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W o r k i n g P a p e r

Technology Market Intermediaries to Facilitate External Technology Exploitation

The Case of IP Auctions

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Abstract

Recently the phenomena of external technology exploitation (ETE) has started to attract attention from scholars, businesses and politicians likewise alongside with a growth of the markets for technology. However, the markets for technology are still characterized by inhibiting obstacles that lead to high transaction costs, thus prohibit efficient transactions and result in market failure. Although, on the one hand the presence of obstacles lead to high transaction costs, the large market potential on the other hand provides incentives for technology market intermediaries (TMI) to develop new exploitation models to facilitate ETE transactions by reducing transaction costs. Throughout this paper we address the general research question of whether and how new exploitation models can actually facilitate ETE.

To address this question, in a first step we generate insights into TMIs acting on the markets for technology and derived a conceptual basis for a further understanding of TMIs. Having carried out a detailed review of the literature, we develop a theory based typology for six TMI archetypes. Throughout this exercise we gain insights into the variety of different functions TMIs have on the markets for technology and various new ways how TMIs try to facilitate ETE transactions.

Throughout the second part of this paper, we focus on IP auctions as one particular business model of the archetype 'IP Broker'. We investigate this 'young' business model presenting first insights into two qualitative studies. In a first step we derive a generic IP auction process based on a qualitative, empirical analysis of IP auction processes. We then translate these results into a theory based process view and derive a generic IP auction process as a specific type of an ETE process. Having thus generated a close understanding of the transaction process, we presented results from four cases of successful transactions, i.e. where patents were sold for particular high prices from two SMEs and two MNCs. The case studies are analyzed according to four main aspects including characteristics of the companies that exploited patented technologies (including motives and selection processes), the patented technology as such, the organization of the transaction and the companies' perceptions regarding the success of the transactions.[1]

[1] This paper should be considered work in progress. The content is an extract from Tietze (2009 (forthcoming)) at Hamburg University of Technology.

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1 Introduction

Throughout this paper we address the general research question of whether and how new models currently offered by TMIs can actually facilitate ETE. To address this question, this paper is structured along two parts.

Throughout the first part we generate insights into TMIs acting on the markets for technology and derived a conceptual basis for a further understanding of TMIs. Having carried out a detailed review of the literature, we develop a theory based typology for six TMI archetypes. Throughout this exercise we gain insights into the variety of different functions TMIs have on the markets for technology and various new ways how TMIs try to facilitate ETE transactions.

Throughout the second part of this paper, we focus on IP auctions as one particular business model of the archetype 'IP Broker'. We investigate this 'young' business model presenting first insights into two qualitative studies. In a first step we derive a generic IP auction process based on a qualitative, empirical analysis of IP auction processes. We then translate these results into a theory based process view and derive a generic IP auction process as a specific type of an ETE process. Having thus generated a close understanding of the transaction process, we presented results from four cases of successful transactions, i.e. where patents were sold for particular high prices from two SMEs and two MNCs.

2 Growing Markets for Technology

Markets for technology have existed even at the beginning of the 20th century (Lamoreaux/Sokoloff 1998). However, just recently the phenomena of external technology exploitation (ETE) has started to attract attention from scholars, businesses and politicians likewise. This might be due to the recent growth of the markets for technologies in the 1990s, that has been observed from various sources, especially in some high-technology areas. Arora, Fosfuri et al. (2001) compared estimates at an aggregated level from three different data sources, which are subject to numerous caveats but which led to rather consistent results. Limiting their analysis to technological knowledge, their estimates indicated an annual worldwide market for technology in the range of US$ 35-50 billion in 2000. Elton, Shah et al. (2002) and Kline (2003) estimated that the overall US patenting licensing revenues increased from below US$ 15 billion per year at the beginning of the 1990s to around US$ 100 billion a year in 2002. For the period 1994-1996 Gambardella, Giuri et al. (2006) estimated hat the size of the market for the EU-8 countries had increased from 9.4 billion euros to 12.7 billion euros from 1997 to 1999, and to 15.6 billion euros to 2002. Although still fairly small, the market size had thus grown from 0.16%, to 0.20% of GDP which corresponds to a total growth of 65% between the third and the first period. Moreover, Gambardella, Giuri et al. (2006) estimated that the potential market has grown from 14.8 to 24.4 billions. This market potential suggests that untapped

opportunities exist for enhancing the market for patents in Europe and to increase the utilization of patents. For Germany as the largest European economy the Institut der deutschen Wirtschaft Köln (2006) estimated a potential market size of 8 billion euros. Further results from Sheehan, Martinez et al. (2004) indicate that a majority of companies expect an increased number of out-licensing deals in the future, while 54% of the respondents has experienced a growth of out-licensing in the past since the mid of the 1990s.

However, aside from the observed growth several scholars, e.g. Lichtenthaler (2006), Arora, Fosfuri et al. (2001) indicated that the market was and still is characterized by inhibiting obstacles that lead to high transaction costs, thus prohibit efficient transactions and result in market failure.

2.1 Obstacles to Efficient ETE

Ford and Ryan (1977, p.370), as one of the pioneers in this research field, provided already almost 30 years ago a first attempt of an explanation why ETE opportunities are not realized by many companies. “This may be due to the supposed difficulties of handling the marketing of an intangible product compared with the tangibility of the normal manufactured product. It may also be caused by the difficulties of recognising a potentially marketable technology among those possessed (and taken for granted?) by the firm.” Throughout the following years, little research was conducted in technology marketing or ETE. Teece (1986, p.303) noted that there are particularly “difficulties in pricing an intangible asset” which is not at least due to the unique nature of the good.

Caves, Crookell et al. (1983) analyzing international technology transfer to foreign countries in terms of licensing provided an argumentation that the market for technology licenses, like other markets for intangible knowledge, is “susceptible to market failures” resulting from five prevalent obstacles. At the time when they published their study, they had observed that typically only very few companies were willing to license a technology they possess, while on the other hand the demand of companies that feel a specific need for a certain technology was limited, according to Contractor (1981). These few available ‘pairs’ lead to small-numbers bargaining conditions on the market. Additionally, Caves, Crookell et al. (1983) argued that the different parties involved in a transaction have asymmetrical access to knowledge about the technology, which leads to opportunistic behaviour. Furthermore, since technologies are usually transacted that still need certain developments until they can be fully utilized or a technology may not work properly at any new location for whatever reason (e.g. missing tacit knowledge) the technology’s economic performance usually remains uncertain at the time of the transaction. Aside from these specific obstacles, Caves, Crookell et al. (1983) argued that the actors involved in any transaction usually act risk averse. Since a transfer of a technology usually involves uncertainty whether the technology will perform as promised, a transaction may threaten the participants due to necessary financial investments. Finally, the preparation and contact costs involved in the transaction can be substantial. Referring to Teece (1977), Caves, Crookell et al. (1983) stated that these costs might be between 2% and 59% (average 19%) of the recipient’s

total costs for the transfer. Thus transaction costs reduce the attractiveness to engage in any transaction additionally.

When the issue of technology trade received increasing attention by scholars at the end of the 1990s and early 21st century, some authors identified and discussed difficulties of technology trade in more detail. Throughout their study of technology trade, which was published in their influencing work, Arora, Fosfuri et al. (2001) identified various reasons, why markets for technology are inefficient. Major difficulties include the problems of valuing intangible assets without the presence of a market and absence of standard valuation approaches, the context dependency of each and every technology, the stickiness of information and the opportunistic behaviour of the market actors. As consequence of the presence of these difficulties high transaction costs exist for selling technologies that lower the profit opportunities for companies that are willing to conduct ETE.

In addition to the problems identified by Arora, Fosfuri et al. (2001), Lichtenthaler (2004) mentioned the OUH (only use here) syndrome that exist in several companies to a certain degree due to political discussions and interests of internal department in context of the resource allocation process. On the other end of the ETE process, the companies that should acquire technologies often fact the NIH (not invented here) syndrome which reduces the incentives to embed a technology into own products or processes that was e.g. invented by a competitor.

Studying the market for technology, primarily in Japan, Chesbrough (2006, p.146) found that there is “no information standard for technology licensing and associated IP trade.” According to Chesbrough (2006), this absence of a standard that fails to provide the terms and conditions for trading IP because it appears to be difficult to compile statistics on technology trade. Without these data, it is hard for companies to know what technology is available in the market and for what price ranges. Additionally, it is very challenging to know how to value available technologies. Chesbrough (2006) lacks a systematic reporting of previous prices paid for external technologies.

Several other studies (e.g. Teece (1998), Teece (2000), Davis and Harrison (2001), Gambardella (2002), Chesborough (2003), Cesaroni, Gambardella et al. (2004), Escher (2005)) elaborate on certain difficulties for ETE and technology trade. Although, to our knowledge no systematic investigation of these problems has been carried out so far, which seems to us essentially when thinking about how to solve these problems. However, this issue is out of the focus of our study. Thus, of relevance to us is only the conclusion that “many imperfections inherent in the markets for intellectual property resulted in the absence of a well-defined demand and supply”[2] and lead to high transaction costs. These costs are today so high that the potential benefits from a monetary external exploitation of technologies is still not high enough

[2] Cf. Lichtenthaler (2007, p.242)

for many companies to be an incentive to proactively pursue ETE, even in spite of the large potential for technology markets.[3]

The growth of these markets and the large expected potential led to an increasing awareness in the business community among patent lawyers from established IP law firms or general councils from large corporations, who started thinking about how to realize potential business opportunities. The huge share of IP assets of the balance sheet from many corporations, further justifies that in the future will be room for nowadays emerging business models offered by Technology Market Intermediaries (TMIs). Gambardella, Giuri et al. (2006, p.V) further underlined that to overcome existing obstacles "standard contracts for technology trade, better means for matching technology demand and supply … and … intermediaries in technology trade would be typical means for achieving this goal."

2.2 The Raise of TMIs

The presence of obstacles on technology markets leading to high transaction costs on the one hand but the large market potential on the other hand provides incentives for technology market intermediaries (TMI) to develop new exploitation models to facilitate ETE transactions by reducing transaction costs. This argumentation links to the theory of Coase (1937). Referring to transaction costs, a firm exists if the transaction costs are reduced compared to pure market coordination. Accordingly, an intermediary exists if its activities induce a reduction of transaction costs between the market actors, thus enhance the outcome of the market. In recent years we have seen a raise of TMIs offering new services attempting to facilitate ETE.

Throughout a pre-study[4] we identified about 70 TMIs, with the majority being based in the US founded until December 2006. Starting from 1980, the number TMIs grew from 4 to 59 in 26 years. An approximated exponential curve fit indicates an annual growth rate of 8% as illustrated in Figure 1. Counting for 80% of the TMIs, US based firms clustered around two centres at the west and east coasts. While a considerable number of them are concentrated around and in the Silicon Valley at the west coast, another cluster is concentrated at the east cost including New York and Massachusetts. The TMIs that are not based in the US are mainly European and Canadian firms. In Europe the British and Germans encounter the majority. However, several TMIs hold regional offices in Europe, Japan, China and the East Asian Tigers.

[3] E.g. Chesbrough (2006) reports that some of he found in his study that in the US over "95% of issued patents are unlicensed, and over 97% never generate any royalties." See further e.g. Granstrand, Bohlin et al. (1992), Lambe and Spekman (1997), Durrani, Forbes et al. (1999) and Lichtenthaler (2005).

[4] We conducted mainly phone interviews with about 10 inductry experts. A full list will be available in Tietze (2009 (forthcoming)).

However, as observed as well by e.g. the OECD, BMWI et al. (2005), TMIs[5] have existed already in the late 1800s and early 1900s. Patent agents and lawyers played an important role in technology markets by matching capital-seeking inventors with investors and by linking sellers of technological inventions with potential buyers who had the means to develop and commercialise them. Ford and Ryan (1977, p.377) used the term 'middlemen in technology marketing' for "agents or brokers who bring buyer and seller together but do not take legal title to the know-how. Normal fees are 1-3 % of selling price or a percentage of the royalties involved." However, according to OECD, BMWI et al. (2005) just recently TMIs have become more numerous and more diverse as demand for technology transfer and patent valuation have grown. As innovation processes have become more open and firms have begun to source more of their technology needs from external sources, markets for technology have expanded, and with it the role of intermediaries. While in the past TMIs were often legally oriented firms (e.g. patent law firms) today TMIs develop new services taking a business approach.

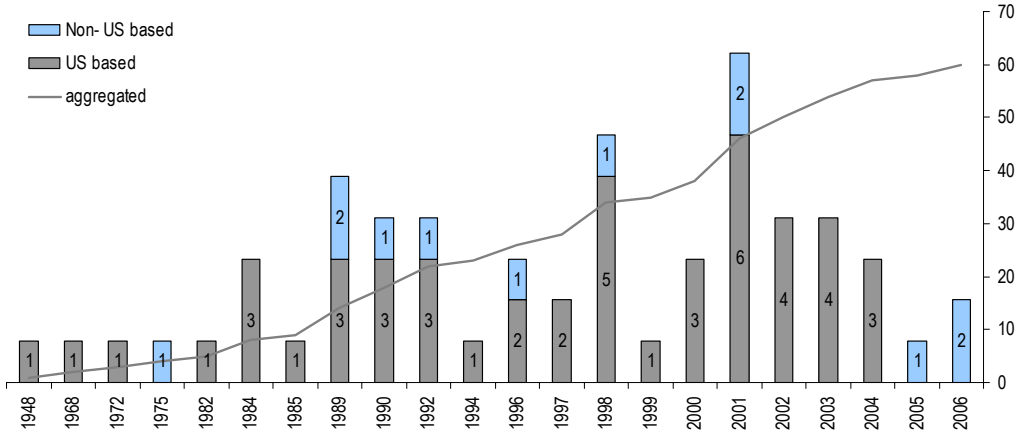

Figure 1 : Birth and growth of TMIs by year of foundation[6]

The EPO, OECD et al. (2006) drew attention as well to the raise of new business models for ETE stating that "the IP marketplace is nowadays in a probe and learn period where the number of intermediaries is rising." In this regard, the EPO, OECD et al. (2006) mentioned partnerships or technology pools to special purpose investments vehicles, auctions, publicly traded IP indexes as well as patent value funds which aim at taking care of IP logistics issues (e.g. finding and negotiating with potential licensees) whilst filling in the financial gap needed to allow

[5] The concept of intermediation can be traced back to Stigler (1951), who published a widely recognized paper on the division of labour in markets and formed a theoretical basis for intermediation, although not explicitly using the terminology.

[6] We do not claim completeness of this sample, since the companies are so widely spread across the globe and the majority is small and the young market is currently undergoing large dynamics. However, we could probably claim that the sample includes the most important ones and has should cover at least 80-90% of the firms until December 2006. Further details on the sampling procedure can be found in Tietze and Barreto (2007).

the necessary managerial efforts preceding the commercialization of new products, i.e. identifying potential licensors, establishing contacts and negotiating with them up to the closing of a deal. According to the EPO, OECD et al. (2006, p.1) these new models "make one step forward towards the development of a market for IP transfers …[and]… contribute to the maturation of the IP market". Chesbrough (2006, p.3) found further "anecdotal evidence … that a small number of intermediary firms have arisen in recent years to assist in the process of identification, negotiation, and transfer of patents from one firm to another."

However, aside from few publications, to our knowledge very little systematic research has been carried out on this 'recent' phenomena. Not at least, this might be due to the difficulties that we encountered trying to map the TMIs in our pre-study. So far even no clear definition exists that has been widely accepted. Thus, we would like to propose a definition that is based on a definition derived from the financial economics on intermediaries in general. According to Newman (1992, p.77) intermediaries are defined as:

> *"enterprises in the business of buying and selling financial assets…They are not just middlemen like dealers and brokers whose main business is to execute transactions for clients…[They] do much more than participate in organized markets…[by] adding 'markets' that would not exist without them…[and] do take risks".*

Based on this definition and on interviews with various industry experts throughout this study[7], we propose the following definition for TMIs as:

> *"firms specialized in intellectual property that provide services to technology based firms to facilitate the external exploitation of intangible assets, predominantly without adding value or holding property of the asset, excluding services provided typically by patent law firms (e.g. all services related to the patent application procedure)".*

However, we would like to note that not all scholars have a positive opinion on recent development, i.e. the raise of TMIs. Lichtenthaler (2006, p.283) takes a sceptical view on the role of intermediaries because "it seems to be difficult to completely rely on the expertise of intermediaries in the markets for technology, whose facilitating role in technology transactions (...) has to be strongly questioned and whom might rather be used as a complement and not as a substitute of a firm's internal activities." Following Stigler (1951), Lichtenthaler (2006) argues further that it should not be taken for granted that intermediaries will solve all existing problems and inefficiencies in the market for technology. In contrast companies might rather develop additional in-house competences. Additionally, Harhoff (2007) concluded with a sceptical view on current developments on the market for technology questioning the many side effects related to the strategic behaviour or rather abuse of the system by firms including particular types of TMIs (e.g. patent trolls) that are currently observed by the EPO and other governmental bodies.

[7] Cf. Tietze (2009 (forthcoming)) for the full list.

How the market for technology will develop and which new ETE models will disappear respectively which will be come widely accepted remains to be seen in the future. This question is certainly of relevance but not the focus of our study. We rather accept that nowadays TMIs are essential actors on the markets for technology. Because, aside few practitioner papers[8] the academic community has not addressed these emerging business models in a systematic and sufficient manner. Although we understand that the prevalent dynamic in young markets might hinder systematic academic studies due to ever changing contextual factors, in the following we analyze and cluster existing, new models that attempt to facilitate ETE.

3 TMIs to Facilitate ETE

Teece (1981) already observed first signs for an emerging market for know-how although Teece (2000, p.112) stated that at the same time "much technology does not enter it … [which]… is either because the firm is unwilling to sell or because of difficulties in transacting in the market for know-how." Being aware of the obstacles in ETE that resulted in market failure, i.e. transaction difficulties and costs, in recent years various market actors, including governments, patent and trademark offices, and firms attempted to develop the markets for technology. Focusing on innovation policy Bessant and Rush (1995, p.100) argued that a "possible element … is the use of consultants as intermediaries to assist and advise firms to compensate for the lack of managerial capabilities" to overcome one of the main barriers to successful 'technology transfer'. Koruna (2001) observed that with new services and instruments on the market the process of externally exploiting technologies is getting easier and thus will probably also gain more acceptance among companies. Thus, to us it appears realistically to assume that intermediaries are important actors in these developments, but at the same time little is known about them yet.

Before we attempt to derive a typology for TMIs, it is necessary to firstly understand how TMIs integrate into existing ETE processes. From our perspective, the support of TMIs throughout ETE projects influences the transaction process substantially. Thus the former direct ETE process where the seller and buyer interact directly becomes an indirect process with TMIs being a third party acting as interfaces between buyers and seller. In the first part of this chapter, we discuss this issue more in detail. In the second part of this chapter, we then review the literature to gain an understanding of how intermediaries have been clustered throughout prior literature. Based on the finding that so far no systematic and sufficient TMI typology exists, we then propose a TMI typology in the third part of this chapter.

[8] E.g. Millien and Laurie (2007)

3.1 Indirect ETE

The perspective of managing the external exploitation[9] of knowledge assets was adopted already in the 1970s by e.g. (Anderson (1979), Ford and Ryan (1977), Lien (1979), Marcy (1979)). Particularly the works of (Ford and Ryan (1977), Ford and Ryan (1981), Ford (1985), Ford (1988)) coined the term 'technology marketing', a "holistic approach to external knowledge exploitation" and formulated three key elements of technology marketing. He argued that technology can be used in the manufacture or design process of a physical product, can be used for the marketing of a service based on that technology, e.g., the sale of a design or testing service and be used for the sale of a company's 'whole', e.g., the sale of a particular bit of electronic know-how to another party for its own use.

Until the 1990s however the concept was not developed very much further, nor did it receive considerable attention by academic scholars besides some very few, e.g. Mittag (1985). Granstrand, Bohlin et al. (1992) presented a typology of technology exploitation and acquisition strategies in context of their analysis of the multi technology corporations. Starting in the late 1990s however, the topic received growing attention in context of the growing importance of intellectual property in the shift towards the 'knowledge society' Granstrand (2000) and the open innovation movement Chesbrough (2003) in the early 21st century.

In order to provide some details on this topic, we analyzed recent studies drawing on a systematic literature review that was presented by Lichtenthaler (2005).[10] Focusing on technology exploitation, thus excluding technology acquisition, Lichtenthaler (2005) reported on prior research and the development from the early studies in the 1970s until today. Lichtenthaler (2005) identified six studies with a 'noteworthy large enough sample' to provide reliable results. However, since the publication of the review by Lichtenthaler (2005) additionally three studies were published including the comprehensive study from Lichtenthaler himself (i.e. Lichtenthaler (2006)) for which the literature review was a pre-study. The two other studies are the ones published by Hentschel (2007) and Escher (2005), although the latter drawing on a comparatively small and qualitative empirical basis.

In addition to the six reviewed studies and the three more recent studies, we think it is worthwhile to add another study from the early 1990s. Because Granstrand and Sjölander (1990) are among the pioneers in this research field since they presented the technology base concept which includes a first systematization of exploitation strategies, the study conducted by Granstrand, Bohlin et al. (1992) among Swedish and Japanese firms should be mentioned, aside from the comparatively small sample. Thus, in the following we draw on ten empirical

[9] Synonyms used in the literature are basically deployment (e.g. Escher (2005)) and commercialization (e.g. by Granstrand (2000), and Lichtenthaler (2006)).

[10] On this topic few reviews exist. Among them some short reviews are embedded in the studies by e.g. Escher (2005), Hentschel (2007).

studies that were conducted since the mid of the 1980s with a clear focus on ETE solid empirical basis. The following table provides an overview of these studies and their sample sizes.

Authors	Sample size	Scope of the study
Ford (1985) *	N=152	US companies probably in the beginning of the 1980s
Mittag (1985) *	N=276	German companies in 1981 (only 98 companies with licensing-out activities)
Vickery (1988) *	N=119	Companies worldwide in 1985/86
Granstrand et al. (1992)	N=42	Japanese, Swedish and US large corporations
Brodbeck (1999) *	N=281	German and Swiss companies in 1996
Elton, Shah et al. (2002) *	N>40	(sample unknown)
Birkenmeier (2003) *	N=281	German and Swiss firms
Escher (2005)	N=29	Interviews plus one workshop
Lichtenthaler (2006)	N=155	Survey among 500 largest firms from Germany, plus 100 largest Swiss and Austrian firms each
Hentschel (2007)	N=228	Questionnaires and 18 interviews

* Note: These studies have been reviewed by Lichtenthaler (2005)

Table 1 : Overview of ten major ETE studies since the mid 1980s [11]

Drawing on Ford and Ryan (1981), Boyens (1998)[12], and Koruna (2001), from the review of the literature Lichtenthaler (2006, p.15) defined external technology commercialization and external technology exploitation (ETE) synonymously as:

> *"an organization's deliberate action of commercializing disembodied technological knowledge to another legally and economically independent organization involving a contractual obligation for compensation in monetary or non-monetary terms."*

According to Ford (1985) and Boyens (1998) ETE involves inter-organizational technology transfer[13], i.e. the transfer of technological knowledge from one legally and economically independent organization to another. While the transfer of technologies between different business units or functional units of a single company may represent an ETE transaction from the perspective of a business unit or functional unit, this type of transaction does not constitute an external commercialization of technological knowledge from a corporate perspective.

Furthermore, the external exploitation of technologies is regarded as a deliberate action of a company. Accordingly, it refers to the intended transfer of technologies and thus does not take into account the unplanned loss and leakage of information as stated by Granstrand and Sjölander (1990) and Boyens (1998).

Usually the external exploitation of technologies is assumed to include some type of contractual obligation. While non-formal ways of externally exploiting technologies such as informal

[11] This table is based on table 2 in Lichtenthaler (2005)

[12] Boyens (1998) in a non empirical work, had used the following definition: "External exploitation of technologies is the planned transfer of technological knowledge from one legally and economically independent company to another and it involves a contractual obligation for compensation, either monetary or in terms of knowledge transfer. "

[13] Note: Inter-organisational refers to inter-firm transfer as one of five categories (international, regional, cross- industry, inter-firm, and intrafirm) of technology transfer by Khalil (2000, pp. 343-4).

know-how trading, are important in practice (Hippel (1987), Schrader (1991)), they are normally initiated by individuals and often do not follow an explicit strategic intention of the company (Boyens (1998)). As such, these non-formal types of deliberate ETC can hardly be integrated into a company's technology marketing strategy and are, therefore, also excluded from further analysis, which again is consistent with earlier works by e.g. Ford (1985).

A contractual obligation already indicates that a company will usually receive some type of compensation for the technology transfer. In the commercialization of products or services, according to Koruna (2004) monetary compensation is by far the most common form, whereas the commercialization of disembodied knowledge offers various other possibilities, such as bi-directional technology transfers, which are frequently used in practice. According to Brockhoff, Gupta et al. (1991) and Grindley and Teece (1997) examples are cross- licensing agreements or the mutual exchange of technologies in alliances.

Finally, the ETE describe an organization’s deliberate actions of commercializing disembodied technological knowledge to another legally and economically independent organization involving a contractual obligation for compensation in monetary or non-monetary terms as defined by Lichtenthaler (2006). Due to the focus on the management tasks of the external exploitation mode, the unplanned leakage of technology is mostly excluded in the literature on ETE as done by e.g. Ford and Ryan (1981) and Granstrand (2004)). As Lichtenthaler (2006) we follow these works and exclude the unplanned commercialization from further analysis.

Aside from the discussion of the ETE definition provided by Lichtenthaler (2005), in the following we present and discuss ETE definitions applied in the additional three studies by Escher (2005), Lichtenthaler (2006) and Hentschel (2007).

Escher (2005) addressed the two main questions: 1) How can the process organization of external technology deployment and its corresponding organizational structure be tailored? And 2) How can a technology-based enterprise go about designing and implementing such an external deployment organization? From compiling ‘extensive literature’ on technology marketing Escher (2005) aimed to develop a holistic technology deployment organization (ETCO) and proposed implications for an implementation of such ETCO. However, throughout his study, not any definition of the technology deployment concept can be found. However, throughout the study, Escher (2005) did not use the ETE concept of Lichtenthaler (2005), but rather applied the ‘traditional’ terminology following Ford and Ryan (1977). For the technology marketing concept Escher (2005, p.24) applied the following definition: “Technology Marketing is a process for pursuing normative, strategic and operational enterprise objectives concerning technology acquisition and technology deployment markets”. Escher (2005) mentioned that the topic technology marketing itself, according to its definition[12], can be divided into the two fields: external technology acquisition and external technology deployment (instead of technology exploitation / commercialization). Escher (2005) perceives licensing and technology-based spin-offs are subtopics of external technology deployment.

Lichtenthaler (2006) in his study applied of course the definition of ETE that he had proposed when he published his literature review as mentioned above. Hentschel (2007) focused on specific forms of ETE, particularly on sales of patents and licensing and provides a brief discussion on the differences between technique and technology. He further elaborated on patent law and patent protection as well as that he provides a definition of a patent. However, he did not discuss how he integrated this into a more generic concept, nor did he provide any definition for ETE.

To summarize the discussion, we can conclude that from the traditional technology marketing two concepts developed. Granstrand and Sjölander (1990) developed a framework that includes external technology exploitation strategies, which was developed further into the ETC concept by Lichtenthaler (2005). Aside from this, Escher (2005) developed the technology deployment concept as part of an integrated ETCO. In the following we use the External Technology Exploitation (ETE) concept referring to the Granstrand and Sjölander (1990) framework because it fits well the purpose of our study. However, we do not conduct research in or make use of the six different forms of technology exploitation, but rather focus on technology sales (i.e. the transfer of ownership) that take place particularly via public auctions.

Nowadays, TMIs have started to develop dedicated services trying to reduce transaction costs. Thus, as the transaction costs which limit the function of the markets for technology are less severe, technology can be sold to downstream firms with relatively small adaptation costs, thus benefits of industry wide division of labour. This concept was already discussed by Stigler (1951). To our knowledge however, a gap in literature exists that addresses this issue with a conceptual framework. So far no framework for ETE indirectly through TMIs was proposed in contrast to the direct ETE using internal resources only. We only found some very little conceptual work in the literature.

When Birkenmeier (2003) discussed the differences and similarities of product and technology markets, he briefly touched upon this issue. Birkenmeier (2003) proposed to differentiate between direct and indirect communication and distribution channels for ETE. However, as distribution Birkenmeier (2003) defined only the tasks that need to be carried out after a contract had been signed. According to Birkenmeier (2003) these can be carried out by own organizational resources (e.g. R&D personal) or via particularly dedicated departments founded solely for this purpose or by using intermediaries. Birkenmeier (2003) further proposed to differentiate direct (including personal, written and phone contacts) and indirect communication channels (including exhibitions, scientific publications and data pools) to address potential customers. While direct communication bears certain advantages (e.g. control of confidential informational to avoid leakage) it has certain disadvantages too (e.g. requires the direct contact persons from potential buyers and the risk to concentrate only on known companies within the closer context of the own company). Thus, according to Birkenmeier (2003) indirect communication channels should be favoured if the company lacks adequate knowledge regarding poten-

tial customers and faces difficulties to reduce this information deficit even via a systematic search process, or if the company faces financial obstacles.

Although the differentiation proposed by Birkenmeier (2003) seems rationally, in our understanding, that follows the ETE process proposed by Lichtenthaler (2006), the communication and distribution tasks are embedded in the planning, respectively realization phase of the ETE process. We believe that the ETE process differs whether companies decide to pursue ETE with own resources only or whether they outsource at least certain tasks to a TMI. Thus, we propose to avoid using separate concepts for 'distribution' and 'communication' channels, but propose the concept of exploitation channels. Companies can directly[14] exploit technologies either using own resources only or with the help – at least to a certain extent - of intermediaries indirectly. The exploitation then includes all tasks as defined in the exploitation process. To illustrate this, we propose an expansion of the Granstrand, Bohlin et al. (1992) framework as can be seen in Figure 2.

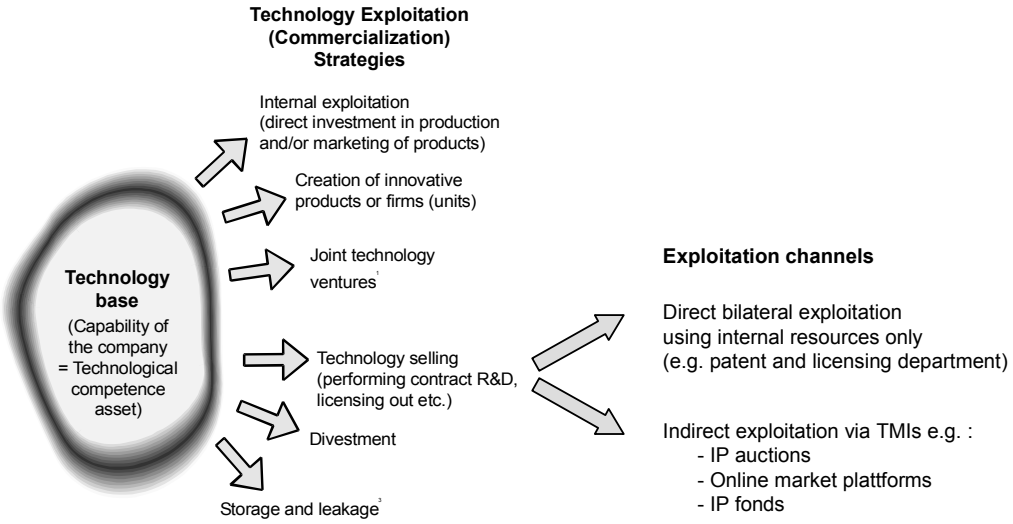

Figure 2 : Extension of the Granstrand, Bohlin et al. (1992) framework with exploitation channels

In prior research ETE has been discussed primarily as a direct process that takes place between a seller and a buyer. Both, the external deployment process by Escher (2005) and the ETC process by Lichtenthaler (2004) do not indicate any interfaces with TMIs. However, today TMIs play an increasing role in ETE transactions. Following the keep or sell decision, companies that decide to exploit technologies externally, not only have to chose the proper exploitation strategy for any technology, but as well decide on the distribution channel, i.e. whether want to pursue a direct exploitation or rather make use of TMIs to leverage the outcome of the ETE transaction. This issue is by far not researched sufficiently, but has to be left to further research at this stage since it is out of the scope of our study. In the following we aim to under-

[14] Czarnitzki, Licht et al. (2001) applied a similar notation and differentiated TMIs that support the ETE process directly or induce an indirect ETE process. See further chapter 3.3.

stand how TMIs facilitate indirect ETE transactions by offering dedicated services along the ETE process. Thus, we continue with a literature review before we then propose a typology to categorize TMIs.

3.2 Intermediaries – A Literature Review

As already mentioned, the intermediary concept emerged from the financial economics and not at least from the theory of disintermediation that was proposed Stigler (1951) following his paper on the 'division of labour'. In the following we start with presenting briefly generic functions of intermediaries derived from financial economics by reviewing the results from Sauermann (2000). We then focus more narrowly on innovation processes and systems reviewing the results from Bessant and Rush (1995) and Howells (2006). Then we focus further on the functions of intermediaries involved in technology transactions reviewing three valuable studies[15] out of the scarce literature including Lien (1979), Czarnitzki, Licht et al. (2001), and Krattiger (2004).

Sauermann (2000) distinguished intermediaries according to their function and proposed four types of main functions, thus four generic types of intermediaries as commonly found in financial markets. According to Sauermann (2000), intermediaries can serve to develop organized markets and transaction systems (e.g. stock exchanges). He argued that on highly organized markets the share of variable transaction costs are usually lower than on markets with a lower organizational degree. However, a higher organizational degree itself causes additional costs, mainly fixed costs. Not at least the characteristics of the traded asset (e.g. degree of standardization, divisibility) as well as the market actors (e.g. the number of actors on the market and their professionalism and transaction frequency) determine the optimal degree as a trade-off between fixed and variable costs. Closely related to this issue is the configuration of a management system to administer these markets properly. Not until such a system for regulating credits and debits on accounts is established, a market can be enable decisions without prohibitive transaction costs via high information efficiency. Following this thought, intermediaries can act to integrate geographically disconnected markets. Efficiency gains results on the one hand from a lower degree of fixed organizational costs and on the other hand the higher degree of informational transparency and economics of scale and diversification. As a second function Sauermann (2000) defined the monitoring function as carried out by e.g. rating and news agencies. Economic transactions are usually associated with risk and uncertainty. However, an investor needs to assess and monitor the risk if she aims for a risk adjusted rent and wants to insure herself against negative incentives resulting from information asymmetry (monitoring costs). Referring to Eichberger and Harper (1997), Sauermann (2000) argues further that these

[15] Further typologies can be found in Mittag (1985) and Fu and Perkins (1995). However, they merely overlap with the typologies presented in this paper, thus are not repeated here.

costs can be extremely high especially for small investors due to the risk of partial market failure. Thus, intermediaries may specialize in the continuous monitoring of risks and opportunities. They might be able carry out these activities for significant lower costs by realizing economies of scale and learning effects. As a third function, intermediaries may carry out 'transformational functions' (e.g. as broker, investment banks). Banks, as an example for this function, may serve their clients to shift funds that are accounted for in the financial statement with certain properties into funds with other properties. E.g. Fabozzi, Modigliani et al. (1994) argues that debts might be activated so they can be accounted as own liabilities, particularly related to batch size, risk and terms. According to Sauermann (2000), as fourth function intermediaries may integrate the abovementioned activities (e.g. investment banks, insurance companies) and offer a full service bundle to reduce the total costs. Intermediaries might integrate in order to avoid reduplication and incentives to produce higher quality through internalizing certain defects to create a stronger bargaining position against capital seeker.

In context of innovation processes and innovation systems, different roles of intermediaries were described in prior literature. Various authors however used different synonyms (e.g. third parties Mantel and Rosegger (1987), intermediary firms Stankiewicz (1995), bridgers Bessant and Rush (1995), superstructure organizations Lynn, Reddy et al. (1996), brokers Hargadon and Sutton (1997), McEvily and Zaheer (1999), Provan and Human (1999), and information intermediaries Popp (2000)). We do not review all these studies, but present results from Bessant and Rush (1995) and Howells (2006), two particularly interesting papers. Although focusing only on one particularly intermediary type Bessant and Rush (1995) conducted an analysis "examining the literature on innovation and transfer" and of some specific cases that led to the identification of five dimensions that can be used for typologizing intermediaries. Howells (2006) proposal of a typology of innovation intermediaries is based on a literature review and case studies in the UK.

Bessant and Rush (1995) provided insights specifically in the role of consultants as a particular type of intermediaries with a variety of sub-types. Based on the elaboration of the characteristics of the technology transfer process[16], Bessant and Rush (1995) proposed, although not made transparent based on which systematic approach, needs for clients in the technology transfer processes where 'consultants' provide support. Furthermore, Bessant and Rush (1995) provide an overview of bridging activities that consultants might fulfil.

[16] According to Bessant and Rush (1995, p.98), consultants support the "multi-dimensional character of technology transfer" processes, which he defined "as non-linear, and characterised by multiple interactions, systems integration and complex networks." Thus, according to Bessant and Rush (1995, p.98) technology transfer is not an "instantaneous event but a time-based process involving several stages… [being a]…complex activity involving multiple actors". These transactions may not always take place on the "basis of one-to-one but may also be one to many or many to many". Furthermore, transactions "may not proceed directly but may often operate through various forms of intermediary."

According to Bessant and Rush (1995), consultants support clients for a variety of generic purposes. To build up certain capabilities, consultants can advice and inform clients to enable the development of key management capabilities in identifying needs, exploring and selecting innovations, planning, implementation and project management. For 'institution building' these schemes also offer an opportunity for developing strategic capabilities across the supply side - for example, mobilising a critical mass of technological knowledge and skills in support of particular technologies. Consultancy services can further help to avoid failures. Providing targeted advice and direct technical and managerial support offered opportunities to reduce the incidence of costly failures of investments through transferring better innovation management practice - for example in selecting appropriate applications of new technology and in project management. Consultants can provide innovation support through information and advisory service less expensive than their clients can do internally. Using consultants as intermediaries opens up the possibility of reaching user firms more directly than traditional financial support mechanisms which tended to lack focus and often failed to reach many potential users within a target group. Using consultants can enable a more decentralised mode of operation, involving less monitoring and control. Once the broad objectives of a programme were set out it could be largely self-managing, with overall monitoring and quality assurance provided by a small and specialist group, itself sometimes outside of government but contracted with the specific project monitoring role.

Bessant and Rush (1995) then provided an overview of specific functions of consultants linking these to the identified needs. Consultants support clients that feel a need for support to articulate demand for specific technologies and throughout the selection of appropriate options. Furthermore, consultants support clients in the identification of needs, the selection as well as the training and development of skills and human resources. Consultants further deliver financial support to make a business case serving as financial sources (e.g. venture capital funds). Consultants further support clients in the identification and development of business and innovation strategies. Using examples of best practice consultants these can further provide education and serve as linker to external knowledge systems, e.g. identification of knowledge sources regarding new knowledge for emerging technologies. Consultants finally serve as specialist resources and provide project management throughout the implementation of external sources e.g. new technologies.

Drawing on the analysis, Bessant and Rush (1995) identified five dimensions that can be used for creating an 'indicative typology' of consultants. Firstly, consultants can offer services ranging from expert to process or secondly from sector specific to general. Thirdly, consultancy firms can be small 'one man shows' or large, multidisciplinary firms. Fourthly, they can apply specific technologies (e.g. total quality) or rather be generalists. Finally, their background can be rather traditionally or linked to fairly new phenomena (e.g. information technology).

From a review and synthesis of the literature Howells (2006) developed a typology and framework to map different roles and functions of the intermediation process within innovation and

operationalized the typology within the context of the UK. Howells (2006) conducted a set of case studies in the UK that involved semi-structured interviews with managers in 22 organizations (plus eight subsidiary companies), based on specific project collaborations, together with overall strategies and work practices. Throughout the case studies, Howells (2006, p.720) applied the following definition for an innovation intermediary:

> *"An organization or body that acts an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations."*

When Howells (2006) conducted the case studies based on the above definition and the understanding of innovation intermediaries he had gained from the literature review, Howells (2006) however was surprised to find "considerably more functions than originally conceived." From his work he identified ten functions that included "new unrecognised or undervalued roles". These ten functions of intermediaries as identified by Howells (2006) are: (1) Foresight and diagnostics, (2) scanning and information processing, (3) knowledge processing and combination/recombination, (4) gate keeping and brokering, (5) testing and validation, (6) accreditation, (7) validation and regulation, (8) protecting the results, (9) commercialisation, and (109 evaluation of outcomes.

Having identified possible functions of intermediaries as financial institutions and reviewed the role that intermediaries play in innovation processes and systems, we continue discussing specific functions of intermediaries for technology transfer.

Lien (1979) defined four functions of the "middleman" in the technology transfer process as follows. Intermediaries can determine specific opportunities in terms of specific needs - i.e. to be guided primarily by market "pull" rather than "technology push". Differently from traditional shopping, where the buyer chooses goods among the ones available on the shelf, intermediated transactions involve a detailed description of the clients needs. The need represents a client oriented transaction. Besides working as salesperson, when the client has a technology offer, the intermediate shall perform the procurement task for any identified need. As a second function Lien (1979) proposed, that intermediaries help to identify appropriate sources of technical breakthroughs, scientific information, and other technological developments that will meet identified needs. Once clients' needs are identified, the intermediary can make use of particular expertise and networking resources to address such needs; thus following an active approach instead of a passive one. Furthermore, according to Lien (1979), intermediaries build bridges between the sources and the users. When two parties of the transaction are identified, the middleman links them through proper presentation, and explanation of how beneficial such transaction can be for both ends. Finally, beyond "building bridges", intermediaries encourage appropriate linking mechanisms and provide other services, skills, and inputs to accelerate

sound commercialization. In addition to the tasks of an agent or broker, intermediaries work as catalyst for transactions, providing specialized expertise of intellectual property in the form of supporting services.

Although their study primarily focused on university technology transfer in contrast to inter firm transfers, Czarnitzki, Licht et al. (2001) provided one of the few valuable typolologies of intermediaries involved in technology transactions. Czarnitzki, Licht et al. (2001) differentiated between direct and indirect transactions. Certain intermediaries support transactions directly. These include consulting and the research of certain information as well as providing training services to companies to build up own competences. Additionally, Czarnitzki, Licht et al. (2001) identified intermediaries that conduct own R&D and thus add value to a certain technology. According to Czarnitzki, Licht et al. (2001), these intermediaries participate in the direct transfer. Intermediaries that support transactions rather indirectly offer services related to the bridging of the supply and demand side, e.g. by providing commercial exploitation of R&D results, services for patent analysis and technology scouting.

Noteworthy to us seem further that based on their analysis of problems in technology transactions, Czarnitzki, Licht et al. (2001) were among the very few who proposed 'points of departure' for intermediaries, i.e. functions how these can help to develop the market for technology, although primarily focusing on university technology transfer. Although their model is neither exhaustive Czarnitzki, Licht et al. (2001) nor very detailed and free of overlaps, it is however one of the very few and should be mentioned. According to Czarnitzki, Licht et al. (2001), in order to solve information asymmetries, intermediaries can provide platforms for technology owner to market their technologies, e.g. in the internet or on exhibitions. Intermediaries can further consult potential buyers regarding technologies offered on the market and monitor important trends and the demand for certain technologies. To overcome problems related to high costs for interested companies willing to acquire a technology intermediaries can act to bridge supply and demand, can carry out certain searches and prepare reports (e.g. due diligence) and offer possibilities for directly contacting companies (e.g. seminars, workshops, fairs). To reduce high transaction costs, intermediaries may offer consulting regarding contract design and project management. To reduce uncertainty regarding externalities intermediaries may facilitate the development of trust between the various actors, carry out 'specific' tasks throughout a transaction and offer financial support when spinning off companies. Regarding the reduced transfer possibility, intermediaries may offer training course, create incentives, offer consultancy in innovation management and support the development of R&D labs.

In addition, Birkenmeier (2003), as one scholar having conducted research particularly on ETE, identified four main functions that intermediaries support.[17] Intermediaries can provide

[17] Birkenmeier (2003) does not provide a detailed explanation of how he developed this typology; neither does he provide any detailed explanations of these functions but the typology seemed noteworthy to us due to scarcy of available material specifically related to TMIs.

information services regarding technological applications, market data, industries, companies and competitors, regarding existing technological knowledge as well as certain funding sources. Secondly, intermediaries consult companies regarding their innovation and technology management. Thirdly, intermediaries may support companies regarding patent applications, licensing contracts, entrepreneurship and human resource development. Finally, intermediaries support companies in their project management.

Aside from the very few systematic attempts to develop a typology some few other publications exist that rather provide lists of various intermediary types. In the following we just like to mention a few to illustrate the variety of existing intermediaries which illustrate as well the early stage of the market development. In this growth phase, new models are currently still emerging which have to stand up to the competition. Later on we might expect a consolidation phase in the market which might lead to a disappearance of some of these.

Krattiger (2004) provided a list with specific intermediaries without discussing their functions only providing some characteristics of each intermediary group. According to Krattiger (2004) intermediaries serve as royalty collection agencies, as various forms of clearing house (information, technology, open-source innovation), act as brokers and other types of facilitators, and provide IP management services (law firms and consultants). Furthermore, intermediaries can act as IP commercialization agents, merchant banks, or develop patent pools. From a practitioner point of view Millien and Laurie (2007) provided another collection of various intermediary types. These include patent licensing and enforcement companies, institutional patent aggregators/ IP acquisition funds, IP/technology development companies, licensing agents, litigation finance/investment firms, patent brokers, IP-based M&A advisory, IP auction houses, online IP/technology exchanges/clearinghouses, IP-backed financiers, royalty stream securitization firms, patent rating software and services, university technology transfer intermediaries, as well as some recently ‘emerging business models’ that include IP transaction exchanges/trading platforms, defensive patent pools, technology/IP spinout financing, and patent-based public stock indexes.

Although we have seen that typologies exist for intermediaries in financial markets, for innovation systems and partially for technology transfers involving universities, we can conclude that so far no systematic typology exists that can be used to classify intermediaries specifically for ETE between firms, i.e. technology market intermediaries (TMIs). Having reviewed the literature as presented above, in the following we attempt to develop such a qualitative and consistent typology for TMIs that includes ‘typical’ or ‘classical’ business models, e.g. services that were available when Lien (1979) proposed a typology, as well as more recent ones.

3.3 A Typology for TMIs

To derive a typology for technology market intermediaries (TMIs) we applied a three step procedure. Firstly, from interviewing experts we compiled data on about 70 TMIs that were

known throughout Europe and the US as a leading country for technology trade. Secondly, we analyzed the business models that we identified applying the 'nine business model building blocks' from Osterwalder (2004) in order to identify similar groups that can be clustered. The model proposed by Osterwalder (2004) was used to analyze four 'main pillars' in the companies characteristics: their products, the customer interfaces, the infrastructure management and certain financial aspects. The first, concerns the firm's value proposition, meaning the range of products and services that create value for the companies' customers. The second pillar describes the interface between the firm and its customers, identifying who are the clients, which channels are used to reach them and how the relationship with them is characterized. The infrastructure pillar describes the activities, resources and competencies which enable the business case and the last pillar, financial aspects, depicts the firm's cash in and out flows. In a third step we analyzed the groups of similar types using the 'business model archetype' framework by Herman and Malone (2003) to develop a generic typology for TMIs that finally includes six different meta types of TMIs.

Applying the 'nine business model building blocks' from Osterwalder (2004), among the 70 TMIs we identified 12 different groups within TMIs have similar characteristics regarding the four pillars. These 12 groups are presented in the following and include Licensing Agents, IP Brokers, IP Auctions, Online IP Market exchanges, IP-Backed Financing, IP Consulting, IP Outsourcing Services, Funded IP Aggregator, Litigation Finance Fund, Technology Transfer, IP Investment Banks, IP Development.

Licensing agents can be regarded as the most traditional type of TMI. Licensing agents are typically middlemen with the core competences being networking with expertise in the licensing process that requires legal know-how and a wide contact network. Their target customers can be either general or dedicated to a specific field, such as the semiconductor industry. Mostly a close relationship exists with clients with its duration depending on the revenue model. Such companies generate revenues either in a single fixed or success fee instalment or as a percentage of running royalties streams. Licensing agents usually act in the middle of the ETE process, during the marketing, networking and transaction phases. Their activities include the identification of potential partners for clients, packaging and the preparation of IP bundles, IP presentation, approaching other party, contacting other intermediaries, due diligence, and negotiations. Eventually the payment is performed through the IP firm. Clients may be either IP owners or licensees. Main cost drivers of licensing agents are expenses for own employees. These firms are usually small and ran by their principals. The lack of infrastructure found in large corporations is compensated by these firms with reduced operational costs. Transactions are preferably carried out via private sale engagements. An important distinction within the licensing business is the approach for the patent monetization. The first alternative is based on assertion, when companies push patent licenses to others using the threat of court litigation as selling proposition. Such approach leads to a rather 'hostile' relationship between licensors and licensees, sometimes observed in recent years e.g. in the electronics and internet industries. Eventually a licensing initiative starts from the licensee. Then, usually licensees aim to estab-

lish and ensure freedom to operate and avoid infringement cases. This type of transaction can be referred as 'assertion approach'. The second approach for licensing is what IP professionals traditionally associate with technology transfer, which is typically employed in the health care and pharmaceutical industries. In this case the patent owners seek licensing contracts as a means to take a technology to the market. There is no anticipation of litigation and the value is determined by the potential for future revenues. This type of transaction can be referred as 'business opportunity approach', and is closely related to patent brokering.

IP brokers and licensing agents are often subject of confusion, due to the close relationship between these two models and the fact that TMIs employ both simultaneously. The basic distinction between brokering and licensing is the ownership of the asset. Whereas licensing agents trade the right to the use of the asset, the broker sells the asset itself. One should note however that an exclusive licensing agreement can have a similar legal effect than the sale of a patent. While brokering is related to the technology transfer approach of licensing, it is hardly associated to assertion. Another difference between brokering and licensing is the relationship of the IP firms with their clients. While licensing agents might take a percentage of the running royalty payments and keep a long term relationship with their clients, brokers typically terminate the contractual relationship to the client after a transaction. Similarly to licensing agents, brokers act in the middle of the ETE process, during the marketing, networking and transaction phases. Their cost drivers are similar. Although the main trade channel of brokers is private sale engagement, they occasionally promote private auctions to leverage the price of the IP.

IP auctions relate to brokers in value proposition and target customers, but differ in terms of the trade channel, and core competences. The IP auction business model is characterized by the public offers of patent licensing or the asset as such, i.e. the patent, either live (a) or online (b). Differently from online patent exchange platforms, which only provide listing of needs and offers, IP auctions actually perform transactions. By conducting transactions in a predetermined date, auctions provide a tool for companies e.g. willing to exploit their intellectual property quickly, for companies in financial difficulties or for selling of IP assets of bankrupt companies. Additionally, patent owners with reduced budgets for advertisement and networking can benefit from the infrastructure offered by IP auctions. While providing a fast and often effective solution, auctions have a significant disadvantage. In absence of many bidders patent owners might artificially reduce the market price of their assets. The auction's cost drivers include expenses related to marketing, human resources, IT infrastructure for online data rooms, and the actual event. Similarly to brokers, the compensation for the auction company might be through success and/or fixed fee.

The business model of **online IP exchanges** (market places) is characterized by the establishment of a platform for promotion of patent demand and supply. They are often called 'exchanges', although there are actually no transactions occurring through the websites. The fundamental model of an online exchange is based on a value configuration which includes marketing and networking activities only. Some online marketplaces combine their business

model with brokering, consulting and outsourcing services. Online marketplaces share some characteristics with online auctions, such as trade channel and cost structure. The main difference between the two models is the extent of engagement throughout any transaction. The first simply lists the technology, with information such as price and terms delivered only after request. The latter explicitly manages transactions, with open price bidding. The revenue model of online exchanges is either based on fix membership and/or success fees. The first occurs when technology based enterprises pay to list their technology in the website. The latter is realized if the buyer and seller successfully complete a transaction. Differently from broker and agent models, the relationship with clients is performed remotely with reduced direct interaction.

IP-backed financing is a business model characterized by the use of IP to raise capital. These TMIs combine financial and IP expertise to provide IP owners the opportunity to raise capital without having to give away any IP or equity stake. The incentives include not only monetary but also accounting and tax benefits. Innovative IP-backed financial transactions are likely to undergo many changes until the market reach maturity. Each type of transaction could become a business model itself. Some examples include securitization of future royalty revenue streams, patent sale license-back (off-balance sheet loan), and collateralization (IP-backed debt). The IP-backed financing firm acts as a 'general' broker, linking the patent owner to the financing institution. The core competences which enable such transactions are financial and IP expertise, as well as good networking in both of those fields. Analytics, like patent valuation and market analysis, might be outsourced to specialized firms.

TMIs offering **IP consulting services** deal directly with a technology based firm without any patent transaction. The usual number of involved parties is therefore limited to the client and the TMI. Such models are often used in combination with others in order to profit from the TMIs knowledge in the field. IP consulting is a particular application of this business model. It is characterized by the sale of expertise from a specialized IP firm to a technology based enterprise. The client typically owns a portfolio of patents and seeks support of specialists for analysis, management, and commercialization of their intellectual property. Traditional applications of such model include legal and IP strategy advising. IP consultants usually deal directly with their clients, providing support along the whole ETE process. Often the IP consultant appoints other IP firms to handle supporting services and commercialization. The cost drivers are basically expenses with human resources. Means for revenues are usually either a fixed fee our accounted hourly.

IP outsourcing firms, similarly to consulting firms, provide services to technology based firms that seek management and monetization of patent portfolios. The major difference between these two models is the value proposition and configuration. While consultants sell only advice, outsourcing firms handle directly services that clients are unable or uninterested to perform themselves. Typically outsourced services include patent and portfolio valuation, contract drafting, patent filing, and portfolio mining. Some firms even complete management solutions

for their clients, where the IP owner simply develops the technology without any effort for either defensive, offensive use of the patents. Besides the value proposition and the configuration, IP consulting and outsourcing firms share similar characteristics. However, the latter might bear higher cost due to expenses in research and development of the tools (e.g. software) provided to their clients.

Funded IP aggregators employ a business model that is characterized by the acquisition of patents to build own IP portfolios, usually mainly consisting of patents. A portfolio can either be focused in a single technological field or encompass a wide range of technologies. Often these companies claim to profit from the development of a technology, however companies possessing patents in the same field of the aggregator's portfolio sometimes fear aggressive assertion 'attacts'. Aggregators might not directly acquire IP, but perform their acquisitions through brokers, auctions or private sales engagement. The revenue model is based on investments from other companies, commercialization or litigation. The investments might be motivated either by the assertion or the business opportunity approach. In the first case, technology based firms invest in a fund to acquire IP related to their activities in a defensive strategy. The funds offer protection from possible future litigation, seeking control of most of the patents related to a sensitive technology. In the second case investors are keen on the future potential of certain IPs and rely on the confidence that a strong portfolio is more valuable than the individual IPs separately. Funded IP aggregators usually raise money for IP acquisitions from other investors. A sophisticated set of valuation tools and networking expertise are indispensable competences for the proper spending of these investments. Those competences are also valuable when selling or licensing IP.

Differently from funded IP aggregators, **litigation finance funds** are not committed to the acquisition of patents. This business model is rather characterised by the union of investors that sponsor costly litigation suits in return of a share of the results. The litigation finance funds may deal on one side with TBFs facing thorough litigation suits. Such companies can refer to funds either when facing financial difficulties caused by legal costs or as resource to share the incurred risks. They can be either the infringer or the proprietor. On the other side litigation finance funds may deal with 'opportunistic' investors without any interest in a particular IP as such, if they gain an appropriate return on their investments only when a case is won or a settlement is achieved. In case of a settlement, a licensing agreement is imposed to the infringer and the investors receive their share of the royalty revenue streams. Litigation finance funds rely particularly on legal and technical expertise to understand the probability of a success of a litigation case.

TMIs offering **technology transfer service** combine patent brokering, licensing and a set of supporting services to fully relocate the technology from one institution to another. This model can be often found to transfer technologies from universities and research institutes to companies. The transaction includes not only patents rights but often also knowledge, technological

know-how and eventually tangible assets. Another type of technology transfer occurs between two companies, when even employees, laboratories and production facilities are relocated.

The business model of **IP investment banks** combines consulting, licensing, brokering, and financial services. The model's value proposition is to facilitate strategic and financial corporate operations involving IP. These TMIs usually adopt the business opportunity approach to enable the IP exploitation for their clients. The value configuration of IP investment banks involve composite transactions, which include licensing, patent sale, mergers and acquisitions, joint ventures, spin-offs, and IP-backed financing. Their clients are TBFs seeking strategic use of their IP. Companies sometimes spin off non-core IP into a new firm to manage a particular technology as a core business. In a case where there is already a market player in the referred area, both companies might share the equity of the spin-off. The first contributes with the IP and the second develops and takes it to the market. In order to tailor such complex transactions IP investment bank have to combine financial and IP expertise with a wide contact network. Their revenue model is similar to brokers and licensing agents, i.e. might be a fixed and/or success or participation on the running payments of licensing agreements. The cost drivers are mainly human resources. Analytic services like IP valuation may be outsourced.

Finally, **IP development firms** carry out activities that aim to increase the value of patents trying to realize synergy effects through the combining of complementing, but previously independent patents or by performing own R&D to further develop a technology. Once a technology reaches a mature level, the IP development firms negotiate licensing agreements with technology based firms to take the technology to the market. The IP development firms differ from outsourced technology developers by the value configuration and revenue model. While the first develops IP without necessarily having a pre-defined client, the latter is hired to fulfil a specific technology need of a company. Furthermore, the business model of IP development firms is typically associated with patent aggregation. These firms rely on technical and IP expertise to identify and acquire patents with high market potential from various sources, including universities, research institutes, inventors, and TBFs.

Because the market for technology is still immature and emerging, in the future we will see some of the existing business models surviving, some disappearing and new ones emerging. Thus, having identified and presented the above mentioned business models that are currently existing, in a next step we applied the framework for 'business models archetypes' of Herman and Malone (2003) to develop a sustainable typology on a higher level of abstraction that is suitable to include existing as well new business models. Herman and Malone (2003) defined the business models consisting of two dimensions. The first dimension addresses the question

of 'what the business model does' while the second dimension addresses the question of 'how the business makes money from its activities'.[18]

The first dimension labelled 'degree of transformation' relates to the level an asset is transformed with the support of a firm and distinguish three cases. Certain companies do not add any value to an asset, e.g. by only linking a seller to a buyer. Other companies conduct own R&D, e.g. construct prototypes of a technology, thus add a significant value to the traded asset. The third case rather distinguishes the extent of the transformation between high and low.

The second dimension labelled 'nature of the service' relates to the type of service that is sold. Herman and Malone (2003) distinguish four cases. Certain firms operate by obtaining ownership of assets, then perform certain activities and pass on the ownership to other entities. Other firms only make use of an asset without obtaining its ownership. Furthermore, other firms operate their business making use of only human resources, i.e. the knowledge and experience of their employees, without any close relation to a traded asset. Finally, certain firms provide solutions/platforms to clients which these use attract attention by other firms. These firms do not generate any revenues that are related to the asset but only from additional services related to the solution provided.

Along these two dimensions Herman and Malone (2003) defined six generic 'archetypes', although these are often combined by firms. However, having carried out an analysis of 500 firms (including over 450 of the Fortune 500) Herman and Malone (2003, p.19) came to the conclusion that "these [six] models can be used to classify all the different combinations that exist." According to Herman and Malone (2003), a company employs the **creator** model[19] if it acquires the ownership of assets (e.g. raw materials or components) from other firms and transforms them to a high degree (e.g. by assembling the components) in order to create a product or a service. The product or service may be physical, informational or financial (e.g. an insurance policy). A company employing the **distributor** model acquires ownership of assets and resells the product to another party, but transforms these only to a limited degree, e.g. by repackaging the product or providing customer service. A **broker** facilitates sales by matching buyers and sellers and also provides advice to either or both parties. Unlike a distributor, a broker does not take ownership of any asset being sold. A broker usually receives a fee from the buyer, the seller, or both often in the form of a commission based on a percentage of the sale price or the volume. A **landlord** does not sell, respectively resell the ownership of any asset but rather sells the right to make use of an asset. In this case the assets are commonly locations (e.g., a hotel room, apartment, or amusement park), events (e.g., a concert), or

[18] Please note, that for detailed analysis of business models Herman and Malone (2003) suggested a more detailed list that defines sub-items of the major business activities (i.e. buy, make, sell, design, and manage). Details on this issue can be found in their paper.

[19] Note that due to the legal character of licening agreements, in this analysis we considered the transfer of licenses as the transfer of (at least part of the) ownership, instead of pure use of the asset.

equipments (e.g., a rental car or recording studio). Depending on the kind of asset, the payments may be called 'rent', 'lease', 'admission' or similar terms. For selling the use of an asset, a landlord can transform the asset to a high or low degree. A **Contractor** usually provides services (e.g. consulting) for specific assets. Most services involve a combination of both human and non-human resources. If the service being sold involves more non-human resources the business model is classified as a Landlord rather than a Contractor. Payments are usually made in the form of a fee for service, often based on the amount of time the service requires. An **Attractor** attracts human attention for an asset by providing solutions/platforms for other firms to use. The attractor may devote significant effort to create or distribute these solutions/platforms for attracting buyer attention, but their source of revenue is disconnected from the asset (e.g. common in internet based businesses).

<table>
<tr><td></td><td></td><td colspan="3">Degree of transformation</td></tr>
<tr><td></td><td></td><td>no</td><td>low</td><td>high</td></tr>
<tr><td rowspan="4">Nature of the service</td><td>Ownership of asset</td><td rowspan="4">IP Brokers
(Licensing Agent;
Patent Broker;
IP Auctions)</td><td>IP Distributors
(Funded Patent Aggregator;
IP Investment Bank;
Technology Transfer Firm)</td><td>IP Creators
(IP developmers)</td></tr>
<tr><td>Use of the asset</td><td colspan="2">IP landlords
(IP-Backed Financing; Finance Litigation Fund)</td></tr>
<tr><td>Human effort</td><td colspan="2">IP Contractors
(IP Consulting; IP Service Outsourcing)</td></tr>
<tr><td>Human attention</td><td colspan="2">IP Attractors
(Online Marketplace/ Exchanges)</td></tr>
</table>

Table 2 : Typology of TMIs based on Malone and Crowston (2003)

Applying this approach, we were able to consolidate the 12 TMI types presented above into the six archetypes that facilitate ETE. Licensing agents, patent brokers and IP auctions act as intermediaries in the ETE process without adding any value to the patents, thus can be consolidated into the category of IP brokers. Funded Patent Aggregators, IP Investment Banks and Technology Transfer Firms combine patents into bundles and prepare these for commercialization, but add-little value to the IP by transforming them only to a limited degree. These types thus can be consolidated into the archetype of IP distributors. IP development firms perform own R&D in order to further develop IP they had acquired from clients, e.g. develop prototypes or to develop IP on their own. Thus these TMIs transform the IP to a high degree. These IP developers suit the archetype of a creator, thus can be called IP creators. IP-backed financing firms as well as finance litigation funds sell the use of IP as a means for ETE. Doing this, these TMIs transform the IP at least to a certain degree and thus can be consolidated as IP landlords. TMIs that offer IP consulting and outsourcing services do not deal directly with the IP assets, but rather sell their competences, i.e. human resources in the form of expertise and labour, thus

can be consolidated as IP contractors. Online market exchanges provide web based software solutions, i.e. web portals for their clients to advertise IP. Using these platforms, online market exchanges support their clients to catch the attention of potential buyers, thus can be regarded as IP attractors. Table 2 provides an overview of the TMI types presented above.

To conclude, although certainly some services appear to be more promising than others and it remains to be seen which will survive in the long run, different models exist today providing a variety of services to facilitate ETE through the reduction or elimination of obstacles throughout ETE transactions. Having reviewed the literature on the functions of intermediaries for ETE, we realized that no systematic typology for TMIs existed so far. Applying two conceptual models by Osterwalder (2004) and Malone and Crowston (2003) throughout this chapter a two step procedure we proposed a typology consisting of six different TMIs archetypes.

In the following we present insights into four successful transactions that were completed through a particular type of IP Brokers, namely IP auctions. Throughout this study, several experts indicated to us in various interviews that IP auctions seem to be a promising business model to facilitate ETE. We follow their advice with this study, although we cannot make any judgements with certainty whether IP auctions will become a prominent model for the market in the future.

4 An Introduction to IP Auctions

Throughout the first part of this paper we investigated new models that facilitate ETE while in the following second part of this paper we focus on IP auctions as one particular model. In order to derive insights into IP auctions, we focus on the analysis of two elements. Firstly, we investigate different IP auction processes and derive a generic IP auction process following a comparative analysis with the aim to derive a detailed understand of transactions via IP auctions. Secondly, we present case studies that take a closer look into successful transactions, i.e. transactions that reached particular high sales prices. With the latter analysis we aim to better understand sellers of IP assets, their motives, the internal management of transactions, and advantages and problems they see in IP auction processes.[20] However, before we start, we provide some brief introduction to auctions in general explaining key auction features, basic auction types to provide a basis of understanding for the following two analyses.

[20] To address the general question, whether IP auctions can be regarded a promissing IP trade model, in addition to the qualitative analysis of the process and transactions presented in this paper, the forthcoming PhD thesis will include a quantiative analysis of a large dataset (n=1.690) of successfully sold patents via IP auctions.

4.1 Auctions – A Brief Introduction to Relevant Design Features

Auctions have been used from time immemorial, but entered economics literature relatively recently. Klemperer (2004, p.16) reports from a survey across the auction literature that aside the wide application of auctions in practice, the "full flowering of auction theory came only at the end of the 1970s with the contributions from Milgrom, in papers both on his own and with Weber; from Riley, in papers with Maskin and with Samuelson; and from Myerson, among others, in addition to more from Wilson."

Auctions can be applied to determine prices of goods that are hard to value, particularly when goods are unique, for new and individual goods (e.g. art pieces) or used goods which are unique in the sense that even once identical goods where used to different extents, thus are in a different condition at a certain point, and goods that are new to the world and thus particularly novel (e.g. 3G licenses). For goods where no comparable prices exist, values need to be determined. In general auctions are regarded as a proper way doing this by e.g. Klemperer (2004, p.16), or Milgrom (2005). According to Birkenmeier (2003) compared to cost based valuation approaches market based valuation approaches, for which auctions are an example, take into account the utility of a technology, respectively IP asset. Although, according to Milgrom (2005, p.251) "the auction itself is just one part of the transaction. The success of depends even more on what happens before and after the auction." According to Berz (2007) auctions are used as a particular competitive negotiation method and in contrast to bilateral buyer negotiations. As negotiations appear everywhere in the daily business, auctions can be found in multiple contexts and for a wide range of products. This ranges from private online auctions, purchasing auctions for awarding contracts and placing orders, sales of real estate properties, business models or even whole companies. Due to the huge number of different applications of auctions at so many occasions it is difficult to classify these.

4.1.1 Basic Auction Types

Throughout the literature, a variety of auction types exist. However, aside from some particular recurrent auction types, we were not able to find a detailed systematic typology of the different auction types in the literature.[21] However, for our study it is not necessary to provide a full and all-encompassing review of the literature, but rather to present insights into relevant auction design features. Thus, in the following we discuss key elements to differentiate four main auction types to illustrate the differences.

[21] We would like to note that for reasons unknown to us, the existing auction theory literature provides very little systematic categorization of the different auction features. Although several literature reviews exist, having reviewed the literature independently by three students, the categorization of the different features appears to us very unsystematic and incomplete. Besides, the literature focuses merely on theorems that are theoretically derived, mathematically proven and illustrated by one or few cases only.

According to Milgrom (2005), Berz (2007) and Klemperer (2004) in practice auctions are commonly distinguished by the direction in which goods flow, i.e. sales or purchase auctions taking the seller or buyer perspective, auctions for single or multiple items, and single or double side auctions. At purchase auction the winner delivers a service or product and receives the bid prices Berz (2007, p.30). In the following we do not deal particularly with any issues related to procurement auctions, because the focus of this study is on IP exploitation, thus IP sales. However, we would like to note that many similarities between these two auction types exist and often the same argumentation applies when just mirroring the attributes. Following Klemperer (2004, p.15), because there are "no formal distinctions between normal auctions, in which the auctioneer is the seller and the bidders are buyers who have values for the object(s) sold, and procurement auctions, where the auctioneer is a buyer and the bidders are sellers who have costs of supplying the object(s) bought." Because we analyze exploitation processes and apply the seller perspective the focus of our study is on sales auctions. We thus neglect purchase auctions in the following.

According to Kumar and Feldman (1998) the design of the bidding procedure can be characterized by three dimensions: the upward or downward tendency of the bidding, the order of the bidding, and way how the price is set which the winner has to pay. However, reviewing the literature, we believe that a proper analysis of auction types has to take into account four features.[22] The first feature is related to the development of the price throughout an auction, i.e. whether the price is raised (ascending) or lowered (descending). In ascending auctions, the bids increase with every bid being made, while in descending auctions, each following bid is lower than the previous one. The intervals by which the bids ascend or descend can be either fixed by the auctioneer (e.g. through a ticker) or can be left open to the decision of the bidder. In the latter case the bidder decided itself how much to raise/lower the bid, although often a minimum interval (e.g. 10%) is defined in the auction rules. A second feature to differentiate auctions is the price logic. In general two categories are differentiated throughout the literature. Either the winner has to pay the final bid price (first-price) or the winner has to pay the second highest bid price (second-price). However, several authors argue following Vickrey (1961) a first price auction often does not lead to maximum revenues for the auctioneer, because the winning bid needs to be just marginally higher than the second highest bid, thus does not necessarily be equal to the maximum willingness to pay of the winner. In order to improve the outcome of the auction for the auctioneer, Vickrey (1961) suggested the second price auctions. In second price auctions, the winner pays not the highest bid, but rather the second highest bid. Thus bidders are incentivised to bid closer to their indifference price, what optimized the outcome of the auction.[23] A third feature to differentiate auctions is related to the way how bids are submitted. The way bids are usually submitted either as open bids, thus bids from all bidders are known to

[22] The following paragraph is the outcome of an own systematisation following extensive readings including Moldovanu (2005), Ockenfels, Reiley et al. (2006) and Bulow and Klemperer (June 2007).

[23] For a detailed reasoning of this mechanism see e.g. Klemperer (2004)

the other bidders, or closed, sometimes called sealed bids. In the latter case the bid of each bidder stays unknown to the other bidders. A mixed form is the case, when the auctioneer announces all different bids but without announcing the respective bidder name. A fourth feature to distinguish auctions is the duration of the auction that can be set by a time limit or by the number of bidding rounds. A particular distinction has to be made between the cases where bidders are allowed to bid only once or multiple times. Auctions can last several rounds or the minimum one round, which can take minutes, weeks or sometimes months. The auctioneer can set a maximum duration of the auction or rather determine maximum durations for the single rounds. In case an auction follows two or more rounds, the auctioneer can decide to set breaks between the rounds. Breaks can be preferred when the bidders need time to rethink their indifference prices depending on additional information gathered during the bidding, e.g. knowing the bids of the other bidders or at least the announcement of the anonymous bids by the auctioneer after closing any round.

Klemperer (2004) claims that four basic types of auctions are widely used. These include the ascending-bid auction (also called the open, oral, or English auction), the descending-bid auction (also called the Dutch auction), the first-price sealed-bid auction, and the second-price sealed-bid auction (also called the Vickrey auction). We follow his advice as one of the most cited scholars in this field and present these four auction types according to the features discussed above in the following. However, we dismiss the fourth feature, because it is not as strong as the other three. For simplicity reasons we concentrate on the sale of a single object. Table 3 provides an overview of these four types.

	English auction	**Dutch auction**	**First-price sealed-bid auction**	**Second-price sealed-bid auction (Vickrey)**
Price development	Ascending	Descending	Hidden	Hidden
Price logic	Second price	First price	First price	Second price
Submission of bids	Open	Open	Sealed bid	Sealed bid

Table 3 : Overview of main features of four commonly used auction types

In the English auction, the price is successively raised until only one bidder remains, and that bidder wins the object at the final bid price. This auction can be run by the seller announcing the price, or by having the bidders calling out prices themselves, or by having bids submitted e.g. electronically with the best current bid posted. Two additional rules are often applied to this general setting. One rule does not allow bidders to step into the bidding again, if they dropped out once. The other common rule applied is that bidders are not allowed to make large “jump bids”. Antiques and artworks are commonly sold using versions of the ascending auction, and houses are sometimes sold this way, too. Different types of ascending auctions are discussed by Bikhchandani and Riley (1991). The descending or Dutch auction works in the opposite way. The auctioneer starts at a high price, that is usually higher than the expected willingness to pay of any bidder and then lowers the price continuously. The first bidder who

calls out that she will accept the current price wins the object at the bid price. Examples for applications of Dutch auctions are flower auctions in the Netherlands and fish auctions in Israel, or tobacco in Canada.

In the first-price sealed-bid auction each bidder independently submits a single bid, without seeing others' bids, and the object is sold to the bidder who makes the highest bid. The winner pay her bid (i.e., the price is the highest or "first" price bid). First-price sealed-bid auctions are commonly used for auctioning mineral rights in government-owned land. In the second-price sealed-bid auction or Vickrey auction, also, each bidder independently submits a single bid, without seeing others' bids, and the object is sold to the bidder who makes the highest bid. However, the price she pays is the second-highest bidder's bid. In practice the price paid is often that of the lowest winning bidder. Among economists Vickrey auctions are studied often because of its "attractive theoretical properties", however, this auction type is used less commonly in practice. Rothkopf, Teisberg et al. (1990) provide some discussions why this is the case.[24] Few examples where Vickrey auctions are used in practice are for stamps[25] by mail or for other goods in some auctions on the internet. Since the equivalence of descending and first-price sealed-bid auctions is completely general in single-unit auctions, and ascending and second-price sealed-bid auctions are also equivalent und many conditions (and have similar properties more broadly) these auctions types are usually referred to as first-price and second-price auctions.

4.1.2 A Generic Auction Process

Having reviewed the literature, we chose the model for a generic auction process as presented by Kumar and Feldman (1998) as one of the detailed descriptions we found. According to Kumar and Feldman (1998), the heart of negotiations is a 'negotiable deal' which is modified by the participants in the negotiations with the aim of reaching a 'final deal' or 'trade'. Consequently the negotiation process includes five key elements (1) a deal which can be in various states such as negotiable, final offer from buyer or seller, or a settled trade, (2) participants such as buyers, sellers, auctioneers, or brokers, (3) messages sent by the participants to modify the deal, e.g. messages are bids and offers to buy or sell, and price changes, (4) a process flow describing how the state of the deal changes as a result of the messages sent by the participants, and (5) messages sent to the participants as the deal changes.

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[24] Rothkopf, Teisberg et al. (1990) found seven reasons why Vickrey auctions are so rarely used. From these they rejected five (multiple objects for sale, bidder risk aversion, bidder asymmetry, nonindependent values, inertia) but found accountability of two (bidder fear of bid taker cheating, bidder resistance to truth revealing strategies).

[25] According toRothkopf, Teisberg et al. (1990), in some auctions of collectible items such as stamps and autographs, the auction involves both mailed-in sealed bids based on a catalog listing as well as oral bids.

Focusing on the auction process, according to Kumar and Feldman (1998), it comprises of five phases. In chronological order these are the (1) initial buyer/seller registration, (2) setting up a particular auction event, (3) bidding, (4) evaluation of bids and closing the auction, and finally, (5) the trade settlement. The first phase deals with the issues relating to authentication. The second phase deals with the description of the items that are to be sold, setting up the rules of the auction, explaining the parameters for negotiation including the price, delivery dates, options to purchase more or less, and the terms of payment. The bidding phase implements the bid control rules of the auction, and for open cry auctions notification of the participants when higher bids are submitted. The fourth phase implements the auction closing rules and notifies the winners as well as the losers of the auction. The final phase handles the payment to the seller, the transfer of goods to the buyer, and if the seller is not the auctioneer, payment of fees to the auctioneer.

Because the buyer and seller registration as well as the trade settlement phases are common to all business negotiations in the following we do not discuss the first and last phases but rather focus on the three 'middle' phases.

According to Kumar and Feldman (1998) the second phase of the process, i.e. the phase to create auction rules and the announcement of the auction includes five issues that have to be managed. The first issue is the selection of the proper auction type. As discussed in chapter 4.1.1 many generic auction types exist and within each method several variations, thus selecting a proper type can be a challenging issue. The second issue relates to the scheduling of the auction event. According to Kumar and Feldman (1998) one of the crucial success factors for an auction company is to bring the maximum number of buyers interested in a commodity to the auction event of that commodity. Two simple means of fostering this goal are auctioning commodities of interest to a common buyer together, to set up a regular schedules and publishing the auction date well in advance so that potential buyers can set aside time to participate in the auction. Furthermore, Kumar and Feldman (1998) recommend to mix popular auctions with less popular ones to force people to be present in the less popular auctions. Alerting potential buyers comprises the third issue in this phase. Kumar and Feldman (1998) recommends that potential buyers who have pre-registered with the auction company and have indicated their interest in any item being scheduled for an auction should be alerted when an auction of interest to them is scheduled. Furthermore, a fourth issue is related to security considerations. Security mechanisms are needed for various reasons, e.g. to ensure that information on interested buyers but as well as details on the items offered remain secret. Finally, for various reason the auction company might restrict access to the auction. The auction house policy and the instructions from the seller would dictate whether the auction is accessible to the public at large, to the

In at least some of these, the mailed-in sealed bids are explicitly upper limits to which the auctioneer, acting as the mail bidder's agent, may advance the bid, rather than a "standard" first-price bid.

buyers/sellers registered with the auction services, or only to buyers registered to participate in any current auction.

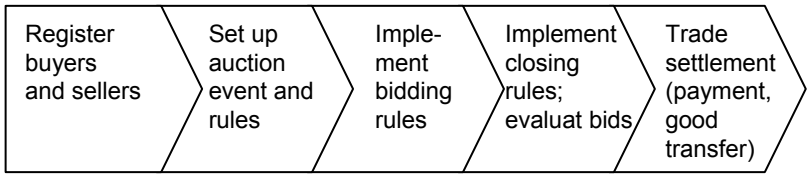

Figure 3 : Schematic view of a generic auction process[26]

In the third phase of the auction process, which is related to the bidding procedure, according to Kumar and Feldman (1998) five issues have to be taken into account. The bidding procedure is defined as the process from the start of the bidding, the so called opening bid until the end of the auction is reached. This is usually the case until only one bidder is left willing to pay the highest bid or until all items are successfully sold. Firstly, Kumar and Feldman (1998) raised the issue of 'notification', i.e. the mechanism to update the bidders on the latest bidding actions. In classical offline auctions through which the bidders are present this issue is of little difficulty. However, if bidders are not personally present in the bidding room they have to be informed about the developments of the bidding. The notification can then be done over the phone or the internet with connections ranging from permanently held by each bidder for the duration of the auction to a manual refresh on client request. Secondly the auction company has set the terms and conditions and make these available to the sellers and buyers. If the bidding process allows the buyers to request changes of the payment or shipping terms, these terms should be treated as part of the bid. The auction chart should display the terms and conditions offered along side the bids shown. Furthermore, when creating the product description, the seller should specify the range of terms and conditions acceptable to him and indicate how they are factored in bid evaluation. Thirdly, the auction company has to decide on the deposits of the bids. Depending on various issues, a deposit may be required, or a bond may have to be posted before a bidder can participate in an auction. Throughout the bidding certain security measures might have to be considered. Particularly in sealed bid processes the auction company has to ensure that a bid submitted is not tampered, that it is not disclosed to other bidders in violation of the auction rules. In open cry auctions, spurious bids injected by the seller or auctioneer to prompt the highest bidder to further increase his bids, maybe need to be prevented. Fourthly, retraction of bids needs to be defined. During the bidding phase, under certain conditions the seller may be allowed to stop or withdraw the auction or modify the rules. Similarly, under certain conditions the bidders should be allowed to withdraw or modify their bids. Finally, defining the closing of the auction is an important issue. Normally the auction would close according to the closing rules specified. At this time the winning bids can be treated as, and if needed translated to, traditional purchase orders.

[26] Based on Kumar and Feldman (1998)

In the fourth phase, the closing of the auction, according to Kumar and Feldman (1998) three activities need to take place. Firstly, the auctioneer must communicate the results of the auction to the bidders. Depending on the auction policy some information would be made available publicly, some common information would be made available to all bidders, and some would be communicated only to bidders to whom it is relevant. Once again security and privacy rules might be needed. If the auctioneer is not the seller himself, the auction results must be communicated to the seller also. The auction results comprise of the winning bidder's or top few bidder's names and addresses, the bid amounts, and the shipping and payment terms if the bidding process allowed changes to these terms. Secondly, the auctioneer must prove to the bidders and the seller that he conducted the auction fairly (record retention). The seller needs to maintain it for his own internal book keeping requirements and to prove that government rules and regulations such as fair trade practices were met. The record retention policy will vary from organization to organization, and will also depend on the monetary value of the transaction and commodity being sold. The records usually include the product description, when and where it was posted, and for what period. It could include the list of bidders who participated and the log of the bids. The evaluation method should also be retained as part of the records. The auction record would be digitally signed by the auctioneer.

Having provided insights into key features of auctions in general, basic auction types, and having presented a model of a generic auction type by Kumar and Feldman (1998), in the following we present the results from empirical analysis of IP auction processes and successful transactions.

4.2 A Generic IP Auction Process

In order to derive a generic IP auction process we chose a three step procedure. Firstly, we investigated auction processes that were designed by two companies, OceanTomo (OT) and IP Auctions GmbH (IPA) for six IP auctions.[27] Noteworthy is that OT held five of these auctions and adjusted the process slightly over time. Assuming that OT made the adjustments to the process throughout the auctions in order to improve the process, we investigate only the process of the latest IP auction of OT in our dataset. Secondly, we conducted a comparative analysis of the processes by OT and IPA with the aim to identify similarities and differences. Finally, to derive a generic IP auction process we transferred our qualitative observations into the ETE process model proposed by Lichtenthaler (2006) as one of the few available, empirically derived and commonly cited process model for ETE.

We investigated the auction processes of OT and IPA using the official publications of the two organizers, mainly auction catalogues, including detailed descriptions of terms and conditions,

[27] OT performed its first public multi-lot live IP auction in San Francisco on 06.04.2006. Until autumn 2007 OT had organized four more IP auctions, three in the US and one in Europe in London, UK in June 2007. Until today IPA had organized only a first public IP auction in Munich, Germany on 15.5.2007, thus we describe the process as designed for this particular auction.

interviews and corporate websites. Furthermore, we personally attended the IPA auction in Munich on 15.05.2007 and the OT auction in London on 01.06.2007.[28] Having investigated the auction processes of OT and IPA we conducted a comparative analysis of the processes by identifying similarities as well as differences in order to then propose a generic IP auction process.

4.2.1 Comparative Analysis of IP Auction Processes

We proceed throughout this chapter is three steps. Firstly, we compare the general structure of the two auction processes throughout the individual process phases including the duration of each phase. Secondly we discuss similarities and difference of relevant elements in the bidding process and thirdly we compare the fee structure and assessment base of the fees charged by the two auction companies.

Comparing the **general structure** of the IP auction processes, we found that both companies initiated the auction process with the development of a set of 'terms & conditions' as a first initial task[29] followed by an announcement of the auction event to the public. Having announced the date and place through their corporate websites and other publications, including IP expert journals, newsletters targeted to the community but as well regular newspapers. OT, having already organized several auctions, additionally used the auction catalogue to promote the next upcoming auctions.

Together with the publication of the catalogues, the auction companies invited sellers to submit IP assets for sale. For both auction processes the sellers had to complete a registration procedure and deliver certain documents for an internal evaluation. OT performed the examination internally after the company had acquired a specialized patent rating company. IPA conducted the examination with support of its mother company IPB. Having evaluated the IP assets, IP assets that fulfilled internal quality criteria were accepted, the others rejected. These were compiled in an auction catalogue, which was then published.

On the one hand the auction company used the catalogue for marketing purposes and on the other hand the catalogue was a tool for interested buyers to conduct a first screening of the offerings based on mainly public bibliographical data, thus some first information for a due diligence. The information provided in the catalogues by OT and IPA was almost similar. Interested buyers were then invited to register on the companies' websites. They had to provide a signed bidder registration form and a bidder agreement, for which a draft was published in the respective auction catalogue. In case buyers were not able to attend the bidding session personally, they had to further provide a signed alternative bid form. In addition, interested buyers had

[28] During the auctions we had further possibilities to interview several sellers, the organizers and IP specialists (lawyers, economists, and IP professionals) attending the auctions.

[29] We would like to note that IPA prior to this step needed to develop a general concept, because it was their first auction.

to provide a bank guarantee and in case the buyers would send a bidding agent, they had to deliver a written authorization confirmation. Furthermore, interested buyers had to pay a bidder registration fee.

Having completed the registration procedure, interested buyers received access data to the online data room in order to conduct in depth due diligences on IP assets they were interested in. The data rooms offered the possibility to review detailed data on specific IP assets provided by the sellers but as well to directly contact the seller to request additional data. Both auction companies used online data rooms from third party providers.[30] In addition to the data rooms both companies had engaged a specific IP evaluation firm to produce detailed reports for buyers on certain IP assets on request and for additional payments. Thus, throughout the two auction processes interested buyers had four information sources to evaluate IP assets: The catalogue, the data room, personal or telephone meetings with the sellers, and reports for specific IP assets buyers could request from a third party that was engaged by the auction companies.

Table 4 provides an overview of the publication dates of the catalogues and the auction dates. From these we can calculate the length of the period in which interested buyers could conduct a due diligence. The length of this duration varied from auction to auction. However, it does not seem that a systematic difference exists between the two auction companies.[31] Following the due diligence phase, the auction event took place. The auctions were governed by a set of terms and conditions and carried out by an independent auction firm.

No.	Catalogue publication date	Auction date	Due diligence period (weeks)
1	14.02.2006	06.04.2006	7
2	Aug 2006	26.10.2006	8-12
3	25.01.2007	19.04.2007	12
4	n.a	15.05.2007	unknown
5	25.04.2007	01.06.2007	5
6	21.08.2007	25.10.2007	9
		Average due diligence period:	8.2 - 9

Table 4 : Length of due diligence period of six IP auctions

Following the IP auction both companies provided the opportunity to unsuccessful bidders and sellers to continue with the negotiations after the bidding ended throughout a post auction

[30] IPA offered a data room by Data Room Services GmbH & Co. KG. OT offers the online data room by IntraLinks, Inc.

[31] Whether the available time for the due diligence can be regarded as sufficient, appears difficult to judge. The available literature does not indicate nor provide any recommendations for a sufficient length of such period. However, according to Niioka (2006) an average of seven weeks should be regarded as relatively insufficient, particularly because not all interested buyers might be aware of the upcoming auction already at the date of the publication of the catalogue.

phase. Throughout this phase the rules governing the post-auction sales differed between OT and IPA. Unsuccessful lots at IPA were subject to post auction sales up to six months after the auction event; whereas OT required a commission payment if the offered IP assets are sold at "any time after the Live Auction" Ocean Tomo (2007, p.24).

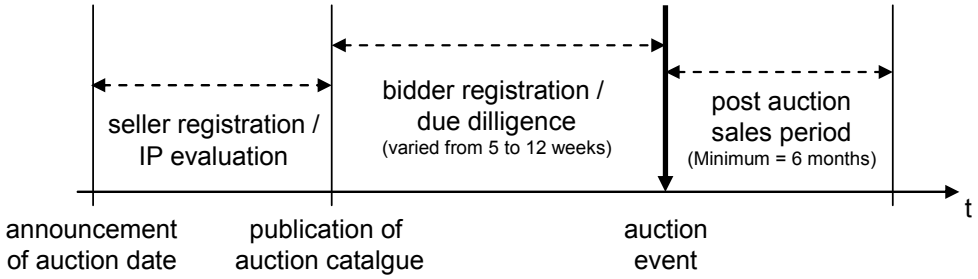

Figure 4 : Three phase structure of the OT and IPA auction processes[32]

To conclude, no major differences in the general structure of the auction processes developed by OT and IPA exist.[33] The processes followed a similar structure as illustrated in the following figure. The figure shows three key events in the process. The process started always with the announcement of the auction, followed by a seller registration and evaluation of submitted IP assets. The second event was the publication of the auction catalogue, followed then by the bidder registration and the due diligence. The third event was the auction as such on which certain IP assets were sold. The IP assets that remained unsold were then available throughout the post auction sales period.

A central event in the auction process is the design of the auction event, particularly the bidding process. **Comparing the bidding processes** embedded in the auction processes as developed by OT and IP we identified three elements with relevance on the outcome of the auctions: the types of IP assets bidders could bid on, the auction type used for bidding and the MRP. Both companies accepted different IP types for sale. These included patents, trademarks, copyrights, and domain names. The IP assets were offered in lots, while a lot could comprise one or more related IP assets bundled together, however usually only of one type. In addition to these four IP asset types offered by OT and IPA, IPA offered as well licenses for sale. Only licenses were accepted for which the license rights could be acquired through a lumpsum payment only or through a down payment with following royalty payments. In addition to the documents sellers had to provide a license contract in the data room to interested buyers. Both OT and IPA used different auction types. In the six auctions of our dataset, OT had applied only English auctions (first-price or open-cry auction), while IPA had applied English as well as Dutch auc-

[32] Based on our own research

[33] We would like to note that very few companies had performed IP auctions before IPA developed its auction process, thus it seems likely to us that IPA had developed their process taking into account learnings from OT.

tions (see chapter 4.1.1). Although increasingly discussed in the literature, the "first-price sealed-bid" auction (Vickrey-auction) was not used so far.

	OT	**IPA**
IP asset types	Patents, trademarks, copyrights, Domain names	Patents, trademarks, copyrights, Domain names, licenses
Auction types	English	English, Dutch
MRP	A1: Confidential (not published) A2: Not published (assumed to be confidential) A3: $10,000 A4: £5,000 A5: $10,000	€25,000

Table 5 : Comparison of feature of the bidding processes as designed by OT and IPA

In the auctions both companies employed the MRP feature. However its amounts differed as charged by the auction companies as well as in the case of OT from auction to auction. At the first and second auction OT kept the MRP confidential, thus the MRP was not known to the bidders. OT changed this strategy after its second auction. In the following US auctions (A3, A5) the MRP was then announced to be $10,000, while the MRP was £5,000 at the UK auction (A4). On their first auction IPA set the MRP to €25,000, thus had chosen a considerably higher MRP than OT had applied at any prior auction. The respective MRPs set by OT and IP at the six auctions have to be regarded as a ‘standard’ MRP as defined by the auction company. Seller however always had the chance to specify own MRPs for any IP asset they offered for sale.

Analyzing **mandatory fees** charged by the auction companies from sellers and buyers throughout the two processes, it appears that both companies charged two different types of fees, the registration fees and the commission fees due on successful sales at the auction and throughout the post auction sales. Both types of fees were charged to sellers as well to buyers, although the amounts differed. Table 6 provides an overview of the fee structures.

On the one hand sellers and interested buyers had to pay a registration fee in order to be allowed to participate in the auction. However both auction companies charged different registration fees depending on different variables.

For sellers OT based the registration fee on three criteria, the IP asset type, the number of IP assets bundled together, and the MRP. Sellers were allowed to define an own MRP for any IP asset. In this case, the registration fee for this IP asset was considerably higher. IPA based the seller registration fee on two criteria, the number of IP assets and the MRP. In case the seller specified an own MRP, IPA charged a variable fee of 3% on the sales price. This additional fee was thus only due in case of a successful sale.

For buyers OT charged a flat fee of $1,500 for participating in the auction. IPA however charged the registration fee of buyers depending on the type of bidding. IPA charged the high-

est fee for live bidding, thus being personally present in the auction room. For 'outside' bidding the fee was half the price (for telephone bidding) and 1/3 of the fee for absentee bidding.

	OT	**IPA**
Registration fees		
Sellers	Depending on IP asset type, number of IP assets and MRP For one patent*: $1,000 with OT MRP $3,000 with own MRP For a 'patent pool', i.e. bundle: $1,000 with OT MRP $6,000 with own MRP *Analogue for other IP asset types	Depending on number of IP assets and MRP Single IP asset: €1,000 Two or more IP assets: €2,000 Own MRP: Plus 3% fee on the sales price
Buyers	Fixed fee of $1,500	Depending on type of bidding Live bidding: €1,500 Outside bidding: €750 (telephone); €500 (absentee)
Commission fees		
Sellers	15% on sales price	15% on sales price
Buyers	10% on sales price	10% on sales price

Table 6 : Comparison of fee structures from OT and IPA auctions

On the other hand sellers and buyers were charged a commission fee for successful sales. Surprisingly this fee was similar for the OT and IPA auctions. Sellers had to pay a premium of 15% on the sales prices (disagio) and buyers were charged 10% on the sales price (agio).

As a result from the analysis of the individual IP auction processes[34] on the one hand and the comparative analysis of those on the other hand we can now propose an IP auction process for ETE.

4.2.2 Deriving a Generic IP Auction Process

Having described and compared different IP auction processes we use and adapt the generic ETE process model from Lichtenthaler (2006) to derive a generic IP auction process being a specific ETE process. However, to create a better understanding of the various stakeholders and their relationships we firstly discuss the roles of these throughout the IP auction process. From the comparison of the different IP auction processes we learned that throughout IP auctions processes three main stakeholders are directly involved. Additionally the auction companies engaged dedicated service firms to support particular tasks with specialized know how. For analyzing the relationships of these stakeholders we apply a holistic ETE framework as

[34] The description of the processes is not shown in this paper, but can be found in (Tietze, 2009).

proposed by (Tietze, 2009).[35] According to this framework any ETE transaction consists of five elements: three main actors (stakeholders) including sellers on the supply side, interested parties on the demand side, and intermediaries facilitating the process, as well as two key elements, the transaction process, and the traded assets. Figure 5 illustrates the monetary and legal relationships between the three main stakeholders involved in IP auctions. Additionally, our analysis revealed that a fourth stakeholder is involved in IP auctions. Dedicated service firms are engaged by the auction company to provide specialized know how for particular tasks. However, in the following our main focus is on the roles of the three main stakeholders.

On the supply side (left) owners of IP assets as well as intermediaries (e.g. law firms) acting on behalf of owners offer IP assets for sale. The sellers have to register and provide information on any IP asset they offer for sale. Before the IP assets are accepted for an auction, the auction company carries out a first evaluation reserving the right to reject certain IP asset. For the IP assets accepted for an auction, the owner has to provide detailed legal, economic and technical information on the assets history to enable buyers to properly evaluate the IP asset carrying out a due diligence in a secure data room. In case of a successful sale, the seller receives a payment from the buyer in exchange for the ownership rights. Although the seller has to discount a commission fee from the sales price payable to the auction company.

On the demand side (right) potential buyers willing to acquire IP assets throughout a bidding session turn into buyers in case of a successful bid. Having proved the financial ligitimy and thus successfully registered for an auction interested buyers perform a due diligence on IP assets they want to acquire prior to the bidding session. If a bid is successfully closed the buyer has to pay the sales price to the seller in exchange for the ownership rights of the IP asset as well as a commission fee to the auction company.

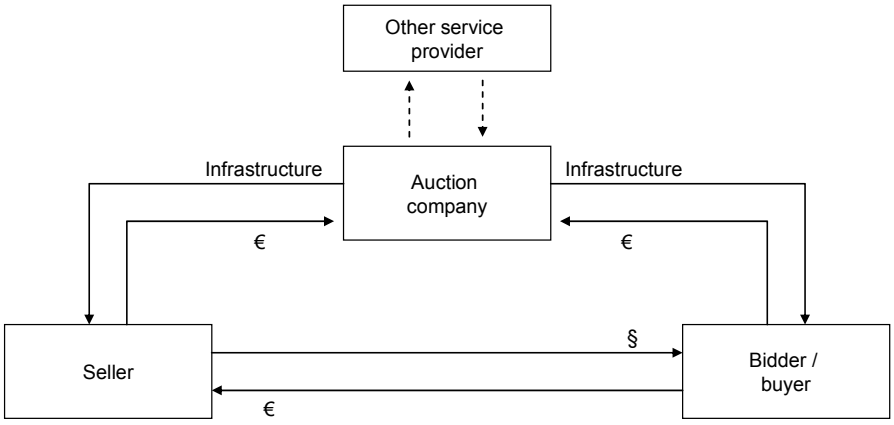

Figure 5 : Relationships of stakeholders involved in IP auction processes[36]

[35] The framework is essentially a stakeholder analysis of ETE transactions and will be further discussed in more detail by Tietze (2009 (forthcoming)).

[36] Own illustration based on our analysis.

As a third stakeholder the auction company provides the infrastructure for the transactions including different services provided to the sellers and bidders/buyers. To the sellers the auction company provides mainly marketing support and a standardized legal framework for carrying out the negotiations and transferring the ownership rights. The marketing efforts are twofold. On the one hand the auction company tries to maximize the likelihood to find a buyer interested in the offered IP assets and on the other hand the auction companies tries to maximize the outcome of the auction, i.e. maximizing the sales prices. The auction company bundles all offerings in a catalogue, draws attention of potential buyers to the auction through press and media coverage, and identifies companies for specifically targeted marketing that might be interested in particular IP assets. Furthermore, the auction company ensures that only solvent buyers participate in the auction. For interested buyers, the auction company performs multiple services. The auction company performs a first evaluation of all delivered IP assets and filters out IP assets that do not fulfil a minimum quality level, e.g. patents that are too old and shortly before expiration. If a buyer becomes interested in a particular IP asset, then the auction company provides support throughout the due diligence. The auction company organizes a secure data room and facilitates possibilities for direct information exchange through e.g. personal meetings. In the phases following the due diligence the auction company then provides a standardized legal framework for negotiations, i.e. the bidding as well as rules and standardized contracts for transferring the ownership rights in case a bid is successfully closed. For offering these services, the buyers pay a participation fee as well as a commission fee on the final sales price for each sold IP asset.

In addition to the three main stakeholders, service companies can be engaged by the auction company to carry out dedicated tasks. The tasks include valuation of IP assets, technical provider for the secure online data room but as well the guidance through the bidding session by an independent auctioneer. In certain cases even the buyers want to commission an independent third party company to carry out a detailed evaluation of any particular IP asset.

Having described the roles of the different stakeholders throughout the IP auction process we can derive a generic structure of an IP auction process with regard to the three main stakeholders. According to the model by Lichtenthaler (2006) we distinguish the process into the three main phases, the planning, the negotiation and the realization phase. [37] Each phase, we further distinguish into individual steps for which we assign the stakeholders involved in each step.

According to Lichtenthaler (2006) any exploitation project starts with the planning phase that comprises four tasks: strategic technology planning, target setting, resource allocation and ETC customer pre-selection. In the specific case of IP auctions, both auction companies initiated the planning phase with the development of a set of terms and conditions for an upcoming auction,

[37] Little information was available on the intelligence and control phases, thus our analysis focuses on the three main phases of the ETE process.

followed then by the announcement of the auction date to the public as a second step usually about three month prior to the auction event. In these two steps, only the auction company was involved. Having announced the auction to the public owners of IP assets are invited to deliver IP assets for sale to the auction company. Sellers have to pay a registration fee depending on different criteria (e.g. type of IP asset) and to provide mainly bibliographic information for each IP asset through the auction company's web interface. In this third step of the planning phase, the auction company and sellers are involved. Following the delivery of IP assets, the auction company carries out a first internal evaluation of the IP assets in order to decide which IP assets will be accepted or will be rejected. Having decided about which IP assets are accepted the auction company compiles and publishes the auction catalogue. Interested buyers can use the catalogue for a first screening of the offerings. Being interested in particular IP assets, interested buyers can register for the auction. To register interested buyers have to provide a bank warranty and pay a registration fee. The auction company guides interested buyers through this process providing pre-produced registration forms. Thus throughout this step these two stakeholders are involved. The planning phase ends with the completed registration of the interested buyers, thus consists of six steps.

According to Lichtenthaler (2006) the negotiation phase is the second phase of any ETE process characterized by the possibility for buyers and sellers to exchange information. Lichtenthaler (2006) differentiated this phase further in the pre-negotiation phase and the detailed negotiation phase. In a first step of this phase, interested buyers can access additional information on the IP assets complementing the information provided in the catalogue getting access to a secure data room which is usually provided online. Interested buyers can carry out a due diligence reviewing and evaluating detailed legal, technical and economical information provided by the sellers. Additionally interested buyers can directly contact the sellers and request further detailed information. In this step of the pre-negotiation process mainly the sellers and interested buyers interact, although the auction company provides the infrastructure to enable and facilitate the interaction.

The auction event follows the pre-negotiation phase as the 'main' negotiation phase. Organized by the auction company and following pre-determined rules and regulations interested buyers bid on IP assets offered on the auction event. However, sellers and interested buyers do not interact directly. The auction company rather acts as an agent for all sellers, although the auction company usually contracts an independent auctioneer from a specialized auction firm. Bids can be placed in person, using an agent, by phone or as absentee, thus delivering a maximum price prior to the auction to the auction company. At past auctions mainly open outcry English auctions were used. The auctions companies used the MRP feature to ensure a minimum price. In case the bidding reaches the MRP specified by the seller, bids are closed successfully. Due to the fact that the auction uses standardized contracts, no addition negotiations are necessary for particular clauses. If a bid is closed successfully, the negotiation phase is finished and the process continues into the realization phase. If however, the MRP is not reached in the bidding session the IP asset is withdrawn from the auction. In this case, inter-

ested buyers can engage into further negotiations. For any sale closed throughout these 'post auction sales' for a varying period the auction company reserves a right to still receive the commission fees from the seller and buyer. The negotiation phase finishes if a seller and a buyer sign a sales contract.

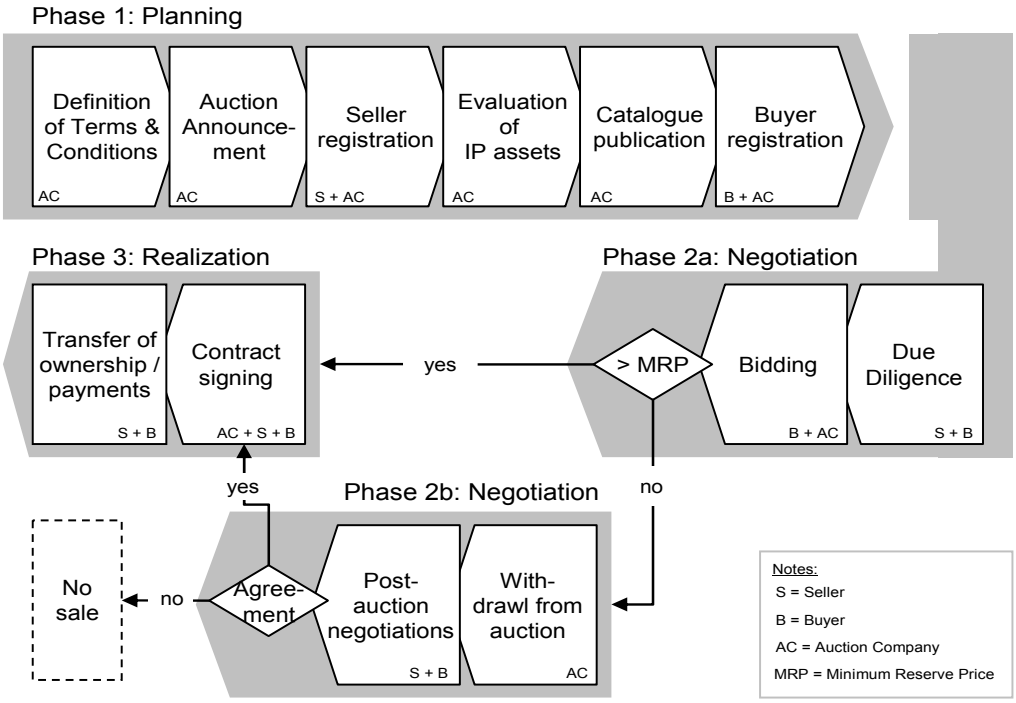

Figure 6 : Detailed illustration of a generic IP auction process structure[38]

Having signed a contract on the auction event or throughout the post auction sales the transfer of the ownership rights of the sold IP asset from the seller to the buyer is the first step in the realization phase. In exchange to the ownership rights, the new owner pays the sales price to the seller, plus a commission fee (adgio) on the sales price to the auction company (usually 10%). Furthermore the seller pays a commission fee for each successful deal (disadgio) to the auction company too (usually 15%). Following the transfer of the ownership rights and the payments of the sales price and the commission fees the new owner might receive additional tacit knowledge through e.g. training courses from the seller. Having transferred the sales price, the ownership rights and additional tacit know how the realization phase finishes and thus the transaction is completed.

Comparing the model of the generic IP auction process as illustrated in Figure 6 with the model of an general auction process proposed by Kumar and Feldman (1998) as illustrated in Figure 3 it can be seen that the main auction activities described by Kumar and Feldman (1998) exist also in the generic IP auction process. However, when comparing the details of each phase it

[38] Based on own research

can be seen that IP auctions have two specific activities not present in general auctions: the due diligence and the follow-up sales. Having presented a generic process model for IP auctions, in the following we provide insights into selected, successful ETE transactions.

4.3 Successful Transactions via IP Auctions

The following chapter illustrates how patented technologies can be sold successfully via auctions. We selected four cases[39] to provide qualitative insights into transactions regarding four aspects, the company that exploited the technology (including motives and selection process of the technology), the IP, the organization of the transaction and the sellers' perception of the success of the transaction. In two of the four cases the sellers were SMEs, while in the other two cases the sellers were multinational firms.

4.3.1 Selection of Transactions and Data Collection

From a dataset that comprises 156 transactions, which we compiled to conduct a quantitative analysis[40] we selected successful transactions according to a two step procedure. In order to identify 'successful' transactions that provide particular interesting insights for our case studies. In a first step, we applied a filter on all 156 transactions according to the type of the seller. In the dataset five types of seller were classified including research institutes and universities (i.e. technology transfer offices), individual inventors, others (e.g. law firms) and firms. Firms were further classified into SMEs[41] and large firms. These two categories were the basis for us to select the following case studies, because our study focuses on private market actors. Having applied this first filter, 81 transactions remained from the dataset of 156 completed. In a second step, we applied a monetary, but relative measure to filter for transactions that could be regarded as particularly successful. From each of the six IP auctions in the dataset, we selected the two transactions that sold for the highest and second highest price. Applying this filter, we identified 12 technologies as 'successful' in terms of monetary returns. Applying this filter on each auction separately, we took into account that the different auctions have reached different price levels (e.g. average and maximum, absolute prices varied) that might be due to learning effects in the market (e.g. a first European auction reached different prices that a third American auction).[42] Thus we wanted to reduce the bias, i.e. that certain auctions were underrepre-

[39] An investigation of four cases certainly is not meant to provide generic evidence, but rather a first explorative step to better understand the nature of these transactions.

[40] Forthcoming in Tietze (2009 (forthcoming))

[41] We have applied the official EU definition to distinguish SMEs from large firms in our sample.

[42] In a first approach, we calculated the overall average value of all 157 completed transactions and wanted to take into account only the transactions with sales prices above the average value. Applying this approach proved however difficult, because none of the transactions completed at the IPA auction had

sented in our sample. The list of 12 successful transactions comprised eight transactions with sellers being SMEs and four of which the sellers where large multinational corporations (MNC). The transaction volumes varied from a minimum of 25,000 € up to a maximum of 649,044 €, with an average value of 202,000 €.

Data for the successful transactions was collected using a questionnaire that we developed particularly for this study. A completed questionnaire was received for four out of the 12 transactions. We developed the questionnaire according to our research questions based on a literature review drawing mainly on nine literature sources. These include the fourth version of the EU Community Innovation Survey (version 4, 2006), Granstrand (2000), Granstrand (2008 (forthcoming)), using the sequential ETE process model of Lichtenthaler (2006) relevant for questions regarding the resource requirements in the various process phases, Gambardella, Giuri et al. (2007) regarding the use of as well as advantages and disadvantages of using intermediaries for technology sales, Milgrom (2005) for questions related to specific advantages and disadvantages on the auction process compared to bilateral sales. Additionally, from Rieck (1993), Kaufmann (2001) and Thiele (2003) we derived questions on bilateral transactions. The questionnaire comprised mainly closed questions to ensure that the respondent can do answer the questionnaire in proper time as well as the possibility to compare the case studies following Atteslander and Cromm (2006). We aimed to fulfil all criteria regarding 'accuracy, uniqueness, and comprehensiveness' as required by Atteslander and Cromm (2006) and Punch (2001). Having finished a literature based version of the questionnaire, the content of the questionnaire as well as the understandability on the questions was validated with three industry experts.[43] Having validated the questionnaire with industry experts the questionnaire was pilot tested with four selected companies.[44] The questionnaire was then sent out to the project managers that were responsible for the transactions.[45]

The questionnaire comprised of 23 questions in three parts. In the first part 15 questions addressed characteristics of the sold technology, the organisation of the transaction process inside the sellers' firm and the motivation of the seller to exploit the technology as well as the selection process and its criteria. Question types on this part include yes/no questions, alternative

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reached above average values. Because we did not want to exclude the transactions from the single European auction, we dismissed this approach.

[43] We would like to acknowledge the support, the valuable comments and suggestions from Tomas Ewing (IP ValueADDED), Boris Peters (IP Bewertungs AG) and Prof. C. Herstatt (Institute for Technology and Innovation Management, TUHH).

[44] These include Diehl Stiftung & Co. KG (Nürnberg), Fraunhofer-Gesellschaft (Munich), HILF! GmbH (Oberhaching) and TuTech Innovations GmbH (Hamburg),.

[45] We were able to identify the responsible project manager from eight companies of the transactions beforehand. For the remaining four companies, the questionnaire was directed to the head of the patent or licensing department with a request to forward it to the responsible project manager.

questions with multiple answer possibilities and closed questions with a five point Likert scale. One open question was included regarding cost drivers throughout the transaction. In the second part questions were designed in order to understand advantages and disadvantages of transactions via auctions compared to the predominant bilateral exploitations. These questions have particular relevance for the analysis regarding the success of a transaction from the company's perspective. This second part comprised four closed questions with a five point Likert scale plus one open question to identify further potential for improvements of technology auctions. Throughout the final part of the questionnaire we collected additional corporate information that was hardly available via the companies' websites or annual reports. These three questions address particular the experience of the companies regarding IP exploitation as well as the their economic performance in the previous years.

For the four transactions, additional data was then compiled from secondary sources. These include various publicly available patent databases (e.g. the USPTO and the EPO), the corporate websites provided data on the organizational structure of the sellers' companies as well as on business data from previous years and the information from the respective auction catalogues.

4.3.2 Results from Successful Transactions

The cases were analyzed in a two step procedure. In a first step, each case study was analyzed according to the four main aspects in question, i.e. the company that exploited the technology (including motives and selection process of the technology), the technology as such, the organization of the transaction and their judgement on the success of the transaction. In a second step we conducted a comparative analysis of the four cases along these four investigated aspects.

The case studies are structured according to the four major aspects of this research. The first part comprises information on the exploiting company (e.g. number of employees, revenues and industry). We emphasize further on the expertise of a company regarding IP exploitation and the importance of IP for that company. The exploited IP is in the focus of the second part. Various characteristics of the IP are described, including the age, the number of patents and the geographical reach of the protection. Furthermore, the origin of the IP (whether it was internally developed or externally acquired), and the strategic and operational importance of the IP for the owner prior to the sale. Throughout the third part the internal organization of the exploitation process by the seller is described. We emphasize on who was leading the exploitation project, the necessary resources throughout the various exploitation phases, and the patent strategy of the company, who had initiated the exploitation process, which motives drove the exploitation. The fourth part of the analysis of each case study investigates the success of each transaction. Therefore we investigate the advantages and disadvantages of auctions compared to bilateral exploitation projects where companies use only their internal resources. Companies were asked to judge how successful they perceive the respective transaction compared to the resources that were necessary to complete the transaction, in respect to the total sales price, and

in comparison to the resources and costs the company had to develop the technology. The fact that a company had tried to exploit the technology via other ways prior to the auction is furthermore an indicator for the success of the auction model that is discussed in this part. We discuss further how companies perceive individual aspects of the transaction process (e.g. the marketing by the auction company).

Having studied four successful transactions separately, the comparative analysis follows a similar structure than in the descriptive analysis of each of the four cases. We started comparing the sellers and the exploited IP as a basis for the understanding of the similarities and differences in the organization of the exploitation processes. Finally we compared the perceptions of the advantages and disadvantages of the IP auction process compared to 'traditional' bilateral exploitation projects and discussed the role of the auction company as a TMI throughout the process steps of the exploitation projects. The results from the comparative analysis are presented in the following.

4.3.2.1 The Sellers

The IP sold throughout the four observed transactions were sold by three German and one Finnish company. One company was active in the chemical and pharmaceutical businesses (ComC), one company in the bio- and nanotechnology businesses (ComA), one in the energy, electrical and industrial businesses (ComD) and a Finnish company focussed on the implementation of patent strategies (ComB). The sample thus consists of two SMEs (ComA, ComB) and two large multinational corporations (ComC, ComD), with ComB being the smallest company with just one employee and ComD being the largest with 392.200 employees.

Company name	**ComA**	**ComB**	**ComC**	**ComD**
Nationality	German	Finnish	German	German
Main industries	Bio- and nanotechnology	Patent management	Chemical and pharmaceuticals	Energy, Electronics and Industry technologies
# of employees	≤ 50 (Liquidations phase)	1	Ca. 32.000	Ca. 398.200
Revenues (2007)	≤ 10 Mio. €	≤ 10 Mio. €	7.057 Mio. €	75.500 Mio. €
R&D expenditures (2007)	n.A.	n.A.	1.028 Mio. €	3.500 Mio. €
SME / MNC	SME	SME	MNC	MNC
Experience with patent management	Low	Low - medium	Medium - high	High
ETE relevance (2002/2007/2010)	medium/ low/ low	high/ high/ high	High/ medium/ medium	Low- medium / high - medium / high

Table 7 : Summary of business data of the sellers

Total revenues of the companies were available only for the two MNCs. ComC collected revenues in 2007 of about € 7,057 mio. and ComD of about € 75,500 mio. In 2007 ComC had R&D

expenditures of about € 1,028 mio. and ComD of about € 3,500 mio.[46] Based on the official EU definition for SMEs however both ComB and ComA qualified as SMEs. [47]

Both SMEs do not apply institutionalized tools for patent management (e.g. use of data bases) or have employed a dedicated patent manager, thus their competence in patent management might be regarded as low. However, ComB's business activities are focused on the implementation of patent strategies, thus the company might employ a certain competence in patent management. ComC as well as ComD however both make use of patent management software and databases and both companies run a dedicated patent management department. However, ComD has an IP committee in place that regularly reviews the IP portfolio as well as an explicit patent strategy with certain elements even focussing on ETE. Thus among the companies in our sample ComD employs the highest patent management competence.

In 2004 ETE had a high relevance for two companies (ComB, ComC). For ComA ETE was of moderate relevance in the daily business and for ComD ETE had a low relevance. The relevance of ETE for the company's business remained on a high level for ComB. For ComA ETE became less relevant and is expected to remain on a low level until 2010. For ComC ETE became less relevant and is expected to remain on a moderate level. Only for ComD ETE became increasingly relevant in the previous years. From 2004 to 2007 the relevance of ETE increase to moderate/high and is expected to remain on this level until 2010.

This overall picture is in slide contrast to the picture the literature shows. According to e.g. Sheehan, Martinez et al. (2004) many companies have experienced and will experience an increasing importance of ETE for their businesses. However, three of the four cases expect that ETE will continue to be of moderate relevance in the future.

4.3.2.2 The Exploited IP

Throughout the four transactions two IP assets were successfully sold from the area of process-, bio-, nanotechnology, respectively chemicals. The other two IP assets were from telecommunications, respectively data transfer. Two of the technologies (ComA, ComB) were process technologies while the other two technologies were process and product technologies. Three companies had developed the technologies entirely in-house, while ComC had developed the technology in a Joint Venture.

The age of the exploited technologies varied between 5.5 and 8 years, with an overall average of 6.6 years. Thus none of the technologies can be regarded as particularly young (e.g. only one or two years old) or particularly close to the expiration dates of the patents (e.g. 19 years old). The number of patents however bundled together as one lot at an auction varied however more

[46] Due to the small size of ComB and ComA these companies refused to publish any business data.

[47] The classification was done based on the statements of the companies in the questionnaire, because no official data was available for the two SMEs on revenues or the number of employees. However, the questionnaire applied the official SME definition for the European companies.

widely. ComD sold only one US patent, while ComC sold 12 patents bundled together, with an average of 5.75 patents per lot.

Company name	ComA	ComB	ComC	ComD
Exploited technology	Process for manufacturing a specific surface	Technology for a wireless file based multi media data transfer	Miniaturized analytical system	Method for secure transactions using chip cards in a network environment
Application areas	Process technology, nano technology, chemistry	Telecommunication (wireless, cellular, optical)	Process technology, nano technology, chemistry	Telecommunication (wireless, cellular, optical)
Average age of patents in lot (years)	6,096	5,497	6,982	8,073
# of patents in lot	7	3	12	1
Matter of protection in patent (Product / process)	Process	Combination	Combination	Process
Development	Internally	Internally	Joint Venture	Internally
Strategic relevance for seller (2002/2007)	High / low	High / high	Moderate / low	Moderate / Moderate
Operational relevance for seller (2002/2007)	High / low	Low / Low	Low / Low	Moderate / Moderate
Positive Return on investments reached until auction date	No	No	No	No

Table 8 : Summary of key facts of four sold technologies

In 2002 two technologies had a moderate strategic relevance for ComD and ComC. For ComC the relevance decreased while it remained on a moderate level for ComD. Among the two SMEs both technologies had a high strategic relevance in 2002. For ComB the relevance remained high in 2007, and for ComA it decreased to a low level.

The technology sold by ComA had a high operative relevance for the company in 2002 that decreased until 2007 to a low level. The technologies of ComB and ComC were of low operative relevance and remained on that level, while for ComD the technology remained on a moderate level. None of the companies had ever implemented any of the technologies in any of their products. Thus none of the technologies had ever reached a positive ROI prior to the sale of the technology. Table 8 summarizes the key data on the four technologies that were sold through the successful transactions.

4.3.2.3 Organization of Transactions

As a starting point the transaction needed to be initiated. The two transactions by the MNC were initiated by employees related to the patent department, respectively the head of the patent department at ComC and at ComD by the licensing committee. At ComA the CEO initiated the transaction while at ComB an external party initiated the exploitation project.

Three companies initiated the exploitation project driven by the motive that the company had made the strategic decision not to develop the particular technology any further. ComB how-

ever, with the business model being focused on the implementation of patenting strategies initiated the exploitation project with the motive to generate revenues from the technology. The resources required for completing the transaction varied between seven men days (ComB) and 14 (ComA) men days. However, three of the four companies needed more than ten men days to complete the transaction. With a little more than two working weeks, both MNCs required almost similar resources to complete the transaction.

Company name	**ComA**	**ComB**	**ComC**	**ComD**
Initiator of the project	CEO	External party	Head of the patent department	Licensing committee
Motive for the project	Strategic decision not to develop the technology further	Generating revenues streams	Strategic decision not to develop the technology further	Strategic decision not to develop the technology further
Necessary resources (men - days)	14	7	12	11
… for planning stage	10	5	10	5
… for negotiation stage	1	1	0	3
… for realisation stage	3	1	2	3
Monetary resource need	10.000 € - 50.000 €	> 100.000 €	10.000 € - 50.000 €	10.000 € - 50.000 €
Main cost driver	Provision fee to auction company, registration fee	Auction fees, legal costs for law suit, interest fees	Salaries, auction fees	Necessary time
Exploitation prior to auction	Internally, with support of another TMI	Internally, with patent attorney, with other TMI, as spin-off	With internal resources	With internal resources
The buyer	Unknown	Unknown	Unknown (probably “Patent Troll”)	Unknown
Additional knowledge transfer after auction	None	None (although the company was willing to)	None	None

Table 9 : Summary of key facts for organization process of the four transactions

Looking closer at the distribution of this workload across the three process stages, it became obvious that all companies had spent the major share of resources on the first, the planning stage. In average, the companies spent 2/3 of the resources for this stage. 20% of the resources were spending in average on the final stage, the realisation stage, while only a little more than 10% of the resources were spend on the negotiation stage. Only at ComD, the distribution varied slightly different. The company had spent almost 50% of the resources on the planning stage. The remaining 50% were distributed almost equally on the following two stages.

With regard to the monetary resources spent for completing the transaction, three of the companies had expenses in the range between 10,000 € and 50,000 €. Only ComB had considerably higher costs for the transaction of about 100,000 €. The company explained these high costs with the proportional auction fee ratio on the sales price. Additionally, the company had to cover legal costs associated with a law suit prior to the auction.

As major costs driver of the transaction, three of the companies identified the proportional success fees claimed by the auction company. Besides, for the two MNC internal salaries were substantial costs in the process to exploit the technology via the auction.

Prior to the auction, all companies had already tried to exploit the IP assets through other ways. Both SMEs had tried to commercialize the technologies with the help of another TMI, respectively a patent law firm, while ComB had even tried to exploit the technology in an own company as a spin-off. Both MNCs had tried to exploit the technologies using solely internal resources.

The buyers of the IP assets remained anonymously after the transactions, thus are unknown to the sellers, although ComC suspects that the buyer might be a 'patent troll'. Thus none of the companies had delivered any additional knowledge after the auction to the buyers. Two companies were even not willing to do so, to not spend any more resources on an IP asset they wanted to sell anyway.

4.3.2.4 Perceived Success of the Transactions

As major advantages of the auction compared to ‚traditional' bilateral exploitation projects two companies identified the standardized contracts, the transparent process and the fixed fees. Furthermore, two companies valued that auctions can be used to exploit even technologies with low or moderate values, due to the relatively low costs as well as the accelerated transaction time.

Compared to bilateral exploitation projects, throughout these auctions the auction company took over certain activities and provided support and expertise. All companies identified the provision of a standardized legal framework for the transactions as particular advantageous as well as the support for closing the contracts. Three companies valued the support of the auction company for the identification of buyers as well as for marketing the technologies in other businesses and partly in other counties as particular advantageous (ComC valued this a bit lower). Two companies furthermore raised the advantage that the auction company supported the transaction for the selection of the technologies, the information exchange between the sellers and the buyers and for controlling the process.

As particular disadvantageous the two MNCs had identified the missing possibility to exclude certain buyers from the auction, while both SMEs identified the high total costs for the transaction as major problems. The costs for the transactions were not problematic however for both MNCs. For ComA additionally the disclosure of sensitive company data was problematic too.

Regarding the overall satisfaction with the transaction, three companies were totally satisfied with the duration of the transaction. ComC and ComB additionally were particularly satisfied with the overall sales price. ComB was additionally satisfied with the ease of the transaction and the sales price compared to the development costs. ComD and ComB were totally satisfied with the transaction in general. Only ComC and ComB delivered suggestions for further im-

provements of the auction process. ComC would like to see more expertise of the auction company in the future as well as more operational freedom for the seller in the auction process. Furthermore, ComC recommended to make use of additional expertise of specialized patent law firms throughout the auction. ComB suggested to include information on the litigation status of the patents in the marketing material (e.g. catalogue)

Company name	ComA	ComB	ComC	ComD
Transaction volume (€)	50.000	649.044	25.000	85.178
Problems	Disclosure of sensitive company data; total transaction costs; price negotiations with buyer	Total transaction costs	Missing possibility to exclude certain buyers	Missing possibility to exclude certain buyers
Advantages	Possibility to exploit technologies with low or moderate values; high sales price; no need for own expertise	Standardized contracts; fixed fees; accelerated transaction process; transparency in exploitation process	Possibility to exploit technologies with low or moderate values; accelerated transaction process	Standardized process and contracts; higher quality in technology valuation
Role of the auction company particularly valuable in…	Contract closing; provision of a standardized legal framework	Selection of the technology; marketing in other businesses and other countries in general; identification of buyers; support the information exchange between buyer and seller; general process control; contract closing; provision of a standardized legal framework	Selection of the technology; marketing in other businesses; identification of buyers; contract closing; provision of a standardized legal framework	Marketing in other businesses and in general; identification of buyers; contract closing; process control; support of information exchange between buyer and seller
Particularly satisfied with the…	Duration of transaction	Sales price; Price compared to development costs; Ease of transaction; Duration of transaction; In general	Sales price; Duration of transaction	In general
Suggestions for improvements	-	To include infringement suits of patents in auction catalogue	Consultation by experienced patent attorneys; Higher operational freedom for seller; More expertise of auction company	-

Table 10 : Summary of success data for four transactions

To summarize, having analyzed four successfully exploited IP assets based on completed questionnaires from project managers representing the seller side we presented background information on the buyer and the exploited technology. Then we analyzed the organization of the transaction process, the perception of the companies regarding advantages and disadvantages of an auction to exploit a technology in comparison to bilateral exploitation project. Finally, we

presented insights into the perception of the companies regarding the role of the auction companies supporting the transaction as a third party and assessed the success of the transactions as well as we asked for recommendations to improve IP auctions in the future.

5 Conclusions

Throughout this paper we have attempted to generate a first understanding addressing the overarching research question of whether and how new models currently offered by TMIs can actually facilitate ETE. To address this question, in a first step we have tried to gain insights into TMIs acting on the markets for technology. Throughout the first part of the paper we provided some new evidence on the growing number of TMIs and derived a conceptual basis for a further understanding of TMIs. Having carried out a detailed review of the literature, reflecting on our first insights into the new models offered by TMIs, we saw that TMIs significantly change the direct seller and buyer relationship as common in 'traditional' ETE transaction towards rather indirect relationships. In their function of linking buyers and sellers supporting ETE transactions, based on empirical data applying the 'nine business model building blocks' from Osterwalder (2004) we were able to identify 12 different types of TMIs which we then consolidated into six TMI archetypes using the framework for 'business models archetypes' of Herman and Malone (2003). Throughout this exercise we were able to gain insights into the variety of different functions TMIs have on the markets for technology and various new ways how TMIs try to facilitate ETE transactions.

Throughout the second part of this paper, we focused on IP auctions as one particular business model of the archetype 'IP Broker' to which our attention was drawn throughout several interviews with industry experts, who believed in IP auctions as a promising business model. Furthermore, from a variety of sources sufficient data was available to investigate this 'young' business model throughout an academic study. Although in this first paper we presented only parts of a full analysis that will be available in Tietze (2009 (forthcoming)). So far we were able to present first insights into two qualitative studies leaving aside a full quantitative analysis of traded patents via IP auctions. In a first step we derived a generic IP auction process based on a qualitative, empirical analysis of IP auction processes. The results from this analysis were then translated into a process view using the ETE process model by Lichtenthaler (2006) to derive a generic IP auction process as a specific type of an ETE process. Having thus generated a close understanding of the transaction process, we presented results from four cases of successful transactions, i.e. where patents were sold for particular high prices from two SMEs and two MNCs.

Throughout this exercise, aside from the mere descriptive analysis of the transactions, we gained first insights into the question of whether IP auctions can actually becomes a sustainable model for ETE. Throughout the questionnaire, addressed to the sellers of the patents, we investigated the sellers' perception of advantages of IP auctions over rather 'traditional' bilateral

ETE transactions. We wanted to understand which of the existing obstacles for efficient ETE transactions are reduced by this new model. Additionally, we investigated the perceived disadvantages of IP auctions.

From this approach, we learned that three of the four companies were generally satisfied with the outcome of the transaction and the process as such. As well companies that had little internal resources and expertise in the ETE area, were able to exploit their technologies via an auction in a relatively comfortable way. Three of the four companies were overall satisfied with the transaction, however it seems as the companies focus on different issues throughout the transactions. While the SMEs would prefer to run the auctions for lower costs, the two MNCs have a more strategic approach and would like to exclude certain buyers from the auction. One company however was not satisfied with the auction. Accordingly the organization of the auction should become more professionally in the future. The sales price which the company reached was too low compared to the development costs and patent fee the company had already spent for the technology.

Throughout the four cases, we identified certain aspects that the companies perceived as particular advantageous, respectively disadvantageous compared to bilateral exploitation projects. As particular advantageous the companies valued the marketing support of the auction companies for their technologies in other businesses than their own businesses. Furthermore, the companies valued the support to identify buyers and the short duration of the transactions. Additionally, the provision of a standardized legal framework, standardized contracts and fees by the auction company was perceived to be advantageous. Thus, we can conclude that the auction model offers companies a relatively easy, quick and cost efficient way to exploit technologies.

However, we came across various drawbacks of the auction model for exploiting technologies. As particular disadvantageous the companies experienced the missing possibility to exclude certain buyers from the auction as well as high total costs, particularly for high sales prices. The financial issues however, were perceived to be more negative by the SMEs, while MNCs rather focussed on the strategic issues. Compared to bilateral exploitation projects, the companies have less operational freedom throughout the auction process. They are e.g. limited in the choice of material they want to provide to potential buyers. However, auctions, due to their standardized process, lead to shorter transaction times and might even reach higher sales prices due to the competitive pressure when several interested buyers are present at the auction.

Prior to the auctions, all companies tried to exploit the technologies already with internal resources only. The SMEs had already tried to use other TMIs or patent law firms for an exploitation or to spin-off an own company dedicated to one particular technology. Thus, we can conclude that for these particular technologies the auction model appeared to be the most promising. However, the technology that is to be commercialized via an auction should still have a certain value because fixed auction fees (e.g. registration fees) will always have to be covered. On the contrary, one has to be aware that for particular high sales prices, the provi-

sional fees can be substantial so that a bilateral exploitation project with its usually high costs might pay off alternatively. Thus, in general companies willing to exploit a technology will have to make a trade off between the short transaction time, little need for own expertise and cost savings for marketing the technology with the eventually high fees for the auction company, especially for particularly high valued technologies.

To conclude, it appears to us that IP auctions actually have a potential to become a sustainable model for ETE transactions as an alternative to rather traditional bilateral ETE, particularly because the auction model reduces certain obstacles in the exploitation process that make bilateral transactions often burdensome. However, auctions certainly will not be suitable for exploiting all IP assets, respectively patents to a similar extent. As long as sellers cannot exclude certain buyers from any IP auction sellers will be reluctant to exploit patents that are of particular importance to the company and should not be bought by certain buyers, e.g. direct competitors. Thus one could hypothesis that companies will not prefer the auction model for these particularly valuable assets. A more complete picture of this discussion will be available in Tietze (2009 (forthcoming)) when more detailed insights are available on the traded assets particularly. Furthermore, the results of these four cases should be taken carefully due to the limited number of observation points. Further research is needed to better understand specifically under which circumstances, respectively for which particular assets IP auctions can be a preferred ETE model. This question will be discussed in more detail and further addressed by a large quantitative analysis in (Tietze, 2009).

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