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COMPLEX PURCHASING – A CASE STUDY OF EVALUATION MODELS FOR LONG-TERM NETWORK CAPITAL INVESTMENTS

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ABSTRACT

This paper addresses purchasing evaluation models in the European electrical grid sector, with a particular focus on complex and long-term network capital investments. The findings are based on 49 interviews with 10 organizations (power companies, engineering firms, the regulatory body, and special interest groups). This research contributes to knowledge building in the under-researched area of evaluating value in complex long-term purchasing. The study finds that the inherent long-term nature of the investments in products and systems, and the underlying financial situation are of the utmost importance in evaluations, together with strong regulator influence. In fact, the regulatory body not only defines the willingness to pay for the end-consumers through regulations with a focus of protecting consumers from monopolists unfair/high-prices, but also defines the opportunity costs by the predefined a number of costs in the grids in terms of 'standard-costs'. Although theoretically customer value is defined as the perception of benefits minus the sacrifices for the end-user, in this setting it is the regulatory body that defines this value on behalf of the end-user/consumer. Thus, the regulatory body plays a pivotal role defining the value, value creation and value sharing, and is therefore pivotal in the way in purchasing evaluation models are structured.

KEYWORDS: Purchasing; Supplier evaluation and performance measurement; Supplier selection.

INTRODUCTION

For certain industries (e.g. defence, power generation/transmission, and telecom) buyers have traditionally played a pivotal role in the development of products and posed technical requirements to suit their technical needs. However, the market for many large engineering companies (e.g., ABB, Ericsson, Siemens and GE) has changed. Deregulation of markets and increased the internationalisation of customers put new demands on the way complex sales are evaluated by the buyers. From a situation where sales have been focused on selling product attributes to a highly technically versed purchasers, sales today must much more instead be directed towards customers' short-term financial goals and shareholder value. Their role has instead turned to evaluating competing bids for specific projects (e.g., de Paula, 2006). For example, large investments in infrastructure make the buying decision more complex. This is related to the uncertainty of technology development and the difficulty in defining distant future cash flows over extended periods, which can vary between 30-50 years or more.

From both a theoretical and practical perspective, the definition of value becomes important for long-term investments. However, the more long-term the investment, the more uncertainty and risk in the evaluation of different options and the value that different offers may have. This means that it is increasingly important to understand the driving forces behind the evaluations, and the impact evaluations can have on future operations (e.g., purchasing evaluation models, cost of money and cost of energy). Although there is a growing interest in the area of value creation, there is little attention paid to the issue of dynamics in value creation and appropriation (some exceptions are Narayandas and Rangan, 2004, and Eggert, et al. 2006). In this project, the inherent long-term nature of the investments in products and systems, mean that dynamics is of utmost importance in the value created and appropriated. Furthermore, although much of the value appropriation discussion is based on contract negotiation (cf. Fisher and Ury, 1991; Neale and Bazerman, 1992) and value definitions are based on price (see Anderson et. al, 1993), little research have been made on actual price and evaluation models and its consequences on value creation and appropriation. Much of the value literature has its focus on the seller, whereas very few describe the definition and

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evaluation of value by the buyer, which is the focus of this paper. In order to address, our paper aims to investigate how buyers define and evaluate value in complex long-term purchasing.

The remainder of this paper is organised as follows: the next section reviews value creation and value appropriation in the power sector. Subsequently, the research methodology is addressed, followed by the description of evaluation models in the power sector and a discussion. Finally, conclusions are drawn.

VALUE CREATION AND VALUE APPROPRIOATION

From an academic perspective value creation through tight collaboration between firms has been described in some length (see e.g. Håkansson and Johansson 1992, Håkansson and Snehota 1995), where value is regarded as being created jointly between the seller and the buyer, in those products and solutions are developed in tight relationships. This research also implied that the total value created is larger when working in tight relationships, than when buyer and seller act individually. However, the ability to create value is a fundamental trait for any business enterprise (Anderson et. al, 1993). From an economic theory perspective (efficient markets), every firm tries to extract or appropriate as much value as possible for itself (e.g., Williamson, 1985). In value-chains the basic thinking is that separate chains compete with other chains, and that it is the role of one chain to create the highest total value, and at the lowest cost possible. In this paper our starting point is that value is created in value chains, where different actors create various types of value for the final end-usage and the consumption of the products and services. In other words we believe that there is a value-chain of different companies, who together in "value-constellations" (e.g., Normann and Ramirez, 1993), or separately, add value along the chain.

From this perspective value is generated from the activities within the chain. However, this tells us little about the way in which an individual firm within an industry is able to appropriate maximum value for itself (cf. Mizik and Jacobson 2003). From an economic perspective total available value and created value can be defined as the difference between willingness to pay and the opportunity cost (see Figure 1). Drawing on the work of Brandenburger and Stuart (1996), the way in which value is appropriated is very much dependent on a number of factors. These are (see also Figure 1):

a) Perceived and available value;

b) Pricing models, that is, the way in which sellers exhibit their offer;

c) Purchasing evaluation models, or the way in which buyers value offers from sellers, where both b) and c) can vary across and within industries.

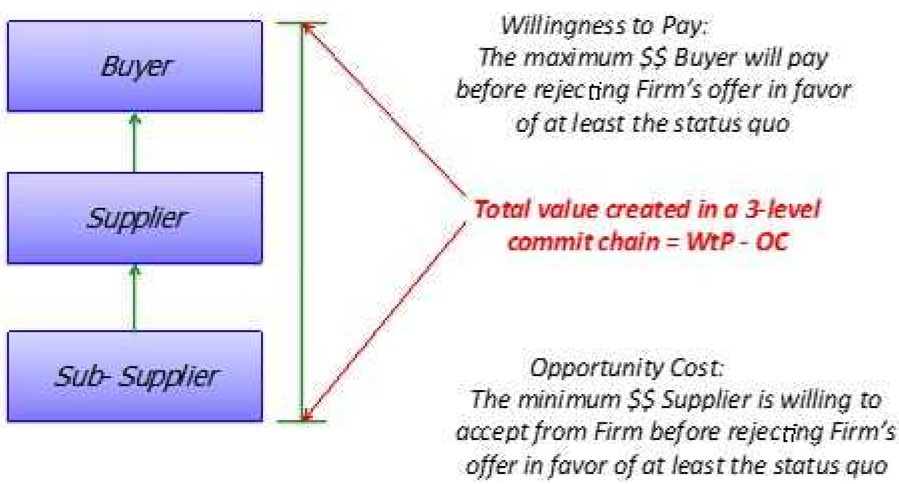

Figure 1. Illustration of value creation (Brandenburger and Stuart, 1996)

In most markets there exist strategies and ambitions to lower costs and also create more end-customer value to maximise the total available value that can be distributed among actors in a value chain (Brandenburger and Stuart, 1996). With this starting point, this paper will describe and analyse the case of evaluating value in complex long-term purchasing in the power sector.

RESEARCH DESIGN

This research addresses purchasing evaluation models in the European power sector, with a particular focus on complex and long-term network capital

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investments. Data collection has been completed in two phases. In the first phase an in-depth study about the current situation of the Swedish market for electricity grids was conducted. The second phase of the research focused on studying the European market and included three separate parts (see Figure 1).

Figure 1. Focus of data collection for phase 2

The starting point for the data collection was to follow the empirical phenomena of complex purchasing in the sector with a focus on evaluation models for investments, reinvestments and maintenance. The paper is based on data collected through 49 interviews with 10 organizations (see Table 1).

Table 1. Overview how data was collected

Type of institution/ company	*Interviewed institutions*	*Number of interviews*
Buyers – grid companies	The Swedish and UK national grid companies 3 European grid companies 2 Municipal owned regional grid companies	34
Suppliers - Engineering firms	A global supplier of products and systems for power transmission, serving a wide array of industrial customers and utilities with focus on large projects, with sales to governments or large utility firms	11
The regulatory body	The Energy Markets Inspectorate that supervise the electricity, natural gas and district heating markets	1
Experts and special interest groups	Experts and lobby organisations with industry expertize and active role in the evaluation of new and state of the art power technology	3

The companies and organisations selected for the study were decided based on dialogue with outside experts and an industry organisation, which is a research cooperation between electricity companies, manufacturing companies and public authorities. The interviewees included general managers, purchasing managers, sales managers, technical managers, project managers, industry experts, and engineers. In almost all cases, the interviews were conducted in the respective interviewee’s office and lasted on average for one hour. The analysis started simultaneously with the data collection (cf. Eisenhardt, 1989; Yin, 2003). The analysis had a replication logic approach, including cross case conclusions as well as mapping data to theory to compare and contrast the findings with previous studies (Eisenhardt, 1989; Voss 2002; Yin, 2003).

RESULTS AND DISCUSSION

The power sector can be subdivided into 3 sectors; 1) power producers, 2) transmission grids, and 3) distribution grids to consumers (regional and national grid). These three sectors conduct business with each other, but under different conditions; the power producers principally act under free competition, whereas the grid business can be considered as a regulated monopoly. Investments in all three sectors have to follow different rules and have different

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requirements regarding earnings. The power sector operates within very complex market conditions, but the overall goals are to contribute to efficient production and transmission of electrical energy, still under requirements of returns on investments made.

Historically, network investments in the power sector have in most Western European countries gone from a strong capacity expansion phase to a market ("case-by-case") phase. For example, in Sweden, a larger share of the 20th century was characterized by a continuous capacity expansion with little uncertainty in investments and value creation/evaluation, where grid companies assumed strong future demand growth (see Figure 2). In the beginning of the 1990s the sector reached close to over-capacity and with the market deregulation the market entered into a new low-intensity investment phase, with a focus on cash-flows and return-on-investments of individual business cases.

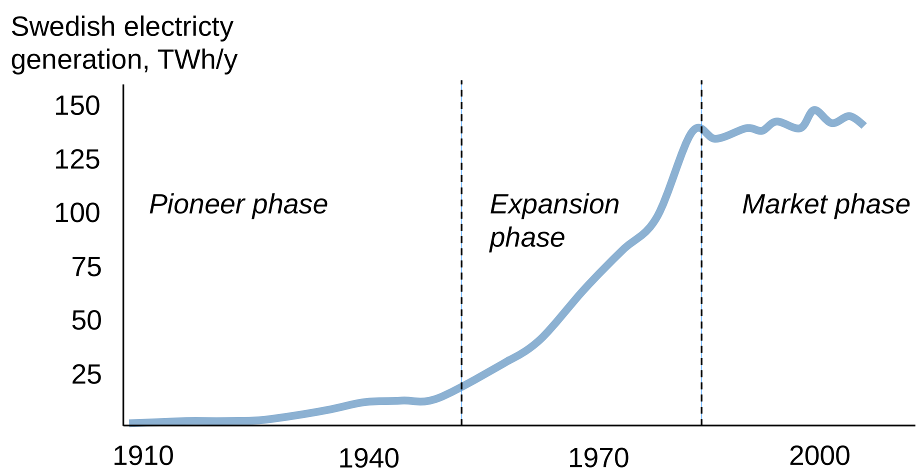

Figure 2. Development of the Swedish electricity generation capacity

Now the European market is once again changing. The EC and individual countries have also set challenging targets to increase amount of energy produced from renewable sources and to lowering CO2 emissions. For example,the Swedish Government committed to lowering CO2 emissions by 40% 2020, and by 80% in 2050). In this respect the EC see the electricity grid as an important lever to reach sustainability targets. The European Commissioner for Energy described the strategy this way:

'We can draw three key lessons from the roadmap. First, we need to act quickly. Our energy networks are aging and need billions of euros of investment. The current investment cycle must be the one which transforms Europe's energy system. If not, we will be locked into higher emissions for decades.' (Energy roadmap 2050)

It is estimated that around one trillion euros must be invested in the European energy system between today and 2020 in order to meet energy policy objectives and climate goals (EC communication on Energy Infrastructure priorities for 2020 and beyond, 2011, p. 11). Germany, for example, is acting as frontrunner in Europe and will gradually phase-out nuclear power by 2022 and is implementing the new energy policy. The goal is faster adaptation of renewable energy sources; with wind power as a central component. New power policy will lead to the development of bottlenecks in the grid system as energy production must be transported from Northern to central Germany. Such transformation will in Germany alone require investments of around 40-50 billons euros (GTAI; 2012; VKU, 2012; Netzentwicklungsplan 2012).

The European Commission (EC) is working towards creating a single energy market and has over the last two decades enforced a number directives and regulations to facilitate trans-European trade within the European region: 1996-1998 harmonization (e.g., Dir 96/92/EC; Dir 98/30/EC); 2003-2005 market integration (e.g., Dir 2003/54/EC; Dir 2005/55/EC; Reg 1228/2003; Reg 1775/2005); 2009-2012 EU-wide institutional and regulatory framework (e.g., Dir 2009/72/EC Dir 2009/73/EC; Reg 714/2009; Reg 715/2009; Reg 713/2009; Reg 838/2010). In line with this work and to ensure market integration the EC has also recently proposed a focus on four priority electricity corridors that will help to remove energy islands and enforce trans-European trade until 2020

(EU – Directorate – General for Energy, 2010; EC communication on Energy Infrastructure priorities for 2020 and beyond, 2011).

Purchasing evaluation models in the power sector
Based on the current market conditions, evaluation models of the buyer in the power sector can be described in three key dimensions (see also Figure 2): available resources (what resources are available for making investments), prioritization (how to prioritize between different possible projects) and initiation (what kind of investment should be made for a chosen project).

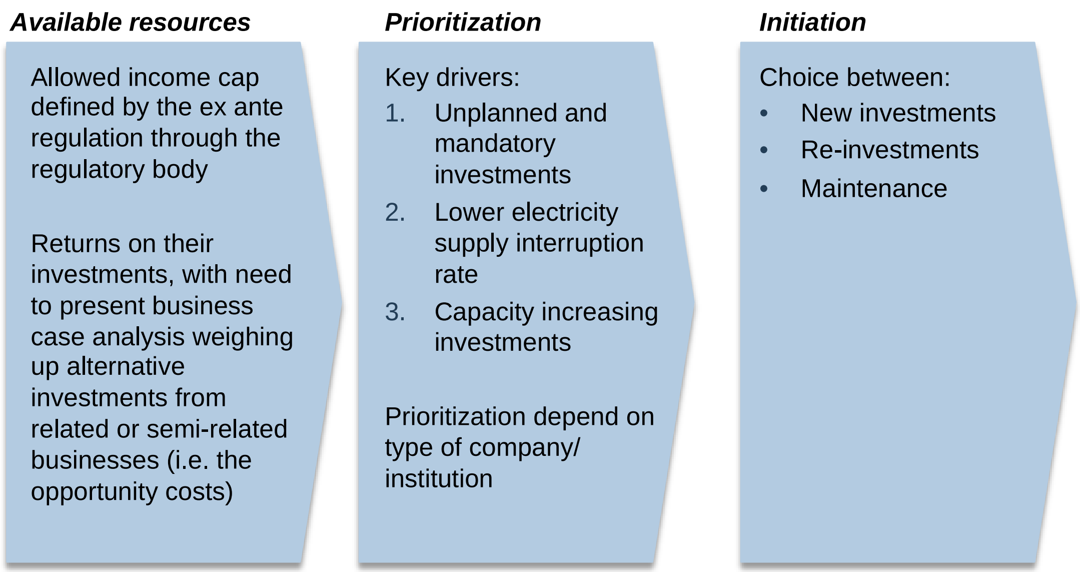

Figure 2. Overall structure of evaluation model

Available resources
Grid companies' available resources for making investments are predominantly defined by two key factors: 1) Allowed income cap defined by the regulatory body; 2) Returns on investments required by the company or owner:
While the European Union is moving towards a trans-European trade of energy, there are still some country specific variations in the regulatory models. However, the focus of the different regulations is the same: to protect consumers from monopolist's high-prices, while maintaining a sufficiently healthy electricity grid business, where the former seems to take precedence over the latter. In Sweden, for example, the regulatory body Energy Markets Inspectorate (EI) recently introduced an ex-ante regulation for grid tariffs on the Swedish market (see e.g. EI R2010:03; EI R2010:06; EI R2010:07; EI R2010:11). Prior to this regulation the Swedish market was regulated ex-post, where companies subsequently had to defend to EI their tariffs based on their costs, which often resulted in legal disputes between the parties. The starting point for the ex-ante regulation is that the companies should be reimbursed for their grids based on their forecasted costs, and that the system should be cost-neutral. In order to establish these costs EI has predefined a number of costs in the grids as 'standard-costs', such as costs for power lines per km, costs for transformer-stations etc.
Electricity grids are capital intensive with long investments horizons. In the EI regulation this is managed by having long depreciation horizons that should also match the technical lifespan of the systems. Investments made to reduce energy losses in the system are not treated explicitly in the EI regulation and the development of energy prices over the long-term is completely neglected. Instead, the calculation of costs related to energy losses is solved by reimbursing energy losses at spot market prices. This means that losses are always reimbursed and incentives for investments in energy savings systems are de-facto non-existent.
A complicating factor in regulations is the cost of capital in the calculations. Regulatory bodies often use weighted average cost of capital (WACC) as a basis for internal interest rates. This speaks for a fairly high estimation of interest rates, which is associated with a more short-term orientation (maybe 6-10%). However, they also discuss the issue of investments in electricity grids as being less prone to risk (sometimes referred to as risk free), resulting a lower interest rate

interval (5% or lower). However, if the regulatory body reimburses tariffs based on a low cost of capital (i.e. interest rates) this will result in a lower calculated tariff and thus less available resources for grid companies to make investments. The consequence is a more short-term regulation that protects consumer from higher prices. Still, Paradoxically this will thus prevent from making energy efficiency investment decisions presumably leading to less efficient networks.

In addition to the allowed income cap defined by the regulatory body, companies more often than not have requirements for returns on their investments. However, these resources available will differ depending on type of grid company. Large pan-European grid companies' investment focus will differ from smaller municipal owned utilities:

- Regional/ local grid companies (often municipal owned) with mainly distribution grid (low voltage): Focus on satisfying inhabitants and companies within the municipal (i.e. offer competitive price in electricity), which also define the resources available. The investment budget is often more or less constant from year to year.
- European/ national grid companies with both transmission and distribution grids (low-medium voltage): Profit oriented companies that need to make business case analysis, weighing up alternative investments from related or semi-related businesses in other regions and countries (i.e. the opportunity costs).
- National electrical grid owner which transmits electricity (high voltage) from the major power stations to regional electrical grids: The investment budget is defined by the owner (in Sweden and England this is the state) with a focus on the economic benefits to the community. In Sweden, for example, the parliament establishes the framework for the Swedish National Grid's investment and financing activities.

Prioritization

Priortization of different investment projects can be described with starting point from two major factors: 1) type of company making the investment; 2) type of investment project:

When investing in larger electrical transmission systems, such as High Voltage Direct Current(HVDC) or in a single transmission product such as power transformers, the companies studied generally value their investment based on an expected energy loss, and the capital cost of the investment (ca 30+ year life-span). The calculation is consequently reliant on the internal interest rates that the companies use when they invest in networks as well as the expected cost of the energy loss, often calculated as net present values. A consequence of this is that the definition of the interest rates and future energy prices are very important, and that depending on the company focus this can vary significantly, leading to very different investment decisions. However, different companies may have an alternative strategic focus that leads to different prioritization: A focus on share-holder value with a high proportion of institutional investors would hypothetically lead to demands for fairly high returns on investments over the short-term, whereas companies/countries that are focused on building infrastructure for the longer-term, with environmental concerns factored in, can have totally different demands on returns.

From a project type, companies that own distribution grids typically give highest priority to unplanned and mandatory projects e.g. connecting new customers or power suppliers. Unplanned projects can be the unexpected breakdown of transformers or other equipment which will require prompt investment. Typical investment size of such projects is small to medium, making it more manageable. Subsequently, prioritization is typical given to reduce electricity supply interruption rates, e.g. improve supply reliability and sensitivity to storms by changing to underground cables. Finally, the lowest priority is given to capacity increasing investments. This when improving supply reliability of electricity often requires medium-sized investments, while increasing the capacity typically require large investments. While unplanned and mandatory projects usually need to be initiated on short notice, capacity-increasing investments can be postponed during times of tight budgets. The owner of the national grid which transmits electricity to the regional electrical grids starts from similar project specific factors but there is a greater focus on removing bottlenecks and promoting open national and European markets. Thus, a high priority is also given to capacity increasing investments.

Initiation of the project

Once a grid company has decided upon a project with the available resources, there are three further types of choices in the next step shown previously in figure 2:

- Maintenance investments – continuing to repair and maintain the existing grid
- Re-investments – make an replacement investments on the existing grid

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- Investments – increase of capacity by new investment

In order to evaluate different bids for a specific project (e.g., reinvestment or new investment) it is common that the investment is evaluated as a Net Present Value (NPV), where the investment and the expected capitalised energy losses is added to a total lump sum. With this starting point, grid companies have to tackle the question of how to value an investment versus the benefits the investment will bring to the operations. Net Present Value is a way for the grid companies studied to distinguish different bids from one another. For the long-term investments, two factor prices/costs become particularly important, i.e. the future cost of money (interest rates and return on capital) as well as future energy prices. Understand the dynamics of costs is of particular interest when considering value creation in long-term investments. This is because costs can vary considerably over time. This is known as the experience or learning curve, where buyers and sellers adjust to one another as well as other influencing factors. This can result in cost reductions or increases as factor prices fluctuate (cf. Rehme, 2006). The future energy prices is not only reliant on the way in which energy markets can function, but also on defined values of environmental considerations, which can be a consequence of the discussion on CO_2 emission caps (but also CO_2 trading and energy taxes etc.) (Rehme and Nordigården, 2012).

However, to use a NPV model to evaluate infrastructural investments is challenging as it may lead to completely wrong investment decisions. This when more often than not these models speak for comparably high internal interest rates, which promote investments in cheaper, and thus less energy efficient, products and systems. Similarly, an evaluation based on comparably lower future energy prices (based on today's market prices), can also lead to investments in simpler and less energy efficient products and systems. Since these investments are long-term, these decisions can prove to be wrong from a business perspective, and perhaps even worse from a public economy, as well as an environmental sustainability perspective, and does not lead to the development of better and more environmentally friendly power products/systems.

CONCLUSION

This research contributes to knowledge building in the under-researched area of evaluating value in complex long-term purchasing. The study finds that the inherent long-term nature of the investments in products and systems, and the underlying financial situation are of the utmost importance in evaluations together with strong regulator influence. In fact, the regulatory body not only defines the willingness to pay for the end-consumers by regulations with focus of protecting consumers from monopolists unfair/high-prices but also defines the opportunity costs by the predefined a number of costs in the grids in terms of 'standard-costs'.

Although theoretically customer value is defined as the perception of benefits minus the sacrifices for the end-user, in this setting it is the regulatory body that defines this value on behalf of the end-user/consumer. Thus, the regulatory body plays a pivotal role defining the value, value creation and value sharing, and is therefore pivotal in the way in purchasing evaluation models are structured (see Figure 3).

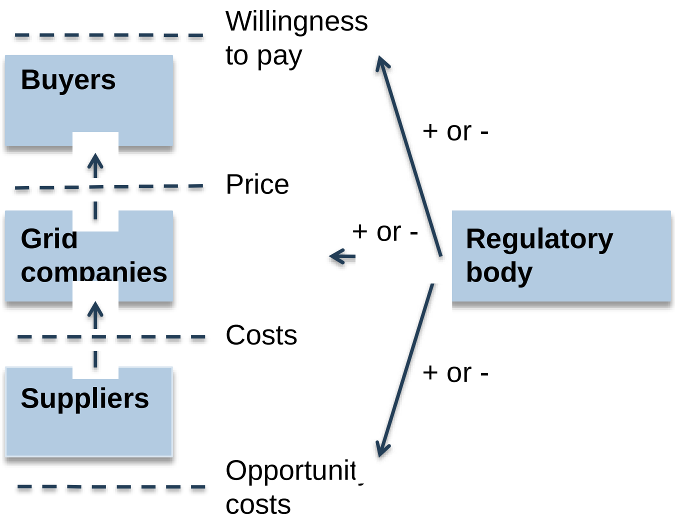

Figure 3. Illustration of value creation and value appropriation in the context studied

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