TIMING-CONFIGURATION OF VALUE NETWORK FLOWS

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Competitive Paper

ABSRACT

Purpose

Although intuitively clear, implementing the principle of postponement is challenging in business practice since it involves configuring a complete supply chain thereby hindering business implementation. An alternative approach to timing product supplies from a single firm perspectiveembedded in value network context is proposed based on more recent studies on the principles of postponement and speculation. This approach highlights product supply timing from an individual firm's decision-making embedded in a value network context as well as wider environment. This approach was developed by integrating primarily Alderson's (1950) original view of postponement with his later transvection (Alderson 1965) approach to marketing channels. The transvectionhighlights value network *flows*; product transformation supported by adapted information in relation to sequentially organized intermittent decision-making events. In addition flows of people and monetary flows are modeled. The purpose of this study is to model the configuration of timing in value networks based on individual flowsconfiguration and interaction between these different flows.

Research method

This is a conceptual paper providing literature discussion as basis for modeling the value network as a configuration of interacting flows, the context of strategic and operational timing of product supply, as foundation for further inquiry.

Research findings

This study primarily proposes a new model demonstrating supply timing for a specific product identified from the perspective of the end-user as interaction between different value network flows. The characteristics of these flows and their interaction are discussed developing a complex view of multiple flows supporting value creation in the value network involving a range of flows involved in different business functions.

Main contribution

The model provides contribution to value network practitioners' discourse and a stepping stone in modeling of value networks. This study is intertwined with developing value network integration, here viewed as an incremental inter-organizational learning process and not a strategic initiative.

Keywords

Value chain management, Value networks, Postponement, Transformations, Timing flows.

BACKGROUND AND PURPOSE

The purpose of this study is to model the configuration of timing in value networks. Alderson introduced the principle of product supply postponement in 1950 as an approach to mitigating operational risk balanced with providing increased customer value from a marketing channels perspective. Postponement involves delaying product supply until receiving orders. In 1965 Bucklin, based on the original theory of postponement, widened this original approach to also encompass the principle of speculation involving production for inventory and thereby sales from stock. Since thattime the principles of postponement and speculation, as strategies for complete supply chain configuration, were left relatively unnoticed until Pagh and Cooper (1998) provided a new set of models, based on decoupling theory (Christopher and Towill 2000), modeling variations in the postponement principle based on time, place and form features of products. Although intuitively clear, this approach is challenging in business practice. It involves configuring a complete supply chain. A complete supply chain is a conglomerate of different interfacing and potentially interacting businesses. Due to both the inherent complexity of industrial networks including mismatching actor interests often exposed through power struggle, the complete supply chain context represents accordingly an obstacle for applying the principle of postponement in accordance with the model proposed by Pagh and Cooper (1998). However, many businesses have applied the principle of postponement involving inter-organizational cooperation in parts of a supply chain (van Hoek, 2001). These applications have often involved developing integration between partners, taking into consideration the organizational context for using this principle (Bowersox and Morash, 1989).This involves development of network atmosphere measured in relation to 1) power and dependence, 2) conflict and cooperation, and 3) trust and commitment (Gadde et al. 2011, p. 114-120).

Through a preceding study,Jafari and Engelseth (forthcoming) direct attention to the role of these principles in relation to decision-making at a firm level rather than attempting to model the principles of postponement and speculation along the line of research developed by Pagh and Cooper (1998). This approach, taking into consideration more recent studies on the principles of postponement and speculation, (Morehouse and Bowersox 1995, Anderson et al. 1997, Van Mieghem and Dada, 1999, Brown et al. 2000, Van Hoek 2001, Yang et al. 2004a/2004b/2005, Appelqvist and Gubi 2005, Boone et al. 2007, Goodrich, 2007, Rahimnia and Moghadasian 2010) highlight product supply timing from an individual firm's decision-making embedded in a value network context as well as wider environment. This view is in accordance with Christopher's definition of supply chain management (SCM) as: "The

management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole". Within the field of business logistics, Heskett et al. (1973, p. 26-29) had then previously modeled a similar management perspective in regards to logistics. Heskett et al. (1973, p.26-29) term "physical supply" as the management of inbound product flows, while "physical distribution" represents management of outbound product flows. These lines of perspective regarding logistics management of product flows product involving SCM are regarded from the perspective of the individual firm as opposed to the inter-organizational chain or network level. The unit of analysis in SCM studies may be found at either the firm or network level depending on which SCM definition is applied tom guide research(see also Soni and Kodali, 2011).

Through applying Christopher's SCM definition, managing business relationships is alternatively perceived from the viewpoint of the single firm implying that business relationships are regarded as context and not the phenomenon to be directly managed. In line with Heskett et al. (1973, p. 58), the manageable aspects of logistics are two-fold and found along two dimensional lines: 1) movement control and 2) demand-supply coordination in relation to a) product and b) information flows. Flows are designed and managed to reach SCM objectives. Although impacted by interactions with other companies,business logistics remains predominately in this view an intra-business function concerning, of course, using inter-business relationship shared resources to manage supply processes. While SCM is inherently occupied with development at a network level (e.g. Lambert et al. 1998), how to achieve integration is approached, when applying Christopher's (2011) SCM definition, from a firm as unit of analysis. In this study we apply in a similar fashion the firm as the unit of analysis to regards the role of flows in relation to the principle of postponement; a principle that involves network configuration. We discern accordingly between manageable processes and the more complex network structure that is impacted by process development representing an approach to SCM.

THE POSTPONEMENT PRINCIPLE, SUPPLY TIMING AND VALUE NETWORKS

The principle of postponement was originally developed by Alderson's (1950). In our preceding study (Jafari and Engelseth, forthcoming) this principle is assimilated with later writings by the same author on marketing channels configuration taking focusing on the interdependence between transactions (marketing) and transvections (logistics). The transvection model (Alderson 1965) represents taking into account the interrelationship between product sales/purchase interrelated with physical distribution from an end-to-end supply perspective. The transvection involves applying a set of vital presuppositions as basis for modelling timing product supply. These include purpose associated with end-user satisfaction regarding product time, place and form characteristics; we term as "value realization". From a supply perspective value provision is supported through value network flows. It is predominately the flow of products (or goods) that through sequential transformations directed by intermittent decision-making events (sorts) creates value. Based on the transvection model of marketing channels we take the perspective from individual sorts to identify realms of product supply that may be taken into consideration or at least, impact on product supply at any location in the complete supply-oriented chain or network. The model depicted in this paper proposes *timing* of supply as mixing of different factors in context to provide customer value. These factors include transport, product storage, manufacturing, information, component storage, price, retailing, payment, purchase, product design, packaging, labelling, and assembly as shown in figure 1 below:

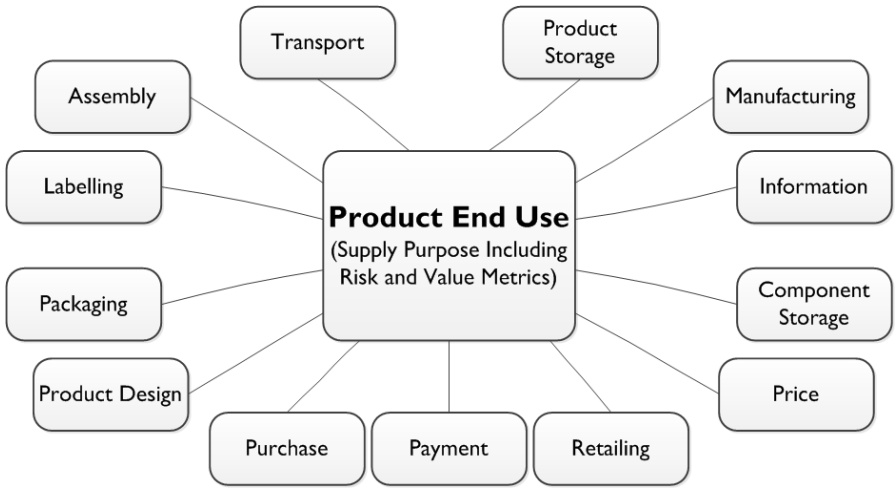

Figure 1. Aspects of process timing in supply.

These aspects represent different and distinguishable value network processes that may be timed in different ways. We continue by modelling how configuring the timing of these factors in relation to each other involves taking into the context of operational-level decision making as shown in figure 2:

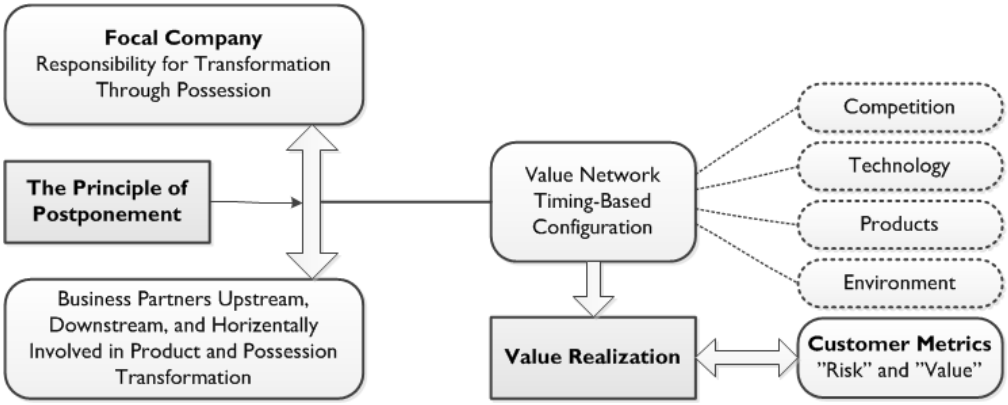

Figure 2: Timing supply configuration ina value network context.

Primarilythis model depicts how decisions regarding supply process timing involve using the business relationship with the supplier as the core realm for communication. Timing we view as a dyadic mixing of different timing concepts in relation to processes (Abbot 2005). More specifically, “logistics flows” involve a “kairotic” (derived from the Greek god Kairos) sequential ordering of heterogeneous value creating events related to combinations of product, service or information transformation, while chronological time (derived from the Greek god Chronos) represents metrics-related aspect of time (Hedaa and Tornroos 2002). Here we focus on the kairotic aspect of time (“flows”) and use chronological time to enable measurement of timing flows.

Supply purpose is defined as value realization, a metric measured as perceptions from a customer perspective influenced by timing flows. Value realization is the accomplishment of “customer value”; perceived benefits of an offering balanced with total costs of ownership (Christopher 2011), a construct related to, but different from “customer satisfaction” (Eggert and Ulaga 2002). Risk indicates perceptions of value prior to receiving the product (Christopher 2011). This customer perspectiveof both “risk” and “value” is modelled as impacted by competition, technology, products and environment. The environment is

understood as consisting more specifically of both the social as well as natural environment. These altogether represent environmental factors.

Alderson (1965) saw a necessity to model complementing detailed understanding of marketing-oriented transactions with the more logistics-oriented supply side; what he coined as “transvections”. The tranvection model is at core logistical and depicts marketing channels as predominately technical entities where intermittent decision making (sorts) guide product transformation in an end-to-end end-user value-oriented supply context. From a perspective, Alderson’s (1965) marketing channels theory evolved into a dyadic entity, consisting of modelling transactions interacting with transvections; detailed understanding of customer value through marketing becomes interlinked with detailed logistics technology. Alderson (1965) widely uses in his writings the flows metaphor to describe the logic of value creation leading to value realization focusing on the flow of goods supported by a flow of information. Heskett et al. (1973) proposed a more detailed understanding of business logistics as concerning aset of four business flows, “materials”, “information”, “people” and “monetary”,complemented by “management”, to describe resource transformation in a functional context. This paper probes into the context of timing product supply understood as a flows structure, how different flows represent variations in inter-linkage with different business functions, functions that may also be regarded as crossing firm boundaries when taking a flows view. We proceed to develop the notion of timing configuration by further modelling the embeddeness of models provided in figure 1 and 2 in a value network context. This we seek to achieve through modelling how timing can be considered within individual value network flows as well as considering how different timing solutions in individual flows interact. This involves modellingprocesses and process interaction within the complete value network as context for the chosen unit of analysis; the value network flows. Modelling is in this picture aimed at providing both theoretical understanding as to how in practice to implement principles of speculation and postponement as well as provide guidance to empirical investigation. As previously stated, this approach to studying complete value networks involves the firm as the unit of analysis meaning that the value network is context. This firm is regarded as the unit managing divergent interacting flows impacted from the micro level by flow configuration and from the macro level by network configuration.

VALUE NETWORK FLOWS

A core feature of logistics theory is represented by flow constructs (Arlbjørn and Halldorsson 2002). Flows are metaphors applied to illustrate transformations embedded in functionally-driven processes. These value network flows are complementary illustrating transformations in an end-to-end value chain. Flows are arenas for transformations, hence the use of the flows metaphor. Question arises as to whether these flows may be organized as a hierarchy or in some way are interdependent revealing priorities between the flows. All flows are directly or indirectly associated with the predominately technical purpose of product transformation(see Priem et al., 1997). The core flow in *logistics* involves what may alternatively be termed as related to “products”, “goods” or “materials” transformation. Relative importance of the flows is regarded as dependent on the functional approach. Taking a business logistics or SCM stance to supply, products and services emerge as playing a corerole in the value chain since materials may be regarded as purely technical entities, while customer offerings constitute complex combinations of products and services interlinking sales transactions with logistical transvections.

According to Alderson (1957: 69), "...progressive differentiations of products and service is key to defining values created by marketing". Alderson (1950) states in relation to postponing product supply that "All these changes in form, identity, and location of the product are bracketed by the economist under the term 'product differentiation'". In this statement *timing* represents the core factor in this construct. Timing is therefore not attempted modelledmentally through this statement. Product flow timing is therefore alsosubject to analysis in relation to other factors in this construct. Thestatement, coupling "identity" to transformation,also reveals the fundamentally interlinked nature of logistics and marketing in product transformation. Identity is a perception of the product/service outcome from the interrelated value network flows.Value realization is measured, as previously discussed, as an aspect of customer value, an equation of perceptions of customer benefits in relation to the total cost of ownership (Christopher 2011). Product and service identity is interlinked with value perceptions. Transformations impact also on product as service positioning on the marketplace indicating the role of the value network in relation to competition. This indicates that product value perception is embedded in a more complex *product and service identity* construct where competing offerings are compared with each other as well as with meanings derived from a wider social and natural environment. Based on this discussion value network flows are modelled in value network context in the figure on the following page:

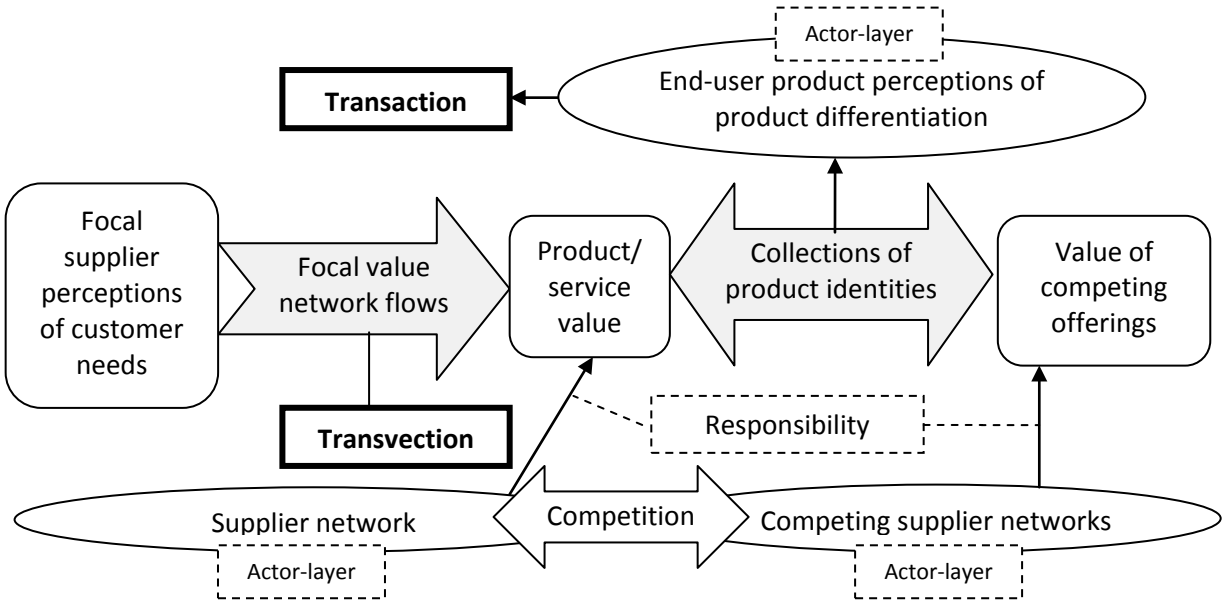

Fig. 3 Value network flows and the embedded core function of product identity in a competitive context from a focal value network perspective indicting the complexity in interrelating transactions with transvections.

Through focusing on the identity factor in relation to the transformation construct, figure 3 evokes value creation as embedded in a competitive context. Value networks, as an area consisting of actorsinterconnected through businessrelationshipscarrying out transvections and transactions, are not autonomous phenomena. The value network is embedded in its environment. Furthermore, given the value network's intrinsic system qualities based on its core customer value orientation, boundaries may be roughly drawn from a strategic perspective against networks of competitors. Transactions are dependent on end-user perceptions of product value in relation to different offerings; a core postulate in the "value network". This value concept represents collections of product/service identities providing

foundation for customer decision-making leading to the transaction. The transaction and transvection are accordingly modelled in figure three as interrelated in through a complex set of processes and value perceptions. Alderson (e.g. 1950, 1957, 1965) developed his theories of marketing channels in a time when the field of marketing encompassed much of what we today would regard as business logistics and SCM (Gripsrud et al. 2006). The product value chain (or physical distribution) involves what Thompson in 1967 described as a long-linked form of technology characterised by predominately sequential dependencies. Product transformation are proposed modelled based on Alderson's (1965) transvection view of marketing channels as stepwise transformations regarding product time, place, form and possession characteristics (Bucklin 1966:7). Seeking efficiencies in these transformations is the domain of logistics and SCM. However, acquiring cost efficiencies in product transforming operations through technical processes is meaningless if they do not generate sales. Developing supply efficiencies must therefore balance with customer needs. However, in a multi-tiered supply setting, the role as "customer" is also held by intermediaries holding dual roles as both purchaser and seller. In line with Alderson's transvection view, customer perceptions may be accounted for at multiple stages through a value chain. In this multiplex picture of product transformation through flows, value is most importantlymeasured from an end-user perspective. This is the picture adopted by Alderson's (1965) transvection model; linking product transformation with customer perceptions of product utility from based on product placement in the hands of the end-user.

In services the flow of offerings is harder to model since there is no core identifiable product in service supplies. Labelling the flow as centred on transformations of materials, goods or products is essentially a question of perspective. "Materials" bring predominately technical aspects in mind;"goods"are predominately logistical, while "products" are focal to transactions. Materials, goods, or products have basically the same connotation with nuances of differences dependent on the context. An offering constitutes also of services, in some cases the service is the main value creating element with products supporting the service offering. Through applying the "value network" as context for interaction between product transforming flows in a firm, our unit of analysis, this involves combing multi-tiered customer and supplier perceptions entailing that value perceptions in relation to transactions is the bench-mark of evaluating product supply quality. A fulfilled transaction may be regarded as an expression of confidence from the customer regarding the quality of the supplied product.

Service-dominant (S-D) logic developed by Vargo and Lusch(2004) highlights the process of value-creation that occurs when an individual consumes (or uses) a product (or service), as opposed to when the output is manufactured (Vargo and Lusch, 2004). Lusch and Vargo(2006a) contend that in S-D logic, service is the common denominator of exchange and thus is hyperdynamic to goods and they argue that services is a good-dominant (G-D) logic term. According to Schmenner et al. (2009), under G-D logic the firm and the customer were separate; the firm produced value and the customer consumed and destroyed value. Hence, Lusch and Vargo(2006a) define service as "the application of specialized competences (knowledge and skills), through deeds, processes, and performances for the benefit of another entity or the entity itself".As Lusch and Vargo(2006a) discuss, "service" indicates a process of doing something for someone, rather than the plural "services", implying units of output as would be consistent with goods-dominant (G-D) logic.

Returning to Heskett et al. (1973), where business logistics involves predominately technical movement control and demand-supply coordination. Through a value chain management (VCM) perspective (Jodlbauer et al. 2012)a multifunctional value-related challenge emerges regarding how to influence both supply and demand. This involves predominately an actor-

level approach regarding how to both create and realize value. However, the discussion so far has indicated tight interaction between the technical realm of value-changing flows and the actor level of networking between firms. In this study a bottom-up approach is taken involving through first accounting for processes in interaction at a firm level as well as between firms to generate understanding of different flows timing configuration at a value network level.

Laying out the flow as a core metaphor in VCM thinking involves research focus on processes generating value through resource transformations. Flows run in one direction;accumulating and assorting products (Alderson 1957). A flow is at core sequentially dependent indicating long-linked configuration (Thomplson 1967). Thompson (1967) also indicates that all types of industry display aspects of these three dependencies; sequential, reciprocal and pooled.However,in various industries the relative significance of these dependencies varies. While manufacturing involves predominately sequential dependencies, services involves predominately pooled and reciprocal dependencies (Stabell and Fjeldstad 1998). In construction, pooled and reciprocal dependencies are also predominant. Alderson's transvection modelrepresents an early attempt to model linearly an end-user customer-oriented supply process. In the transvection, where the product flow may be regarded as focal, the transformed product resource is measured in relation to time, place and form features (Alderson 1965). The transvection is in fact a ground-breaking initial modelling of a value chain. The transvection modeldoes lack operational detail by predominately modelling "the flow of goods". Information is weakly modelled and considered contextual to decision-making "sorts" in the transvection model. People and monetary resources are purely contextual to the original model. Furthermore, the transvection does not consider actor networking to support coordinating different value chains in a value network context; modelling product distribution in networks consisting of interacting different transforming products. The transvection model is here expanded to encompass multiple flows as well as networking viewed as technical interaction between multiple value chains.

From a logistics perspective, each value chain may be regarded as a product flow at core supported by other flows; each flow characterized by value generating transformations of the core resource in mind. Through descriptions of flows and chain interactions, understanding regarding how to manage value chains may emerge. The complex value network entity is regarded as context of value chains, a relatively unmanageable entity. However, management and networking activities between firms may certainly influence the nature of the value network.

Flows are kairotic-timemetaphors, an element in professional discourse, representing in speech and writing process configurations. Processes are then again discernible as subsets of predominately sequentially dependent operations. While operations and activities are repetitive, actions is what actually takes place. The process is accordingly the routine, the pattern implying an expected picture of product supply. The interplay between planned and actual flows is measured in relation to uncertainty. Risk management involves accounting for how perceptions of uncertainty regarding future flows may be handled in the present. Timing configuration of value network flows involves therefore a complex set of perspectives that includes in addition to configuring the flows themselves, also taking into account risk management.

While the postponement principle and transvection model represent relatively static approaches through modelling supply structure, this study seeks to incorporate a more dynamic approach through not only indicating how postponement as a supply pattern may

mitigate risk, but though indicating the structure and dynamics of value network flows themselves and their interactions within firms and across firm boundaries ma contribute to dynamic handling of risk; “risk management”. Furthermore, risk and value are related constructs; both are perceptions. Coupling customer value to the “risk” construct involves focus on future realization of customer value, a value chain objective. Risk management will insuch a context involve developing value chains that support not only quality product supply, but impact on chain design as well as evoking process configurations and continuous risk assessment in a value network context.

The next step is to develop a flows-based view of value network configuration. The industrial network may in line with Håkansson and Johanson (1992) be perceived as consisting of three layers of substance; actors, resources and activities. The actor level indicates the realm of purposeful network interaction, resources the value-laden static components, and activities as the dynamics involved in resource use by actors. This classification is purely analytical since in reality any value generation involves interactions within these layers of substance as well as between them. Analysis may apply one of these layers of substance as starting point. In this study focusing on flows should indicate an activities-based approach. However, this has not been the case. In this study analysis will start at with considering flows as arenas of resource interaction and thereby enabling a description of process configuration. Activity represents through this approach accordingly emergent purposeful patterns. We describe purposeful activity based on resource interaction. In this manner flows as resource configurations are interrelated simultaneously with both actors and activities as elements of pattering.

Terming the context of flows as “value network” indicates a presupposed function of this network limiting analysis to consider quality product supply. This represents a limited systems feature of this type of network construct. Purpose is indicated without clear boundaries. Also the purpose statement is open for multiple actor interpretations in line with network thinking. In this manner our study is influenced by functionalistic systems approach to distribution (e.g. Alderson 1957, Heskett et al. 1973) and integrating this view with IMP network thinking (e.g. Håkansson and Johanson1993, Håkansson and Snehota 1995). We accordingly model these focal flows in their network contextto evoke developthrough timing configuration . The act of modeling itself indicates a first step involving creating an inherently static picture of supply as grounds for considering the dynamics of flows and flows interaction in value networks. Flows and value chains represent in this picture a systems construct indicating system function, borderlines and complexity.

MODELLING VALUE IN CONTEXTUALLY EMBEDDED NETWORK FLOWS

According to Heskett et al. (1973) the concept of flows can be modelled in the following manner:

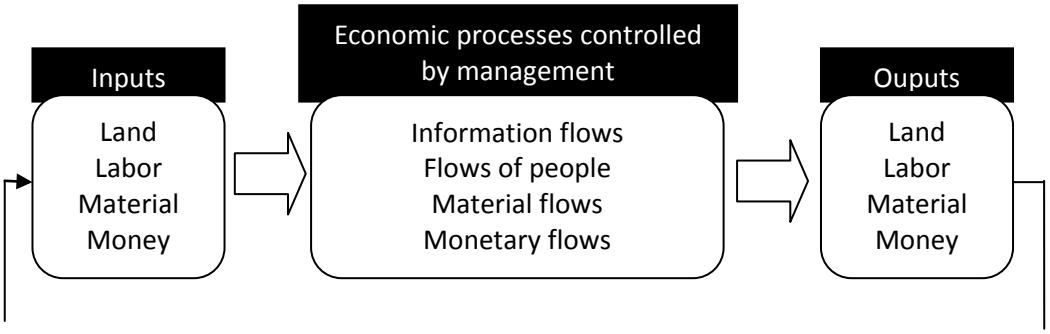

Fig. 4. The flow concept of economic activity (Slightly redesigned based on Heskett et al. 1973. Fig 1-1, p. 8)

Economic processes displayed in figure 5 as "flows" are driven by actor-shaped value creation objectives. Value is a customer perception of product benefits associated with the total cost of ownership (Christopher 2011, p. 29). Although a value chain consists of multiple customer roles held by intermediaries, in line with Alderson's (1965) transvection model, the ultimate measurement of customer value takes place as perceptions of product placement in the hands of the end-used followed by product use. With increasingly dynamic customer needs, greater demand uncertainty increases the challenge of generating customer value through the value chain (e.g. Christopher 2011). The model depicts a simple input-output relationship where flows represent an arena for resource transformation. The four various flows indicate different focal resources transformed through operations; information, people, materials and monetary. This understanding also indicates a likewise classification of operations; informational operations, personnel operations, materials operations and monetary operations. Furthermore, this classification indicates, though not explicit in figure 4, specialized management adapted to these different flows.

These focal resources are complementary. Heskett et al. (1973) limit their view of management as a "fifth factor of production", as "…the vehicle by which the necessary flows are achieved" (ibid. p. 7). Management is accordingly regarded as a resource that cannot be described through the flow metaphor. This is in line with Engelseth (2012) that advocates the knowledge resource as fundamental in management and since knowledge is located always as a part of people, knowledge transformation takes place within people. Knowledge never flows anywhere else than in the mind of a person. Therefore Engelseth (2012) proposes that in a value network context, distinguished from other social contexts by its flows configuration related to quality product supply objectives, it is people that are managed. Management is modelled by Engelseth (2012) as knowledge use in a network of actors, and therefore in line with Heskett et al. (1973), one of five core resources used in a value network that also is clearly distinguishable from the other four resources. The main distinguishing aspect between management though knowledge use and the four flows is that management through interaction with the flows learns from experiencing flows and directs flows. Engelseth (2012) models this interaction as information flows as a mediating arena for resource transformation that interlinks actors with products. In this study this model will be further developed to encompass interactions between the four technical flows we term as 1) product flows, 2) information flows, 3) monetary flows, and 4) people flows. These flows are regarded as "technical" since they are intertwined with value creating activities; value creation through resource transformation. These flows together with management using knowledge constitute the core of the value chain. Management is also an activity, but this activity is concerned with organizing the flows; indicating a clear distinction from technical flows value closely intertwined with value creation.

Empirical evidence shows that the product in its end-state also facilitates labelling the complete value chain from raw-material to retail (Engelseth 2007). Interacting value chains may with ease be regarded as systems due to their static overall configuration due to more limited complexity than networks. Each of the value chain systems together constitutes the complex value network. The value network is the context of value chains and this entity does not have given borderlines presupposedby a clearly stated unifying perception of supply purpose. Evidently, studies of value networks involve predominately an actor-based approach

to study issues regarding 1) power and dependence, 2) conflict and cooperation, and 3) trust and commitment (Gadde et al. 2011, p. 114-120). In this flows-oriented framework these features are regarded as elements of context.

Heskett et al. (1973) continue to develop the flows concept by embedding the four technical flows in their functions. The product flow is associated with production and distribution. This flow is in line with Alderson (1965), and as previously discussed, regarded as the core value chain flow. Production involves 1) creation of skills and services, 2) agriculture, 3) extraction, and 4) manufacture while distribution consists of logistics and promotion (Heskett et al. 1973, p. 9). This indicates how distribution may be regarded as an arena for interaction between supply and demand management through marketing and logistics. VCM may represent as a construct an approach to such functional integration in business practice. The product flow is also core in Alderson's (1965) transvection. We apply a variation of the Heskett et al. (1973) flows model through regarding, as previously discussed, the product flow as core and the other flows as supporting. This is natural provided the explicit statement of purpose in a value network regarding customer value realization as product time, pace and form features. In line with Bowersox (1969) possession is added as a transformed feature of product resources. Including possession underpins the close interrelationship between the transvection and transaction postulated by Alderson (1965) as grounds for developing the transvection model. Product flows are accordingly proposed measured in relation time, place, form and possession features of the material dimension products including packaging.

The other flows, information, monetary and people are regarded as supporting the product flow. In services people, and accordingly, the people flow may be regarded as the core resource involved in value creation.Information is, as already indicated, regarded as an inter-linkage between knowledge and product transformation. Information is a complex resource constituting a combining of information components adapted for use. Information is received, stored, transformed, duplicated, and communicated. While knowledge is inherently tacit, with explicit knowledge representing communicable knowledge elements transformable into information, the information resource is like products transformed in relation to time, place, form and possession. Information transformation takes place in embedded in information systems (IS) supported by information technology.

The monetary flow is interrelated with finance. This involves the perspective of the company owner. From an investment perspective customer value must be balanced with returns on investment. High returns of investment secure procurement of funds, while achieving customer value secures recurring sales and together with costs associated with value creation generate returns of investment. Profitable operations secure a healthy allocation of funds to various company stakeholders. The monetary flow represents accordingly an indicator of economic quality of product supply. In the value chain there are a range of different financial resources that may be transformed also in relation time, place and form. These transformations are registered in the accounting system. As information, monetary resources may be both material such as money and immaterial as registrations of obligations in IS. The monetary flow is closely intertwined with the possession aspect of the product. Monetary resources, and therefore their transformation, predominately support transactions. The monetary flow is embedded in accounting and wider financial systems supported by financial and accounting competence and skills.

The people flow is interrelated with human resource management (HRM). Two aspects of "people" be accounted for; 1) labour and 2) knowledge. When regarding people as a technical resource it is the labour aspect supports directly the product flow. The manual aspect of

product transformation is evoked through describing the role of labour. However, HRM also involves knowledge management. This role of people is found in decision-making at both managerial and operational levels. Taking into account the transvection model (Alderson 1965), sorts are regarded as intermittent decision-making events binding together different forms of operations transforming products. This indicates the operational aspect of knowledge management at an operational level intertwined with the product flow. While knowledge use at the managerial level is regarded as associated with organization, knowledge use in operations (such as logistics skills) represent aspects of the people flow intertwined with the other technical flows. Knowledge management at the management level can hardly be described as a flow since this is involves interaction between people involving predominately pooled and reciprocal dependencies. The people flow involves using HRM systems supported by organization competence and skills.

Value network flows are configurations of interwoven activities and resources. Sequentially organised resource transformations interlinked with value creation indicate that the flows metaphor is appropriate. Value network interaction is fundamentally based on individual flow characteristics. The following table on the next page provides an overview of the four technical flows in relation to management:

Product Flow	Product resource transformation providing key customer value indicator. Supporting value creating resource in services.
Information flow	Information resource transformation supporting all other flows and management
People flow	Indicator of people transformation through placement. Primarily related to decision-making location (operational knowledge resources) and labour resources. Core value creating resource in services.
Monetary flow	Indicator of financial resource transformation. Interlinked with transactions. Impacts on possession features of products.
Management	Concerns knowledge transformation. An organizational resource embedded in people. Managers may be regarded as part of a people flow; management knowledge embedded in these people. It is not appropriate to apply the flows metaphor to “management” since it lacks core sequential dependencies in relation to value creation.

Table 1. Overview over flows and management interaction

Evoked dissimilarities between flows reveal complementarities indicating purpose of interaction at the flows level. This involves predominately management at the firm level, with each individual firm regarded as a system. The flows transcends firm borders, so the value chain construct is needed to account for managing flows and flows interaction between firms. At the value chain level flows interaction is set in a systems perspective involving inter-organizational networking. This networking should certainly not be bound by systems thinking. However systems thinking may provide understanding regarding the nature of flows and flow interactions in a wider value network context. Based on a taken restricted systems approach, individual flows and flow interaction may be modelled and simulated representing a contribution to VCM in practice. At the network level another dimension of analysis emerges more in line with IMP network thinking. At this level flows and chain configurations

may be developed taking into consideration features of network atmosphere unbound by system presupposed notions of purpose and system boundaries. The value network level emerges accordingly as the complex and thereby challenging and ever-changing realm of creative thought for flows and flows' interaction development. This understanding is modelled in figure five on the next page:

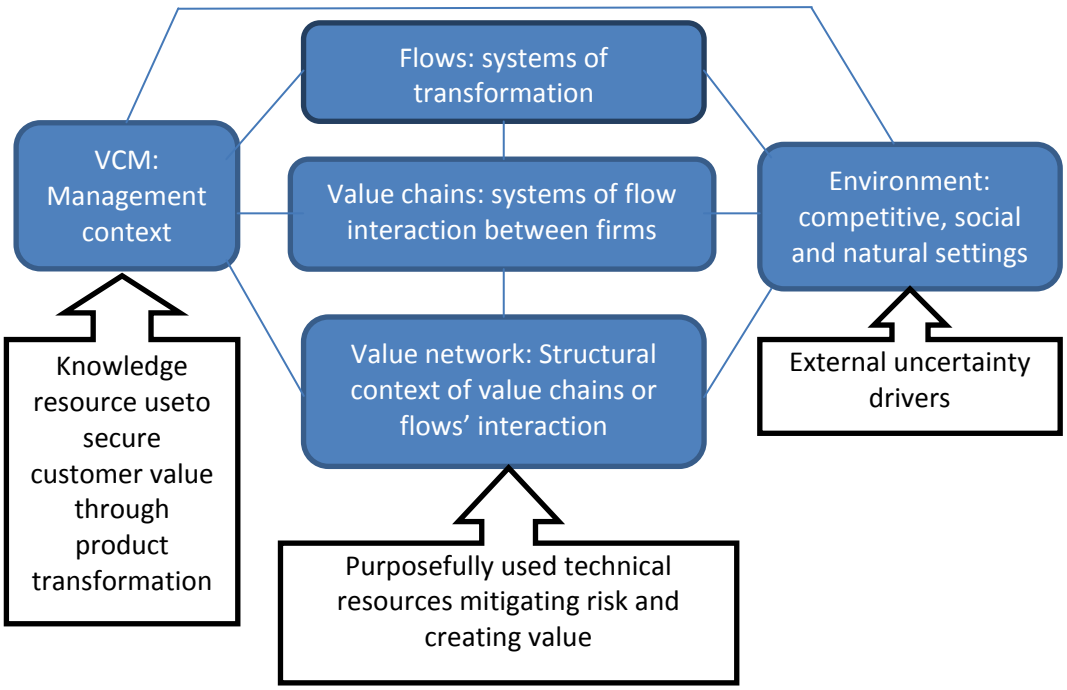

Figure 5: Flows in context and environment

The model depicted in figure five is clearly derived from the Heskett et al. (1973) flows model depicted in figure four. The grounds for modelling in the manner depicted in figure five is an explicit statement of purpose. While supply chain models (e.g. Lambert et al. 1998) do not discern between management and technical process, this model portrays the value network as solely a technical configuration. Furthermore, while the ARA (Actors, Resources, Activities) network model (Håkansson and Johanson 1992) attempts to account for multiple and interacting perceptions of purpose, our modelling effort is based on a clear statement of customer value in product supply as the main value network objective, and hence the basis for terming our entity as a "value network". Provided the distinct and different nature of knowledge in relation to transformation, as previously discussed, VCM is modelled as

separate from theentity to be managed. In relation to the ARA network model (Håkansson and Johanson1993), these constructs all represent mixing of actors, resources and activities. The ARA model may be used to characterize the nature of this mixing in relation to perceptions of purpose and risk as well as particularities of empirically evident actor, resource andactivity combinations. This is analogous to Thompson's view that resource use involves combinations of dependencies. The value network configuration of this mixing may differ in different empirical settings. Flows, chains and networks are technical arenas for value creation impacted by and impacting both management and the environment. There is also a linkage between the environment and VCM driven by the need to understand and inform this environment consisting of natural, technical as well as knowledge resources. This model creates foundation for considering timing in value network flows.

TIMING CONFIGURATION IN INTERACTING VALUE NETOWRK FLOWS

The final step of this study is to integrate the preceding models and discussion to generate a model depicting timing configuration logic in value networks. Since we indicate a customer value-oriented modelling of product supply configurations, the customer must be added as a component in this model. In line with SD logic (ref.), the customer is regarded in this framework as a dynamic component in supply timing together with management and the indicated flows. Through integrating figure one, exhibiting various supply timing alternatives we place theses in relation to arenas for timing supply in the following table:

Transformation arena	Timing factor	Comments
Product flow – transformation of product resources	Transport, Assembly, Labelling, Product storage, Packaging, Manufacturing, Component storage, Retailing,	The great variety of timing factors reveals the core nature of this value generating flow. Core value creating realm in physical distribution.
Information flow – transformation of information resources	Information	Information is generic supporting other flows and management. Core in information providing services.
People flow – transformation of operational knowledge resources and labour resources		People are involved in managing as well as operations including services. HRM supports supply timing evident in other flows and management. Core value creating realm in

		services
Monetary flow – transformation of financial resources	Payment, Price	Reveals two aspects of postponement particular to this flow. Supporting function except in financial services where it represents the core value creating realm.
VCM– transformation of organizational knowledge resources	Product design, Purchase	The role of management is more long-term involving product design and securing recurring customer purchase (sales).

Table 2: Transformation arenas and timing supply.

The table firstly indicates that modelling individual flows and flow interaction in value networks must be adapted to various industries. The main input of table 5 is evoking that product supply timing is multi-faceted; a classification. Applying the principle of postponement involves value chain design consisting of numerous interacting components. Taking a timing perspective, table 2 indicates therefore also numerous variations in designing product supply. Table two also provides through this classification a doorway to simplifying managing timing of product supply sinceresource transformations are subject to VCM. In addition to different timing configuration possibilities, timing one factor may be combined with timing other factors. Through classifying transformations into flows, this provides a more transparent inter-linkage between VCM, actual management by people, the technical flows and customer value metrics modelled in figure six on the next page:

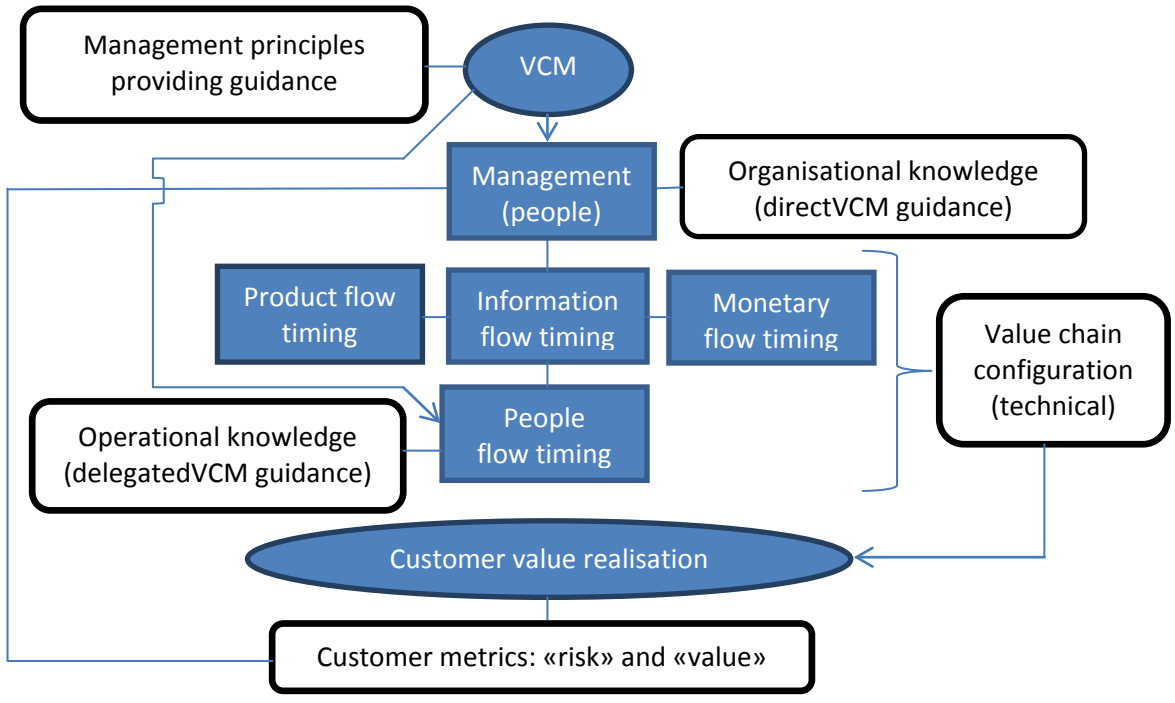

Figure 6 Interrelationship between VCM, management, technical flows and customer metrics

Figure 6 represents a generic model that can be applied to study any form of supply; products or various type4s of services. Figure six indicates how decision-making responsibility is divided between management and labour. Delegated VCM guidance involves influencing decision-making at an operational level indicating making also grounds for agile supply. This also reveals how timing product supply represents facilitating adaptions in value chain configuration based on initial-supply, internal-chain and end-user demand-related uncertainties. Using of the chain metaphor in the model in figure six involves understanding chains as a system; individual value chains thereby are understood as interacting in an overall network which may be regarded in relation to atmosphere including degree of competition. Figure six provides more than a static snapshot picture of value chain configuration through including how components in the model may be combined as a gateway to understanding resource flexibility coupled with potential value chain agility needs. People represent the most flexible resource in value networks grounded on their core role in decision-making at strategic to operational different levels. The model portrays a core role of people in finding product timing solutions through operational decision-making involving combining use of VCM principles, management-provided plans and flexible resources (products, information, monetary and people).

CONCLUDING REMARKS

The principle of postponement is a gateway to designing value network flows and influential thereby on value chains as well as the overall value network configuration. Designing value network flows is an inter-organisational effort, and since the different flows are modelled as interacting, the objective to further model and design value chains in a value network context emerges. Value chains are considered as systems embedded in a network context. This creates grounds for developing efficiencies within flows and how the interact. Timing configuration (or organising) of the kairotic-type value creating flows represents one approach to such value chain development. The chronology of flows represents a more detailed inquiry of measuring and developing flows we now leave for future inquiry. At this stage we provide models of kairotic timing directing attention to timing metrics potentials.This approach reveals a quest for purposeful design as opposed to letting operations muddle through a complex context impacted by more or less coincidental events and interactions between people based on local emergent knowledge. In a seemingly more and more complex and unruly business environment modelling technical processes is proposed as a gateway in developing understanding and a necessary minimum of product supply control.

There are many possible ways to model different product supply solutions. A next step in this research would be to consider the economics in different potential supply solutions. This would involve case studies of actual products embedded in particular value chains to consider customer value balanced against supply costs. Furthermore considerations of market competition as well as natural and other social environmental factors may be considered in such case studies. In addition, market analysis may reveal how each of the timing factors may be considered individually as well as value chain configurations (sets of timing factor solutions) in relation to customer value. Furthermore, how different value chain timing-based configurations impact on other value chains in a value network context may also be considered as a research path. Delaying supply involves different factors and different flows

providing value chain configurations. Furthermore, the role of planning in timing-based value chain configurations may be studied through product supply cases. Interaction between services and timing the product flow may be considered. This involves considering people as the core resource in the value network as opposed to products. Furthermore, highlighting the importance of services evoke a services approach involving value-co-creation thinking in relation to supply timing (Stabell and Fjeldstad 1998). In addition, how the value chain is configured may be adapted to individual customer specifications indicating the need for developing agile value chains. Agility must also be balanced with leanness, indicating that the cost of supply must stand in proportion to the value created. Finally, timing in value chains may also be considered form a risk management perspective. This would involve firstly how specific more static value chain configurations impact on risk mitigation. In addition, the dynamics of using agile supply chains in relation to perceived risk and emergent demands for adaptation may be considered.

The principle of postponement, when embedding this in VCM thinking, transpires complexity demanding a series of individual focused studies. To handle this challenge it is proposed to use the more generic term "timing", since an "optimal" solution may equally well involve speculation.

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