take long time to yield correct analyses when companies need to get a perspective in the short-term. Given that BI is hard to set up, there are other ways to provide BI, such as SQL (Structured Query Language). SQL is a domain specific language designed for managing data held in a relational database management system. As discussed previously, the focus of supply chain management is to optimize tools and methods in manufacturing, sourcing and distribution sectors in order to reduce delivery times, inventories and costs. Applying the concepts of BI to SCM systems provides strategic information to decision makers in organizations. Besides, real-time BI has an impact on business decisions and current business processes. Ittmann (2015) summarized the situation well with the following statement:

> "Organisations need to understand forces in their marketplace better and respond faster to changes in their environment in order to remain competitive. The proper use of any tools and methodology to assist in this is essential." Using BI tools has become essential in the current business environment because there are many advantages for companies to use BI in their strategies because it allows them to be more competitive on the market and manage customer relations in the easiest and best way.

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