

Exploring efficiency and effectiveness in the supply chain

A conceptual analysis

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Abstract

Firms struggle for efficiency and effectiveness. Strategies involving collaboration between actors and integration of activity chains are reliant of factors that firms do not have direct ownership and control over. This has implications for strategizing, setting the goals and measuring performance. Efficiency and effectiveness are often used to describe performance. From a resource dependence perspective efficiency is defined as an internal standard of performance and effectiveness as an external standard of fit to various demands (Pfeffer and Salancik 1978). In supply chains efficiency improvements are e.g. Just-in Time production while effectiveness is achieved through customer orientation and innovation.

The conceptualization of efficiency and effectiveness has its roots in system theory. Definition of the system is difficult for a quasi-organization as a supply chain that has blurred structural boundaries. Defining the system as processes of activities implies that the meaning of and the relation between efficiency and effectiveness might change as well.

This is a conceptual paper with a purpose to describe and analyze efficiency and effectiveness as constructs based upon activity systems. The analysis of efficiency and effectiveness involves the meaning, the use and the relations between efficiency and effectiveness. We will use the resource dependence perspective's definitions and recent development and usage of efficiency and effectiveness from IMP literature in the description. The analytical framework is in three steps: Dualism, duality and beyond (Ericson 2004). First, efficiency and effectiveness are described as two independent constructs, i.e. as a dualism. Thereafter efficiency and effectiveness will be described as two interrelated constructs, i.e. as a duality and finally we will analyze the constructs beyond the duality applied to a supply chain context. The framework illuminates that efficiency and effectiveness cannot be seen as independent in a supply chain context with focus on processes. This as the evaluation is neither of a relation nor of an organization but of an organization of relationships. In the analysis of efficiency and effectiveness the main difficulties are time, boundaries, and interdependencies.

Keywords: Efficiency, effectiveness, activities, value processes.

Introduction

Concepts as supply strategy rely on balancing within a network: In Harland et al's Delphi-study an outcome was that:

“The role for managers appears to be a more dynamic balancing act, maintaining their own organisation's viability and prosperity, within a much more complex network, the survival and success of which are of critical importance to its constituent firms.”
(p. 669 Harland et al. 1999)

Goals for an organization have thus to be set in relation to its network's needs. This means that *organizational* efficiency is an insufficient evaluation and so is effectiveness in *one* relationship.

Strategies involving collaboration between actors and integration of activity chains are reliant of factors that firms do not have direct ownership and control over. This has implications of measurement and definition of goals in a network context. Especially in the growing research flow of supply chain management, where efficiency and effectiveness are objectives, it is important to explore efficiency and effectiveness to understand strategies.

The supply chain is defined here as a part of a network that supplies a specific product from raw material to final customer – it is a whole commercial chain embedded in the network (Hertz 2001) with a common objective of efficiency and effectiveness. Efficiency is an internal standard of performance while effectiveness is an external standard of fit to various groups' demands (Pfeffer and Salancik 1978).

Efficiency is a cost-related advantage and effectiveness is an advantage of customer-responsiveness within supply chain management research. This means that efficiency improvements are achieved through Just-in-Time production and logistic supplier nets while effectiveness are achieved through customer orientation (Möller and Törrönen 2003). The value concept are related to efficiency and effectiveness (Forsström 2003; Fredriksson and Gadde 2003; Håkansson and Prenkert 2004; Möller and Törrönen 2003). Value is defined as perception of monetary as well as non-monetary outcome where value creation is a set of direct and indirect relationship functions (Walter et al. 2001).

Möller and Törrönen (2003) discuss supplier efficiency and effectiveness based on Walter et al (2001) value functions. Supplier efficiency is seen as a direct influence on value while supplier effectiveness and network effects are seen as an indirect influence on value in relationships. In these functions are efficiency and effectiveness related to the supplier, i.e. one organization. In this paper we will argue that efficiency and effectiveness are related to the outcome of value creation processes involving several organizations. Håkansson and Prenkert (2004) distinguish value as exchange value and use value:

- The exchange value relates to a relationship's efficiency in buying/selling and producing/using activities.
- The use value relates to effectiveness through utilization in co-operating and networking activities, e.g. by utilizing interdependencies (Dubois et al. 2004; Håkansson and Persson 2004).

Exchange value and use value are outcome of activity systems. The supply chain is a producing/using activity system embedded in a networking activity system in Håkansson and Prenkert (2004) characterization of exchange systems. This means that the production facilities are the resources that are activated throughout at least three actors. Activities in a supply-chain are sequentially interdependent but have also pooled and reciprocal interdependencies (Håkansson and Persson 2004). The serial interdependent activities are managed through integration of processes and adaptation of activities. The pooled interdependencies are managed through a standardization and specialization and the

reciprocal interdependencies are managed through responsiveness and a capability to innovate.

The definition of efficiency and effectiveness is based on an evaluation of organizations independently of its context. In order to evaluate efficiency and effectiveness of activity systems rather than organizations this definition might be problematic.

The purpose of this paper is to conceptually describe and analyze efficiency and effectiveness as constructs based upon activity systems of supply chains. The analysis of efficiency and effectiveness involves the meaning, the use and the relations between efficiency and effectiveness. We will use the resource dependence perspective's definitions and recent development and usage of efficiency and effectiveness from IMP literature. The ambition is to put forth interrelatedness and dynamic in this "pair of outcome" as a complex duality. The framework will have efficiency and effectiveness as two independent principles as a starting point, i.e. as a dualism. Thereafter efficiency and effectiveness will be elaborated as two interrelated principles, i.e. as a duality to finally end up beyond the duality.

Analytical framework: Efficiency and effectiveness as duality and dualism

Pfeffer and Salancik argue that efficiency and effectiveness are constructs that should be seen as independent of each other from a resource dependence perspective. Liljegren argues that these constructs are interrelated and complex from an industrial network perspective (Liljegren 1988). Lately development of these constructs describes a unidirectional influence; where effectiveness is dependent on efficiency (Håkansson and Prenkert 2004). The effectiveness and efficiency are outcome of activity systems with two different value creation processes; exchange and use. We are especially interested in how these interrelate to each other.

Therefore we use an analytical framework of "dualism, dualities and beyond" (Ericson 2004) and illuminate that efficiency and effectiveness cannot be seen as a harmonious way to value. Sometimes efficiency and effectiveness are contradictory constructs, e.g. when firms internalize demands of effectiveness to a call for efficiency (Pfeffer and Salancik 1978).

The analytical framework of dualism, duality and beyond (Ericson 2004) is a structure to describe effectiveness and efficiency.

First efficiency and effectiveness will be separately described in a dualism as if there were no middle ground between them, this to distinct the constructs instead of interpreting them through each other (figure 1). Dualism is defined as opposites that complement each other¹. This division of a phenomenon of study into paired elements affects a simple form of classification and drawing a contrast (Ericson 2004). The classes must be unambiguously divided – it is two independent underlying principles, this separates dualism from duality (Ericson 2004).

Thereafter we will analyze efficiency and effectiveness as a duality, i.e. as interrelated and complex where efficient is opposing to inefficient and effective are opposing element to ineffective but where also an internal relationship exists (figure 1). A duality is defined as interrelated but of opposing elements. The interrelatedness is especially important when to balance managerial implications regarding contradictory phenomena and to generate theories (see e.g. Håkansson and Ford 2002; Håkansson and Waluszewski 2004). Finally we will analyze effectiveness and efficiency beyond the duality for an assessment of time, space and network effects.

¹ In this paper efficiency and effectiveness, other examples are stability and change, top-down and bottom-up processes, formulation and implementation of strategy

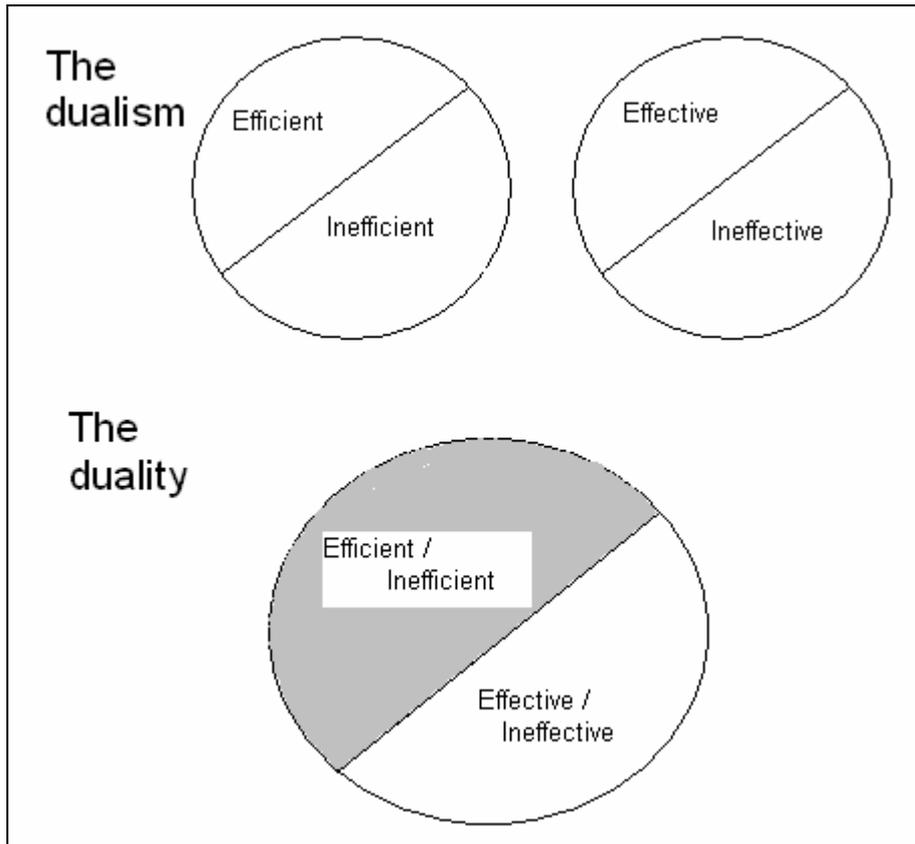


Figure 1 Analytical framework

Analysis

Efficiency and effectiveness are used to describe and evaluate an activity system. Before we analyze whether efficiency and effectiveness are independent or interrelated we start to describe efficiency and effectiveness separately.

Efficiency

Organizational efficiency is defined as an internal standard of performance (Pfeffer and Salancik 1978) and is approximately a construct “for doing the things right”. From a resource-dependence perspective efficiency is an independent measure for evaluating organizational productivity:

Output produced per resources utilized should equal 100 % inclusive losses.

Efficiency seen in this formula is a good measure of a closed system’s output, such as an organization from a machine-bureaucratic perspective when produced output is the same as profit.

However, making evaluations of activity systems, as supply chains, rather than organizations is more complex as boundaries is flux (Hoek 1998). Håkansson and Prenkert (2004) conceptualize efficiency based on a dyadic system’s exchange value. Exchange value is evaluated by the two actors regarding the activity system’s utilization of resources. A supply chain is an activity system, i.e. an exchange system of producing/using activities as well as a networking activity system. If we elaborate that one firm use its resources to 100 %, it seems to be efficient. However, in a producing/using activity system, as a supply chain, this might be

inefficient due to expensive inventory costs. Efficiency is thus a quantitative as well as a qualitative evaluation in a supply chain as goals have to be negotiated.

Efficiency is seen as a “value free” quantifiable measure – highly valued as a rationale for activities such as improvement programs or as a base for rewards. This is problematic for social systems (Pfeffer and Salancik 1978) as efficiency is two dimensional (input and output) and social systems usually have several dimensions in their output. An example of this is the interdependencies within as well as among supply chains that cause efficiency in one supply chain and inefficiency in overlapping supply chains (Dubois et al. 2003). This means that efficiency within a supply-chain system is difficult to optimize due to limited knowledge of interdependencies within the supply chain as well as towards other supply chains. This is evident in the ramp-up phase of Volvo’s S80 model. Despite a trade-off where Volvo’s suppliers balanced between efficiency (through scale) and unique solutions they contributed to the supply chain efficiency (Corswant et al. 2004). This implies that the supply chain is a specific activity system, where the efficiency goal is compound and negotiated along the chain. This is seen in findings from Volvo Car Corporation evaluation of their suppliers (Fredriksson and Gadde 2003). The efficiency is therein described as a compound evaluation of quality, delivery, cost, and overall capability that is not only planned and reviewed in the relationship but also a measure of the relationship. The efficiency of the producing/using system is influenced by serial interdependencies through relationships. Efficiency is thus evaluated of several parties within the exchange system and negotiated interdependencies determine efficiency goals.

Two variables are left to elaborate on from the formula of efficiency: Resources utilized and losses. These variables capture lots of efficiency goals targeted in JIT, Kaizen and lean production. Volvo Car Corporation uses a JIT-production, which is mirrored in their use of efficiency evaluation. Utilization of scarce resources has cost implications but also implications regarding capability to innovate (Fredriksson and Gadde 2003). This implies that losses in an evaluation of one firm or one relationship are efficiency to the supply chain. Efficiency thereby means exploitation of interdependencies, reliability and control of resources. This means that efficiency is neither value-free nor easily quantifiable measure. Thus, the supply chain efficiency as an internal standard of performance differs from the organizational efficiency as the activity system’s *boundaries* shifts. Activities are also a problematic unit of analysis as they are *interdependent* and changes influence dynamically several outcomes. And finally the meaning of efficiency is ambiguous as very high resource utilization is not necessarily perceived as efficiency.

Effectiveness

Organizational effectiveness is defined as an external standard “*of how well an organization is meeting the demands of the various groups and organizations that are concerned with its activities*” (p. 11 Pfeffer and Salancik 1978) which approximately is a construct “for doing the right things” or having validity of outcome (Hines et al. 2000). A conceptualization of effectiveness as use value is interesting to highlight that *how well* as well as *demands* in the above definition is vague. Håkansson and Prenkert (2004) seem to refer use value to evaluation of the network’s utilization of resources. In resource dependence perspective is effectiveness seen as an independent measure for evaluating organizations. Meeting demands of various evaluators means that conflicting as well as compatible demands are prevalent. Pfeffer and Salancik (2003) foresee conflict when one stakeholder’s demand constraints other stakeholder’s demand, which is the case for the supply chain actors. Conflict but also co-operation gives “*lesson’s learnt*” in one exchange process that is leveraged in other exchange processes. The evaluators we are concerned with are customers; customers seen in the producing/using activity system as well as in the networking activity system. Suppliers are effective if they deliver what is asked for, no matter if they are bound to fill their warehouses to manage, i.e. if they manage the task inefficiently. In supply chain management research is effectiveness equalized with supply chains’ flexibility and agility to customer demand. Ineffective supply chains are loosely integrated with poor management of existing interdependencies.

Effectiveness is by definition a qualitative measure set by evaluator. Möller and Törrönen (2003) argue that effectiveness “*refers to an actor’s ability to invent and produce solutions that provide more value to markets (customers) than existing offers*” (p. 112). This definition seems to equalize effectiveness to entrepreneurial activity as the ability to invent new solutions with added value is emphasized. In a supply chain context seems this definition to be counterproductive as it is based on an assumption that relationships are compared to competitors offers rather than evaluated in relation to customer’s and their customers’ demand. In practice is the evaluator, who is interdependent with the supplier, influenced by the relationship, by the supply chain and by the network. Effectiveness is created in a relationship in a process of attention to different interdependencies, i.e. the evaluator is influenced in its evaluation. We would propose that effectiveness, as a use value in a supply chain, is a combination of indirect benefits gained through the supplier and the supplier network (Walter et al. 2001). Ineffectiveness is an experienced misfit of resources in a resource pattern. This means that existing problems might be overlooked and that a relationship is evaluated as effective as long as there is potential of the exchange system to fulfill demands. It means also that effectiveness is goal oriented on a strategic level (Liljegren 1988). The effectiveness is a co-created measure that is changed due to an increase in demand or a strategic change rather than regularly in short-term intervals. In these occurrences buyers evaluate the fit between supplier capability and buyers’ need.

Efficiency and effectiveness – independent?

In the resource dependence theory organizational efficiency and effectiveness are seen as independent standards to evaluate an organization:

“Organizations can be both efficient and effective, neither efficient nor effective, effective but not efficient, or efficient but not effective” (p. 35 Pfeffer and Salancik 1978)

This independence is claimed out of organizations’ possession and utilization of resources. The ownership delimits what is a within system (efficiency) and what is the external to the system (effectiveness). The external measure evaluates the environmental fit of the organization. The underlying logic is based on a static situation. Håkansson and Prenkert (2004) argue that efficiency and effectiveness are based on two dynamic processes that have different logic and content. Efficiency is based on exchange value, and is dyadic, while effectiveness’ is contextually determined and based on network’s use value.

The supply chain is a quasi-organization of several organizations and of an activity system, partially with the same interdependencies and partially with overlapping interdependencies. We will come back to the eventual interrelatedness in the next section after an attempt to delineate efficiency and effectiveness as outcome of the supply chain as exchange system. Table 1 refers to this specific type of exchange system. The resources that deploy the exchange system are denoted as objects. The exchange unit is seen as an outcome. Based upon object and outcome are evaluated outcome assessed. The objects of interest are the bits and pieces of the material flow, i.e. the product; these are processed by another object, i.e. the production facility. The dyadic relationship is an object that control production facilities and indirect relationships are characterized by pooled and reciprocal interdependencies.

The exchange systems are closed on different levels with different content (table 1), to evaluate the supply chain’s outcome. Listed in the order of increased complexity the first closure involves the pure transaction, i.e. the first row. The efficiency is optimization of exchange of product vs. money. The effectiveness is the use value of the product evaluated by the customer, which is determined by the benefits the product generates either in actual usage or in further refinement. At this level efficiency and effectiveness are independent. Next closure is involving an aggregated exchange system; the production facility. The efficiency is multifaceted on this level as the exchange value is intra-organizational outcome

for the supply chain but inter-organizational to the actors. The production facility involves service providers, out-sourcing arrangements and other parties. The outcome is advantage of exchange system, own resources and capacity of adequate quality. The effectiveness is the use value of the production system evaluated by the customer. Effectiveness is accessed when deliveries is in line with what is agreed upon in contractual or verbal agreements. The user is taking advantage of the facilities' outcome with higher involvement than at the product level – integration of the production process and exploitation of serial interdependencies is exchanged and valued by the user. This implies that efficiency and effectiveness is interrelated at this level of analysis. The customer buys the capacity, which extends the organizational boundary of the exchange system to involve the customer.

Supply chain integration is often a case of dyadic and sequential integration (Fawcett and Magnan 2002). The closed activity system is linking the different production facilities but also the interfaces the actors have to other actors.

The outcome as exchange value is difficult to plan as what specific resources to deploy is unclear before and difficult to quantify – the exchange value includes the earlier discussed exchange systems outcome (product vs. money and capacity) and adds more general services and knowledge. The exchange value is coordination to other relationships i.e. leverage of resources. This coordination is sometimes seen as use value (Håkansson and Prencert 2004) but we argue that the leverage spring out as a value of the exchange, an exploitation of possibilities in the interface; the knowledge gained is used for advantage. Use value involves exploring these services and knowledge with existing ones and potential reciprocal changes to restructure exchange systems. Exchange value is taking serial, pooled as well as reciprocal interdependencies into account for the direct relationship.

Leverage of pooled and reciprocal interdependencies is outcome of indirect relationships. The output depends on knowledge of the other party, and adaptation of resources. The effectiveness is the adaptations made to enhance value for the customer. An effective relationship with lead users facilitates the efficient activity system enclosed in the dyadic relationship.

If any of the producer or user is a “lead-user” the outcome for the other actor is emphasized due to the reciprocal dependencies. This means that exchange value might amplitude effectiveness. The direct and indirect relationships have similar efficiency and effectiveness but the use value is extended as the system to explore is wider. How is this interrelatedness commensurable with the external vs. internal perspective of use value vs. exchange value? It seems to be difficult to separate an external to an internal perspective of outcome of the activity system. Even if efficiency and effectiveness are defined as independent of each other and divided by the organizational boundary, these boundaries are blurred by actual activities. External stakeholders become internal as a supply chain have actors that are suppliers and customers simultaneously. If the organization has discretion to initiate, maintain, or end activities then these activities are within the boundaries (Pfeffer and Salancik 1978).

Table 1 Efficiency and effectiveness of supply chain as exchange system

| Exchange system's object (resources) | Goal / Evaluated outcome Exchange value (efficiency) | Goal / Evaluated outcome Use value (effectiveness) | Exchange unit (outcome) |
|--------------------------------------|---|--|--|
| (Flow of) Product | Lowest costs; negotiated prices paid and the matched cost | Fit in product range and cash generated | Product / Money |
| Production facility | Co-ordination to other production facilities make an extended production system (i.e. ability to link and create a common system) | Ability to deliver goods in the right time and ability to solve problems | Capacity / knowledge beyond organizational possessed resources |
| Dyadic relationship | Co-ordination to other relationships (i.e. leverage of resources) and gain of having relationships with "lead users" with resulting cooperative strategies Exploit | Fit in relationship derived from a lead-user position Explore | General services and knowledge |
| Indirect relationships | Co-ordination to other relationships (i.e. leverage of resources) and gain of having relationships with "lead users" with resulting cooperative strategies Exploit | Fit in relationship derived from a lead-user position Explore | General services and knowledge |

Summing up, in a resource dependence perspective; as an extension of open systems theory; matters the situations of the organizations. In an introduction to the classic edition of Pfeffer and Salancik (1978) Jeffrey Pfeffer emphasized the interdependencies:

"...organizational strategy as focused not just on products and customers but also on suppliers and other entities in the environment...that ultimately affect the flow of resources to those organizations. In that sense *The External Control of Organizations* anticipated the growing interest in supply chains and value chain management" (p.xii Pfeffer and Salancik 2003)

The resource dependency theory's independence between efficiency and effectiveness seems to relate to the unit of analysis; the organization, and that the evaluation of the organization is done in a static situation. If activities are used as unit of analysis instead the distinction gets messy. The characteristics for a supply chain starts at the producing/using exchange system using resources (production facilities) that is not solely owned by one organization. This means that claimed independence of efficiency and effectiveness is false in a supply chain as the organization also is part of a quasi-organizational effects of the chain as well as effects of the network (Hertz 2005).

The resource dependence theoretical evaluation of efficiency and effectiveness as a dualism is a simple picture of the system based on clear-cut boundaries diverging inside/outside resources and potential important evaluators. Goals and strategies for a supply chain would probably have problems if they were based on this dualistic thinking. Processes of activities are complex and a clear-cut division of their outcome will probably not facilitate knowledge of their logic.

Efficiency and effectiveness – interrelated?

Efficiency and effectiveness as a duality are presupposing that the opposing elements are interrelated. The elements are still argued to be distinct but the efficiency / effectiveness relationship is not in opposition. The discussion above indicates that in social activity systems, as direct and indirect relationships, seem efficiency and effectiveness to enable each other. Liljegren (1988) propose in his fourth thesis that an interrelation between efficiency and effectiveness exists in a long-term relation that express a long-term and a short-term dependence between the actors. Liljegren studies a dyadic relation rather than serial relations but the underlying ambiguity from his case study is applicable; on the one hand the two organizations are striving for individual short-term efficiency and on the other hand they have a common long-term strive for co-operation. Criteria to evaluate the partner's effectiveness are stable and related to the relationship and connecting relationships. If the buyer changed strategic direction then was criteria for supplier effectiveness re-evaluated. This means that effectiveness is about adaptation in the relation. Liljegren further discuss mutuality in demands. The demands and criteria of effectiveness are expressed by the customer to take advantage of the buyer's own resources, which implies that demands for effectiveness are an attempt to increase customer efficiency. Liljegren's case illustrates however that the supplier have criteria of customer's effectiveness too and that effectiveness is negotiated. Effectiveness is negotiated in strategic relationships, i.e. to lead-users or to lead-producers. This is in line with Pfeffer and Salancik's (1978) description of how the organization influences its stakeholder's evaluation of effectiveness. Liljegren's line of arguments is built upon interdependency, in a relationship *as well* as in the network. This implies that adaptation (effectiveness) as well as conflict (ineffectiveness) is a result of demands from indirect relationships as well as direct relationships.

A supply chain's interdependencies create a case of suppliers and customers that are of strategic importance to each other. This means that effectiveness and efficiency are negotiated within the supply chain; sequentially from relationship to relationship. Liljegren (1988:393) state that effectiveness is related to goals and strategies and is measured in relation to these goals. Effectiveness goals are long-term direction for adaptation and a basis for the strategic direction. The evaluation of effectiveness is a follow-up of the exchange system compared to what is expected (p. 393 Liljegren 1988). Efficiency is about short-term coordination of resources and is related to effectiveness rather than to usage-rate of resources.

A scenario that illustrates an interrelatedness of efficiency and effectiveness follows. Figure 2 illustrates three supply chains; A, B, and C. These are related by one firm; a third tier supplier in supply chain A is a part in overlapping supply chains as well. We focus on supply chain A. A's exchange value, E1, describes its efficiency and its use value, U1, describes the evaluated effectiveness.

However the third tier supplier's efficiency in supply chain A, E4, is not its organizational efficiency with account to its part in supply chain A, B, and C. This firm's efficiency in supply chain A is negotiated based on supply chain A's efficiency, E1. Efficiency might be seen as an interpretation of effectiveness goals that guides the short-term coordination of resources. As such it is interrelated to effectiveness. In supply chain A the interrelationship is as follows: The end user evaluates the effectiveness of the supply chain and the selling firm interprets this evaluation and transmits it as demands toward its supplier. These demands are negotiated in the supply chain and goals of effectiveness as well as of efficiency are determined. Thus, If we return to our third tier supplier;

- its effectiveness, U3, is determined and evaluated by the firm and its customer;
- its efficiency, E4, is a measure of how it coordinates resources to fulfill effectiveness demands.

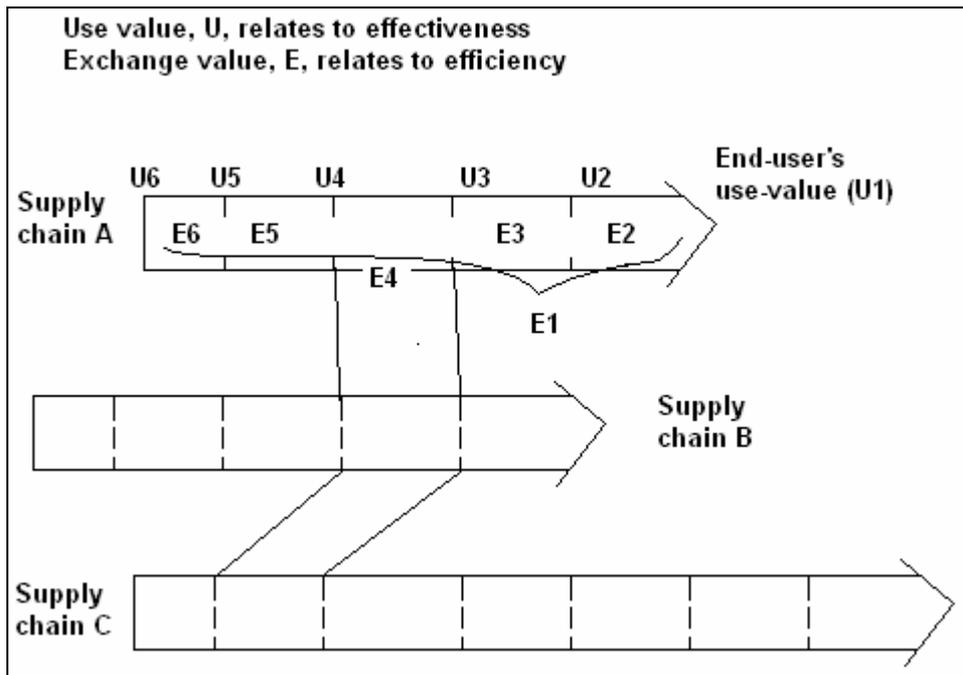


Figure 2 Use value and exchange value in a supply chain context

So, interdependencies in long-term relations illuminate an interrelationship between efficiency and effectiveness. The interdependencies imply that a supplier co-produce *and* co-evaluate the customer's effectiveness demands. The interdependencies change the meaning and the relation of efficiency and effectiveness due to flux boundary of the exchange system and due to the time dimension. Liljegren (1998) argues that the system's boundaries are related to feasibility of control; feasibility is not fixed and actors' view plays a role. This is in line with the idea that organizational control is rather based on networking than on ownership and that the organization is temporal rather than static in a supply chain context (Hoek 1998). Liljegren (1998) further argues that a time dimension would blur the independency of Pfeffer-and-Salancik definitions of effectiveness and efficiency. A supply chain consists of long-term relations where efficiency of the past is interpreted to demands of today; effectiveness. This means that efficiency and effectiveness in the supply chain is interrelated over time. It is a reciprocal interdependency as perception of efficiency is input to what effectiveness is and effectiveness becomes a negotiated strategic goal that influences efficiency goals.

This interrelationship is a dualism. The dualistic nature, i.e. with an interrelation, is logical as the two value creation processes use the same resources and is managed by common actors. The effectiveness seen as use value and efficiency seen as exchange value are two processes that delimit and amplify each other.

Beyond efficiency and effectiveness

Efficiency and effectiveness have to be assessed with regards to interdependence, time, and boundaries as goals to and evaluations of supply strategies.

The outcome of the value creation processes is correlated as sub-processes have interdependent activities. Use value determines present and future efficiency and exchange value influence choice of what present and future effectiveness is. This is in line with Håkansson and Prentert's (2004) suggestion that the embeddedness of one exchange process' closing will affect how the parties want to continue the exchange and influence future closings. When relationships are seen as complex and dynamic processes interdependence and time will make the activity system's outcome interrelated. Furthermore are organizations' boundaries blurred due to different types of collaborations, e.g. logistic partnerships (Håkansson et al. 2004), which is especially the case in supply chains. A closure that bounds

the firm to its own resources is too narrow in a supply chain context. Closures involving technical partnerships, logistic partnership, or outsourcing agreements illustrates that one firm have multiple organizational boundaries. New solutions are co-created (Håkansson and Waluszewski 2004) and so are the measurements of them. This perspective of co-created goals, and measurement is sustained by strategies that are emergent and deliberate (Håkansson et al. 2004; Mintzberg and Waters 1998) and a continuous combining and recombining of resources (Gadde et al. 2003).

Liljegren (1988) argued that effectiveness and efficiency is interrelated and we propose that the negotiated goals might be a starting point for any refined definition. Effectiveness is a co-created expression of goals while efficiency is an operationalization of effectiveness. In general do these express a strategic alignment of activity systems, and in particular express a fit or misfit between demands and their fulfillment.

Table 2 Efficiency and effectiveness as value creation processes

| | Activity outcome Efficiency | Activity outcome Effectiveness |
|-------------------------------|---|---|
| Value creation process | Exchange value based on serial, pooled and reciprocal interdependencies | Use value based on exchange value and reciprocal interdependencies |
| Focus | Exchange of resources | Utilization of resources |
| Activities | Buying/selling producing/using coordinating and networking | Fit between exchanged resources and existing resources, adaptation |
| Boundary | Process between two parties (the user and the coalition of producers) to best utilize counterpart's resources | Process between two parties (the user and the coalition of producers) to contextualize a given exchange's resources, i.e. capability to combine resources |
| Measures | Relation between input and output that should equalize a negotiated goal | Perceived capability to leverage service absolute and/or relation between input and output that should equalize a negotiated goal |

Table 2 summarizes the main implications by using efficiency and effectiveness in a supply chain context and its description forms a concluding discussion.

Concluding discussion

We started this paper with a purpose to describe and analyze efficiency and effectiveness based upon activity systems as is found in supply chains. The description is framed by a duality/dualism perspective.

Pfeffer and Salancik's definition of efficiency and effectiveness in 1978 have been effective for organizational studies. In quasi-organizations the boundary of what is internal vs. external is less distinct. The supply chain makes up a quasi-organization where interdependencies, time and shifting boundaries makes these definitions problematic. Efficiency has shifted from an internal measure used to find waste to a measure of goal fulfillment. The value creation process that is measured is the exchange process that consists of activities as buying/selling,

producing/using coordination and networking. The process is measured as a ratio. Maximum is a negotiated goal rather than system capacity.

The notion of what is external to the organization shift in case of a quasi-organization where customers are suppliers as well. Effectiveness' value creation process is to create and take advantage of use value. This is done through adaptive activities for fit between exchanged resources and existing resources. The effectiveness is bounded by a process between two parties (the user and the coalition of producers) to contextualize a given exchange's resource. This means that the outcome is dependent on reciprocal and pooled interdependencies and is a perceived capability to leverage service. This use value might be measured as a scale or as a ratio of negotiated demands.

Thus, effectiveness is ultimately an interpretation of indirect relationships: an exploration of that might be exploited within and among supply chains. This can be related to costs as well as innovation. Efficiency is the internalization of effectiveness. This interrelationship is important to emphasize the long-term effect of efficiency on effectiveness.

In summary; supply chain efficiency and effectiveness is interdependent standards to evaluate a quasi-organization:

Supply chains are both *efficient and effective* when the exchange value of the activity system fulfills expectations that make up the use value. The use value is accumulated demands from the network that is internalized in sequential relationships and negotiated as efficiency goals. Effectiveness and efficiency are correlated through strategic direction. This means that efficient supply chains are effective by definition, and vice versa.

Supply chains can be *neither efficient nor effective*. An example is a supply chain that focuses on economies of scale when innovation is needed, i.e. the common goals are a false notion of the market. Even though the supply chain takes advantage of scale economy the activity system is misused, this leads to very low exchange value and use value.

In reality might supply chains be effective but not efficient seen in specific actors' perspective. An example of this is suppliers that maximize exchange value to the chain with poor organizational efficiency (e.g. Corswant et al. 2004). These are dependent on that the chain share benefits in addition to risks so they get compensated.

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