

TIMING VALUE CO-CREATION IN SUPPLY NETWORKS

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ABSTRACT

During the past decade the emergence of the “value co-creation” concept in both purchasing and marketing literature has been taken to the fore. A case study of tendering and carrying out engineering processes in the petroleum logistics industry using a process-founded and network embedded approach. Based on a social constructionist stance, value co-creation is regarded as being a notable part of existing interactive processes of business relationship regardless of terms used in business practice. Through a developed process-oriented network-embedded approach dependencies and their timing are explored in supply based on dependency theory as well as the transvection approach from marketing channels literature. This approach is applied to further evoke the role of timing in value co-creation. Management and information processes are analysed in the same manner as operations and information processes; as value –creating processes related to fluid perceptions of customer value. The nature of dependencies may vary whether processes are involved with either managerial, informational or operations processes. All process types may be regarded as associated with either production or exchange. Notions of service-dominant logic are rendered, based on analysis through the constructed framework, as managerial imperatives found predominately in professional discourse in the network. A foundation is created for further research concerning business processes, whether managerial, informational or operations, and their timing. This understanding of value creation through interacting types of processes, and their timing involved in value co-creation in an industrial network, extends current literature within the field.

Keywords: Timing, value co-creation, process interaction, petroleum logistics, transvection, value networks.

INTRODUCTION

Value co-creation is, from a normative viewpoint, a strategically founded design of customer and supplier interaction (Zwick et al. 2008). The main body of literature on value co-creation concerns developing it from a strategic viewpoint, while this study moves the research focus towards the operational level by looking more closely at the role of time in value co-creation in processes involved in achieving customer value. Time is a general key component in how humans create meaning about their own life and events they encounter. Human framing of “time” is continuous and impacted by experience, context as well as culture. In the same manner, business interaction is framed in various ways by the involved actors including how specific value co-creation logics impact on business interaction as well as how to design supply operations. Business relationships and networks are therefore regarded as continually emergent phenomena (Medlin & Saren, 2012), and this emergence is in part understood in relation to time. This emergence may be accounted in relation to transformations through processes functioning as value creators and as changes to the configuration of processes over time including how various processes are temporally interlinked. Although time is always in some manner related to space, in this study we place focus on the time and view space as contextual. This conceptual constructing provides foundation for analytical focus.

The role of time in process research is still underdeveloped in the study of interactive business relations (Ford & Håkansson, 2006a; Ford et al., 2010; Andersson & Mattsson, 2010a,b). During the past decade a notable emergence of the “value co-creation” concept in both purchasing and marketing literature has been developed (Prahalad and Ramaswamy 2000, Vargo and Lusch 2004). This line of thought stems originally from services marketing where exposing and developing the fine points of customer-supplier interaction is an inherent and vital aspect, ensuring quality in most types of service offerings (e.g. Grönroos 2001). Within this literature Normann (2001, p.114) points out that the distinction between goods and services is misleading, while Gilmore and Pine (1997) state that “...while the term “product” never was appropriate for service providers, it is increasingly outdated for goods manufacturers”. From a manufacturing viewpoint, a stream of literature termed as “servitization”, has also probed into details of how offerings comprise of complex combinations of service and goods components (Vandermerwe and Rada 1988, Chase and Garvin 1989, Oliva and Kallenberg 2003 Baines et al. 2009). Developments in services marketing, coupled with increased use of mass customization in offerings demanding increased interaction between the purchaser and supplier, paved the way for the development of a service-dominant logic view of market offerings (Vargo and Lusch 2004). However, the servitization stream of literature still regards services and goods as heterogeneous resource combinations associated with transformation to facilitate value creation. The notion of co-creation indicates a specific form of timing; connectivity with simultaneously reaching towards the achievement of customer value. In this study we seek to more closely analyse the role of time in relation to value co-creation and thereby develop understanding of value co-creation as an exchange process.

Value co-creation involves placing analytical focus on managerial-level exchange processes; how e.g. suppliers and purchasers interact in relation to a sales and purchasing process (Hammervoll 2014). In this specific time-prolonged context including events both prior to and after a transaction, value co-creation plays a role as a managerial normative quest that is supported by degrees of supply chain integration. Exchanges take place in the prolonged (related to an actual exchange) time-context of a business relationship. Vargo and Lusch (2004) propose within marketing literature that it is not the product but what they term as

“service” that represents the distinguishing competitive factor on the current globalising marketplace. This proposition is clearly normative, indicating a pathway to improved competitive advantage of firms that succeed in value co-creation. Services are rendered focal and goods playing a supportive function within the service-dominant logic of marketing.

Value co-creation may, however also be seen and analysed from an operations (logistics combined with production) perspective. Focusing on combinations of processes in a network that create value, value co-creation represents from an operations perspective a way to achieve responsive supply. A marketing perspective, on the other hand, underpins value co-creation as a means to communicate with the customer and achieve customer satisfaction and recurring sales. This difference we believe provides complementary insights on how to understand value creation in conjunction with exchange processes between the supplier and purchasing customer supporting operations that produce value in the form of goods and services. Exchange processes involve predominately information exchange while production involves value creation providing service and goods outputs (Hammervoll 2014). In this study the feature of time is used to in-part elaborate on how timing exchange processes is an integral part of value co-creation. This understanding of value co-creation is provided in figure 1:

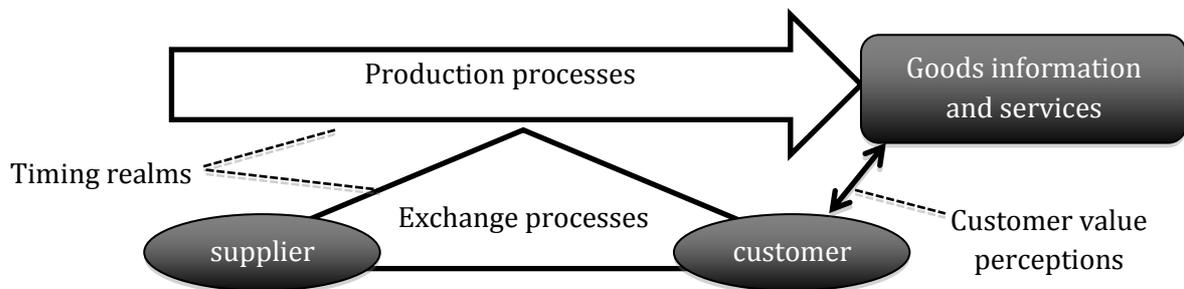


Figure 1: Value creation through exchange processes supporting production

Figure 1 exhibits how exchange processes support value creation through operations and are accordingly a realm of interaction classified as distinct from operations where value creation itself may be accounted for. Furthermore, figure 1 illustrates that exchange processes are regarded as directly associated both with value creation. This means that the logic of exchange is vital both in processes securing the transfer of a goods/information/service title as well as how value is created. Regarding timing, both production and exchange processes are found prior to and after a transaction, likewise they are found both prior to and after a delivery and consummation. Supply is accordingly rendered as a configuration of different types of interacting processes that are timed in different manners.

We experience though previous research and informal business encounters that companies have no problem in bringing forth accounts of inter-firm cooperation. On the other hand, developing inter-firm interaction from an explicit value-co-creation viewpoint is often neither explicit nor formalized. This is made here by studying actual value-creating business processes including interaction of these processes aligned with transaction-related negotiation processes associated with purchasing and sales functions. We consider use of “value co-creation” as a part of professional discourse accordingly as an aspect of how exchange processes are carried out. Since activities resembling what literature posits as “value co-creation” are posited as detectable in business practice.

Value creation involves supplying a form of goods, information and service bundle of components, a value configuration object, through a chain of resource transforming events. Series of such events are termed as processes at a micro level, within and between firms, and as chains at an inter-organisational level. Processes and services are usually considered from an analytical viewpoint as systems (Brown et al. 2013). These systems may again be seen as configured as inter-organisational networks (Christopher 2011). Since we are considering the proposed conceptual movement from a “goods-dominant” to a “service-dominant” view of value creation, it is worthwhile to also consider what fundamentally distinguishes value creation in services from value creation in goods distribution as well as in the information supplying industry. We apply Thompson’s (1967) theory of dependencies to clarify this distinction. In physical distribution goods are sequentially and visibly transformed in physical form. In services, transformation involves to a higher degree active involvement of human resources (Normann 2001, Grönroos 2001). Service configurations also involve to a higher degree than product offerings shifting customer expectations prior, during and after service transactions. Customer value is accordingly an unstable entity in the network. Services involve a higher degree of pooling resources and reciprocal dependencies between actors than goods production that involve predominately sequential dependencies (Thompson 1967). Since it is fair to state that few offerings in markets are purely physical or purely immaterial, all market offerings involve a complex resource bundling and transformation of physical and informational components through series of events; through processes. One may therefore today consider whether all offerings in some manner may be termed as “product packages” as found the terminology of advanced mechanical component supply in shipbuilding (Engelseth and Zhang 2012).

Value creation takes place through processes embedded in value chains that may be mapped for analytical purposes from a point of origin to the end-user. Processes are defined as how events unfold over time in specific contexts (Van de Ven 1992, Pettigrew 1997). Timing is here seen as specific acts that materialize between logistical actors managing value-creating transformations in processes; emerging mainly through their interaction. The market offering that is supplied is accordingly a complex entity embedded in what may be termed as a “value network”. A value network may be regarded as a network of actors collaborating evoking value creation and customer value as highlighted purposes (Hammervoll et al. 2014). Value creation through service-product intertwinement and transformation through “flows”, is accordingly proposed, in line with Arlbjørn and Halldorssen (2002), as the “core” of logistics. Value creation may be classified as taking place in different logistics flows (Alderson 1965, Heskett et al. 1973) classified as entities to describe transformations of goods, information, people and monetary focal resource objects. In supply postponement literature (Alderson 1950, Bucklin 1965, Zinn & Bowersox 1988) the flow of goods is described in relation to timing variations. The purpose of timing variation of goods supply is in this stream of literature mitigates supply risk. Engelseth and Jafari (2013) propose a set of 14 different activities that are subject to decision-making regarding timing value creation. This approach increases awareness of the complexities of supply timing through highlighting timing value-creating operations. At its core, value co-creation involves interaction between purchasing and sales actors interlinked by a business transaction. However, the interactions between people are about logistics operations. These operations represent intertwining of service and goods components where timing and placement of services and goods is a core feature of value creation.

In this paper we expose the role of timing in value co-creation, based examples on a case study of exchange processes within a business relationship between an engineering firm

specialising in offshore platform installation maintenance and modification operations and its oil company customer within the offshore petroleum logistics industry in Norway. Placement, the space factor in value creation, we consider as complementary in describing and analysing timing issues. In the following review of literature we consider first fundamentals of time and process in a co-creative supply management context. This is followed by a brief discussion of how customer value and value creation processes may be interpreted in a network context. Customer value represents the aim of supply whilst value creation concerns how this aim is sought reached. A transvection view, based on Alderson's (1965) marketing channels model, is then presented providing approach to inquiry regarding how processes and customer value interact in a network context. Based on the preceding discussion, an analytical framework is provided to guide investigation into timing and supply value co-creation. This analytical framework is followed by a presentation of the applied method and approach, the case narrative, analysis and conclusion.

TIME, PRODUCTION, EXCHANGE AND CUSTOMER VALUE

In developing the analytical framework we first probe deeper into the construct of time in relation to exchange and supply processes found in networks. Time can be considered related to an event; when something happens. Time is associated with regulation of an occurrence, pace or coordination to achieve a desired effect (<http://www.websters-online-dictionary.org/definitions/timing>). Time is also an inherent aspect of value creation and the quality of customer value may be considered in part in relation to the time factor. Time is never absolute when viewed from a constructivist perspective; it is culturally embedded and impacting on how human individuals experience time. Time and timing are created through interaction (Bluedorn 2002; Nowotny 1994; Sorokin & Merton 1937). In this highly relational perspective of time (Halinen & Törnroos 1995), actors create a “past-present-future” construct in relation to a specific event. Johanson and Vahlne (2010) rely on this time perspective in elaborating internationalization as a process of present interaction within an interaction structure composed of the “past-present-future”. Das (1991) points to the strategic aspect of time, how executives' time frames impact planning horizons (short to long term). In a flow of goods the product may always be tracked to inform upon its present location, tracing a product indicates preceding locations, and plans indicate the future direction of a product (Engelseth 2009). Furthermore, what constitutes the “present” may be further elaborated in narratives of past or future events. The “present” may in narrative accounts be depicted as state that has passed or a state within plans. For instance product history documentation related to product traceability may depict where a product was at a specific chronologically measured time; when, where and how a product discrepancy occurred, and relate this to its previous transformations as well as the product's following transformations (Engelseth 2007). This altogether indicates the relative aspect of “time”. The concept of time may accordingly be classified as having two fundamental dimensions: 1) the chronological dimension and 2) the relative dimension.

Chronological time is an inter-subjective human construct (Halinen et al. 2012). When people meet they create a richer meaning of events through storytelling using chronological time. Time organises in the minds of humans what has previously happened; a component in a socially constructed mental model. Events are actions involving combinations of artefacts and persons. Time and events are thus relative to the entity and the nature of the entity shapes time (Bergmann 1992; Hedaa & Törnroos 2008). For example, Kavanagh and Araujo (1995)

consider time as a social creation, resulting from contestation between two entities with regard to a third. An equivalent chronological timing solution of business events may in different cultures be perceived as more or less appropriate or inappropriate depending on how a specific culture, where the event took place, is perceived. Orlikowski and Yates (2002), accordingly, conceptualize time and timing as a mixture of objective and subjective meanings. In the objective view time operates as an environment, or backdrop, for business interaction. In this view, the metronome of clock time enables synchronization of business interaction (Halinen, et al. 2012). For instance, in lean manufacturing process development, using time efficiently does not equate hard work (Dennis 2007). Lean manufacturing is supposed to follow “tact time” indicating an order-driven flow where “hard work”, that is reducing idle labour time to a minimum, is not profitable when this results in risk-prone surplus inventory. In a lean framework quick production, involving using production resources at maximum capacity does not, accordingly, equate “smart production”. Following a postponement strategy (Alderson 1950), consumers learn through marketing promotions, communication with salespeople and word-of-mouth product communication to expect a product delivery delay in exchange for increasing tailoring to customer requirements either they are professional purchasers such as retailers or consumers (Engelseth and Jafari 2012). An important aspect of time in value networks is accordingly the timing of supplies; a complex phenomenon embedded in cultural context ranging from individual perceptions, through corporate culture, its market setting to the widest social levels including globalisation of timing concepts. We seek to evoke complexity of timing through applying a network approach. This complexity is the foundation of analysis of interaction of factors within timed processes and between these process aggregates viewed a network organisational components.

Strategy is organizational and encountered across time (Gavetti & Rivkin 2007) concerning working from the present into the future (McMaster 1996). Management activity including strategy, and the more operational planning and control activities are accordingly subject to analysis in relation to time. When managers conceptualize and manage international strategy they apply contested forms of time, create timescapes (Adam 2000), prepare timelines, set up timing and coordination of activities, and envisage outcomes against a financial period. The objective time of financial periods is applied as one set of times to achieve activity coordination across space and time. This involves highlighting the aspect of relative time. The other times are those created through coordination between internalized firm activity, coordination of business relationships and events in markets. Time represents in the empirical realm a constructed entity; “time” is made in the network, a part of corporate and business relationship culture with the meaning and use of time perpetually changing.

Halinen et al. (2012) have argued that five elements impact upon how we perceive time: “before time (individual sense apprehension), time flow, time periods, the connected nature of time flow and periods, and different times” can be applied to process research in business networks. In particular, the concept of time flow and time periods offers alternate ways to envisage the managerial as well as operational processes. Time flow is described as punctuated on-going duration, where events mark time periods for operational or managerial process appraisal and action. Humans construct boundaries of the “present” and rely upon a past and future to interpret the present (Medlin, 2004). Relative time provides accordingly a richer meaning to operations and is complementary to chronologically based time measurements.

Value co-creation plays in this view a role by being present in the interaction process between

a purchaser and supplier. Information exchange is a central feature of this interaction as well as the development of a specific atmosphere (Gadde et al. 2010). Value co-creation is dependent on a managerial inter-firm negotiation process that involves decision-making to transact product ownership or the provision of a service as well as guiding processes. Processes are defined, following Van De Ven and Poole (1995, 512), “as the progression (i.e., the order and sequence) of events in an organizational entity's existence over time.” Processes may be operational or managerial. Interaction between managers from different companies is a mutual communicative process involving inputs, transformations and outputs. Two resource aspects of value creation, i.e. management and operational knowledge, are interlinked and their impact on operations strategy may be termed as “top-down” or “bottom-up” influences mitigated by influences of a firm’s internal resources and marked demands (Slack and Lewis 2011). Brown and Blackmon (2005) point to the need to align market demand with features of a firm’s resource capabilities to avoid “strategic dissonance”; involving accordingly features of both internal and external integration. This internal integration involves bridging market knowledge with operations knowledge; value creation continuously being aligned with customer value through strategically-driven operations. In a value co-creation framework, these interactions are characterised by a high degree of integration involving numerous information-based iterations to guide operations that secure customer value. These interactions need obviously to be timed to secure customer value. The research issue may now be refined to more precisely investigate the features and role of timing in value co-creation, which accordingly represents interlinking a specific form of inter-organisational communication process with value creation through operations.

Assessing product value accordingly involves a complex set of factors and weighing these against each other. Customer value may be defined as customer perceptions of supply benefits perceived in relation to total costs of use (Christopher 2011). This definition invites a range of interpretations as to what customer value is as well as to how it may be understood and thereby transformed into information that may be communicated through business relationships. It is natural to say that customer value never can be measured as an exact figure; a fluid perception impacting on customer attitudes to different suppliers in an equally fluid market context. Gilmore and Pine (1997), for instance, point out that transformation is an important aspect of an economic offering. This fluidity invites for interpretation of how customer value changes through a time-flow; similar to operational processes associated with supply (considered later in this section), purchasers undergo change. This process is mental and therefore change is associated also with customer value.

Processes may be classified as weak or strong (Tsoukas & Chia, 2002; Langley, 2009; Van De Ven & Poole, 2005). Weak process sees the world as made of things and views process as a change in entities. Strong process views the world as a process in which things are replications of processes and in a constant state of becoming (Van De Ven & Poole, 2005; Tsoukas & Chia, 2002). The process studies of change in organizations “conceptualize change as a succession of events, stages, cycles or states in the development or growth of an organization” (Van De Ven & Poole, 2005, p. 1389). Weak process contemplates the world in terms of things where change is observed. The other approach labelled as process study of organizing draws on the idea of strong process and focuses on the unfolding of social processes. Timing is accordingly an important part of a process analysis regardless of a weak or strong process view.

A constructivist (Lincoln & Guba, 2000) stance influences our view of the value network as context for service and goods supply. In this constructivist perspective, time and timing are not an absolute; they are perceptions that are contextually embedded. Time refers to event

time, or social time, where events are connected to each other in meaning and time is a property relative to the entity (Bergmann, 1992; Elias, 1992; Hedaa & Törnroos, 2008; Nowotny, 1994; Sorokin & Merton, 1937). From an event time, such as in the case of decision-making to guide transformations, and the timing of resource transformations themselves, the nature of this decision-making and the value-creating transformation shapes time as perceived by actors (both managerial and operational labour). Time in relation to value creation is accordingly understood in multiple human ways according to the characteristics of the entity's culture, organization and/or personal aspects (Halinen & Törnroos, 1995). Elaborating the value creation in a business network sense, time is constructed, following the lines of Hassard (1991), by organizational forms such as firms and especially through interactions in business relationships. A "time culture" may accordingly be accounted for and analysed in industrial networks. This will expectedly impact on perceptions of supply time and timing. This culture also impacts on the role and nature of customer value in a specific network.

The next step in developing our analytical framework involves, based on the preceding discussion on timing value co-creation and how customer value is understood, to consider how to approach "transformation"; the consideration of how value is created. Logistics operations are commonly modelled using flow charts to describe how various logistics and production tasks in a process are interdependent. Alderson (1965) provides through the transvection model a simple end-user utility model of how customer value is achieved. Alderson (1965) pictures product supply as an end-to-end flow of goods, a piecemeal transformation process directed by intermittent decision-making events termed "sorts". This represents a step-by-step and relatively local mode of analysing how the flow of goods is provided direction through managerial decision-making. The "supply purpose" construct in a value network is, following Alderson's (1965) transvection view, the provision of utility measured from the perspective on an end-user. This provision is finally measured as a collective effort of a conglomerate pool of interrelated networked firms. The concept of "value network" embodies here accordingly a network approach with actors functionally aimed towards achieving customer value. However, through applying a network approach, "customer" value" is understood as transient and exposing at any given time variation in perception of divergent network actors. Following a network view applying the transvection understanding of supply, actual value creation need not be well coordinated. While individual transactions (which there may be many of in a single value chain configuration of supply) provide a customer-oriented purpose to flows, transvections (which there also are many of) provide logistics descriptions of sequentially dependent decision-making events supporting value creation through goods transformations (operations).

In the transvection sorts and transformations represent two different types of events. Sorts are decision-making events guiding the value-creating transformations of the focal resource objects. In this study we build upon Alderson's original conceptualisation of "sorts" and adding their placement in a network in relation to value-creating processes as well as management processes involving use of knowledge and managerial labour. The sort we regard as a node on value networks, where information, managerial and value-creation processes interact. In Alderson's model, the transvection concerns supplies of goods. It is possible to develop Alderson's (1965) original "goods-dominant" model also to encompass value creation of information and service offerings. The transvection may be classified as an event network involving combining of information, people and artefacts (goods) to supply service/product offerings to locations where customers need them. Such a network is defined as the connection of events (such as sorts) and processes (such as transformations) through time and in time (Hedaa & Törnroos, 2008). Events become meaningful through their human

connection to past, present and/or future events within an event–time network. They are socially constructed (Hedaa & Törnroos, 2008). The sort is predominately a managerial process involving decision-making. It is related to preceding and following goods transformations. This model may be equally used to consider decision-making in relation to services since these also may be regarded as a sequencing of tasks even though their predominant nature of resource dependencies is pooled or reciprocal (Thompson 1967).

In services we focus accordingly on the weakest of these dependencies to analyse service processes. The sort represents usually a shorter time period than transformations; it is an information gathering, analysis and decision-making process carried out by an individual or a team; a form of exchange process related to production rather than transaction. This is a form of managerial labour. The sort has location, but it is primarily timing that provides the fundamental logic of the transvection view of achieving customer value through piecemeal sorts and resource transformations. The time flow of a sort involves using combinations of information, labour/knowledge (people) and communication to provide direction to the flow of goods or a flow of services. A sort may be accounted for chronologically; when it started, when it was completed and how long time it took to decide (this may involve a conglomerate of smaller decisions leading to a final decision on how to direct the flow of a focal resource object). However, it is the *relative timing* of a sort in relation to transformation that gives it meaning, not as much how long time the decision-making took. Certainly how long a decision-making takes does bear analytical interest if one is considering decision-making efficiency. Chronological time is applied to perceive the quality of customer value; an expression of effectiveness as well as efficiency at different stages in the value creating processes as well as use and potential disposal/return in the case of goods.

The concept of “relative time” shows how the heterogeneity of transformations and sorts are organized, and how they provide meaning to each other. The sort is organized between transformations, and their placement in time. The past provides records of preceding transformation quality, while the future involves deciding how to achieve “customer value” that may be split up into quality metrics. At the sort conceptions of past and future operational transformations are intertwined with managerial conceptions of overall wellbeing of the firm. Information is then accordingly constructed based on a complex combining of knowledge and informational inputs that may involve several decision-makers acting more or less as a team. This understanding of sequential dependencies is predominant in physical distribution. However in services, pooling resources and reciprocal dependencies are of greater importance (Thompson 1967). Furthermore, what is the nature of dependencies associated with information transformation? In accordance with Thompson (1967), all market offerings represent a mixture of sequential, pooled and reciprocal dependencies. It is the proportion of importance of these dependencies in relation to each other that may vary. The transvection, since sequential dependencies are evident (though not dominant) in services, may also be used to analyse value creation in services.

Location is also complementary in describing logistics operations and may also represent an important feature of customer value. Clearly the transvection understanding (Alderson 1965) is a weak process view (Tsoukas & Chia, 2002; Langley, 2009; Van De Ven & Poole, 2005). However, in this study we merge these views. This is because when linking value co-creation to value creation following the transvection view, emergent features of a flow of goods and services dependent on resource interaction in varying sort-related contexts are accounted for. Our interpretation of timing value co-creation is accordingly social constructionist.

The challenge posed by the co-creation model is in “...establishing ambiances that program consumer freedom to evolve in ways that permit the harnessing of consumers’ newly liberated, productive capabilities” (Cova et al. 2011). Value-creation involves accordingly intimate and time based interaction between product and service users. In value co-creation timing also involves accounting for complex time in relation to intimate and complex communication events between two or more actors to secure customer value through quality supply. Applying the transvection understanding (Alderson 1965), the sort is where logistics processes and negotiation processes meet. Goods are identified and thereby provide information concerning preceding goods transformations, information is used at sorts to direct following transformations (Engelseth 2007). Services may in a likewise manner be regarded as organised following a sequence of transformations and sorts, the main difference being that services involve an intricate and fluid pooling of resources. Services normally do not involve an easily identifiable resource object as in goods supply. Following a flow of services and goods numerous sorts are encountered providing direction to the flow. Information derived from business negotiations intertwine exchange negotiations with operations at sorts.

Figure 2 and provides an overview covering different aspects of timing that may be considered when analysing timing value co-creation:

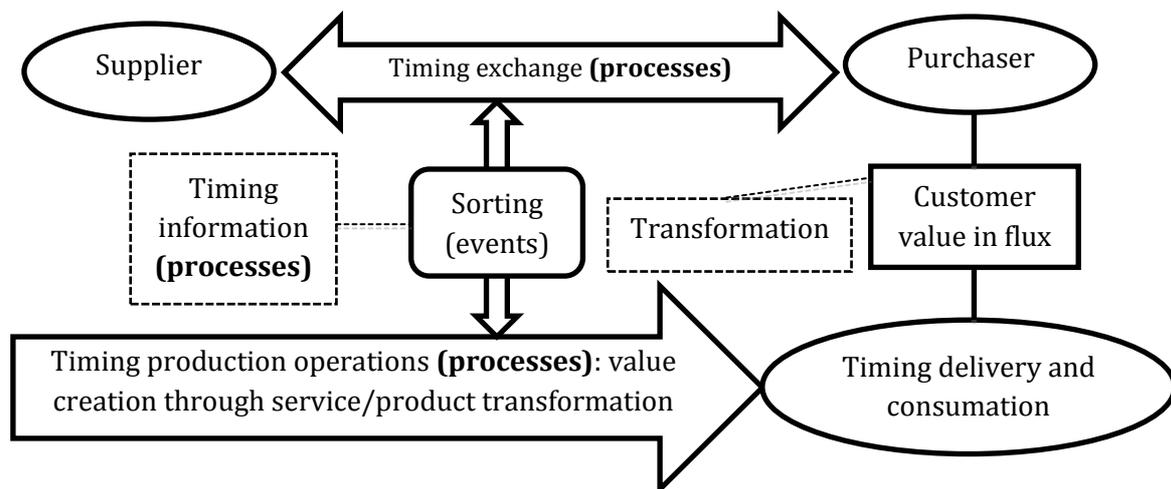


Figure 2: Timing value co-creation: a model

Figure two illustrates, through using a transvection approach, sorts are events that bind through information use, exchange processes with operations processes. Exchange is regarded accordingly as actor-layer processes that bond actors. This is the realm of management. Operations are activates using resources to transform product/service bundles for delivery and consummation thereby facilitating value creation. This is the realm of production, supported by management. Furthermore, change is also related to customer value, a perception subject to change as discussed in a preceding section. Supplier-purchaser integration is increasingly described as subject to value chain management objectives. This indicates three types of processes involved in value co-creation; managerial, information and operations. In addition, customer value is a fluid entity subject to transformation. Four features of network interaction are proposed founded on a value-co-creation perspective of supply and also rooted in definitions of “operations management”, “logistics management” and “SCM” (e.g. Christopher 2011, Brown et al. 2013) that may be used to analyse value co-creation in relation to timing:

1. **Management processes:** Interaction between purchasers, sellers and other supporting actors. Involves managerial processes including transactions and decision-making. Management provides direction to supply through planning and thereby interlinking operations with supply purpose. Customer value is the supply purpose.
2. **Operations processes:** Interaction between transformed resource objects (service and product related) and facilities supporting their transformation. Involves logistics (time & location transformation) and production (form transformation, in services form change through resource combining) processes. This is the realm of value creation.
3. **Information processes:** Interaction between operations and management and supporting thereby production as well as exchange. However, information may also be deliverables intertwined in service/goods offerings. This is not accounted for in figure 2.
4. **Customer value transformation:** The fluidity of customer value embedded in human minds. Impacted by context and personality. Indicates the main purpose of supply and that purpose is therefore perpetually in change.

This framework constituting of four areas of value co-creation may be examined in relation to their process-embedded dependencies and thereby also their timing in a network context.

APPROACH AND METHOD

“Petroleum logistics” denotes in our case complex offshore-related supply, installation and maintenance operations found within the upstream portion of the petroleum industry supply network. The study involves interviews with a set of informants within the petroleum logistics industry located on the coast of North-Western Norway. These two chosen interactions are related to operations on the same offshore platform. We review an associated discussion, i.e. a timing approach to develop an understanding of value co-creation in business practice. Timing is here predominately used as a methodological aspect used to design our research as well as develop the value co-creation theoretical construct. This is an on-going research projects, and the current interviews involve predominately point mapping (see Halinen et.al. 2012) of the described value co-creation process in different business relationships as described by chosen informants with access to the issue from various perspectives. This involves examination of the value co-creation process from a distance by interpreting and describing processes after they have materialized. These narrative descriptions are based on the informants' accounts of their past experiences, or of possible futures as the primary data (Corsaro and Snehota, 2012). Changes in business relationship configurations at the industrial network level have also been accounted for along a timeline. This is in line with the research design by Abrahamsen, Henneberg and Naudé (2012). The process construct as perceived by practitioners is approached through practitioner descriptions of how these recur and change over time. The value co-creation process is studied in retrospective based on informant expressions provided through interviews concerning how they perceive these processes as a set of tasks intentionally highlighting the timing and interaction features associated with transaction negotiations and their nature of intertwinement with different types of operations. Altogether six interviews have been conducted in this currently on-going research. Interviews were semi-structured with open-ended questions. The interview resembled a conversation with an inter-subjective atmosphere that partly resembled as a mutual learning process. The researcher learning about the process the informant had access to, and the informant learning about our concepts and theories driving our question formulations. These interviews were taped and transcribed. The transcriptions were peer reviewed and brief additional questions were posed to informants after their interviews when

in need of clarification.

Point mapping involves creating a snapshot picture of the studies value co-creation processes. This mapping is dependent on close contact and trust between the researcher and informant to gain truthful accounts of the processes as they are carried out on a continuous basis. To some degree process descriptions involved historical events related to relatively unique processes or strategic-level accounts of business relationships impacting on value-co-creation processes. “In point mapping the researcher is acting outside of the process, which means that good interpretative skills are required from both the informants and the researcher. Post rationalization of key events on the part of the informants may create a reliability problem. Also personal interests or bias on the part of the researcher in relation to what actually has happened may hamper the study. Time-distance to the studied events potentially causes epistemological problems” (Halinen et al. 2012). These represent potential limitations to this study, and we have therefore asked informants after the interviews, when writing the case narrative provided in this paper as well as when constructing our analysis to comment on our interpretations. These comments are taken into account and made explicit to increase credibility in cases where they provide important nuances concerning writing the narrative.

EXCHANGE PROCESSES IN PETROLEUM LOGISTICS

The case concerns the oil company’s exchange processes regarding maintenance and modification operations (MMO) and electronics, automation and telecommunications supply. MMO is outsourced to an engineering firm. The case concerns supporting MMO on an offshore platform. This comprises of the part of petroleum logistics associated with production operations as opposed to search and drilling operations. Contracting a MMO arrangement between the engineering firm and the oil company customer is a process lasting approximately one year. The oil company must first provide documentation of its needs. A lengthy cross-functional process is carried out where different functions report MMO needs in the coming period. Documents are paper-based and organised into binders containing several hundred pages with technical requirements, specifications and technical drawings. Prior to tendering, communication between the oil company and competing engineering service suppliers may flow freely. After making the offer public communication must follow strict rules governing interaction in this transaction process. These documents represent a vital part of the bidding processes in negotiations. In case of changes in the tender, the oil company may invite suppliers to a meeting to inform all market actors of the amendments in the publicised tender. The engineering firms then create documents of equal proportion as the tender stating how they intend to solve the customer needs as well as pricing their offering. This proposition must be in the hands of the oil company within a stated deadline. Three companies listed in the Achilles (www.achilles.com) database are chosen to compete. These companies are ranked in accordance with an internally created rating system where suppliers are apportioned points in accordance with various weighted factors. The creation of this offering is carried out by the central organisation of both the oil companies as well as the engineering companies. These agreements commonly involve, from the perspective of one of these oil companies, MMO contracts for all their related needs within the given contract period. This contract provides accordingly the formal context of MMO operations. The awarded contract is for 6 years with an option for prolongation of 2 years. Prolonging a contract simplifies a future contracting process.

The engineering company, upon winning the bid, commences MMO-related operations. These operations are not handled by the oil company themselves. Usually the operations handled by the engineering firm are more complex and may be defined as a project; a set of MMOs that are fundamentally described in relation to specific starting and finalising points in time. The engineering firm produces nothing themselves and carries out no logistics operations on their own. They organise and carry out MMO-related engineering tasks. Technical solutions (engineering) are implemented on the platform by a specialist in order to support petroleum production. A primary task of the engineering firm is to contract supplies; in addition to engineering and purchasing which is a core activity of this firm. These companies indicate a number of different technological functions: e.g. electronics, structures, instruments, piping, noise control, and steel. Purchasing involves combinations of service and product supplies. Contracts are negotiated much in the same way as these companies' sales contracts with the oil companies. The main contracts run for varying periods, typically 2 years with options for prolonging the contract period. These agreements bind purchasing to this supplier in the contract period with orders carried out through simpler notifications using e-mail. Minor purchases are contracted individually using the Achilles database. The engineering companies also carry out quality inspections of their suppliers to verify quality features of different processes. A main supplier is contracted for each project. The value of this main tender is about 70-80 % of the total value of the project. This supplier supplies a technical package that involves the supplier again contracting with their sub-suppliers. In addition there are between 10-20 minor suppliers. In all there may be about 50 different specialised projects running simultaneously.

During project implementation the engineering company has a set of different meetings each week with its oil company customer. These meetings use video technology and consist of approximately 5-8 representatives of the engineering company and 2-3 representatives of one supplier and 2-3 representatives of the oil company. Such meetings are technically focused and involve one supplier only. Features of goods logistics location and timing, parts design, timing and location of labour are discussed to ensure a smooth flow of MMOs. The project plan created through contracting the project is sought verified and potentially adapted based on communication at the meeting. Each project involves at least a weekly meeting. In periods with intense operations meetings may be carried out daily. In these meetings the engineering company runs through a checklist describing supplies (products and services), logistics and current operations affiliated with the project.

3-4 petroleum supply vessels (PSV) transport goods to the platforms. Personnel are transported by helicopter to the platform. On the platform, the main bottleneck is sleeping capacity. Finally, MMO involving shutdown of oil production must be carefully timed since shutdowns are extremely costly. Termination of projects does not always fall in line with plans. In some cases oil companies decide to change priorities between projects, keep one project on hold, while advancing in time another project. One such project, started in 2010, was still on hold. In addition, various factors may create delays demanding operational coordination through the described project meetings.

ANALYSIS

Introduction: Timing MMOs are described in the case as seldom of urgent character. These are planned operations; MMO projects are accordingly relatively predictable. A great effort is taken to carry out MMO projects in accordance with plans. This is in part due to a range of constraints including most importantly interaction with other projects and housing capacity at

platforms. This planning includes aspects of their timing. However, when discrepancies from time-to-time occur, this is experienced as urgent for the oil company. The timeline of operations then changes impacting on both exchange and operations including how these processes interact. The engineering firm then must exhibit flexibility and be responsive to secure quality supply thereby securing customer value. In both MMO purchasing and the oil company's simpler purchases, after contracting relational triads are developed as complexity increases. In more routine types of purchasing this is only carried out in case of "emergencies" and involves rapid and timely communication between the requisite, supplier and purchaser representing examples of reciprocal dependencies core to the value co-creation construct. The role of value co-creation varies regarding the degree of predictability of operations. Furthermore, while the case shows how location is relatively unimportant at this layer due to telecommunications, the relative aspect of timing in supplier-purchaser interaction emerges as fundamental. The use of telecommunications is most evident in the case in relation to exchange processes concerning sorts; to support production through logistics.

Customer value: Is never explicit in the studied network and is sought frozen by network actors through translating objectives into documentation used in both exchange processes and production. In the case customer value transformation is predominately associated with supply uncertainty through weather changes, coordination with other projects and delay in supplies needed to carry out MMOs. It is accordingly contextual impact that predominately changes customer value and to a lesser extent personality or changes in preferences. Safety and control are the encountered explicit objectives in the case. Timing exchange processes where managers meet to facilitate value creation through developing plans and guidelines for processes has a relatively routine character. Control measures are broken down in the documentation using technical terms by providing a set of sequentially attainable goals. These goals are then fixed, no longer subject to change unless they undergo a complex exchange process. Timing of exchange is surprisingly sequential when viewing this process in line with the transvection whether in the case of tendering or in supporting operations after a contract for MMOs have been agreed upon. Even though project meetings involve predominately pooling of people and information, and information exchange, they also follow an agenda. A rigid sequencing of topics informed and decisions is strictly followed. This is possibly also to secure a form of control with the outcome of the project meeting process. Timing is accordingly applied as a tool in exchange and production to cope with "customer value". The objectives of supply are frozen and only changed through complex management processes. Freezing customer value into simplified and controllable measures thereby strengthens the chosen highly formalized plan driven procedure. Plans are however, rather than large overarching forecast-driven statements, smaller modules that are developed stepwise dependent on preceding steps in the planning process. This indicates some degree of responsiveness to fluid customer value objectives.

Management processes: Managerial interaction encompasses processes where people, comprising of both labour and knowledge resources, work together in both space and time. This involves MMO exchange processes in relation to transactions and in relation to sorts. Exchange in relation to transactions is concerned with tendering and negotiating contracts. These exchange processes are relatively time consuming and involve exchanging predominately information to secure a transaction in competition with alternative actors in the network involving actors at many different locations. Exchange is characterised as a process consisting of events were perpetually perceived as "before" and "after" in the minds of the managerial actors of the network. Timing of operations starts from the tender phase. First suppliers formally indicate their needs and based on this information, suppliers provide an

offering. This offering is affected by precedent relationships, references and a value analysis of the oil companies needs based on the tender. This offering represents a form of value proposition embedded in a formalised tendering process. This timing of the tendering process is not characterised intimate interaction. Reciprocal dependencies are accordingly weak in the described tendering processes in the case description. The tendering process is more challenging to understand using the transvection model since exchange processes involved in tendering do not support operations. However, when considering information as the process outcome of decision-making events, the tendering process may also be described using the transvection with sorts supporting interaction between an information flow and exchange process. Control is a part of the network culture and is organised through different project triads. These encounters are organised into different projects that are relatively routinely timed in relation to sequential project process. In addition different projects, each with its own set of timed project meetings, need to be timed in relation to each other. This is a form of process coordination where not only operations, but also exchange processes need to be coordinated in relation to each other.

The engineering firm and the oil company work collectively before, within and after the scheduled project meetings. These meetings are timed events in an exchange flow, applying the transvection view of supply, they may be termed as “sorts”. Project meetings facilitate, as sorts, interaction between value creation and managerial interaction. These sorts are interconnected predominately through an information flow. Through evoking sorts as a key event in securing value creation, relative time becomes a key issue. The case provides empirical evidence of specific nature of sorts as decision-making in interaction with other resources. Pooled information is complemented by reciprocal information exchange in project meetings. The project meetings involved manual decision-making; sorts dependent on information exchange facilitated by the project meeting. People are active in these meetings and their pooled knowledge resources are vital in reaching their commonly accepted operations safety and control objectives. The nature of individual project meetings are accordingly characterised as predominately featuring reciprocal and pooled dependencies. Each project meeting is embedded in a process of different meetings. In addition, project meetings are timed with series of meetings in other projects providing a contextual feature of sorts as sequentially dependent. Also the participants location must be timed so they can participate at different project meetings they are involved in. Pooling people therefore is also sequentially dependent. This provides an understanding that while the projects meetings themselves reflect predominately features of both pooled and reciprocal dependencies, their network context reflects predominately features of sequential dependencies.

Project meetings may be interpreted as exchange processes associated with internal customers. This evokes a notion that exchange processes have characteristics as predominately “services”. This also evokes expectations that reciprocal and pooled dependencies should be most important in regards to value creation. Exchange, when modelled as a transvection evokes the sequential dependencies as foremost. This shows how the tools used to analyse also impact on how a same process may be perceived through analysis. How exchange processes support operations is designed and may be empirically investigated. The exchange solutions in the case are embedded in a culture that may be described as goods-dominant since rules and checklists follow predominately a sequential understanding of exchange. However, if loosening up this control regime leads to increased risk of oil production failure changes will most likely not be approved by the oil company customer. This discussion evokes an alternative notion that exchange processes may be analysed as “production” or value creation on equal terms as operations themselves. A timing-based view provided basis for regarding management as operations and can, likewise as

operations, be developed in relation to effectiveness and efficiency measures. Also, the information flow may also be subject to development in accordance with efficiency and effectiveness measures. From a network perspective, the most important aspect is no not shy away from analysing the complexity of interacting features of management, operations and information processes within as well as between firms. This is when viewed from a research perspective clearly a challenging analysis, but highly called for when seeking process development. One may therefore speak of management labour on relatively equal terms as production and logistics labour.

Information processes: Information supports both management and operations and binds them together through timed sorts. Does this somewhat rigid view where sequential dependencies are evoked to characterise management, operations and information processes undermine the notion of value co-creation? Certainly not, but an operational-based timing perspective provides nuances of understanding that co-creation is a feature of processes that may be planned and organised by managers in different ways. Value co-creation is found in the case in way information exchange is facilitated through organising meetings; a form of teamwork. In the case risk is mitigated through sequential organising. Although no-one talks about it in the studied petroleum logistics network, this provides a rigid culture of organising a fluid customer value construct. Certainly the actual way to organise exchange may be altered. This change, however, in potentially developing “value co-creation”, must be adapted to the company’s existent perceptions of safety and control needs to avoid conflicts and misunderstandings as an existent discourse for how logistics is organised in the case is changed.

Operations processes: The analysis is concluded by considering how operations processes viewed in light of the transvection are impacted by managerial process, information processes and a customer value in flux. The case evokes how, although services are dominant, sequential dependencies play a key role in securing customer value. This is in-part in line with Thompson (1967) who regards production to always encompass all three forms of dependencies. The final phase is therefore termed as supply quality rather than customer value since this state, when the project is finalised be subject for control and inter-subjective analysis based on potentially divergent quality perceptions. This view of value co-creation in petroleum logistics projects, predominately a service offering, is shown in figure three:

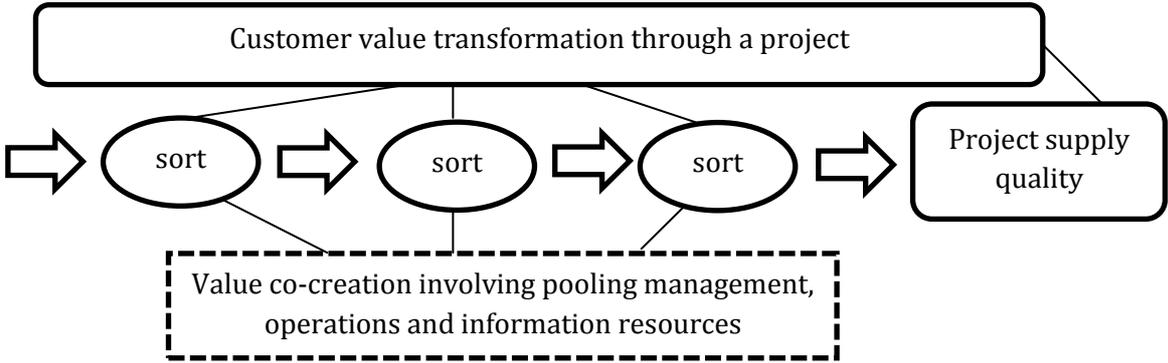


Figure 3: Value co-creation in petroleum logistics projects: Services viewed as sequentially dependent sort events.

Figure three illustrates how customer value as a fluid perception impacted by the sequential nature of operations. This model therefore provides foundation for developing responsive supply through agile networks interacting with perpetually changing perceptions of customer

value. The figure also illustrates, as it is developed in the grounds of the transvection understanding of supply operations, that timing is an important feature of value co-creation. Exchange processes are related to both transformation of products and services through operations as well as transformations in supply. The more long-linked the configuration of supply is, the longer the time frame from initiating a supply to its final delivery, the more clearly the features of sequential dependencies become through stretching the flow of products and services involved in sorts. Likewise, exchange processes may be considered using the model in figure 3 and its sequential dependencies become likewise clearer through lengthening the time frame of exchange processes, since more and more sorts need to be accounted for, and they do take place as events after one-another. Finally, developing figure three to encompass a network perspective would involve including other processes and how a focal process interacts with these different processes. This naturally increases the complexity of timing processes to the degree these processes are interdependent of each other and thereby demand to be coordinated.

CONCLUSIONS AND IMPLICATIONS

Value creation is proposed as consisting of two complementary and interdependent processes; exchange and production. Both are dependent on resource and activity integration involving movement, operations, information and perpetually changing customer value perceptions. Although “value co-creation” is not explicit in most professional terminology, inter-linkage through interaction to secure customer value is. Through a timing-based approach we have provided a view of how managerial interaction, information transformation, logistics operations and production (including services) are inter-related with the perpetually transforming customer value factor. Since customer value is a perceived knowledge component, it is as knowledge in general, inherently fluid in nature; an expression of learning, in the case exhibited through reciprocal dependencies that also may be termed as value co-creating. The evoked complexity and transient nature of customer value heightens the importance of the value co-creation concept in facilitating responsive supply; agility. This involves accounting for not only why to co-create value, but also how to operationally do it. Value co-creation involves at core reciprocal dependencies, a mixing of material, information and operations resources in activities termed as either production or exchange. In process development the classification of supply as either goods or services is relatively unimportant. It is the dependences regarding resource interaction and coordinating activities that always feature logics of timing that are important when seeking to understand the detailed nature of any form of supply. It is through this process-based analysis evoking features of particularities and dependencies in the realm of interacting network processes difficult to perceive the contribution of a service-dominant logic other than as a managerial imperative, which admittedly, based on a social constructionist view, may be important both in developing theory as well as business practice. For business practitioners this understanding may pave way for organisational development of the technologically focused engineering management practices. Inefficiencies in petroleum logistics have been up to now covered by enormous profits. Should oil prices fall the need to develop production and logistics efficiencies will be evoked. The case points to how efficiency consideration is not limited to operations, but involves managerial and information process and how these interact. Furthermore, evoking supply as a perpetual learning process is clearly called for given the transient nature of customer value. In complex purchasing, the case shows how this evidently is understood and already accounted for, although not in an explicit manner; neither as “value co-creation” nor any other normative business proposition or model.

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