

The Information Technology in Supply Chain Integration: Case Study of Reda Chemicals with Elemica

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Abstract— The main objective of this article is to highlight the role of information technology in the supply chain, specifically in the B2B business automation, which is helping supply chains to achieve global integration. The benefits of this approach to improve the performance of supply chains are explained in this article through a case study of Reda chemicals using Elemica supply chain integration solutions for B2B automation. A qualitative approach is used to evaluate nodes in the supply chain integration and the results of the case study as well. The findings of this research are mainly comprised by two facts: (1) the information technology is essential for supply chain integrations and (2) it was established by our case study that using B2B business automation has led to significant improvement of the supply chain. The main contribution of this research lies in developing best practices of supply chain integrations using B2B automation.

Keywords— *information technology, supply chain integration, B2B business, collaboration, logistics.*

I. Introduction

Neither supply chain nowadays can work in a silo away of the others; it became a prerequisite before creating any competitive supply chain to identify how the business relationships with other partners will work.

In the past using a computer based information system was advantageous for a supply chain, but now it became a matter of its survival and a key

only for the information system of the supply chain, but also for system integration, which the supply chain uses to communicate with other partners. The degree of success of any supply chain is determined by its ability to integrate with others to create the most effective and responsive operation. [1]

During the last decade, the information technology (IT) support for supply chain integration improved significantly. In the past computer based information systems worked only as facilitators of the business of any company, but now they work also as linking facilities, connecting the business of any company to its partners and to the global marketplace as well through B2B business automation. In this regard new networks have appeared such as Elemica (www.elemica.com) and others, specialized in supply chain integration using the most advanced information technologies.

II. Research methodology

The authors use a qualitative method in this article to explain the various concepts related to the role of information technology in the supply chain integration.

The arguments about the importance of this subject are brought forward in the literature review. The research methodology is explained next and leads into the case study to highlight how the concepts of the supply chain integration are implemented and to stress the role of information technology in the integration.

A case study of Reda Chemicals is presented in this article as a practical experiment in supply chain integration through B2B business processes.

The descriptive nature of the qualitative method is suitable for this article to describe the subject and to present the findings of the case study as well.

III. Discussion

4.1 Literature review

Many researchers explained the role of the information technology in the supply chains, already, for example [2], [3]. This is due to the fact that the global business environment became complex and expanding, so the need of information systems became extremely important in order to be able to communicate with the business partners worldwide, and in order to maximize the benefits of the information systems in the business environment. Currently, there is an increasing requirement to eliminate the human role in the business integration process and replace it by an automation system. There are many reasons behind this trend:

- To eliminate the possibility of the human errors.
- To save the time of the manpower of any organization.
- To do the work 24 hours per day if required.
- To reduce the cost of the overall business.

The role of information technology is very obvious in the supply chain, particularly for demand forecasting and for illustrating a clear demand downstream, so the upstream suppliers can dedicate the required resources which suit that demand continuously.

Hence, there is no doubt about the benefits of using information technology and e-business nowadays, some authors even tried to develop models for measuring the impact of doing the business electronically, for example Ferbar, L [4] measured the impact on the reduction of ordering cost when using e-business tools into the entire inventory cost of any supply chain. The ERP system of any supply chain partner can play the role of managing this information, but in the actual business environment each supply chain partner may use a different ERP system. From here a new concept has appeared to connect various ERP systems among each other in

order to achieve “supply chain integration”. This integration of the information is the essential tool allowing the business partners to collaborate, communicate, and cooperate. Thus the Business to Business (B2B) integration technology has appeared. This is the general term of many forms of information integration such as EDI, XML, web-based portals and many others. The concept behind this is to have middleware solutions to connect the various ERP systems to each other, or in other words to talk to each other without human interference.

The information system is not just a way for collecting data, but it is a harmonization system combining the hardware, software, and people interaction in line with the business process of the supply chain. The information will not work alone unless there is a system to utilize it and get the perfect outcome of the data, and moreover to translate the same into actions to benefit the supply chain. Information technology is also crucial to share the dates between all the participants of the supply chain, so they can have the right action on the right time.

The main achievement of using the information technology in the supply chain integration is to reduce the uncertainty through flexible operation strategy, which has capabilities to respond directly to the market at once. [5]. To do that, it is essential to have an effective information system to link all the partners into a single network and centralize the demand information throughout the supply chain [6], in order to enable each party to have full visibility of the system, so there will be no need for guesswork or speculation, [7].

This information sharing can be considered as the first step towards the processes alignment and furthermore the systems integration, where there are no boundaries and all the parties are working in harmonization through an extended enterprise.

Some authors consider the information technology as substitute to the inventory, as it can pull the raw materials from its sources rapidly and supply them on time; hence there is no need to maintain physical stock or at least to reduce it as much as possible. This is indicated by Christopher. M [8] as virtual supply chain based on information – not on inventory. (Goldsby and Martichenko) stated “the less information is shared, the more inventories are created in the system”. [9]

In the supply chains there is always decoupling point of the materials where the demand matches the supply, but with the development of the information technology recently it became very essential to the supply chain to set up another decoupling point – beside the material decoupling point – for information, [10]. This point should be pushed as far as possible upstream, so the suppliers can always have full visibility of the real demand.

This feedback from the end customers to the suppliers is essential for reducing the distortion of the demand. The main concern at this point is not only to make the information visible, but also to ensure the availability of the information as early as possible. So it enables the supply chain to prepare its operation before enough time to comply with the changes of the markets.

4.1.1 Elemica supply chain integration

Elemica [12] is a supply chain operating network developed to help the companies to achieve the best control of their global supply chains through information sharing between the business partners in order to create value across the supply chain.

Elemica currently process 230 billion \$ as annual transactions and has more than 6500 trading partners. Elemica started in 1999 with 22 companies only, but now it became a very large network integrating the leading chemical companies of the global market.

Elemica provides innovative solutions to integrate the supply chains, starting from e-procurement, vendor inventory management, order processing, and collaborated forecasting. The ERP system of each company is connected to the ERP's of the other companies through the network of Elemica to create B2B supply chain interfaces.

Elemica connects the various technologies of thousands of companies. The automation can be done without the need to change the business process of any company.

Elemica provides different levels of integration because one standard level is not appropriate for all, as Lambert and Cooper [11]; indicated that the level of integration should vary from link to another inside the entire supply chain.

Elemica has two solutions for this connection:

1. Quick link network

This is suitable for the limited transactions between the supply chains. The members who choose this solution have the total flexibility to use EDI, XML, IDOC, or any other format. Moreover they can choose also the connectivity mechanism such as HTTPS, AS2, VPN, or sFTP.

In the quick link network, the member can connect to his business partners through any of the following solutions:

- Quick link ERP to connect ERP of the member to all the ERP systems of the other business partners
- Quick link E-mail allowing the business documents to be transferred automatically between the various ERPs of the members through Elemica, this represents a self generating documentation solution, which is preventing any possibility of human errors while creating the documents and moreover, allowing the people to have much time for order processing. The documents can also be signed automatically – if required – as per the law.
- Quick link portal and this is a web-based solution enabling the members to interact online and allowing easy access anywhere through internet. The online portal can prevent the member from placing any order behind the production capacity of the supplier, so it is a powerful interactive tool for achieving the best operation control system.

2. The smart link applications

If the quick link is mainly suitable for the limited amount of transactions, the smart link is developed to handle the large amounts of transactions and responds to the specific needs of the supply chains in terms of:

- *Customer management*

In the small organizations, the order processing could be done manually with some expected percentage of errors, but in the large organizations, it is impossible to be done manually, not only because of the number of orders, which normally is very large, but also because any human error while processing the orders can be very costly, so the ideal practice is to depend on an automated order processing tool such as the smart link of Elemica.

This tool helps the supply chain to manage thousands of customers using different business processes and ERP systems including all the activities of the customer management; sales orders management, vendor managed inventory (VMI), repeat orders, Kanban system, and delivery schedule.

- *Logistics Management Solutions*

As the logistics information have a dynamic nature and are changing over time, it is crucial for any supply chain to be constantly updated with all the changes of these information. This tool of Elemica presents an innovative approach to collaboration between the supply chain and its logistics providers efficiently and responsively. It enables all participants in the supply chain to have continuous updates of all their logistics information. This update is achieved through information visibility and plays a very important role in eliminating the paper work or any manual way to get the information such as phone calls, e-mails, faxes The updates can be received through a cloud based application.

Furthermore, this tool of Elemica contains all the activities of the logistics transport management; road transport, ocean transport, time slot booking, warehouses, carrier rates, and freight invoices.

- *Supplier Management*

As Elemica's customer management could do for downstream of supply chains through, it works for upstream the supply chains through suppliers management as well. It is a cloud-based solution automating the activities of the suppliers purchase orders, vendor managed inventory, demand forecasting, global supply, and commercial invoices.

- *Sourcing Management Solutions*

As Elemica is a network connecting thousands of companies, it provides a very effective and powerful tool for sourcing.

The sourcing solution of Elemica is to be engaged to the purchasing activities of the supply chain to provide the most effective approach to buying the materials through specific steps: Self Service Bid, Supported Service Bid, Accelerated Sourcing, Assisted Strategic Sourcing, Strategic Sourcing,

Collaborative Sourcing, Special Projects, and Logistics Sourcing.

IV. Case Study

4.1 *The experiment of Reda chemicals in the global supply chain integration*

4..1.1 *Introduction about Reda chemicals*

REDA Chemicals is a leading chemical distributor providing business-to-business solutions for users of industrial and specialty chemicals in the Middle East, Africa and India. Through a team of over 500 professionals and technically oriented experts, Reda offers innovative solutions to a wide range of markets.

With a growing number of facilities Reda operates 30 sales offices and 25 warehouses and logistic centers strategically located throughout the regions it serves.

4..2.1 *The status of the operation before B2B automation*

As its business is operated worldwide, Reda has a wide range of suppliers, customers, and service providers distributed globally. There are many activities and transactions to be done daily through complex business processes. The communications with the business partners to be done momentarily in order to liaise between the suppliers upstream the supply chain and the customers downstream and throughout operation handling with the logistics providers, it is a real challenge to coordinate between very wide range of partners to do very wide range of activities through very different business processes in each company, this used to be done by human interaction with the following characteristics:

- Long operational time to handle such complex activities in different countries, while each country has a different time zone.
- Different cultures of the workers, where each has a different understanding and approach against any problem.
- Possibility of human errors because of the manual handling and the large number of transactions.

These characteristics resulted in long lead times of the materials and much expense, so in other words,

the supply chain faced a situation of inefficiency and irresponsiveness

4.3.1 *Elemica experiment*

Collaboration is the cornerstone of Reda chemicals strategy, so it was essential to have a network integrating all the business partners in order to share the planning and exchange the information in real-time. Because of that, Reda chemicals joined Elemica which is a supply chain integration network specialist in chemical industry.

It does not matter, which ERP system is used in each company, for example: some companies use SAP and others use Microsoft Dynamics such as Great Plains or Axapta, as all these various ERP's are integrated in the same network.

The network contains all the business partners upstream and downstream, moreover the service providers as well.

For example: if a company (A) would like to purchase raw chemicals from company (B), the process of the order will be as following:

- The purchase order to be saved in the ERP system of company (A), and processed through Elemica.
- An automatic notice will be sent directly to company (B), notifying that there is a new order received and should be processed.
- The ERP of company (B) examines the commercial terms of the order, such as the price and the delivery conditions, and if these terms are ok, then the system of company (B) starts to check the current stock of this material.
- If it is available, then an automatic confirmation will be generated from the system of company (B) to company (A).
- If it is not available, then a production slip will be created automatically in company (B), and consequently the production will start only once the customer's order is received.
- An estimation of the cargo readiness date will be sent to both (A) & (B).
- The same notice will be sent to the shipping lines to book the next available vessel for the

shipment.

- The shipping documents will be self-generated from the system of company (B) according to the terms and conditions, which were agreed upon earlier.

All the above steps run automatically, without human interference,, thus minimizing the possibility of human errors, increasing the responsiveness across the supply chains, and efficiency of orders processing.

The biggest advantage of Elemica is to aid the participating companies to remain lean and agile at the same time, whereas the operation of each company starts only once a customer's order is received. Thus all the companies can implement pull strategy without worries about the risk of delaying the materials. Real time information sharing enables all the parties to perform the necessary actions at the right times.

By using Elemica, Reda chemicals is currently able to interact with multiple business partners through a single platform and this is facilitating the order processing, invoicing, and logistics information sharing. So, Elemica helped Reda chemicals to enhance the information sharing across its supply chain.

4.4.1 *Technology obstacles in supply chain integration*

- *Different ERP systems*

Reda chemicals uses Microsoft Great Plains as its own ERP system, but definitely there are hundreds of suppliers and customers, who are not using the same program or even any kind of dynamics applications from Microsoft. With Elemica this is not a barrier as it provides a middleware solution to connect incompatible software of all the members enabling the various ERP systems to talk with one another.

- *Systems configuration*

Another obstacle was related to the configuration process. Linking a system to another is a time consuming process and requires much effort to be done in mapping out the data fields of both systems, however the benefits of such a process exceed the effort and time spent to create it. The supply chain integration after creating this link

shall generate a fast communication business environment and cost effective handling, as Wood, stated “since the supply chain represents 60% to 80% of a typical company’s cost structure, just a 10% reduction can yield a 40% to 50% improvement in pretax profits”. [13]

- *Information confidentiality*

The third obstacle, which Reda Chemicals faced, is confidentiality. Connecting to other systems through fully integrated supply chain may involve a risk of disclosing some of the confidential information of each company, so it is not desirable to integrate with all the companies we have some kind of business relationship with, the integration of supply chain should have the following characteristics

- To have selective nature, so not to engage with all.
- To have degrees of integration based on size of the business between two partners.
- To identify the confidential information that should not be a subject of sharing with others.

Reda chemicals identified the following prerequisites to the partners to integrate with:

- **Trust:** based on the history of business relationship between the two companies; this is prerequisite for any information sharing process not only in Reda chemicals case, but in general, without trust, there is no possibility of supply chain collaboration [14].
- **The size of the business:** the degree of integration to be set based on the size of business of two partners and the shared benefits.
- **Commitment:** the integration process requires time and effort to be achieved and unless there is a long-term commitment between the two partners, it does not worth to do if there is no commitment.
- **Reliability:** the integration is to be done with reliable partners only – not with just casual business relationships – we have to trust that each party will comply with its promises and to be reliable while handling the business.
- **Security:** securing the data which subject to integration is very crucial, this is to ensure that all the shared data will not be treated in a non ethical way of business handling.

- **Collaboration:** as indicated, the integration process is lengthy and hard, it needs collaboration between the two partners and unless this attitude is there, nothing can be achieved.

The selection of partners

Beside the before mentioned qualitative criteria for partners’ selection, there are also quantitative criteria:

- *Financial stability*

It is a fundamental pre-requisite for any collaboration and any partner selection is to have financial stability. Companies are seeking always for the strong finance while forming any alliance; this is in order to have a strong position on the market, so the collaboration can achieve its objective.

The financial stability is the guarantee to establish a successful business partnership and sustain the same over time.

- *Continuous improvement*

In terms of finance, it is not suitable only to have strong partner financially as of today, but this financial position must be reviewed and measured periodically to ensure that continuous strong financial position and to indicate any problem timely to ensure enough time to sort it out.

The period of reviewing the financial situation of the partners is normally every year with the financial statement, and some companies use to review the financial results of the partners quarterly. This is an essential practice to measure the financial stability over time through legal revision of the financial statement.

- *Business growth*

The final goal of any collaboration is to grow the business with a selected partner, and unless this goal is achieved, the collaboration is not useful, the initial step is to setup a forecast of the market share, then monitor the marketing process on monthly basis to see if the target is achieved or not. By the end of the year 10 % of business growth is a satisfactory percentage to enhance the

collaboration, if this is not achieved, a detailed report should be prepared, explaining the reasons and the corrective actions in the future. In case within 3 years there no growth, this is an indication that the partnership is not beneficial for the supply chain partners and major changes must take place to replace the partners or reengineer the entire collaboration process.

4..5.1 The status of operation after B2B automation

- Increased agility of the supply chain of Reda through on time actions and prompt responses to the customers' needs.
- Achieved high level of velocity through information sharing interfaces with all the business partners.
- Much free time for the human resources, which were consumed in manual activities earlier.
- Efficient operation handling through high level of flexibility.
- Reduction in overall inventory and minimizing the bullwhip effect as the information are visible to all the participants of the supply chains, which is enabling all parties to take the right actions on time; this is helping to reduce the safety stock in general.
- Providing innovative solutions for problems in a far better way through communication with the business partners.
- Reducing the human errors across the supply chain by automating the activities.
- Enhancing the collaborative planning with the business partners through real-time information sharing.
- Having very accurate data with no room for errors.
- Improving the sourcing and marketing activities as the network contains thousands of companies which could be potential suppliers and/or customers.

With the B2B automation the information are collected at each point of the supply chain of Reda and presented in a timely manner, so the receiver of the data can utilize them perfectly. Late data means late action by the receiver which was handicapping for the entire cycle of Reda's chain. However in this regard, all the data are not presented to all users – only the relevant data to the user's work are presented. This is very important to avoid any

confusion by the users and saves their time for searching among large amount of data for the exact useful piece of information.

V. Conclusion

The integration is very important approach to all the supply chains, and this integration is in continuous development as everyday new technologies appear. The B2B automation is very useful approach to supply chain integration, and Elemica is a powerful network enabling the supply chains to interact within a single platform thus creating a value chain across all the members of the network in terms of improving the effectiveness and responsiveness of the supply chains.

Reda chemicals succeed in achieving best value of using Elemica as integration network and this helped the company to improve its overall operations and represents a competitive advantage for the business of Reda chemicals in the market.

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