Analysis and evaluation of e-supply chain performances

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Electronics industry, Supply chain management, Performance management, Organizational structures, Modelling

Abstract
This study proposes a model for the analysis and performance evaluation of e-supply chains (e-SCs), that are supply chains (SCs) in which actors are connected by Internet technologies. It is assumed that e-SC performances are influenced by the network organizational structures, by the criteria adopted to manage relationships among involved actors, and by the critical activities that the leading company performs. At first, the variables influencing such factors are identified and the interdependencies among them are analysed to establish existing correlations. This, in turn, enables one to group the values of the influencing factors in four coherent sets which are consistent with different business environments, thus assuring the effectiveness and efficiency to the e-SC. The obtained reference model is then tested by applying it to literature-based case studies. The output of this model may be used to design totally new e-SCs or to redesign the existing ones, in both manufacturing and services industries.

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Nomenclature

B2B = business to business
B2C = business to consumer
CCE = collaborative community exchange
CT = control type
CTE = consortium trading exchange
e-SC = e-supply chain
ITE = independent trading exchange
LFI = leading firm degree of influence
MF = market fragmentation
ND = network dynamism
PPC = product/process complexity
PTE = private trading exchange
SC = supply chain
VI = product/service value integration
VTE = vendor trading exchange

1. Introduction
The importance of supply chain (SC) management for the competitiveness of industrial and services enterprises has been demonstrated by several authors (Baldi and Borgman, 2001; Beamon and Ware, 1998; Chandra and Kumar, 2001; Cooper et al., 1997; Lambert et al., 1996; Murillo, 2001; Nøkkentved, 2000; Tapscott et al., 2000; Zheng et al., 2001). Such a criticality is even more relevant in the case of enterprises adopting e-business strategies, i.e. involved in e-supply chains (e-SCs), that are SCs in which actors are connected by Internet technologies and/or EDI in a network to buy, sell, and distribute products or services and to transfer cash flows (Fliedner, 2003; Lightfoot and Harris, 2003; William et al., 2002).

Based on such considerations, it is evident that the need for specific criteria and models to verify the fit between the e-SC organization and the business environment in which it operates, and to effectively and efficiently manage the relationships among the actors within the network. Such relationships, in fact, are characterized by many-to-many connections instead of more traditional one-to-one. Therefore, a deep revision of current managerial techniques is dramatically requested. Despite the huge number of works on this subject, (Chandra and Kumar, 2001; Cox et al., 2001; Cravens et al., 1996; Harland et al., 2001; Lamming et al., 2000), reliable criteria for the analysis and the evaluation of e-SC networks, based on the relationships among economic actors interconnected through Internet, are not yet available. As a result, managers usually operate according to empirical methodologies that often do not assure optimal performances. In order to contribute towards the solution of such a problem, Cucchiella et al. (2002) preliminarily examined the factors that mostly affect the e-SC performances.
In this paper, a methodology for the analysis and evaluation of new or existing e-SC is presented. This method is specifically developed for manufacturing and services firms.

2. The factors affecting e-SC performances and their interdependencies

It may be assumed that effectiveness and efficiency of an e-SC depend on the coherence between the characteristics of the environment in which the embedded actors operate and the way in which relationships among embedded actors are managed. The management of such relationships, in turn, is based on the following three factors (Cucchiella et al., 2002):

(1) the structures adopted to organize the relationships among the actors of the network (organizational structures);

(2) the criteria adopted to manage such relationships (managerial criteria); and

(3) the activities to be carried out for coordinating the relationships (critical activities).

With respect to the organizational structures, Tapscott et al. (2000) define five types of b-web adopted to manage relationships among embedded actors based on the level of product-service value integration (VI, high vs low) and control type (CT, which may be hierarchical or self-organizing):

(1) agora,

(2) aggregation,

(3) value chain,

(4) alliance, and

(5) distributive network.

According to Nøkkentved (2000), the managerial criteria may be instead defined on the basis of two variables, the market fragmentation (MF) and the product/process complexity (PPC). Consequently, six types of criteria may be identified:

(1) auction house;

(2) independent trading exchanges (ITE);

(3) vendor trading exchanges (VTE);

(4) consortium trading exchanges (CTE);

(5) private trading exchanges (PTE); and

(6) collaborative community exchanges (CCE).

Finally, several authors (Biemans, 1995; Harland, 1996; Johnsen et al., 2000; Lamming et al., 2000) analysed the critical activities that have to be developed in an e-SC according to the specific business environment in which it is embedded. In this paper specific reference has been made to the critical activities indicated by Zheng et al. (2001) which are the following:

(1) decision-making,

(2) equipment integration,

(3) human resource integration,

(4) information processing,

(5) motivating,

(6) knowledge capture,

(7) partner selection, and

(8) risk and benefit sharing.

These critical activities are determined on the basis of two variables: the leading firm degree of influence (LFI) and the supply network dynamism (ND).

However, the above mentioned influencing variables (VI, CT, product process complexity (PPC), market fragmentation (MF), network dynamism (ND), and leading firm degree of influence (LFI)), are determined by specific dependence parameters (Cucchiella et al., 2002; Nøkkentved, 2000; Tapscott et al., 2000; Zheng et al., 2001), as shown in Table I.

To sum up, each factor (organizational structures, managerial criteria, critical activities) depends on two influencing variables which, in turn, are influenced by some dependence parameters (Table I). Interdependencies among the influencing variables may be thus analysed referring to the dependence parameters.

To reach such an objective, it is useful to subdivide the investigated variables into two different sets. The first one is composed by CT, MF and LFI, and the second one by VI, PPC and ND.

With respect to the first set (CT, MF, and LFI), it is evident that CT and LFI are both related to the presence of a leading actor and to its role in the decision-making process. At the same time, according to the resource-dependency theory (Pfeffer and Salancik, 1978), CT depends on the industry concentration, that is the MF. As a consequence, a strict interdependence among the three variables under investigation seems to exists. At the same time, it must be noted that there is no correlation among the dependence parameters related to these variables and those influencing the other three (VI, PPC and ND).

On the contrary, parameters impacting on these last three variables appear strictly interdependent. For instance, the value of offered benefits (which impacts on VI) is tightly connected with the product customisation degree (which influences PPC) and to product variety (affecting ND). At the same time, the greater the product customisation degree (which has an effect on PPC), the greater the cost of switching supplier (which influences ND). Besides, the market dynamism (which impacts on PPC) is directly correlated to the innovation frequency (which has an effect on ND) and inversely to the market maturity (which affects ND). Insofar, the other three variables under investigation (VI, PPC and ND) are strictly
connected and all refer to the type of relationships established among actors embedded in the e-SC.

Given the earlier defined groups of variables, it follows that also the factors they influence are interconnected. As a consequence, it may be stated that organizational structures, managerial criteria and key activities are closely interconnected. More specifically, it is possible to define four combinations of such factors which result homogenous, coherent and consistent with specific business environment (Table II).

3. An integrated model for e-SC analysis and evaluation

In the previous section, four consistent combinations of e-SC organizational structures, managerial criteria and key activities were identified. Each one of such combinations is consistent with the relationships among actors and the environment in which they are embedded.

As stated earlier, strong correlations between two sets of variables, which shape the factors affecting e-SC performance have been found. The first one is based on the presence and the possible role of the leading company with respect to the decision-making process, while the second one on the type of relationships established among various actors. Based on such results, it seems possible to identify two new macro-variables characterizing the environment in which the e-SC operates: the decision-making concentration degree and the internal integration degree. The former depends on CT, MF, and LFI (Figure 1), while the latter is influenced by VI, PPC and ND (Figure 2).

More specifically, CT, LFI and MF are positively correlated to the decision-making concentration degree. As a consequence, the latter will result higher if CT is hierarchy-based, the market concentration index high and the leading firm is extremely influencing. Even VI, PPC and

<table>
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<td>Influencing variables</td>
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<th>Table II</th>
<th>Combination of factors influencing supply chain performance</th>
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<tr>
<td>Organizational structures</td>
<td>Managerial criteria</td>
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<tr>
<td>Agora</td>
<td>Auction house</td>
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<tr>
<td>Aggregation</td>
<td>ITE, VTE</td>
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<tr>
<td>Value chain</td>
<td>PTE, CCE, CTE</td>
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<tr>
<td>Alliance</td>
<td>PTE, CCE</td>
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</tbody>
</table>
ND are positively correlated with the internal integration degree. As a result, the latter will be higher if the offered value is relevant, the product/process complex and the network environment variable over the time.

Based on such evidences, an integrated model may be developed which, according to the value of the two new macro variables introduced, identifies four different kinds of business environments, which is schematically shown as distinct quadrants in Figure 3. In each of such four quadrants, the combination of organizational structure, managerial criteria and critical activities more consistent with the specific business environment are also indicated.

In the lower left quadrant, agora and auction house are both characterized by efficiency aims and are consistent with many-to-many contexts in which standardized products and services are exchanged. In this business environment information processing and equipment integration becomes extremely critical and partners need to be motivated to share risks and benefits.

At the same time, in the upper left quadrant, aggregation and ITE/VTE are both useful in similar business contexts: huge number of actors and homogeneous products. Accordingly, partners selection and integration becomes the most critical activity for the leading company, as well as the decision-making, supported by information processing of data and information available within the network.

In the upper right quadrant, value chain and CTE have the same aims, effectiveness and efficiency. To reach such objectives, actors selection and integration results extremely critical, as well as the management of available knowledge.

Finally, in the lower right quadrant, PTE and alliance pay the same attention to actors competencies, to integrate them. This enables to capture knowledge and to motivate actors to share their risks and benefits.

The proposed integrated model therefore allows to identify the more appropriate set of organizational structures, managerial criteria and critical activities, based on variables characterizing the environment in which an e-SC is embedded.

**4. Integrated model verification**

The above described reference model can be verified by analysing the behaviour of actual enterprises and checking if they fit the proposed model.
framework. This means verifying if the model output is consistent with the performance factors characterising enterprises adopting sets of factors coherent with the business environments in which they operate. In order to carry out such a check the following procedure may be applied for each analysed case study (Figure 4).

1. At first, e-SC information about factors or their influencing variables are gathered, resorting to literature or field data.
2. Subsequently, the information gathered are analysed in depth to identify the known factors, either directly or through the values of both their influencing variables.
(3) On the basis of the factors identified the reference model quadrant (Figure 3) to which the case belongs is then selected, also implying the values of the corresponding macrovariables.

(4) Following the values the remaining unknown factors are determined according to the model;

(5) Finally, the model output is checked with the actual behaviour of the considered e-SC;

In this paper, as an example, the verification procedure has been applied with reference to four relevant case studies from literature.

**Step 1.** Four e-SC have been chosen – Covisint, Sun Microsystems, eBay and PlasticsNet – among those described by the referenced authors (Nøkkentved, 2000; Tapscott et al., 2000) to explain, respectively, organizational structures and managerial criteria.

**Step 2.** Table III shows the known factors and the other available information on single influencing variables.

**Table III** Examined case studies information

<table>
<thead>
<tr>
<th>Organizational structures (Tapscott et al., 2000)</th>
<th>Managerial criteria (Nøkkentved, 2000)</th>
<th>Other available information</th>
</tr>
</thead>
<tbody>
<tr>
<td>eBay</td>
<td>Agora</td>
<td>eBay.com (Houser and Wooders, 2000)</td>
</tr>
<tr>
<td>PlasticsNet</td>
<td>Aggregation</td>
<td><a href="http://www.plasticsnet.com">www.plasticsnet.com</a> (Barratt and Rosdahl, 2002; Davis, 1999; Sharma et al., 2001)</td>
</tr>
</tbody>
</table>

**Step 3.** The model quadrants that may be associated to each e-SC are selected as follows:
- Covisint: I quadrant; Internal integration degree: high, Decision-making concentration degree: high;
- Sun Microsystems: II quadrant; Internal integration degree: high, Decision-making concentration degree: low;
- eBay: III quadrant; Internal integration degree: low; Decision-making concentration degree: low; and
- PlasticsNet: IV quadrant; Internal integration degree: low, Decision-making concentration degree: high.

**Step 4.** The values of the remaining unknown factors are determined using the proposed model as shown in Table IV.

**Step 5.** The check between model output and actual behaviour of each considered e-SC is developed in the following sections.

4.1 Covisint

Covisint (www.covisint.com) is a typical business-to-business (B2B) electronic exchange platform. Its name comes from “co” – that means connectivity, collaboration and communication – “vis” – standing for vision and visibility – and “int” – which means integration and international scope (Bailey, 2001; Lichtenthal and Eliaz, 2003).

It was originally established by the three American leading carmakers (GM, Ford and Daimler Chrysler) in order to coordinate their own SCs and increase the bargaining power with respect to components suppliers (Barratt and Rosdahl, 2002; Lichtenthal and Eliaz, 2003; Skjøtt-Larsen et al., 2003). For a second time, other carmakers (such as Renault, Peugeot and Nissan) were accepted as partners of the business Web under investigation. In such a way the founding partners had the possibility to further increase their bargaining power and the new entrants experienced positive results in terms of procurement costs reduction (Barratt and Rosdahl, 2002; Lichtenthal and Eliaz, 2003).

As a consequence, nowadays, all partners involved in the Covisint network are part of an online consortium. The leader of such a business Web act
as an unique agent with respect to the huge number of automotive components suppliers, such as Bosch and Brembo (Bailey, 2001; Mahadevan, 2002). Therefore, relationships among involved actors may be schematically shown as in Figure 5.

As a consequence, Covisint leads partners to create value (Barratt and Rosdahl, 2002; Lichtenthal and Eliaz, 2003; Skjøtt-Larsen et al., 2003). The creation of such a value derives from the following elements:

1. the relevance of components in the car final value is dramatically increased in the last years (Clark and Fujimoto, 1992);
2. the participation to this Web allows for a considerable time-to-market reduction (Barratt and Rosdahl, 2002) and huge costs savings;
3. partners benefits of minute switching costs, being always possible to choose the at-the-moment less expensive supplier for the specific purchase; on the contrary, the other carmakers outside Covisint consortium generally experience high levels of such costs (Bailey, 2001), being the automotive components industry quite fragmented (Mahadevan, 2002; Bailey, 2001) and components not always standardised.

Covisint may offer to partners such an high benefit value because it owns both critical assets and specific knowledge. With respect to the first element (critical assets), it must be pointed out the presence of a complex data processing system – the so-called i-Supply Service – which enables suppliers a real time access to carmakers warehouses in order to verify their needs in terms of material and components (Bailey, 2001).

Specific knowledge, on the contrary, is related to automakers technical needs. Such a knowledge is assured by the fact that the main world automakers are either stakeholders (GM, Ford and Daimler Chrysler) or customers (Renault, Peugeot and Nissan) of Covisint.

Nøkkentved (2000) classified Covisint as a CTE, since this network is characterised by a high level of both PPC and MF. As aforementioned, the coherence of this business model with the other two factors of the upper right quadrant imply therefore, that the business Web under investigation adopts a value chain organizational structure and is characterized by the following set of critical activities: partner selection, decision-making, human resources integration and knowledge capture.

With respect to the consistency with the organizational structure (value chain), it may be noted that Covisint is a particular type of value chains, since the outsourced activity is extremely critical for automakers. On the contrary, such organizational structures are generally built to outsource not core activities (such as after-sales services, as in the case of Cisco Systems). As stated earlier, Covisint is the common interface of involved automakers with respect to several independent suppliers operating in the components markets. In doing so, the network leader enables both, suppliers and car manufacturers, to efficiently interact through

Table IV Factors to be verified

<table>
<thead>
<tr>
<th>Quadrant</th>
<th>Analysed firm</th>
<th>Factors</th>
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<tbody>
<tr>
<td>I</td>
<td>Covisint</td>
<td>Organizational structure: value chain&lt;br&gt;Critical activities: partner selection, decision-making, human resources integration, knowledge capture</td>
</tr>
<tr>
<td>II</td>
<td>Sun Microsystem</td>
<td>Critical activities: motivating, risk and benefit sharing, human resources integration, knowledge capture</td>
</tr>
<tr>
<td>III</td>
<td>eBay</td>
<td>Critical activities: motivating, risk and benefit sharing, equipment integration, information processing</td>
</tr>
<tr>
<td>IV</td>
<td>PlasticsNet</td>
<td>Critical activities: partner selection, decision-making, equipment integration, information processing</td>
</tr>
</tbody>
</table>

Figure 5 The relationships map of Covisint
Internet applications, as already shown speaking about the I-supply service. Based on these considerations, it is possible to verify the presence of the two typical features of a value chain, the high level of value integration and the hierarchical control. With respect to the latter (hierarchical control), Covisint is clearly the leader of the business Web, since carmakers completely outsourced to it the procurement activity. In order to play this role, as showed earlier, the business Web leader developed specific competences in the automotive industry and critical assets. On the other side, regarding the level of integration, it must be noted that the leader closely coordinate and integrate partners' SCs, mainly by the I-Supply Service platform.

With respect to the consistency of the critical activities, it is crucial the Covisint ability in partner selection, due to the high fragmentation of automotive components market and the concomitant concentration of carmakers industry (Mahadevan, 2002; Nøkkentved, 2000). The relevance of such an activity is confirmed by the decision of original founders (the three American leading automakers) to offer supply services also to other competitors (as the French Renault and Peugeot). At the same time, decision-making is extremely relevant since procurement activities are totally outsourced to Covisint, which is in charge to optimize their costs. Finally, as stated earlier, Covisint has developed specific tools to capture knowledge regarding both carmakers needs and suppliers’ technical features.

Based on the earlier discussion, the coherence among the three factors belonging to the upper right quadrant of the proposed model is confirmed. At the same time, information prior analyzed permit to state also that the levels of the two macro variables (internal integration and decision-making concentration degrees) are both high, as shown in Table V. Consequently, the coherence among the three factors under discussion and their relative macro variables are verified.

### 4.2 Sun Microsystems

Sun Microsystems (www.sun.com) is a leading firm operating in the software and hardware components (servers and workstations) industries (Nielsen and Sano, 1995), two market areas resulting quite concentrated. Owing to the nature of products offered by Sun, the risk of product obsolescence is extremely relevant, inducing to realise continuous innovations. With this respect, the business model under investigation is founded on close connections among partners of the product development process. Such connections are requested because no one has the complete set of knowledge required to autonomously develop the new software version. These relationships are realised through Internet technologies. More specifically, Sun has developed the Java platform as a result of an intense collaboration among partners within the b-web (Tapscott et al., 2000). As in the more recent and well known case of Linux operating system (www.linux.org), the company played a central role within the product development process. Such a process was realised in close connection with a wide range of actors – which may be defined as prosumers, since they are both producers and consumers of the software – linked through its Internet site. As a consequence, such embedded actors can discuss and evaluate different ideas and innovations to be developed within the Java platform (Tapscott et al., 2000). In order to reach such results, Sun created a Web site (www.java.sun.com) containing technical information and possible applications of the Java technology developed both, from Sun engineers and external actors. Moreover, the firm has realised a “collaborative workspace” (http://java.net) where users and participants can closely work and collaborate to further improve the Java. Finally, the company under discussion promoted the creation of a “Java Community”, where all customers may discuss with experts of the Java technology through a forum and several chats. As a consequence, relationships among different actors embedded in the Sun business web are schematically shown in Figure 6.

The business Web under investigation permits to create high benefit values for each embedded actors, since all of them may benefit of software improvements proposed by each other. At the same time, however, there is not a leader within the network, being Sun only a coordinator of

| Table V Covisint dependence parameters |
|-----------------|-----------------|-----------------|-----------------|
| **Macro variables** | **Influencing variables** | **Dependence parameters value** | **Macro variables value** |
| Internal integration degree | Value integration | High offered benefit value | High |
| | PPC | High degree of product customisation | |
| | ND | Low switching cost | |
| Decision-making concentration degree | CT | Presence of a leader | High |
| | MF | High number of suppliers | |
| | Focal firm influence | Presence of critical assets and resources | |

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differentiated contributes coming from both, its employees and external prosumers.

Nøkkentved (2000) and Tapscott et al. (2000), respectively, classify Sun as an alliance and a CCE. The first classification (alliance) is justified by the high level of value integration and the self-organising control. On the other hand, the classification as CCE derives from the high products complexity and the low market fragmentation. As aforementioned, to verify the coherence of this business Web with the factors in the lower right quadrant of the proposed model, the consistency of Sun with the following critical activities must be proved: motivating, risk and benefit sharing, human resource integration and knowledge capture. With respect to the risk and benefit sharing, it derives from the direct participation of prosumers to the software improvement. Such participation is intensely promoted by Sun giving to such actors total access to all technical information regarding the development of the software platform, and even the software source. As a consequence, the capture and management of internal (within Sun) and external (within the business Web) knowledge became the most relevant activity played by Sun. Finally, a strict collaboration among prosumers and Sun employees is dramatically requested, confirming the relevance of human integration activity.

Based on the earlier discussion, it is confirmed that the coherence among the three factors belonging to the lower right quadrant of the proposed model. At the same time, information prior analyzed permit to state also that the levels of the two macro variables (internal integration and decision-making concentration degrees) are, respectively, high and low, as shown in Table VI. Consequently, the coherence among the three factors under discussion and their relative macro variables are verified.

4.3 eBay

eBay (www.ebay.com) is the most well-known example of consumer-to-consumer Internet site. More specifically, it enables millions of registered consumers to exchange different kinds of products (such as coins, stamps, books, etc.) characterised by a low degree of customisation. As a consequence, the offered benefit value is quite minute. On the contrary, switching costs – including the time and efforts involved in uploading information on items up for auction and building a reputation on a new site – are extremely relevant (Saloner et al., 2000). This is confirmed by the fact that eBay is assured as the largest Internet auction site all over the world.

Exchange relationships may be implemented according to two methods. The first is the classic online auction. The second – called “Buy It Now” – is a more traditional sale, where the consumer buys the product merely accepting to pay the requested price. In both cases, however, eBay has not leading role, offering only the electronic platform for the exchanges. As a consequence, relationships among actors embedded in the e-Bay business Web may be schematically shown in Figure 7.

Both Tapscott et al. (2000) and Nøkkentved (2000), use eBay as a case study in their works, defining it, respectively, as an Agora and an Auction House. The first classification (Agora) is justified by the low level of value integration and the self-organising control. On the other hand, the classification as Auction House derives from the low level of both, product complexity and market fragmentation.

As aforementioned, to verify the coherence of this business Web with the factors in the lower left quadrant of the proposed model, the consistency of eBay with the following critical activities must be proved: motivating, risk and benefit sharing, equipment integration and information processing.
The relevance of partners motivation activity is supported by the total absence of a leading company, being eBay the modern version of Walras (1874) auctioneer. Such motivation is partially based on the Feedback Profile Service, an utility within the business which allows customers to check information concerning all buyers and sellers which have been realised exchanges since the foundation of this business Web. In doing so, eBay strongly contributes to preserve potential buyers from interacting with unreliable actors. At the same time, sellers who respect the site rules may build up a positive brand image (Houser and Wooders, 2000). At the same time, the adopted exchange mechanisms (auctions and “buy it now”) allows to share the risk among consumers and on the central actor. The latter, in fact, will earn the commission only if the product is sold. Finally, the huge number of potential customers and effected transactions ask for an efficient and effective data management system.

Based on the earlier discussion, the coherence among the three factors belonging to the lower left quadrant of the proposed model is confirmed. At the same time, information prior analyzed permit to state also that the levels of the two macro variables (internal integration and decision-making concentration degrees) are both low, as shown in Table VII. Consequently, the coherence among the three factors under discussion and their relative macro variables are verified.

4.4 PlasticsNet

PlasticsNet (www.plasticsnet.com) is a vertical e-marketplace, leader in the online plastic products intermediation (Barratt and Rosdahl, 2002; Davis, 1999). As a consequence, the mere matching between customers and suppliers is the only phase effected within the PlasticNet business web. Even if this “virtual plaza” offers a minute benefit value, the role of network leader is quite relevant in the creation of this narrow value. More specifically, it offers some different kinds of services, generally related to the information aspects. For instance, participants may collect information about products and relative sellers, which, in turn permits them to compare offers with respect to technical features and prices. At the same time, producers may receive “request for quote” and buy research reports on the industry trends. Finally, with respect to frequently purchased items, buyers can create a catalogue of priced products offered by different suppliers.

To sum up, PlasticsNet main contribute for producers is the reduction of costs and times for vendors research and relative evaluation. On the other hand, sellers can plug into a global distribution channel at a lower costs (Tapscott et al., 2000). Moreover, small companies may have a “window” on the market as the biggest one. This assumes particular relevance because of the high level of market fragmentation on both supply and demand side (Davis, 1999).

Based on such description, relationships within actors embedded in the PlasticsNet business Web may be shown in Figure 8.

Nøkkentved (2000) and Tapscott et al. (2000), respectively, classify PlasticsNet as an example of Aggregation and ITE, the two elements in the upper left quadrant. The first classification (Aggregation) is based on the hierarchical control and the low level of value integration. On the other hand, the classification as ITE derives from the low product complexity (raw materials) and the high level of market fragmentation (Davis, 1999).

As aforementioned, to verify the coherence of this business Web with the factors in the upper left quadrant of the proposed model, the consistency of PlasticsNet with the following critical activities must be proved: partner selection,
decision-making, equipment integration and information processing. With respect to the first activity (partner selection), it is crucial because of the already pointed out high fragmentation on both demand and sales site (Davis, 1999). At the same time, information processing is quite crucial because of the wide number of actors interacting on the Web site (Sharma et al., 2001), still due to MFs. Finally, the equipment integration is realised on the base of a common electronic platform which allows both one-to-many interaction (as in the case of request for quote) and a one-to-one interaction (as in the construction of “ad personam” catalogues).

Based on the earlier discussion, the coherence among the three factors belonging to the upper left quadrant of the proposed model is confirmed. At the same time, information prior analyzed permit to state also that the levels of the two macro variables (internal integration and decision-making concentration degrees) are, respectively, low and high, as shown in Table VIII.

Consequently, the coherence among the three factors under discussion and their relative macro variables are verified.

5. Conclusions

The relevance of SC management for the creation of a sustainable competitive advantage is generally recognized, both by academics and practitioners. However, to implement an effective SC – and especially an e-SC – a deep reorganization of relationships with partners embedded in the network is dramatically requested.

In spite of the huge number of research works in the SC field, a lack was identified with respect to the definition of suitable integrated global frameworks for the management of e-SC.

Therefore, in this paper, a model which can be used to analyze and evaluate the performances in manufacturing and services industries has been described and tested. Testing has been carried out by applying the model to specific case studies analyzed in the literature for which at least one of the factors influencing the e-SC performance was known.

Based on such results, in future works, an extended analysis of SCs belonging to industrial and service sectors will be conducted to further verify the usefulness of the proposed model. At the same time, aiming to transform the proposed model in a decisional tool, an algorithm will be developed, able to automatically define the coherent set of affecting factors on the basis of the specific business environment in which a focal firm is embedded.

### Table VII eBay dependence parameters

<table>
<thead>
<tr>
<th>Macro variables</th>
<th>Influencing variables</th>
<th>Dependence parameters value</th>
<th>Macro variables value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal integration degree</td>
<td>Value integration</td>
<td>Low offered benefit value</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>PPC</td>
<td>Low degree of product customisation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ND</td>
<td>High supply switching costs</td>
<td></td>
</tr>
<tr>
<td>Decision-making concentration degree</td>
<td>CT</td>
<td>Absence of a leader</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>MF</td>
<td>High number of suppliers (C2C) and consumers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Focal firm influence</td>
<td>Low contribution level offered to value creation</td>
<td></td>
</tr>
</tbody>
</table>

### Table VIII PlasticsNet dependence parameters

<table>
<thead>
<tr>
<th>Macro variables</th>
<th>Influencing variables</th>
<th>Dependence parameters value</th>
<th>Macro variables value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal integration degree</td>
<td>Value integration</td>
<td>Low number of operators types</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>PPC</td>
<td>Low degree of product customisation</td>
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</tr>
<tr>
<td></td>
<td>ND</td>
<td>High market maturity level</td>
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<tr>
<td>Decision-making concentration degree</td>
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</tr>
<tr>
<td></td>
<td>MF</td>
<td>High number of suppliers and consumers</td>
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</tr>
<tr>
<td></td>
<td>Focal firm influence</td>
<td>High contribution of leader to value creation</td>
<td></td>
</tr>
</tbody>
</table>
References


Walras, L. (1874), Éléments d’Économie Politique Pure, Corbaz, Lausanne.


Further reading