

Challenges in IT supply chain management

Sebastian Dudek

University of St. Gallen
sebastian.dudek@unisg.ch

Falk Uebernickel

University of St. Gallen
falk.uebernickel@unisg.ch

Walter Brenner

University of St. Gallen
walter.brenner@unisg.ch

ABSTRACT (REQUIRED)

Multiple players are involved in the process of service provision in today's IT industry. IT service is mostly a combination of process output of different IT service providers. A single IT department is still unable to produce and deliver the entirety of the desired IT service without the risk of inefficiency. Additionally, the emerging trend of IT outsourcing over the past years accelerates the separation of service provision. Therefore it could be useful to examine the entire IT service chain to avoid failures and to save time due to lacks of information or not standardized communication processes. As a possibility to face these problems, traditional industry branches developed and introduced a new management task called supply chain management. With this in mind the following paper focuses on challenges in IT supply chain management to improve communication processes between separate IT service providers of the IT industry.

Keywords (Required)

IT service, IT service chain, outsourcing, supply chain management, IT supply chain

INTRODUCTION

In evaluating the IT industry over the past years it could be observed that an increasing amount of IT service providers are concentrating on the core of their business to become more efficient and to improve the quality of their offering. Hence vertical integration of each entity in the value chain is on the downward trend, but the value chain as a whole is becoming more complex. Many newly-established intercompany relationships led to the need for enhanced communication during all processes from IT service design to IT service delivery. At the end of this value chain a service integrator combines all preliminary services into one value-creating service for the customer.

The evolving network of IT service providers could only be successful if all parts are connected efficiently (Forrester 1958). To this end it is useful to establish an inter-company management structure that focuses on the "integration and management of supply chain organizations and activities through cooperative organizational relationships, effective business processes, and high levels of information sharing to create high-performing value systems that provide member organizations a sustainable competitive advantage" (Handfield et al. 2002), or in simplified terms so called supply chain management.

STATE OF THE ART OF IT SUPPLY CHAIN MANAGEMENT

First of all it is necessary to clarify the term "supply chain management" in general.

Two streams of authorship in supply chain studies lead the field of research. While one group defines supply chain management as a firm-wide undertaking and of the highest level of logistics development, the other sees continuous, coordinated tasks and activities in supply chain management. Due to the fact that a pure, physical-logical consideration, for example that of (Bowersox et al. 1987; Engelbrecht 2003) is being spearheaded to transfer to IT supply chain management, the definition of this paper orients itself to the definition of authors like (Handfield et al. 2002; LaLonde et al. 1994).

Authors such as (Stölzle et al. 2005) are indeed representatives of the perception of supply chain management as the highest level of logistics development, however they acknowledge that along with original logistics tasks, continuing processes must be included in supply chain management. Consequently this particular contribution of supply chain management will be defined as „integration and management of supply chain organizations and activities through cooperative organizational relationships, effective business processes, and high levels of information sharing to create high-performing value systems that provide member organizations a sustainable competitive advantage“ (Handfield et al. 2002). Taken also into

consideration (Westhaus 2007) the understanding of the supply chain concept is being expanded further to a concept as a value network because it is increasingly understood that a purely sequential supply chain exists rarely in reality. Closely following (Wildemann 2001) a central driver of supply chain management is the cutback of information asymmetries in consideration of organizational and informal aspects. This suggests that the concept of efficient value-added management orients itself toward the analysis of total value-chain.

This paper spans a field with industrialized information management on one side and supply chain management on the other side. The second basis of the contribution is industrialized information management (Zarnekow et al. 2005). After this model, the IT industry is presently transitioning itself from a typical “Plan-Build-Run” paradigm to a “Source-Make-Deliver” approach. This suggests that on one hand the customer-service relationship is receding to a middle-area of priority while on the other hand the integrated service portfolio—rather than pure project development—draws greater focus. This model is essential for the existing contribution, as only the change of prioritization enables the building of an efficient IT supply chain and the acknowledgement that also in the IT industry there must be standardized processes between IT service providers. This follows the origin of this model, the SCOR model, which states that every entity in the supply chain has its supply, make and deliver processes. It is necessary for efficient supply chain management to integrate the source and deliver (perhaps also return processes) of following entities in the supply chain.

Built on these two pillars, this present contribution addresses the treatment of integrated value chains in the IT industry over all levels of value-added and disengages itself from one of the isolated perceptions of functions within IT service providers. This should prepare the foundation to eliminate information asymmetries in applying concepts of IT supply chain management to the IT industry. The terminologies IT supply chain, IT service chain and IT value chain are used equivalently in this paper.

RESEARCH METHODOLOGY

There are two main areas of research that are addressed by this article: on the one hand the model of the IT supply chain (see Figure 1) should be evaluated and on the other hand challenges in the context of IT supply chain management should be developed. The findings of this present contribution were gained at a workshop carried out in October 2008 titled, “IT Supply Chain Management.” This research methodology follows the approach of focus groups (Krueger et al. 2000), a procedure which enables information-gathering in the relatively unstructured and unresearched area of supply chain management in the IT industry. Participants of this workshop were high-ranked leaders from diverse IT service providers. An overview of the participants and the corresponding companies is shown in Table 1. Hardware or software vendors of Tier-5 weren’t present at the workshop. Prior to the workshop, the reference model of an IT supply chain (see Figure 1) was derived, which then served as the basis for indentifying challenges for each firm.

Information about Participant and industrial sector	Number of employees	Business value	Position in the IT Supply Chain of the participating IT department ¹
Representative of an IT Service Provider of a large telecommunication company ²	▪ 2.600 (IT Service Provider) ▪ 20.000 (whole company)	▪ 760 Million US-Dollar (IT Service Provider) ▪ 9.3 Billion US-Dollar (whole company)	Tier-4
CIO representative of one of the large automobile importer in Switzerland	4700 (whole company)	3.6 Billion US-Dollar (whole company)	Tier-2
CIO representative of a global market leader for customized plant, systems and services for the pulp and paper, hydropower, steel and other specialized	13.200 (whole company)	3.15 Billion US-Dollar	Tier-2

¹ See Figure 1 for further information and explanation

² This company was used as an example for this contribution (see Figure 2)

industries (solid/liquid separation, feed and biofuel)			
Representative of a leading provider of IT consulting, IT solutions, and IT services in Central and Eastern Europe, in the Germany-Austria-Switzerland region and in China and Japan.	3.200 (whole company)	650 Million US-Dollar	Tier-4, Tier-5
CIO representative of a worldwide leading supplier of pneumatic and electrical automation technology	12.000 (whole company)	1.9 Billion US-Dollar	Tier-3

Table 1: Overview of participating units (companies)³

IT SUPPLY CHAIN MODEL

Deriving a model of IT supply chain

In its development, the following supply chain (see Figure 1) in the IT industry relied on the Supply Chain Operations Reference-Model (SCOR-Modell) of the Supply Chain Councils (o.V. 2008). In the complete model internal and external departments are differentiated, while within the firms the business side and the IT-side of the enterprise are further differentiated. The business unit normally describes the user of IT services. This could be units responsible for controlling or vendor management where IT services are supporting main tasks but also production units where IT services are primary supporting secondary tasks. Units of requirements engineering are mainly located on Tier-1. Here are typically found CIO units that haven't own IT service production and focus on communication tasks to enhance the business/IT-alignment. Internal, non-independent IT departments must be assigned to Tier-2. They are characterized by own IT service production (in contrast to Tier-1) that could be application development or more hardware –oriented issues like running oracle servers. Tier-3 also describes internal IT units that are independent corporations and balanced by their own but the concern still stay owner of this sub-company. This often occurs when companies decided to concentrate on their main tasks and want their IT department to provide their services on the market, too. Tier-4 and Tier-5 focus on IT service providers that are external to the origin company. The difference between Tier-4 and Tier-5 is that units on Tier-4 mainly offer managed services (e.g. “ready-to-use” databases) while companies on Tier-5 only sell hardware, software or people (e.g. hardware vendors).

³ No data available for internal IT units; only available if IT unit is an independent company

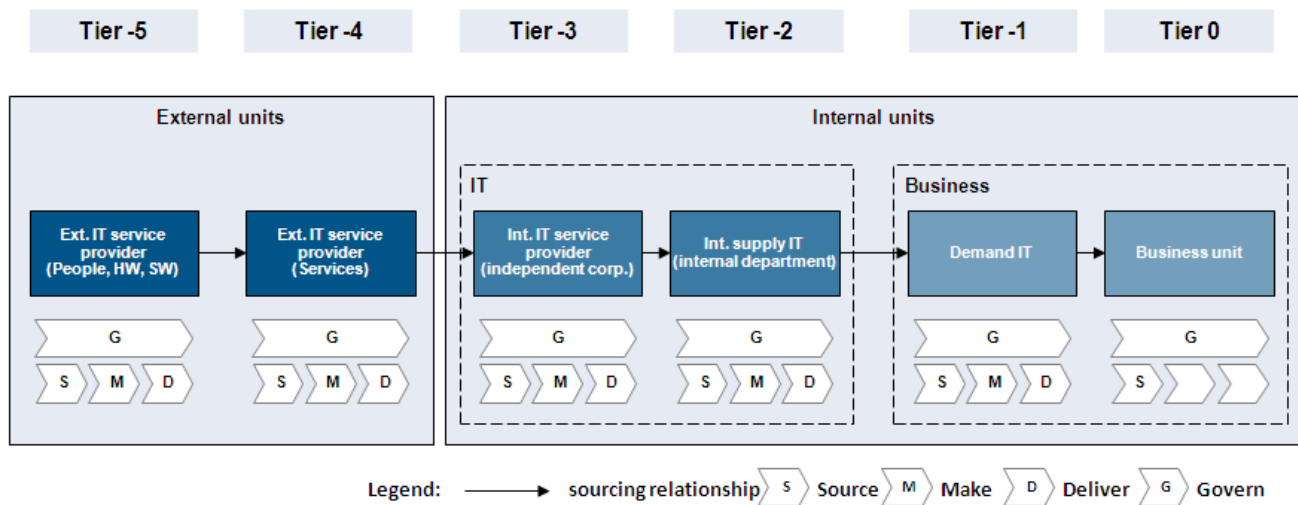


Figure 1: Model of an IT supply chain

Concerning to (Mentzer et al. 2001), more levels of complexity in this model can be considered; it is worth noting that not all levels in an individual context must take shape. (Mentzer et al. 2001) differentiate between the direct, the expanded, and the ultimate supply chain. The direct supply chain is comprised of three entities, which stand in direct relation to one another. With the suggested IT supply chain, an example would be a carving out of an “internal IT supply department”, “demand IT”, and “business unit.” (Mentzer et al. 2001) define the “expanded supply chain” as five entities. One particular analytical framework in the IT-supply chain would be, for example, as “external IT-service provider,” an “internal IT-service-provider”, an “internal supply IT”, a “demand IT,” and a “business unit.” As in this example, an expanded supply chain concept breaks down the firm’s internal consideration and in this case would in its latest phase consider outsourcing issues. The ultimate supply chain encompasses all entities which are stakeholders in the IT service provision process, including the end-user. The total complexity couldn’t be considered, as the business unit could be the principle end-users for the IT service-provider, however further value-added levels follow until the final and ultimate end-user is reached. In the analysis, the last level of development of categorization according to (Mentzer et al. 2001) will not be completely considered.

Example of an IT Supply Chain

The following example describes a supply chain of a workshop participant. The supply chain belongs to an internal, yet legally-independent IT service provider.

Concerning the IT supply chain (see Figure 2) the company would be a vendor of the Tier-3 delivery level. It sources hardware and software from the corresponding Tier-5 delivery to produce its product portfolio. In addition, it sources network products from a provider of communication-infrastructure. By contrast to the hardware and software service, the IT-service provider receives a ready-for-use product within the network service. In this case, the Tier 4 supplier takes over the collective tasks, which is necessary for the provision of network services. On Tier-4, an external service-provider exists next to a communication-infrastructure provider. It is noteworthy here, that two different or the same firms which like on Tier-5 (e.g. IBM and Oracle) can offer corresponding services.

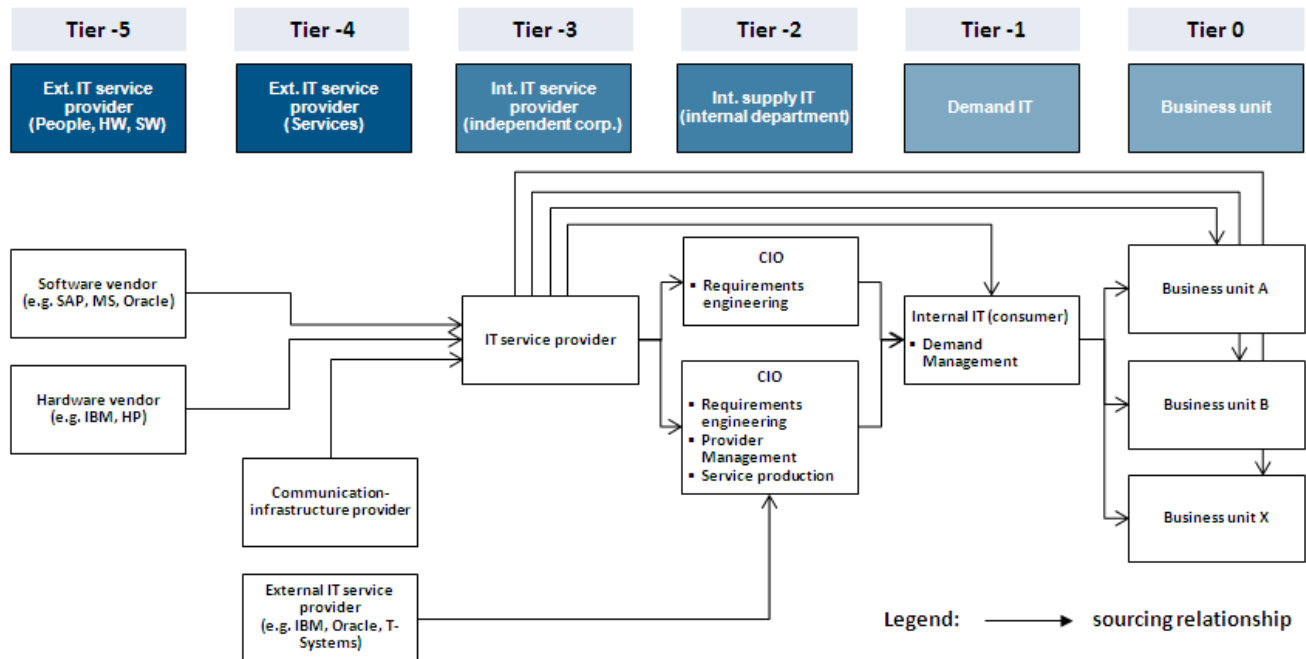


Figure 2: Example of an IT supply chain

The exemplary IT service-provider on Tier-3 has as its direct consumers on all following tiers. In this example, the clients on Tier-2 are two types of CIO units. The separation of the two types results from the organizational structure of the firm, in which the IT service provider is embedded. It is an issue of more CIO units of different business areas, which were however simplified. The main duties of the CIO unit on the top are only requirements engineering. The unit obtains requirements by the business units, consolidates them and delivers them to the IT-service provider. By contrast, the unit illustrated underneath could also add services that sourced from the IT-service provider on Tier-3 or add service by their own (service production), e.g. application development. The IT service provider also offers its products directly to the concern's internal demand IT and to the business units. This also implies challenges which are discussed later ("Organizational Challenges at the process of service description", "Organizational Challenges with collective performance assurance").

This example was chosen to illustrate three main aspects: first of all the model of the IT supply chain can help to structure sourcing relationships between different IT (internal and external) units. The model allows drawing "real-world" scenarios. Second, in contrast to the original idea that CIO units have to be assigned to Tier-1 it is possible to illustrate other relationship structures in the IT value chain. Third, the model could be enhanced to structure whole IT value networks (multi-sourcing).

CHALLENGES OF IT SUPPLY CHAIN MANAGEMENT

Joint Planning

As a consequence of information asymmetries between the participants of the supply chain, the suppliers are not placed to promptly react to client wishes. As a main problem in this relationship, it was identified, that the planned projects were not communicated early enough, and therefore the delivered quality could be evaluated negatively by the clients.

A similar effect, described in (Forrester 1958; Lee et al. 2004), is called the "Bullwhip-Effect". In this instance, the supply chain swings between overproduction and underproduction because of information asymmetries. The "Bull-Whip" effect emerges in the real assets industry due to exclusive control within the supply chain by order size.

A transfer of this phenomenon into the IT industry leads equally to two extreme results: either one or more suppliers build unnecessary capacity or one or more suppliers are not able to deliver desired service because of insufficient capacity. Both cases lead to undesirable consequences. The development of unnecessary resources leads to inefficiency within the entire supply chain, which in turn leads ultimately to higher prices. On the other hand, with unavailable capacity, the service provider cannot deliver the service, which damages its reputation in the eyes of the client. This phenomenon occurs when the

IT-supply chain is controlled solely on the basis of orders and no knowledge of future projects or future system shut-downs are communicated.

Standardization

The standardization of IT services requires an optimized trade-off between custom-tailoring and cost efficiency. On one hand the client would like to obtain an individual product, which meets its exact challenges; on the other hand, the IT-service provider would like to implement standardized processes in order to increase scalability and maximize experience curve effects. IT service-providers have normally standardized service portfolios, which absolutely cannot or only partially fulfill the needs of the client. This leads eventually to the result that only a part of the standardized services of the IT-service providers are being reused, many disparate and individual client solutions are the result.

The aforementioned area of conflict refers at first glance uniquely to those relationships at Tier 0 where the business division participates as the end-user. When fit to individual specifications, these problems can also occur at earlier stages of the supply chain.

Bargaining Power of Suppliers—"Vertical"⁴ integration of suppliers

The analysis of the supplier's challenges led to the following result: among the Tier-5 suppliers, the concentration of only a few firms occurred. As already mentioned in the chapter about the IT supply chain model, mostly hardware and software suppliers are on this level. This concentration of power has a negative effect on the later stages in two respects. Due to the consumers' weak bargaining power, they are exposed to randomness of its suppliers and have little influence, for example, on price determination. The second and perhaps the more important point is that in later stages they have little opportunity to influence the supplier processes, which could possibly lead to sub-optimal processing.

Along with that there is a danger of supplier firms following a strategy of forward integration. This would mean, for example, that software and hardware firms suddenly also compete at the same value-chain stage. On one hand this threatens the existence of the company – and accordingly, the firm's own IT unit, and would on the other hand lead to further complexity in the coordinative process between companies at the same value-chain stage. This dynamic is discussed below.

Organizational Challenges at the process of service description

Many communication problems between provider and consumer of IT-services emerge as a result of insufficient structural and process organization. According to the participants of the workshop, organizational units are missing on both sides which would possess the necessary competence to bundle the demands of each. On the supplier's side it is of utmost importance to establish corresponding account management with respective rights and duties in order not to force the consumer to communicate with each service provider. Many consumers of IT services (business unit or earlier stages of the supply chain) are also interacting with suppliers that don't belong to the previous supply stage. The reasons for that are many, however are mostly related to a non-existence but, required flexibility.

On the other hand the participants of the workshop complained about the missing demand IT in the following stage of the supply chain – there was often an absence of consolidation among the requirements of the business. This deficiency not only leads to problems in coordination between supplier and consumer but also undermine the possibility to build up experience in consolidating requirements. It is therefore necessary to consolidate the requirements and plan therein the opportunity to assure the efficient production of IT services. Standardization would also slow down as a consequence of these two organizational weaknesses.

Value Proposition / Value of IT

An often mentioned problem is the determination of the IT value-proposition. Most firms struggle with the fact that, at the customer interface, negotiations revolve around price, but not performance. The present "IT-as-commodity" discussion exacerbates the problem (Carr 2003). Due to this fact the IT service provider face consequences like cost cutting without having in mind that IT could also be an enabler of business innovation.

⁴ The concept "vertical" refers to the top-down approach of the supply chain. In this contribution the version of an horizontal-forward integration would be the correct terminology, however, in the concept of the integration of successive value-chain stages, the "vertical" concept is established and therefore preferred.

Organizational Challenges with collective performance assurance

If IT-service providers incorporate inputs from globally-operating firms, new challenges arise along with the aforementioned disparity in bargaining power based on probable differences in company-size. Many globally-operating firms are regionally-positioned in order to service local market specifications. Consequently, however, there is a further problem in that the contact partner is often not identified on a regular basis. Through that unnecessary complexity increases in the sourcing process. Additionally the regional delivery desperation of the delivering firm leads to the fact that the services must be sourced in that region where they are consumed. The example of licensing shows that through this problem advantages in quantity can be lost. It should further be noted that regional suppliers can only partially meet demands.

Further coordination problems result from complex organizational and communication structures. In the collective service delivery phase, the processes are only coordinated to a very limited extent. For the first consequences, there is a slowdown in coordination, which results in a decrease of service provisioning. The consumer perceives this ultimately as inflexibility and delayed performance.

Along with those aforementioned issues there is an absence of a suitable coordination mechanism at those same value chain levels. Pre-arranged coordination mechanisms among those two competitors will have to establish in order to render a collective service. Inter-firm competition could result in strengthening of local market position but ultimately leading to weakened customer satisfaction.

Customer rights-scalability of IT-service providers

The design of IT services is oriented to the size of demanding business unit. This results however in the problem that IT-service providers conceive services for large divisions, which nevertheless for purposes of highest possible frequency of re-application, are offered for small business areas: However, paradoxically these services are unrentable for those small business units.

Performance control and quality of the suppliers

Although in many firms actual service-level agreement descriptions are available and have undergone several layers of refinement, control and monitoring of those agreements are in noticeably short supply. Lack of monitoring and control within the supply chain leads to an inability to uncover weaknesses in the actual service delivery. A consequence at the very least is insufficient quality and lack of professionalism among the suppliers.

SUMMARY AND FURTHER RESEARCH

This contribution presented challenges in IT supply chain management in the context of emerging industrialization of IT management. It was first developed a model of an IT supply chain, which in turn served as the foundation at a workshop of experts collaborating to identify challenges in the IT supply chain.

The model was evaluated by the experts and it was possible to structure different IT supply chains using this model. One example was shown in this paper to illustrate how the model could be used. It can be stated that the model was the foundation to discuss arising challenges in the context of IT supply chain management.

The model illustrates only a part of the whole IT service value network and could be enhanced to a become reference model spanning the entire spectrum of possible sourcing relationships. In addition, it may be possible to define better coordination mechanisms for the separate participants in the service provision process. Researchers could focus on further validating concepts like efficient consumer response (ECR), collaborative planning, forecasting and replenishment (CPFR) to make available for adoption by supply chains in the IT industry. Finally, mechanisms for optimal vertical integration of IT service providers and CIO units could be developed in order to guarantee efficient IT service production.

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