VALUE CHAIN INNOVATION PROCESSES AND THE INFLUENCE OF CO-INNOVATION

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ABSTRACT

Today's leading enterprises are surrounded with business partners in their value chain. Next to traditional outsourcing processes, partners can be involved in co-investing in innovation. While several examples of co-innovation have shown a remarkable performance, the mechanism through which it occurs is still poorly understood. Previous research only limitedly explains the drivers.

In this research paper, the basics of value chain theory and the foundations of the value chain processes are explored. Six theoretical perspectives are used to develop an analytical framework. This framework consists of three foundational dimensions: *continuation, conception and configuration.* These dimensions are used to analyse case studies of successful value chain driven innovations on one hand and product innovation on the other hand.

The case studies show support for the relation between value chain innovation and product innovation. Co-innovation is one of the drivers within *configuration* and of influence to the product innovation process. In particular, a concept of an *innovation investment multiplier (IMP)* emerged as salient driver of co-innovation. The IMP factor expressed the effect of co-innovation in the sense of co-investing in innovation reducing the investments in innovation and multiplying these over the chain / partners

As a result of co-innovator partnerships, sharing of intellectual property, investments, and production emerged. These effects of sharing are expressed by multipliers for reasons of quantification. Investments and production are multiplied throughout the supply chain contributing to make enterprises more lean.

The outcome of the research gives insight in the drivers of co-innovation. Enterprises can use this insight to improve innovation performance in respect to their value chain.

Introduction

The classic value chain defined by Michael Porter in 1985 brought together the main disciplines within the enterprise creating value (see figure 1). Primary processes are production, logistics, commerce, services. The secondary processes are; technology, finance, human resources, procurement and infrastructure. The customer is not part of this value chain model. The model was based on (mass) production and (mass) marketing as a primary value generator and pushing. The processes were sequentially organized and based on a push system using stock as buffers to adapt to the market demand.

In today's electronics and automotive industries the supply chain stretches on global scale under influence of globalisation, liberalization and ict tools. Partners in the value chain are involved to generate a part of the total product/services value. Purchasing transformed to procurement to outsource many processes. Non core activities are cut of from the classic value portfolio's and processes. In stead of pushing products through the chain, the customer demand is pulling the chain. Technology has become a value generating discipline to cope with the desire of the customer supporting the innovation processes. The classic value chain defined by Porter has to innovate as well in perspective of innovation within the current market and the desire for more affordable, faster and better products & services.
The current developments are towards network or multi lateral systems where value chain players become connected and former supportive value chain processes become primary processes, somehow related in parallel ways.

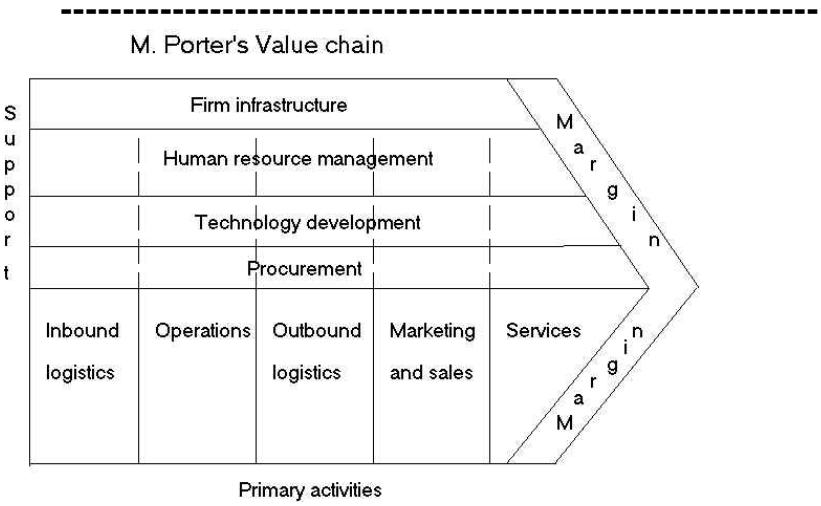

Figure 1: the value chain according to Porter (1985)

Research question
The research is looking for the drivers of innovation within value chain processes and the relation to innovation of products in the sense of co-innovation. In that sense the research question is 'how can a value chain be organised in order to improve faster, cheaper and better innovation?' In this paper we disclose the results of our research so far. The research is based on literature research and case studies. Now we first elaborate on the historic perspective of value chains.

Research method
First three case studies in different types of business will be researched on the "Value chain innovation process". Interviews are used as main method of data collection. The frame work of the 3C's; Continuation, Conception, Configuration are researched in respect of sharing investments, intellectual property, leading to faster, better and cheaper development of products and services. Measurable indicators are found for support the vision concerning the value chain innovation process, based on the 3C construct. Results of the five cases will be used as input to research specific aerospace cases.

VALUE CHAIN IN HISTORIC PERSPECTIVE

To better understand the essence of the value chains, it is of interest to go back to the origins. The most pure form of an integrated value system was what we called the “Trust” company was created at the turn of the 19th century as a result of the industrial revolution. Large vertical integrated monolithically structured enterprises were formed that controlled the complete supply chain from, for instance, mining iron ore to exploiting complete railway enterprises. Availability of a large cheap labour capacity in combination with profit capitalization was the driver for these mega enterprises. It was the beginning of capitalism as described by Adam Smith.

In the beginning of the 20 th century many of these super large companies dominated the western economies with the start of mass production of products. For instance, Ford started the mass production of cars, where customers could get any colours as long as it was black. This is a significant example of dominating and dictating the consumer demand.

After the second world-war the multinationals, large and diversified integrated conglomerates, dominated the industrial landscape. The enterprises had to split up and tear down there market monopolies in the seventies under pressure of the anti trust law by the US Government. It was the end of large US Telco’s like ITT and Bell and the beginning of market liberalization and start of competition satisfying the customers demand. At this point of time, economists like Keynes and later enterprise strategists like Michael Porter, had a large impact on strategies for economies and enterprises. The traditional drivers of value chain were the primary activities (Porter 1985) consisting of sales, production, and logistics. They were driven by market share, economies of scale and patent positions. The serial value chain processes were focussed on “push” models and providing from stock to the market.

Within the eighties and nineties of the last century the serial value chain concept came under pressure from “low wage” countries. Value chains started to decompose in smaller segmented parts, making use of advanced ict systems to better control production and stock. It was the influence of Hamel & Prahalad in the nineties to re-orientate enterprises on there core business by focussing on “Share Holder Value”. Value thinking in money terms was introduced, causing enterprise divisions to become more “lean” and focus on the strength and efficiency of the value chain. Non core activities were sold off to other partners and departments were trimmed down in size. The principals of Lean Manufacturing (Womack, 1996) were introduced, turning push based systems around to “pull” (Goldratt 1986), thereby creating “flow” in the processes. Large laboratories from Philips, Rand, IBM, Xerox started to rethink and refocus their research and development activities by “opening up the resources” to achieve better alignment with the market demand and core enterprise values (Chesbrough 2003).

At the end of the 20th century the world economy started globalizing. Recent developments in India and China show how quickly new markets and suppliers are connected to the already developed economies in the western hemisphere. State monopolies are becoming obsolete due to the process of privatisation. Capital is flowing into these attractive equity markets, where fast growing companies are provided with fresh capital. The next global stage (Ohmae 2005) is on. ICT makes the world more transparent and enabled access to the customer demand more efficient. Value chain processes like design, engineering, production, assembly and logistics could be optimised and de -coupled again with help of value chain management. The classic enterprise model with production-to-stock belongs to the past. Nowadays, production is aligned to customer demand with help of many suppliers. The customer demand becomes leading in the value chain process (von Hippel 2005), the role of ict, and more specifically, internet is crucial to develop market transparency and connect the supplier base to the customer demand (Kuglin & Rosenbaum 2001). The role of “purchasing” has become more important to tie in suppliers and coordinate in- and out sourcing processes.

It seems enterprises are reconfiguring their value chains to innovate their products and services. Some examples are Boeing with aircraft manufacturing, Raynair with low cost flying, Dell computers with PC’s, Cisco Systems with internet routers, ASML with semiconductor lithography machines and Philips with electronic consumer products.

To cope with the desire for a new long haul aircraft B787, Boeing introduced various Japanese and Indian partners to co invest, develop and built complete highly innovative sub systems in shorter time compared with classic value chain configurations. South West Airlines, Raynair and Easy Jet, the first "Low cost" carriers optimised value chain processes by not only outsourcing MRO activities but changing the service processes on board and innovating the processes on ground to dramatically reduce the turn around times. Various enterprises like Dell computers and Cisco Systems could make a step change by radically changing the classic value chain processes into an e-driven value chain (Leifer et. al 2000). The customer drives the value chain as they order and compose their product via the internet portal. HP ties up with Zeiss for obtaining the optics in digital camera's. Nokia with Zeiss for camera's in mobile phones. All partners are bonded together and contributing values in the specific chain. It seems the convergence of technology is supporting innovation of value chain processes creating value with the customer (C.K.Prahalad & Ramaswamy 2001).

THEORETICAL CONSTRUCT OF THE VALUE CHAIN INNOVATION PROCESS

Theoretical perspectives on value chain innovation are used to develop an analytical framework to identify drivers in case research. Various authors have studied processes around innovations in value chains. The next six major publications refer to the relation between the value chain and innovation:

1. (Porter 1985) defined the value chain with primary and supportive processes. The supportive processes like technology, procurement and infrastructure are contributing in today's enterprises essential value to the value chain.
2. (Moore 1995) states that by partnering rewards of market development are spreading among multiple companies, creating multiple sources of support in the market place. By contrast, when vertically integrated vendors win, no one else does. This means every hand in the market is turned against them.
3. (Leifer et al. 2000) in "Radical Innovations" refer to the value chain process influencing innovations and which requires system thinking.
4. (Prahalad & Ramaswamy 2001) in "Future competition" state that convergence of technology enables new products and services by introducing the customer into the value chain and combining technology cultures into new products and services. Creating value with customers is their adagio.
5. (Chesbrough 2003) in the publication "Open innovation" state that industrial R&D should be better aligned to the market demand by a) introducing missing R&D from outside the enterprise and/or b) abandoning under-utilized R&D capacity, both impacting the value chain.
6. (Von Hippel 2005) state that innovation is initially driven by the end-customer and advocates sharing innovations and creating user-communities.

By combining literature the issues value chain innovation and product innovation are brought into a combined perspective. All six publications make a reference to the value chain in relation to innovation. The concept of co-innovation is not dealt with explicitly. Based on these publications on value chain innovation, three drivers emerge that can be used as a framework to identify the following drivers of the value chain innovation process.

- *Continuation:*
  Accessibility to and focus on customer satisfaction. This is a necessity for business continuity. The customer is the place where innovative products/services start, are perceived and adopted as a success or failure. Market success can be expressed by Market Share generated by the product platform.
- *Conception:*
  Unique technology and smart and original processes; matching customer satisfaction, supported by Intellectual Property (IP) shared with partners.
- *Configuration:*
  To organise and collaborate with co innovating, investment sharing partners in order to create and accelerate added value in the sense of co-innovation. The innovation investment multiplier (IMP) (Beelaerts 2006) expresses the ability of the innovator to

multiply the investments in innovation due to sharing investments with partners: total investment in innovation divided by investment of the innovator.

These three drivers combine into a triangle that is shown in figure 2.

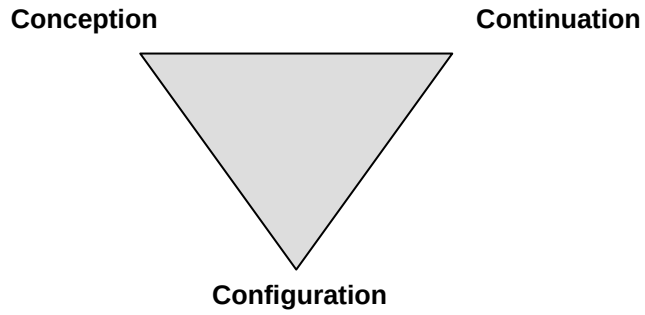

Figure 2: The value chain innovation construct

The value chain innovation construct (Beelaerts 2006) is used to analyse cases to elicit the drivers of product innovation in modern value chains. In the next paragraph the cases are described and some conclusions can be drawn on the usability of the conceptual model.

CASES OF VALUE CHAIN INNOVATION INDUCING PRODUCT INNOVATION

The following cases of value chain-innovation are identified. Interviews are used as main method of data collection to sustain the framework and drivers of value chain innovation. Within the following enterprises partners are involved in co-innovation projects:

1. The Boeing corp. asks partners to co-invest multi billions, co-innovate, co-develop and produce the B787 aircraft for the long haul point-to-point market.
2. ASML, supplier of semiconductor lithography machines, works together closely with Zeiss for the development of new lens systems, the most critical part of the machine.
3. Philips introduced various partners to co-innovate new consumer products such as “Senseo” and “Perfect Draft”.
4. Cisco Systems is surrounded by partners for product innovation, assembly, manufacturing, development and logistics to concentrate and invest in innovation.

The aforementioned enterprises have strong focus on the desire of the customer (*Continuation*) for which new products / services have been developed (*Conception*) with help of partners to meet finally the customer demand (*Configuration*) effecting innovation. Each of the cases is described along the lines of the three drivers of the value chain innovation construct.

BOEING COMMERCIAL AIRCRAFT; B787

Continuation

Boeing Commercial Aircraft (BCA) has developed the Dreamliner B787 for the long haul Point-to-Point market segment carrying 200-300 passengers. This development was driven by the market analysis presented by Randy Basler, Vice President Marketing Sales from Boeing at Delft University 2004, identifying the desire of passengers and airline customers for long haul “point to point” connections, bypassing the congested main hubs functioning within the “hub and spoke system”.

The aircraft launched in 2004 claims a performance improvement of 20% compared with former aircraft types from Boeing and competitors due to improved weight ratio’s and less fuel consumption. The airline customer, representing the passenger, is part of the value chain as they were involved in the development of the aircraft concept.

The positive market expectations have become true as the sales performance of the B787 since launching in 2004 mounted to 291 units up to moment of writing the paper, April 2006.
Market Share: The market for Long haul point to point aircraft is served by Boeing with the B787 and the Airbus A350. In total 291 units are sold by Boeing and 91 for Airbus which leaves a market share of 70 % and for Airbus 30% for this segment of the market.
Break Even: It is anticipated that Boeing will turn into Break Even with 400 aircraft, based upon first research results. Further research is pending.

Conception
Co-innovation partners; For the development of this new aircraft platform Boeing needed *"leading technology partners"* for making a step change towards the "All Composite Aircraft". Vought-Alenia and Japanese "heavy industry (MHI,IHI, KHI)" are main partner enterprises with experience in composite technology due to their involvement with the Boeing aircraft B777.
The market reception and acceleration of building up market share is induced by the product platform spin off from the B787-8 into B787-3, B787-9 and B787-10, and the orders of sold units since market launch.
IP sharing; Boeing is owner of the overall design of the aircraft. Boeing has taken a position for the B787 as final system integrator. Boeing is the first aircraft manufacturer to launch the All Composite Aircraft (ACA) using new composite materials and production technologies. Boeing passed over IP to the partners but keeps the ownership. IP developed by the partners for the B787 is cross over licensed to Boeing. Design rights are shared with final integrator Boeing. In case of under performing the design rights will be automatically at disposal for Boeing.

Configuration
Boeing positions itself as final integrator of the total aircraft system and asks complete sub-integrated systems in stead of components from the suppliers. Boeing therefore concentrates on strong first tier suppliers as co innovating-developing partners. These partners are investing in new technologies products, processes and services to cope with the specific performance requirements in respect of the B787 development. Boeing configures a value chain which spreads the investments across the value chain.

Investment sharing: The final integrator Boeing Commercial Aircraft (BCA) induces innovation investment throughout the chain with Partners**.** The total launch investment costs of the B787 are estimated on $ 13, 4 billion, Boeing carries approx. $4, 2 billion (Pritchard and MacPherson 2004). Compared to the former aircraft development from Boeing B777 all investments were carried by Boeing. Different for the development of the B787 is the contribution of investments by the "risk sharing partners to develop, design and built aircraft systems. The innovation induced by Boeing is multiplied throughout the chain with partners. From this phenomenon the innovation investment multiplier can by defined:
Innovation investment multiplier[IMP]; The IMP for Boeing is 13, 4 / 4, 2= 3,3. The value chain partners are benefiting from an initial investment by Boeing of $4,2 Billion. The innovation investment is multiplied with factor 3,3 throughout the chain.
Production sharing [PM]; It is envisaged the partners are sharing production in the same way they do in the innovation phase. PM= 100/30= 3,3. Boeing multiplies it's production share with factor 3,3 over the chain partners.
Partner reciprocity; Effect of the configuration process is the benefits in terms of reciprocity the partners can obtain. The Japanese partners are moving up in the chain from design & production of composite components for the B777 to design & manufacturing of complete subsystems like wings, adding more value. Boeing at the other hand gets access to the Japanese industry and finally access to potential customers tying in the launching customer for the B787 in Japan ANA to the value chain. Configuration influences *Continuity* positively.
Lean organisation [TC]; Boeing makes use of a network organisation by introducing many partners to the value chain as system integrator. Where Airbus is using the "vertical integrated value chain" (Prichard, MacPherson 2004) carrying the investments in the own company. Boeing Aircraft Corporation has 52.000 employees. This results in a turnover per capita of [TC]= $ 430.000.-

ASML; TWINSCAN™

Continuation
ASML is market leader in semiconductor lithography machines with a market share of 80% for the top end market. Customers are wafer production plants for producing microchips, like Samsung in South Korea and TSMC in Taiwan. ASML machines are working under extreme vulnerable conditions regarding vibrations and cleanliness as the chip circuits are within nano [nm] reach. ASML strategy is focusing on Technology and Customer service. The investment in the development of the TWINSCAN platform starting 10 years ago was about Euro 1 billion. The development time was 3 years. The machine is 6 years in production. In total 650 units are delivered.

Conception
ASML operates in a market with high entry barriers due to the complexity of the involved technologies, speed of technology developments and investment capabilities. ASML combined leading edge optical technology with Wafer stepper technology. Agreements on intellectual property (IP) are concluded with the various co-innovating partners.

Configuration
ASML has taken a position as final integrator working together with partners supplying complete integrated subsystems. The partners are sharing in development and production. ASML works close together with 20 partners in co-innovation of which 5 main partners for optical and drive & control technology. Despite of the cyclical market effects, the value chain of ASML with partners is able to adapt to market fluctuations.
Co-innovation partners; Zeiss and 4 other main partners.
*Innovation investment multiplier[IMP];*The total investment to develop a new generation machine is approx. Euro 1 billion. ASML carries Euro 360 million or approx. 36% of the development costs, the partners carries 64%. The IMP= 100/36= 2,78. The investment is multiplied by factor 2,78 over the chain.
*Production sharing [PM];*ASML is outsourcing for Euro 1,7 billion of value in the supply chain. The chain shares for 95% in the production leaving for ASML 5% production value. Production Multiplier PM= 100/5= 20. ASML production value is multiplied 20 times by the chain configuration.
*Lean organisation [TC];*ASML generates a turnover per capita [TC] of Euro 500.000,-. based on a turnover of Euro 2,5 billion in 2005.
Former value chain supportive processes like technology, procurement and finance have become primary processes represented in the board of management; CEO,CFO,COO,CTO. Marketing sales is incorporated in Technology and Operations is managing the supply chain and final integration and tests of the machines.
Partner reciprocity; ASML has obtained extensive knowledge concerning optical technology a necessity for development of the next generation machines. Zeiss as partner moved up into the chain from Electronic microscopes to semiconductor core technology. Partners are contributing to the scalability of ASML to adapt to market fluctuations.

PHILIPS; SENSEO

Continuation
Philips in the Netherlands, producer of medical systems and consumer electronics has adopted the “open innovation” policy according Chesbrough to improve the effectiveness of the R&D capabilities. As a consequence Philips started to be more receptive for cooperation with enterprises to add missing know how and /or selling off non core technologies.
Senseo brings together hardware “low pressure” espresso technology in combination with the exact refined and blended café pad from Sara Lee/DE. Since the launch in 2001 about 10 million café machines have found there way to the customer. About 10 derivative café machines are developed based upon the original product platform.
Market share: The market impact and success of Senseo can be measured by the achieved market share and Break Even. This information is non disclosed. Philips stated that the initial market share was 100% as there was no competition in that market segment at the moment of launch. Further research is pending.

Conception
Co-innovation partner for Senseo; SaraLee / DE
Senseo which is a café machine containing the provision for special café pads is a joint development between Philips and SaraLee/DE. Philips is responsible for the "hardware" machine and SaraLee/DE for the "software" café pads. Senseo is a new brand created by the partners.
IP sharing; For Senseo, Philips is sharing IP with SaraLee/DE on a 50/50 basis. This is formalized and organized within a Joint Venture. Both partners have a mutual cross over license agreement on either IP content. Infringements of patents are defended jointly by Philips-SaraLee/DE JV.

Configuration
Philips is not taking risks alone but introduces partners to co-innovate. In the meanwhile 30 partnerships have been established. New partners are adding value to the Philips value chains by bringing in their markets, competences and resources. This partnership approach is part of the main business strategy of Philips. The partnerships are based on an investment and revenue sharing basis.
Investment sharing; Philips shares investments with SaraLee/DE on a 50/50 basis, each partner invest approx. Euro 5 million. The Innovation Multiplier IMP= 100/50=2
Production sharing Philips [PM] ; Philips 30%, partners 70%. Production Multiplier PM= 100/30=3,3. Philips multiplies it's production value 3,3 times over the supply chain.
Revenue sharing; Philips receives a non disclosed revenue share over the turnover consumables from the partner.
Market research sharing; Consumer behaviour for development of new derivative machines and tastes /blends are jointly researched.
Partnership reciprocity; Due to this partnership strategy Philips is involved in the market for consumer consumables; Philips made the consumer part of the value chain. SaraLee/DE has the advantage to be linked to consumer investment goods.

CISCO SYSTEMS; INTERNET APPLICATION IN MOBILE TELPHONE

Continuation
Cisco Systems is a transparent and customer driven organisation with a clear mission. John Chambers, CEO makes it laud and clear. "The soul of Cisco is "customer success and satisfaction". Cisco Systems is a major player on the market for availability and accessibility of information at any place at any time against the lowest costs by using technologies like IP (Internet Protocol) and broadband via the internet (fixed) and wireless applications.

The ratio of processing orders via the internet is 97% which demonstrates the accessibility for the customers.
The infrastructure of Cisco Systems is based on internet communication from customer demand to the contract manufacturers. Customer satisfaction is an asset for Cisco Systems and measured on a regular basis. New products and services are derived for the customer satisfaction in respect of continuity.

Issues with co-innovation for Cisco Systems are; the size of the network with co-innovating partners in its complexity from the point of view to manage the co-innovation process. Cisco Systems confirms the 3C's (Continuity, Conception, Configuration). It is recognized as the working model to improve innovation as it meets the principals of Cisco's customer orientation, Technology focus and collaborative "Network Virtual Organisation model (NVO).

Conception
Convergence of Technologies leads to co-Innovation and collaboration. The co-innovation with Nokia combining wireless Internet with hand held telecom is an example of this new direction. Another "Big Bet" is "Converged Buildings" where the Building is fully utilized with wireless communication to operate the building as well as facilitating the employees working in the Global Virtual Network or "Multi Lateral Organization".

Cisco Systems contributes in this co-innovation with Nokia to the development of unique software called "Call Manager" this software is developed to communicate in a dual mode umts / wireless with the Nokia hand set. Nokia develops the mobile telephone containing the Cisco Systems software for distribution to the consumer market.

Co-innovation business partners; Cisco Systems and Nokia
The Internet Protocol world meets the Telephone world. Cisco Systems provides in Internet Protocol enabling functionalities like; Meeting place, VOIP, Video Conference. Both of best worlds are matched within this new product.
IP sharing: With Nokia on a equal shared basis 50/50.

Configuration

Innovation investment multiplier[IMP]; Cisco Systems and Nokia share there investment on a 50/50 basis. IMP= 100/50=2
Revenue sharing; Cisco Systems has a revenue sharing agreement with Nokia on the number of sold hand set telephones by a non disclosed royalty fee.
Production sharing [PM]; Cisco Systems in general outsourced production for 80% with Contract Manufacturing Partners. Cisco Systems contributes 20 % production value. Cisco multiplies the own production factor PM= 100/20= 5. The goal of Cisco Systems is to reduce the number of contract manufacturers and to increase outsource of production towards 100%.
Lean organisation [TC]; To become more "Lean "Cisco Systems has changed the outsourcing policy. The last decade a large base of subcontractors was built up to outsource manufacturing. In total 30 manufacturers where connected. The next decade Cisco Systems will change this strategy and improve the supplier base for contract manufacturing.
Cisco is considered by there peer group as NVO (Network Virtual Organisation) the most advanced form of network organisation. As the production value of Cisco Systems is largely contributed by the business partners, the organization has to be structured and managed differently. Main management fields are Customer Relations, Technology & Innovation, Operations orchestrating partners, Finance and Human Relations. Operations by partners are taking over the classic "Production" factor. Partners are becoming increasingly important and are taking over complete competences of the value chain like the entire logistic process. To manage this "multi lateral value chain" with partners, Cisco has installed a Business Process Operation Council consisting of all the VP's. Specifically Partnership relations are managed by this council. Today Cisco Systems turnover per capita is $ 700.000,-
Partner reciprocity; Goal for Cisco Systems is to have access to the consumer market by leveraging on the Nokia product and brand. Nokia benefits by having access to the enterprise market of Cisco Systems strong in enabling communication network connections internet routed.

ANALYSIS OF THE CASES

The cases are researched on the value chain innovation construct formed by; *Continuation*, *Conception and Configuration*:

- Continuation and Conception interacts as the demand for innovation is customer driven and generates Conception of unique products, processes and services (IP). The customer has become part of the value chain.
- Configuration and Conception interacts positively as conception is driven by co-innovating partners both generating and sharing of IP aligned with and focused on Continuation.
- Continuation and Configuration interacts positively due to the lean effect induced by sharing investments in innovation, production sharing and multiplying investments in innovation (IMP) and production (PS).

PRELEMINARY CONCLUSIONS

- Introducing the customer (Continuity) to the value chain process aligns the useful Conception (technology) and Configuration (partners) eliminating waste from the value chain process, contributing to a range of useful innovative products which results in a competitive advantage for the innovators, rewarded by initially high market shares with positive effect on Break Even, resulting in *faster and better* innovation.
- Configuration enables co-innovating, co- investing, co-producing partnerships and stimulates innovation expressed by the innovation investment multiplier (IMP). Convergence of technologies is part of the adding value partnerships. Sharing of technology, IP, investments and production multiplies the investments in innovation and subsequently in production throughout the supply chain whilst reducing the investment costs, risks and introducing revenue sharing in some cases. For each partner the investment is "lower / *cheaper*".

- Partner reciprocity occurs where partners get access to the domain of not explored business models, market segments and technologies.
- Canting the classic value chain processes induces the lean “multi lateral” / networked value system where technology, finance, procurement and (e driven) infrastructure have become primary processes, for top end integrators the classic production becomes a supportive process. The turnover per capita (TC) can be in the range between Euro 800.000 to 500.000.- for a “lean multi lateral organisation”.
- It seems product innovation can benefit from value chain innovation.
- The 3C Value chain innovation construct influences positively faster, cheaper and better product innovation.

The preliminary answer to the research question ‘how can a value chain be organised in order to improve innovation?’ is that the conceptual ‘value chain innovation construct’ helps to understand value chains and improve the innovation capacity throughout the chain. The drivers; *Continuation*, *Conception* and *Configuration* give the specific factors that drive profitable innovation.

Further research is recommended to explore and justify the construct of value chain innovation and the resulting organizational effects of co-innovation.

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