Mitigating the Bullwhip Effect with eWord Of Mouth: eBusiness Intelligence Perspective

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ABSTRACT

Whereas the bullwhip effect is a phenomenon strictly related to supply chain management and regards the magnification and variance in order volumes observed at upstream nodes in a supply chain, the eWOM refers to the knowledge exchange which consumers carry out online, known as online rating or review systems. It delivers credible and relevant product information to potential customers and thus can significantly impact the consumer choices. EWOM as a Social Mediated Monitoring (SMM) technique, when combined with web analytics and predictive modeling, will have potential to generate probabilistic information. EWOM is trying to upgrade its portfolio as an effective alternate to brand communication media in the Internet supported business environment. This study aims to explore the influence of electronic Word Of Mouth (eWOM) with the actual adoption of internet technologies in influencing customer demand in the enterprise supply chain management scenario as well as how it influences demand uncertainty that can cause bullwhip effect. The research methodology follows a qualitative method of eliciting literature evidences, correlations and manifestations through reviews, available surveys and brief on example case findings. We conclude that by integrating Business Intelligence and web analytics, organizations can derive better customer demand information and Key Performance Indicator along the Supply chain so that it can be used to mitigate the Bullwhip effect. But providing decision management capability under Multi-Enterprise Collaboration requires the integrated effort of end-to-end solutions to enable collaborative enterprise information sharing capability with visibility and quality customer demand information.

KEYWORDS

Bullwhip Effect, Business Intelligence, Customer Relationship Management, eWord of Mouth, Supply Chain Intelligence, Web Business Analytics.

1. INTRODUCTION

Recently, many firms are exposed to a sophisticated environment which is constituted by open markets, globalsiation of sourcing, intensive use of information technologies, and decreasing in product lifecycles [1]. Moreover, such a complexity is intensified by consumers who are becoming increasingly demanding in terms of product quality and service. It means globalization has increased firms' internationalization, shifting them from local to global

markets and with increasing competitiveness [2]. Furthermore, the dynamic environment (consisting of competitors, suppliers' capacity, product variability and customers) complicated the business process. To that end, many enterprises are often forced to cooperate together within a *Supply Chain* (SC) by forming a virtual enterprise which is a network of agents typically consisting of suppliers, manufacturers, distributors, retailers and consumers [3]. Virtual enterprise is derived from such collaboration among different partners [1] [4]. Previous research [5] [6] posits that SC can be considered as a network of autonomous and semi-autonomous business entities associated with one or more family related products. Virtual enterprises are best described as companies integrated in different stages from design to delivery of products to end user [7].

Consumers (i.e., end or industrial) often require different types of products & services, ranging from ordering batches to maintaining final products. This process needs suppliers to manage their demand chain activities which are often based on customer demand [8]. Previous research in this area posits the importance of internet-based tools in aiding this process [9]. It has been reported that a number of challenges have to be faced while fulfilling demand management through supply chain collaboration [10].

The ever changing market with prevailing volatility in business environment with constantly shifting and increasing customer expectations is causing two types of timeframe based uncertainties that can affect the system. They are: (i) short term uncertainties and (ii) long term uncertainties. Short term uncertainties include day-to-day processing variations, such as cancelled/rushed orders, equipment failure etc. Long term uncertainties include material and product unit price fluctuations, seasonal demand variations. Understanding uncertainties can lead to planning decisions so that company can safeguard against threats and can avoid the affect of uncertainties. As a result, any failure in recognizing demand fluctuations often hold unpredictable consequences such as loosing customers, decrease in the market share and increasing in costs associated with holding inventories [11].

In order to achieve competitive advantage, manufacturers are forced to rely on the agile supply chain capabilities in the contemporary scenario of changing customer requirements and expectation as well as with the changing technological requirements. SC integration often is considered as a vital tool to achieve competitive advantage [12]. Previous research proved the implementation difficulty due to certain factors such as lack of trust among partners and depending solely on technology [13].

Due to commercialization, privatization and liberalization, the traditional role of business organisation is limiting to act as infrastructure providers and leading their way towards understanding about market orientated business, focusing on customer needs. While internal performance indicators and customer surveys are suitable for benchmarking purpose, they do not fully reveal the true customer perspective. Recently, many organizations are adopting social software platform for the purpose of better understanding their customers' needs and to engage them in their business process [14]. EWOM communication as a tool to social media often attracts new customers and is one of the mainstays of the contemporary practices because it not only attracts but also enhances customers' decisions via spreading positive word of mouth [15].

It is thus believed that all the theoretical explanations of influence of eWOM in E-Marketing communication on supply chain customers will considerably reduce the uncertainty and can contribute significantly by adding value to supply chain information to mitigate bullwhip effect. We believe that the research value addition done by us lies in identifying and proposing the strategic idea and approach for reducing the bullwhip effect with the contemporary use of ICT tools and techniques and presenting the corresponding literature study.

2. OBJECTIVE AND METHODOLOGY OF RESEARCH STUDY

Though there are significant number of research studies conducted in eWOM subject, the study on influence of eWOM on supply chain based Bullwhip effect as a part of reducing the Bullwhip effect in B2C market, from the business intelligence perspective is not been explored yet.   These are very limited even if found and that too in an indirect manner. However a direct study on this kind of research topic in the business management domain is found almost negligible. So the objective of this paper is to explore the influence of eWOM with the actual adoption of internet technologies in influencing customer demand in the enterprise supply chain management scenario as well as how it influences demand uncertainty that can cause bullwhip effect.

Our research methodology followed eliciting literature evidences and content relevant to support research objective. The sources included: Journals, research databases, reviews, reports and industry based survey reports, web sites and blogs. Our original work is the basic idea of how to correlate the supply chain based bullwhip effect and its mitigation with the contemporary social marketing practices and how business intelligence can help turning this scenario to generate value based shared information that can contribute to the entire supply chain.

3. ORGANISATION OF OUR STUDY

Since, literature review comes as part of addressing the problem at every place within the body of text of this research paper, authors felt that a separate section on literature review may not add value and may not contribute directly to the research problem at hand.

In the subsequent section authors have mentioned their literature efforts and evidences for the topics viz., supply chain management, Bullwhip effect (include strategies for reducing the bullwhip effect), eWoM, CRM 2.0 and Social Media Monitoring (SMM), Text Mining, Web Analytics with Business Intelligence and its influence on Demand Uncertainty, Role of Enterprise Application Software and Recent Information Management Trends for mitigating Bullwhip Effect.

4. SUPPLY CHAIN MANAGEMENT

Supply Chain Management (SCM) focuses on managing internal aspects of the supply chain. SCM is concerned with the integrated process of design, management and control of the Supply Chain for the purpose of providing business value to organisations lowering cost and enhancing customer reachability [3]. Further, SCM is the management of upstream and downstream relationships among suppliers to deliver superior value at less cost to the supply chain as a whole [6].

Many factors such as globalization and demand uncertainty pressures forced companies to concentrate their efforts on core business [16]. A process which leads many companies to outsource less profitable activities so that they gain cost savings as well as increased focus on core business activities [17]. As a result, most of these companies have opted for specialization and differentiation strategies [18]. Moreover, many companies are attempting to adopt new business models around the concept of networks in order to cope with such a complexity (e.g., system has become extremely volatile, making planning and predicting [19].

The new changes in business environment have shifted the concentration of many companies towards adopting mass-customization instead of mass-production. Further, it derives the attention of many companies to focus their effort on markets and customer value rather than on the product [20]. This forced process may lead industries worldwide to focus on integrating, optimizing, and managing their entire supply chain from component sourcing, production, inventory management and distribution to final customer delivery [19]. Taking the above

factors, a single company often cannot satisfy all customer requirements such as fast-developing technologies, a variety of product and service requirements and shortened product lifecycles. Creating such new business environments have made companies look to the supply chain as an 'extended enterprise', to meet the expectations of end-customers [7].

5. BULLWHIP EFFECT

In a Supply Chain (SC), the uncertainty market demands of individual firms are usually driven by some macro-level, industry-related or economy-related environmental factors. These are individually managed demand forecasts and are causing SC to become inefficient in three ways: (i) supply chain partners invest repeatedly in acquiring highly correlated demand information which increases the overall cost of demand forecasting (ii) the quality of individual forecasts is generally sub-optimal, since individual companies have only limited access to information sources and limited ability to process them, it results in less accurate forecasts and inefficient decision making (iii) firms vary in their capability to produce good quality forecasts. Significant information asymmetry leads to strategic plays and has been reported to be the main reason for many coordination failures such as well-known bullwhip effect [21] also called Forrester effect as it was first initiated by Forrester in 1961. The phenomenon of bullwhip effect is related to SCM. It is often considered as magnified and varied order volumes observed at upstream nodes in Supply Chain. [22]. However the term bullwhip was used by Procter & Gamble managers which observed the increase of variability of vendors and distributors orders (with respect to the customer demand) through an empirical observation: the supply chain of pampers (the famous baby's diapers) [3] .

The four causes of information distortion in supply chain are identified by [22] as: (i) demand forecast update (ii) order batching (iii) price fluctuation and (iv) rationing and shortage gaming. Simchi-Levi *et al*. (2000) [23] highlighted order and delivery lead time as the main factors contributing to the bullwhip effect. Further, it is asserted that the bullwhip effect might be the result of lack of trust, lack of demand forecasting ability, lack of communication and lack of accurate information regarding the customer demand observed at the downstream nodes among Supply chain partners

5.1. Strategies for counteracting Bullwhip effect

Companies can reduce uncertainty by having information shared along the whole supply chain providing the complete information related to customer demand at each stage [24]. Other counteracts of bullwhip effect include channel alignment [for e.g. alignment of Point-Of-sale (POS), with Electronic Data Interchange (EDI)] and operational efficiency (for e.g., everyday low price) [25]. At private e-market places or in B2B scenario, use of EDI can substantially reduce the bullwhip effect [7]. However the scenarios in B2C market that deal with public e-market place will be different from B2B and should be tackled differently.

So authors would like to propose that eWOM along with SMM, CRM and Business Intelligence has influence in reducing the bullwhip effect.

6. EWORD OF MOUTH

Consumers generally believe that Word Of Mouth (WOM) credibility is higher than commercial advertisement. Therefore, the impact of WOM is typically higher than advertisements [26]. When consumers perceive high social or psychological risk of a purchase, they would search for credible information that is more diagnostic or referential, such as WOM information, from a source they believe to be reliable [27]. The emergence of eWOM could be explained as the phenomenon of increasing numbers of consumers who are using advanced Internet technologies, to seek and communicate information about a product or a company.

Hennig-Thurau *et. al*. (2004) [28] defined eWOM as "any positive or negative statement made by potential, actual, or former customers about a product or company which is made available to multitude of the people and institutes via the Internet". Previous research by [29] posits that eWOM refers to "any positive or negative statement made by potential, actual and former customer about a product or a company via Internet". Further, Hennig-Thurau *et. al.*, (2004) [28] state that eWOM refers to the knowledge exchange consumers carry out Online.

The growth of development and participation of Internet tools has led the appearance of new forms of word-of-mouth communication. Using the Internet, consumers can now publish their opinions, providing thoughts, feelings and viewpoints on products and services to the public at large [30]. However previous research by [31] and [27] regarding eWOM asserts the difficultly for online consumers to determine the credibility of the message (i.e. whether or not the recommender is on the same side). When consumers evaluate the product attribute, they are involved in the product and feel disturbed about the uncertainty of purchasing the product, which means they now have perceived risk. Consumers with a high degree of product involvement actively look for information related to the product and evaluate all the alternatives, whereas consumers with a low degree of product involvement do not. Therefore, when degrees of product involvement differ, perceived risk for purchasing a product differs [27]. At present, most of the well-known online retailers are offering eWOM systems as essential elements of their businesses. The eWOM has a significant impact on consumer choices. For example, the online review system provides customers (current or potential) with reliable product information which they often use to make their decisions.

6.1 Prior studies on eWOM

A number of studies have been conducted to investigate the relatively new eWOM phenomenon. These studies include: the study of characteristics of eWOM that enables market researchers in analyzing the role of the systems in businesses [32]; The relationships between the eWOM and sales/price [33][34] [35]; the cognitive impacts of eWOM on trust and customer's purchase intention [36] [37] [38]; use of eWOM in interactive marketing, viral marketing and innovation [39]; the use of micro-blogging for eWOM branding [40].

The eWOM systems provide customers with quality product and service information [33]. By providing quality information, eWOM enables customers to know more about a product, accordingly articulate their demands for the product. In B2C exchanges, customers face serious disruptions if product/service providers fail to meet expectations. Consequently, customers typically rely on a small number of trusted product/service providers that consistently deliver high quality products or services [41]. Interpersonal influences are often classified into two types: (i) normative, which are found to be significant across nations, and (ii) informational, which can be found significant among consumers [42]. Since eWOM remains available on the Web, in contrast with traditional WOM, eWOM is visible for the public and triggers social comparison and behavior among consumers. The nature of eWOM implies the visibility of a larger amount of messages posted by many people and possibility to follow threads. In such a setting, consumers get an opportunity to compare themselves with the majority of other consumers. Thus, we expect that an online environment enables the emergence of the effect of consumer need for uniqueness on information processing and the behavior of individuals [43]. Moreover, this kind of message can effectively reduce the risk and uncertainty recognized by consumers when purchasing products or services, so that their purchase intention and decision making can be further influenced [31].

Various platforms, such as discussion boards and other online communication tools, often facilitate eWOM, which in return impact the adoption and use of products and services [44].

EWOM media can be classified based on level of interactivity into synchronous/asynchronous; and based on communication scope such as: one-to-one, one-to-many and many-to-many (see Figure 1) [43].
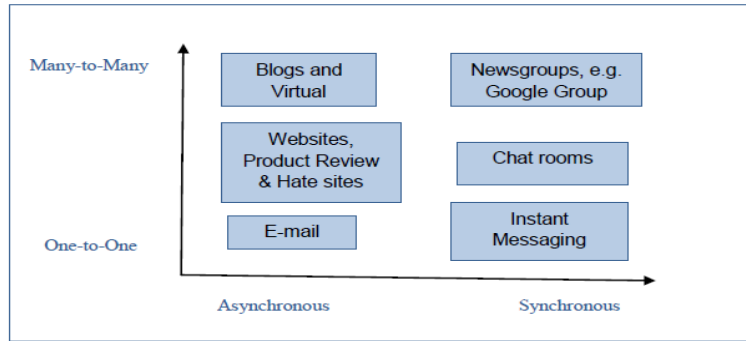
Figure 1. EWOM Media Classification [43]

7. CRM 2.0 AND SOCIAL MEDIA MONITORING (SMM)

Customer Relationship Marketing (CRM) solutions are considered to be the latest and mostly used topic in business world that facilitate business growth in B2B and B2C markets [45]. Internet is considered as an empowerment tool both in the field of consumer behavior and information systems with the capability of allowing consumers to interact with the rest of the world at different levels including personal, group, community and others. Social psychology and marketing literature are the main sources for the definition of consumer empowerment. For example, based on a consumer empowerment Index, countries like UK, Sweden, Poland and Germany display the highest empowerment match as compared to Iceland, Italy and Spain in European Union [46]. It acts as: a distribution channel for digital goods and services; advertising medium from the company perspective; potential source of information [47]; and content consumption and an area to voice/publish one's opinion from the consumer perspective [30].

CRM 2.0 is a modern business practice. It shows how it impacts customer insights through incorporation of social media tools and strategies to meet the 21st century social customers demand [48]. Social Media Monitoring (SMM) tools as a measure of web trends has enhanced the eWOM [49]. These tools can effectively deliver two main business benefits: (i) monitoring online brand conversation and (ii) monitoring the buzz being created by the brand [50]. SMM tools are becoming essential to measure social media performance, business impact and return on investment. SMM tools allow businesses to monitor the information related to: business, product competition, key words, phrases and results categorized by the type of social medium such as tweet, blog, post, forum, news item, video or image; key influences include channels and individuals with the greatest potential for generating viral, eWOM effects; real time update of information through e-mail alerts and RSS (Really Simple Syndication). CRM 2.0 describes interactive exchange that businesses and customers can "connect into" to match customer needs, requirements and expectations with those businesses that can best fulfill them. The organizing principles of CRM 2.0 are to create high value relationships between the enterprise and its customers, partners, and employees [51]. CRM 2.0 can categorize and monitor the social relationship of individuals based on the frequency of contact and potency of a bond between members of a network [52]. SMM tools if properly integrated can very well fit into the close loop CRM methodology [53] so that brand communication awareness and consumer complaints awareness can be elicited.

Sigala (2011) [50] presented a useful summary of emerging thinking related to eCRM in Web 2.0 environment. Web 2.0 provides numerous opportunities for better eCRM through active listening and monitoring of customer-to-customer conversations [49]. It reflects the activity of fulfilling the goal of online business communication by engaging customers [53].

SMM tools significantly enhance the online customer experience and can raise brand awareness [54]. Full development of a number of interactive web 2.0/social media channels aimed at building robust online community and maximizing eWOM effects including Facebook community, Flickr, YouTube, Twitter channel and Wiki. For example, 'Creating the buzz: merchant city' (Glasgow) case study examined a wide range of strategic and operational marketing issues related to tourism 2.0, including the use of social media for brand awareness, reputation management, eCRM, e-marketing, WOM effects. Another example is a reference from Lithium; a California based Social Media Monitoring Company, which is teamed up with MarketingProfs to investigate more thoroughly into the issue of Social Media Marketing ROI surveyed over 450 marketers. It has considered eWord-of-Mouth as one of the social KPIs (Key Performance Indicators) as a part of focusing on long-term strategic goals such as community building and increasing brand awareness [54]. A review on the Litium's research indicated a significant increase in the presence (Facebook 48% in 2009 to 86% in 2012; followed by Twitter 43% in 2009 to 84% in 2012 followed by Linkedln 39% in 2009 to 72% in 2012; followed by YouTube 26% in 2009 to 69% in 2012) of various marketing companies as customer engagement through social media. The above indicators explain that the presence of social media has encouraged organizations to focus on creating a meaningful engagement with customers, to establish methods for measuring customers' responses and to analyze it. The majority of the social media marketers surveyed by Lithium (about 71%) say that they are now concerned with demonstrating value to upper management. The survey also revealed the common objectives of the social media marketing in which 91% of marketers listed brand awareness as one of the core objectives and majority of the other objectives are related to downstream activities (of the supply chain) such as: increasing purchase consideration (56%), driving direct sales online (46%) and offline (33%) and driving CRM activities (31%) towards unknown but decreased percentage of actual sales percentages [54].

Various Web 1.0 tactics used for performing Web site marketing include: developing and implementing a proactive e-marketing strategy; support of new web site including search engine positioning strategy; proactive links strategy and the implementation of an e-communications strategy using advanced e-mail news letter software supported by a robust and low cost hosted CRM system. Social Media engagement strategy can be achieved by developing, implementing an integrated and coordinated web 2.0 tools [53].

The criteria for measuring effectiveness of social media marketing monitoring include factors such as: customer engagement (53%), brand engagement (felt hard to quantify), brand acquisition (felt hard to quantify), lead generation (48%) and direct revenue generated through web sales (29%). Other indicators are: Web site traffic, number of downloads, number of subscribers, number of likes, number of fans can provide some consumer-centric metrics that can provide customer insight. A below average percentage of marketers indicated that it can be considered as an indicator of company performance [54].

Actionable customer insights can be developed in the following ways: by using web analytics; by social media monitoring; by customer/business feedback through new web site and online communities; by web content/text mining and analysis and by building professional networking site for local business and partners. The social feedback cycle is driven mostly by WOM which is further driven by actual use, trail or sampling experience. Harnessing this feedback helps in consumer decision making aspect related to consumer awareness, consumer priorities and consumer purchase. The adoption of Web 2.0 has an impact on creating customer value and thus on adoption of eCRM 2.0 for combining, integrating and engaging both networking and social/customer intelligence along the firm's value chain operations [50].

8. TEXT MINING, WEB ANALYTICS WITH BUSINESS INTELLIGENCE AND ITS INFLUENCE ON DEMAND UNCERTAINTY

Web analytics as an outcome of the recent internet technology development has stimulated the current research trends in academia. Therefore it is proposed to examine this problem by focusing on the how eWOM of strategic customers to voluntarily provide advance demand information [56] and how eWOM influences the Bullwhip affect at various segments of supply chain including the retailer, distributor and manufacturer.

ECRM system has a potential to allow a company to predict the customer demand by translating customer behavior patterns in terms of products and their purchase time by customers. ECRM provides better decentralized decision making regarding customer profiling and relationship with corresponding branches [57]. However multi-dimensional deep-dive web analytics can optimize marketing efforts with: (i) geo-profiling insights (ii) search engine analytics (iii) internal search analysis (iv) user behavior insights (v) social media influencers (vi) customer segmentation. Web Intelligence when combined with Business Intelligence can provide campaign optimization intelligence and site optimization intelligence [58]. This will ensure customers to go through different stages of business process such as registration, purchase and after sale services. While marketing can optimize the brand communication, bring people to the site and improve customer relationship [59], those processes necessarily rely on back end systems which reinforce data quality, integrity and security. As with other processes, Information Technology's (IT's) role in this context should support the business by providing the most appropriate solutions including support for web analytics and business intelligence. The goals of web analytics are slightly different from traditional business intelligence objectives. Web analytics focuses on measuring users' awareness in online marketing and their interactions with social media, mobile, video and the web itself [60].

IT related Social Media Measurement Tools and Techniques include: paid buzz-monitoring services (eg. Radian6, Visible Technologies etc.,); free buzz-monitoring services (eg. Google Alerts, Tweetdeck, Technorati etc.,); paid analytics software (eg. Adobe Omniture, IBM Coremetrics etc.); free analytics software (eg. Google analytics, YouTube analytics etc.); tracking clicks, posts, tweets etc. [55].

Use of these tools and techniques produce non-personally identifiable activities. The activities are largely non-transactional and have relatively short life span and are much closer to the realm of statistics – with implications of sampling and margin of error. Customers are identified and require longer time span with more thorough analysis which will lead to improved business process and better strategies. Therefore, IT should focus on the use web analytics for marketing efforts. As web analytics grow and integrates with business and marketing data, eventually entering into business analytics domain becomes a necessary task to optimize the online representation of business processes [61].

EWOM has an increased sense of interpersonal communication. Consumer reviews are described in a point of evaluation or a text-based format. In order to build an effective e-market strategy, online vendors should understand the format and message configuration, which increases the EWOM's effectiveness as a business tool [62]. For this purpose the company can use text mining techniques to isolate new attributes from the text and then combine it with previously available structured data to expand the total amount of relevant usable information. It uses the technique of mapping the free-form text to a feature vector. The text is then modeled and used by structured data for analysis purpose with traditional BI tools such as: (i) Ad-hoc reports, (ii) On Line Analytical Processing (iii) Data mining and (iv) Predictive modeling [63].

Once entered into the domain of Business Intelligence (BI), rooted in rigorous scientific methodologies, BI provides on-demand conversion of real time sampling of attitudinal and likely behavior data into validated insights as a part of predictive intelligence so that managers

peer into the future with increased certainty. It uses advanced analytics and visualization tools for this purpose. Web-based predictive intelligence systems are able to reach out and collect accurate data from areas once obscured by their separation from the business. For example, utilizing the PeriscopeIQ online survey solution, one of the leading global makers of Waterjet machinery manufacturing company is able to collect valid intelligence from their end user even though the end-users are separated from OEM (Original Equipment Manufacturing) network. This is because PeriscopeIQ was able to provide cost-effective solution and helped the company to quickly transform their relationship with its OEM and significantly increased the customer satisfaction. PeriscopeIQ has transformed the study of wide range of areas that include end-user preferences, competitor behavior, market conditions and sales predictions into strategic metrics for the top management on critical customer issues and brand perception [64].

The capability of predictive analytics is to turn uncertainty into usable probability. But in order to achieve the competitive advantage with differentiation under collaborated enterprise environment, it is not only sufficient to generate OLAP data, reports and visualization with dash boards but also should provide decision management capability based on producing quality information in terms of accuracy of the modeling programs [65].

Decision management is an approach or business discipline that automates and improves decision-making capability. It improves day-to-day business results by supporting automation and improves operational decisions. It builds on existing enterprise applications to put data to work and manage uncertainty by increasing the transparency to provide complete control on the business [66].

9. INFLUENCE OF ENTERPRISE APPLICATION SOFTWARE

The Internet has influenced the usage of supply chain models in three ways: (i) it facilitated the increased use of Enterprise Resource Planning (ERP) and Advanced Planning and optimization Solutions (APS) (ii) the ability to obtain real time information and the access to large computer systems to enable firms to develop detailed supply chain models (iii) it has created opportunities to integrate information and decision making across different functional units there by creating the need of supply chain models that go beyond a business unit to study the extended enterprise [67].

Prevailing ERP software allows firms to have access to data across the supply chain for gaining better efficiency and effectiveness [68]. The growth of e-business allows and requires that the information made available from the ERP systems be shared with other firms in the extended supply chain through the Internet [67]. This enables firms to coordinate and collaborate with their suppliers and customers as well as synchronize their in-house operations. Various E-business technologies developed for B2B, CRM, ERP, EDI (Electronic Data Interchange), APS and SRM (Supplier Relationship Management) can provide real-time access to demand, inventory, price, sourcing and production data to be shared by manufacturers and their suppliers spanning the boundaries of the supply chain. The use of these e-business technologies in SCM propelled companies towards collaboration [69]. Applications such as mySAP (SAPSCM, SAPAPO), E-Business Suite 11.0, J. D. Edwards, Oracle Acqua Logic, IBM B2B Integrator etc. are some of the examples of application software that have added coordination and collaboration functionalities such as integration and sharing of data with collaboration partners.

Due to the dynamic business environment, many organizations are trying to attract their customers' attentions via creating competitive advantages which focuses on CRM and customer intimacy. Management concepts like CPFR (Collaborative Planning Forecasting and Replenishment), CRM, category management and mass customization are integrated in one holistic approach to jointly develop customer bonding and loyalty [70]. However they need further synergy with SMM and BI.

10. EXPLORING RECENT INFORMATION MANAGEMENT TRENDS FOR MITIGATING BULLWHIP EFFECT

Information sharing has been considered as one of the strategies to reduce or mitigate the Bullwhip Effect [71]. As a result any corporation would look to forward and seek to work for one goal called "right access to right information quickly". The research conducted by [75] mentions about Supply Chain Intelligence and Real-time Business Intelligence, which highlights that a real-time view for managing and executing business processes that provide optimized efficiency of selecting best options by organisation out of Real Time Business Intelligence (RTBI) benefit and can quickly respond to its best customers [72]. However providing RTBI is possible by extracting data from various sources like ERP, SCM and CRM systems, transforming and loading it through ETL (Extract-Transform-Load) applications into the data warehouse as a central data repository. Further data mining technique will be used for eliciting knowledge to provide decision making capability. However for establishing such RTBI, key challenges are required to be faced in terms of dealing with automated analytics, semantic based information fusion and business process automation for producing business value. The retail organizations can expect a better and effective supply chain analytic only by defining the analytical needs of enterprise and a well-defined key metrics for organizational strategy. Supply chain intelligence in organizations derives better operational efficiency by giving key performance indicators (KPI) for supply chain managed firm [73]. The business value of BI through supply chain analytics can be achieved through the conduct of improved analytics for better business decisions when more and more customers can make online purchases. The complexity of these decisions also increases as the diversity and volume of data grow. Customer demographic data, business transactions, seasonal ebbs and flows, supplier data and inventory levels all have to be carefully coordinated to enable real time business decisions to achieve customer loyalty [74].

Geishecker (2002) [76] explored the provision of closed loop support that interlinks the strategy formulation, process design and execution of BI. Supply chain analytics addresses measuring supply chain performance against goals and identifies opportunities to reduce costs, improves supplier management, increases manufacturing efficiency and optimizes delivery. Applying the concepts of BI to data from SCM systems, supply chain analytics seek to provide strategic information to decision makers in organizations. BI can produce cost effective what-if scenarios in sourcing, manufacturing, distribution. It has a potential to provide essential valuable interpretation based information. This information regards not only the customer service delivery time and cost derived from downstream supply chain to upstream supply chain [75] using analytical eCRM techniques but also to solve strategic business problem brining visibility to key supply chain processes with the Supply Chain Intelligence [73]. Multi-enterprise collaboration is possible when ERP and DSS (Decisions Support System) can be integrated with CRM and SCM. This kind of integration promotes building valued relationships with all their partners. A survey conducted by Deloitte Consulting in association with Benchmarking partners Inc. in 1998, with 164 individuals at 62 fortune 500 companies in manufacturing and consumer industries found that second wave ERP systems would provide them with improved quality and visibility of information ultimately leading them to decision making. However for which, the respondent rate is obtained only 16% [77].

In order to provide decision makers residing on the multi-enterprise collaborated supply chain with timely and effective support from information systems and to enable decision management capability, Shafiei & Sundaram (2004) [77] proposed an integrated information sharing framework (as shown in figure 2). It fulfills the need to improve the visibility and quality of information that decision makers handle.
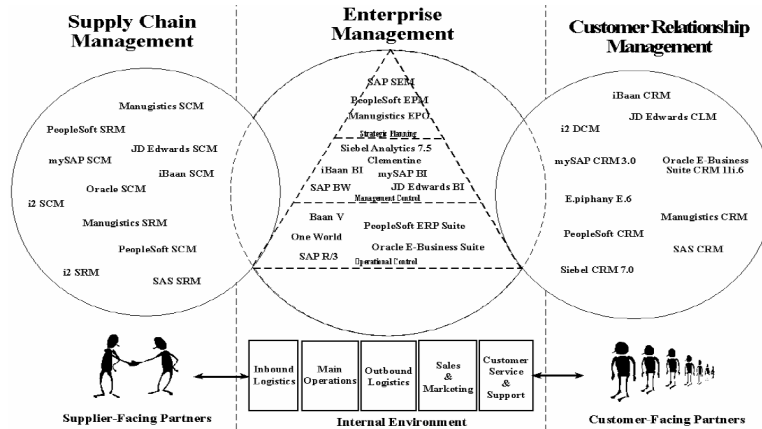
Figure 2 Decision Management Framework for Multi-Enterprise Collaboration Proposed by [77]

11. CONCLUSION

At the new millennium, due to global economic factors and the rise of web channels and e-commerce, the competitive pressure will drive enterprise to automate the intra-enterprise customer-facing process with such back-office functions as supply chain functions. EWOM as a Social Mediated Monitoring tool when combined with web analytics and predictive modeling will have potential to generate probabilistic information. It is attempting to upgrade its portfolio as an effective alternate to brand communication media in the Internet supported business environment. Within several years ERP application suites and XML (eXtended Markup Language) based messaging standards (along with eCRM and eSCM) will facilitate multi-process, cross-functional front to back-office supply chain integration efforts across multiple channels. Vendor consolidation and solutions expansion, collaborative supply chain network evolution and CRM infusion within the multi-enterprise in the twenty-first century will enable upstream demand-driven pull to replace downstream supply-driven push as the modus operandi of demand fulfillment [45].

By integrating BI with Text and Web analytics, organizations can derive better customer demand information and KPI along the Supply chain so that it can be used to mitigate the Bullwhip effect. However providing decision management capability under Multi-Enterprise Collaboration requires the integrated effort of end-to-end solutions to enable multi-enterprise information sharing capability with visibility and quality customer demand information.

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