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Factors influencing the bid/no bid decision making and the success of contract bids in the telecommunication industry

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Formalities

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Abstract

Evaluating customer tender enquiries and deciding whether to bid or not to bid can be complex and time consuming process. A pre-bid screening and analysis procedure can save company resources and lower overall expenses. This paper focuses on examining which factors influence the success of a bid of a telecommunication system solution manufacturer and introduces 18 different factors that have been found by previous studies to influence the bid/no bid decision making in construction and electro mechanical industries. To measure the influence of these factors on the success of bids made by a manufacturer of telecommunication system solutions, a questionnaire was used. The management level respondents involved in the bidding processes identified altogether 56 successful and 56 unsuccessful bids and indicated how each of the factors described the bidding situations. Factor analysis was used to identify the underlying dimensions. Logistic regression models were developed and the final model including all the predictors in the model was capable of classifying the total sample with an overall predictive accuracy rate of 86 percent. The significant predictors contributing to the prediction were the future business possibilities with the customer, the compatibility of the products offered with the customer specifications, the competition in the market and the availability of adequate financial resources.

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1. Introduction

Responding to customer tender enquiries has to be handled carefully and in good time or otherwise it might affect organization´s credibility and reliability. Effective customer tender enquiry management is highly important for majority of enterprises (Oduoza & Xiong, 2009). The more customer tender enquiries the company receives, and the more enquiries it is able to bid on in time, the more chances the company has to get actual orders (B. G. Kingsman & de Souza, 1997).

Evaluating customer tender enquiries and deciding whether to bid or not to bid can be complex and time consuming process and involve the utilization of company´s resources and create expenses that can be damaging for other company business areas (Buzby, 2002; Cova, Salle, & Vincent, 2000). On the other hand, decisions to bid or not to bid, or the overall engagement in the tender process, can be based on subjective evaluation and decision making (Ahmad, 1990). In order to avoid situations where too many resources are used or where decision making is based only on a gut feeling, a pre-bid screening and analysis procedure can become a strategic tool (Cova et al., 2000). Garrett points out that a simple, repeatable, and effective bid/no bid decision making process can be valuable to a company by reducing costs and improving revenues and profits (Garret, 2005).

(Text removed for confidentiality purposes)

2. Research objective

The aim of this research paper is to present a checklist that allows the decision-maker in the bidding process to combine subjective evaluation and data based on past experience into the bid/no bid decision making.

According to the literature review in chapter 3, internal tender analysis processes are stepwise procedures that include several different decision making points. However, before these processes can begin the most important decision needs to be made, to bid or not to bid. This decision can be based on several factors that are transparent and known inside the decision making organization. However, it is also possible that these factors are difficult to identify and analyze as managers use past experience and inner feeling in a situation where fast decision making is needed. This leads to a situation where the initial decision is based on weak reasoning and gut feeling and thus resulting in unbalanced decision making.

Majority of the research conducted on bid/no bid decision making processes and the factors that influence the decision making concern construction industry and large project contracts (Bagies & Fortune, 2006; Stark & Rothkopf, 1979). However, there is a need for effective bidding in every industry as company resources are scarce and bidding for badly chosen requests may result in great loss of time and other assets. Previous literature have identified factors that are important in the bid/no bid decision making, but as the factors are related to large projects they emphasize the need for secure financial resources and minimizing possible risk factors. However, for a manufacturing company the factors can differ, as the number of tenders is higher, the tenders are smaller and as the relationship with the customer can influence the long-term decision making. Therefore, the first focus of this research paper is to identify those critical factors that influence the bid/no bid decision making of a telecommunication system solution manufacturer.

The second focus of this study is to examine what the manufacturing company should consider when pursuing for successful bids. Responding to all possible customer tender requests takes time and overloads the team working with tenders. This may affect the quality of all bids and decrease the overall win rate of bids. The amount of effort put into the specification and estimation process can differ according to the customer request. The company can choose to concentrate more efforts on larger, more profitable tenders and prepare a quick estimate with high margin for other tenders

where later negotiations with the customer are expected (B. G. Kingsman, Hendry, L., Mercer, A., & de Souza, A., 1996). However, the main goal of the manufacturing company would be to concentrate efforts on bids that would be successful in the end and bring in customer orders. As part of the bid/no bid decision making the company could evaluate tenders according to the influencing factors and identify bids that would be successful. Therefore, the second focus of this study is to identify which of the factors influence the success of a bid in the telecommunication industry in the European, Middle East and African (EMEA) region. Based on this the research question of this paper is:

Which factors influence the success of a bid of a telecommunication system solution manufacturer in the EMEA region?

After identifying from the literature the factors that influence the bid/no bid decision making and examining the factors that influence the success of tenders of a telecommunication system solution manufacturer, this study attempts to provide a checklist that can support the bid evaluation process and yield benefits for the manufacturing companies. In the ever tightening global competition such list can help and increase the possibilities of successful bids.

As a summary, the research objective of this paper is to understand and identify which factors influence the bid/no bid decision making and the ultimate success of tenders of a telecommunication system solution manufacturer. Examining these factors scientifically and bringing them to the attention of the decision making managers this research paper contributes to the business operations of manufacturing organizations in telecommunication industry. By indentifying and acknowledging the factors influencing the bid/no bid decision making and the success of tenders, the results of this research set certain guidelines for the decision making managers to evaluate. By taking into consideration the influencing factors the management can increase the likelihood of winning a tender and acquiring prospective new customers.

In order to answer the research question, first a literature review is conducted. The aim of the literature review is to describe individual and organizational decision making and in more detail the decision making of bid processes. Through the literature review the relevant factors that have been considered important by previous studies in the bid/no bid decision making are indentified. After this the factors influencing the success of a bid are measured with a questionnaire. By analyzing the

questionnaire results the aim is to identify those factors that influence the success of a bid and use this information to guide the bid/no bid decision making of a telecommunication system solution manufacturer.

3. Literature review

After a company receives a customer tender enquiry, the request goes through several different processes where different kinds of decisions are made. In the following paragraphs first the individual and organizational decision making processes are discussed. After this the focus is on literature concerning decision making in bid processes and specifically on the pre analysis stage of the bid process and the factors related to that stage.

3.1. Individual and organizational decision making

The individual decision making can be described in several ways such as intuitive (Sauter, 1999), as a political process (Pfeffer & Salancik, 1974) or as socialized (van Dijk & Vermunt, 2000). This paper focuses on the individual decision making of managers through rational approach and through bounded rationality perspective. Rational approach is based on systematic analysis of a problem which is followed by choice and implementation in a logical cycle. When managers understand and are willing to use the rational decision making process it can help them to make decisions even when there is a shortage of information (Etzioni, 1967; Simon, 1955).

However, as the real world is uncertain, complex and rapidly changing, the process is not necessarily fully achievable. In combination with time pressure, a number of internal and external factors and the ill-defined nature of many problems, managers have to rely on intuition and experience (J. W. Dean & Sharfman, 1993). Decision making in these situations is described by the bounded rationality perspective according to which the rational thinking of managers is limited by the complexity of problems (Simon, 1955). Nevertheless, intuition is not arbitrary or irrational but more of a hands-on experience from a longer period of time which helps managers to perceive and understand problems more rapidly and develop gut feeling on how to solve different kind of issues. Incorporating previous experience and judgement into decision making brings intangible aspects into problem solving and thus ensures that more factors are taken into account (Daft, 2010).

Organizational decision making deals with problem solving that involves several managers. The management science approach is equivalent to the rational approach by individual managers and helps in problem solving when problems are analyzable and when different factors and variables can be identified and measured (Courtney, 2001). However, as the quantitative data are not rich and do not contain tacit knowledge, the management perception is needed. Therefore management science should supplement the actual decision making by management as then both qualitative and quantitative data are combined (Daft, 2010). This paper concentrates on indentifying and quantifying the relevant factors that are important in the bid/no-bid decision making and thus develops a management science approach that can be used in combination with managerial experience in organizational decision making.

3.2. Decision-making in bid-processes

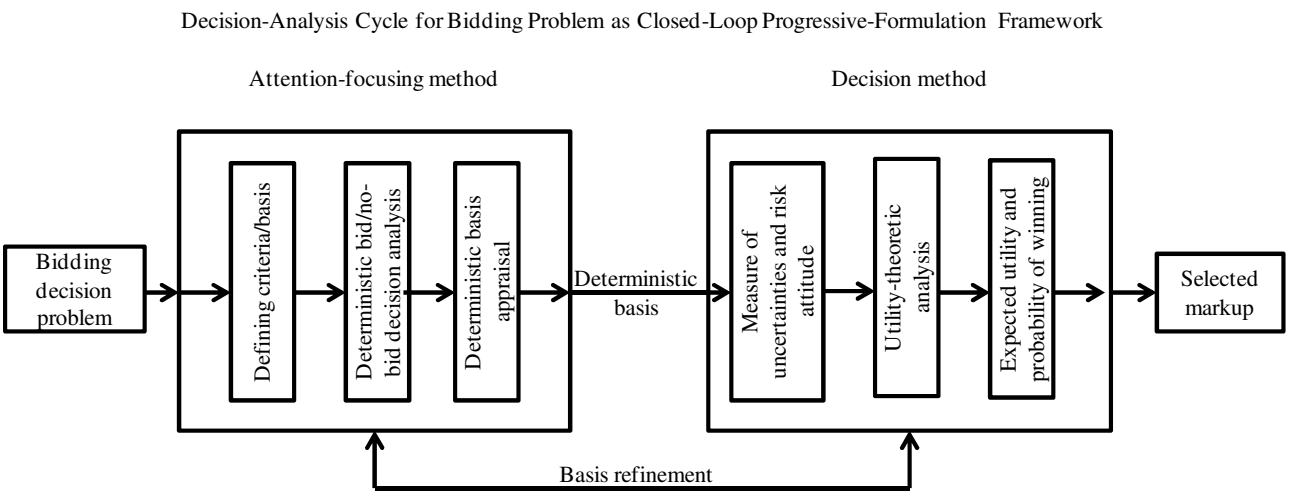
A great volume of literature has focused on bidding strategies and bid/no bid decision making since Friedman (1956) introduced his mathematical model (Drew & Skitmore, 1997; Drew, Skitmore, & Lo, 2001; Drew, Tang, & Lo, 2002; Friedman, 1956; Skitmore, 2002). Based on this approach is also the school of research that has focused on mark-up decisions, models that focus on maximizing the expected profit from a tender (Dozzi, AbouRizk, & Schroeder, 1996; Fayek, 1997; Li, Shen, & Love, 1999; M. Liu & Ling, 2005; S. L. Liu, Wang, & Lai, 2005; Mochtar & Arditi, 2001; Parvar, Lowe, Emsley, & Duff, 2000; Seydel & Olson, 2001). Another research stream has concentrated on bid decision making processes (Ahmad, 1990; Gunner & Skitmore, 1999; B. G. Kingsman & de Souza, 1997; B. G. Kingsman, Hendry, Mercer, & de Souza, 1996; B. G. Kingsman, Hendry, L., Mercer, A., & de Souza, A., 1996; Paranka, 1971) and on factors that affect the bid/no bid decisions (Dulaimi & Shan, 2002; Lowe & Parvar, 2004; Shash, 1998; Wanous, Boussabaine, & Lewis, 1998, 2000, 2003).

As bidding strategies or mark-up decision are not the focuses of this paper, the following paragraphs concentrate first on some of the studies describing the decision making in bid processes. This is followed by a selection of studies in which the factors that are important in bid/no bid decision making were identified.

Paranka (1971) divides the bidding strategy into a pre-bid analysis stage and a bid determination stage. According to Paranka (1971) it is crucial to assess first the pay-off value of a bid opportunity

before placing an actual bid. Ahmad (1990) presented another decision analysis cycle and concentrated on the treatment of the first stage, i.e. the deterministic bid/no bid decision making process of the decision analysis cycle by Holtzmann (1989) (Figure 1). In Ahmad´s (1990) model the individual worths on the factors are weighted and combined additively. This results in an overall score that is based on the subjective evaluation of the request. Ahmad´s (1990) model is flexible as management can change the attributes in the model according to the changes in the business environment.

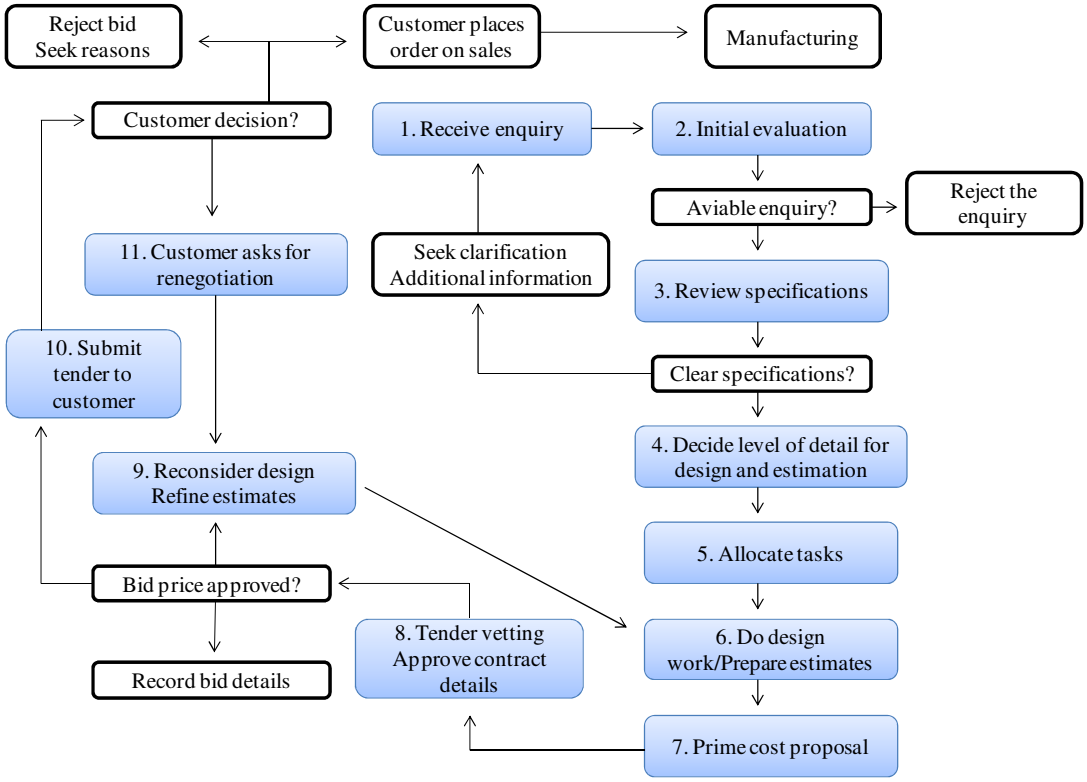
Figure 1: Holtzmann´s decision analysis cycle



Source: Holtzmann (1989)

B. G. Kingsman and de Souza (1997) studied 12 different versatile manufacturing companies and interviewed management level representatives of the organizations in order to understand the work routines and procedures involved in customer tender enquiry and bid process. The result of the research was a sequential stage process describing the different stages that most of the studied organizations implemented as part of their customer enquiry-bid process (Figure 2).

Figure 2: Tender enquiry and bid process by B.G. Kingsman and de Souza



Source: B.G. Kingsman and de Souza (1997)

B. G. Kingsman and de Souza (1997) divide the process stages into two different groups. The first group consists of stages that require judgments or decisions, i.e. stages where management has to evaluate and judge factors that influence the decision making. These factors and situations can involve estimations on how likely it is that the particular enquiry will lead to future profitable business or what is the strategic importance of the enquiry for the organization. The second group of stages requires actions and information transfers as in when receiving the customer enquiry, allocating the work concerning the enquiry to different departments and finally delivering the quote to the customer. The first decision made in the process is at stage 2, namely the initial decision if it is worth to continue with the enquiry or leave it aside, i.e. to bid or not to bid.

The focus of the present paper is to concentrate on the bid/no bid decision making stage that can be found from the models of Paranka (1971), Holtzmann (1989), Ahmad (1990) and B.G. Kingsman and de Souza (1997). The bid/no bid decision making stage is a part of a larger process in all of the models, but has an important role as the decisions in that stage either initiate the process or not. The present paper looks into the variables which influence the decision making in the bid/no bid

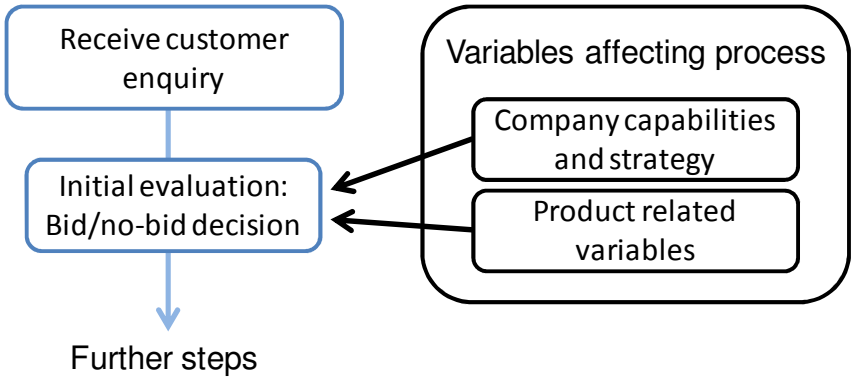
decision making stage and investigates which variables have a significant influence on the success of bids. After identifying the variables that influence the success of bids these variables can be given more attention to in the initial bid/no bid decision making stage and thus make the decision making of the management more efficient and productive. In the following paragraphs previous studies and the variables that have been identified important in the bid/no bid decision making in those studies are presented.

3.3. Factors relating to bid/no bid decision making

In order to make justified decisions that are based on a broad perspective and valid data, several variables needs be taken into account in the evaluation of the enquiries. This will help in determining if it is profitable to bid on an enquiry and realize what the possibilities of winning the bid are.

Ahmad (1990) concentrated in his study on the overall worth of a project, position and goals of the company, resource constraints and market conditions by dividing the factors into 4 main categories; job, firm, market and resource related. These main categories included altogether 13 different factors. B. G. Kingsman et al. (1996) identified certain variables that affect the process stages and separated them into (1) company capabilities and strategy, (2) product related variables, (3) customer related variables and (4) market competitiveness. According to the framework by B. G. Kingsman et al. (1996) company capabilities and strategy with product related variables affect the initial evaluation step of the process; whether to bid or not (Figure 3).

Figure 3: The beginning of the enquiry process by Kingsman, Hendry, Mercer & de Souza (1996)



M. King and Phythian (1992) identified 18 factors that have an effect on the bid/no-bid decision making by examining managerial decision making regarding 14 different historic customer enquiries. In another study Phythian and King (1992) collected 26 different factors by asking managers to consider 12 previous tender enquiries and specify the factors that we used to discriminate between the tenders.

Shash (1998) concentrated on the construction industry and identified 16 different factors that have an effect on the bid/no-bid decision making of subcontractors. The main factors emphasized the importance of financial and experience related issues as the most important factors were the credit history of the main contractor, the issuance of periodical payment and leadership and capability in planning and managing a project. Another study from the construction industry by Egemen and Mohamed (2007) listed 50 different factors based on questionnaires answered by small- and medium sized contractor companies. The factors between different industries are similar even though in construction industry factors relating to financial resources and experience in large project management were emphasized.

Ward and Chapman (1988) listed 8 non-price criteria to be important in the decision making. Mustafa and Ryan (1990) identified technical and cost criteria as main factors while Lin and Chen (2004) found 6 main criteria and 11 sub-criteria that affect the bid/no-bid decision making. Wanous et al. (2000) generated 38 different factors through interviews and questionnaires, while Cova et al. (2000) list altogether 15 factors divided into factors that measure the attractiveness of the project to the bidder and the competitive strengths of the bidder. Lowe and Parvar (2004) indentified 21 factors but concluded that only 8 of them had a linear relationship with the decision to bid.

This paper follows Ahmad (1990), B. G. Kingsman et al. (1996) and Egemen and Mohamed (2007) and divides the factors into four groups to distinguish between the different factors that are important in the bid/no bid decision making. Ahmad (1990), B.G, Kingsman et al. (1996) and Egemen and Mohamed (2007) distinguish between the categories of factors as these present different subgoals in their bid/no bid decision making models. Achieving lower level goals contribute to the overall achievement of the higher level goals that are presented by the variable groups. Furthermore, B.G. Kingsman et al. (1996) point out that this categorization helps the management level to understand better the different variables and the way judgments are made about the variables. In the present paper the categorization of the variables into different groups is

made to help the researcher and the readers to distinguish between the different variables and to understand how the variables relate to the bid/no bid decision making. The factors in these groups are factors that have been identified through literature research. A comparison of 13 different studies was conducted. Each of these studies discussed the factors influencing bid/no bid decision making. The factor groups in this paper are company, product, market, and customer. Each of these groups contains factors that relate either to the company, product, market or the customer related matters.

As previous studies have focused in different industries, such as construction and electro mechanical industries, the factors that appeared in majority of the previous studies and that could also be applied to telecommunication industry were chosen. 23 factors that appeared at least in four of the thirteen articles studied were chosen for further analysis. Out of these 23 factors 13 were chosen for this study. The ten factors not chosen emphasized mainly the needs of large projects that require extensive financial resources and long-term project planning. Construction business is characterized by long-term nature of the contract implementation and joint venture construction projects. Project costs usually include those for land acquisition, planning, financing, design, construction, operations, maintenance and repairs. Furthermore, most construction projects are developed in stages and may take from 1 to 5 or more years (Committee of Advancing the Competitiveness and Productivity of the U.S. Construction Industry, 2009). These large projects are typical for construction business where as the projects in the telecommunication system solution manufacturing business are shorter and require less financial resources to implement. Five other factors not mentioned in the studied articles were added to the list on basis of conversations with the representatives of a telecommunication system solution manufacturer and separate literature research. Market share factor was an exception of other factors as it only appeared in two of the articles studied. However, as the EMEA region is highly diverse and contains several different market areas, market share in a particular area can have great importance in the bid/no bid decision making. Therefore market share factor was added to the final factor list to be studied. Altogether 18 factors are studied in this research paper. The 18 variables and the key literature references are listed in Table 1 below. In the following chapters each of the groups and relevant factors are discussed. The aim is to accomplish an understanding of what each of the factors mean, how they are used in previous studies and how the factors are measured in this study.

Table 1: Factors identified from previous studies with key references

	Group	Factor	Key references
Bid/no bid decision making	Company	Availability of free manufacturing capacity	Paranka (1971), Ahmad (1990), M. King & Phythian (1992), Wanous et al. (2000), Egemen & Mohamed (2007)
		Experience	Ahmad (1990), Mustafa (1990), Shash (1998), Cova (2000), Wanous et al. (2000), Egemen & Mohamed (2007)
		Financial resources	M. King & Phythian (1992), Cova (2000), Wanous et al. (2000), Lowe (2004), Egemen & Mohamed (2007)
		Internal resources	Ahmad (1990), Mustafa (1990), Cova (2000), Wanous et al. (2000), Lowe (2004), Egemen & Mohamed (2007)
		Partners	Cova (2000), Wanous et al. (2000), Lowe (2004), Egemen & Mohamed (2007)
		Incumbency	Teece (1986), Tripsas (1997), A.A. King & Tucci (2002), Rubel (2013)
	Product	Novelty of the products	Dean (1969), Wasson (1976), Kingsman & de Souza (1997), Bijmolt, Van Heerde & Pieters (2005)
		Rigidity of customer specifications	Ward & Chapman (1988), Ahmad (1990), Shash (1998), Wanous et al. (2000), Egemen & Mohamed (2007)
		Compatibility	Kelly & Coaker (1976), Katz & Shapiro (1994)
	Market	Competition in the market	Paranka (1971), Ahmad (1990), M. King & Phythian (1992), Kingsman & de Souza (1997), Lin & Chen (2004)
		Market area	Ward & Chapman (1988), Ahmad (1990), Wanous et al. (2000), Egemen & Mohamed (2007)
		Market share	Lin & Chen (2004), Egemen & Mohamed (2007)
		Total value of the bid	Paranka (1971), Ahmad (1990), M. King & Phythian (1992), Wanous et al. (2000), Egemen & Mohamed (2007)
		Availability of other projects in the market	Paranka (1971), Kingsman & de Souza (1997), Wanous et al. (2000), Egemen & Mohamed (2007)
	Customer	Price sensitivity	Morris & Joyce (1988), Tellis (1988), Bijmolt, Van Heerde & Pieters (2005)
		Sourcing strategy	Kortge & Okonkwo (1993), Choi & Linton (2011)
		Current relationship	Wanous et al. (2000), Lowe & Parvar (2004), Miller (2006), Smith (2012)
		Future business possibilities with the customer	Paranka (1971), Shash (1998), M. King & Phythian (1992), Cova (2000), Egemen & Mohamed (2007)

3.3.1. Company

In this paper the factors that are related to the bidding company and its resources are grouped under the company category. First the factor that measures the need for work is discussed after which the factors describing the company strengths are explained.

3.3.1.1. Availability of free manufacturing capacity

Different studies have emphasized the importance of need for work in bid/no bid decision making and measured it with different factors. Egemen and Mohamed (2007) found out that one of the most important sub goals for a bid/no bid decision process involved the factor need for work. Ahmad (1990) found out that the factor current work load is important for the bid/no bid decision making and Wanous et al. (2000) shared this view while they treated the factor current workload as a negative factor as a high score for this factor would encourage companies not to bid. If the bidding company is experiencing a period of low workload and has available manufacturing capacity it would be reasonable to bid the most competitive price to the customer in order to make sure to get the upcoming order (B. G. Kingsman & de Souza, 1997). This paper follows M. King and Phythian (1992) and uses the factor availability of manufacturing capacity to measure the importance of need for work in the bidding company.

When considering different bidding opportunities the company must evaluate its own strengths and weaknesses related to the opportunities. Companies with broad experience and large resource base are able to rely on their expertise and resources in their bidding decisions. In the following paragraphs the importance of the experience of the company, available resources and the level of incumbency are discussed.

3.3.1.2. Experience of the bidding company

The experience of the company in managing similar projects or producing similar products has been identified as an important factor in the bid/no bid decision making. Shash (1998) ranked experience as the fifth important factor and Wanous et al. (2000) concluded that experience is one of the factors that have moderate or high importance in the bid/no bid decision making. Egemen and Mohamed (2007) found out that the experience and familiarity of the firm in the specific type of work was the eight important factor. As the experience factor has been identified to be an important part of the bid/no bid decision making in previous studies, it has been included into this study as well.

3.3.1.3. Financial resources, internal resources and external partners

Several authors have discussed the importance of the company resources in supporting projects (Cova et al., 2000; Egemen & Mohamed, 2007; Lowe & Parvar, 2004; Wanous et al., 2000). Previous studies have concentrated on the financial resources of the bidding company and especially on the importance of the financial status of the company on the bid/no-bid decision

making. In addition, the importance of the company internal resources, such as qualified employees, plants and equipment, and the importance of the company external resources, such as qualified subcontractors and material suppliers on the bid/no-bid decision making have been investigated. Egemen and Mohamed (2007) included all the factors relating to financial, internal and external resources into their final bid/no bid decision model as the overall importance weights of the factors were relatively high.

3.3.1.4. Incumbency of the bidding company

A supplier can have an incumbent position in the established market but when entering new market areas the supplier faces the threat of competitors or is at the same starting line with smaller suppliers. However, an incumbent supplier company is able to rely on its previous investments, technological capabilities and especially on its complementary assets to survive in the new market (A. A. King & Tucci, 2002; Teece, 1986; Tripsas, 1997). Furthermore, Rubel (2013) found out that incumbent companies should keep their pricing strategies constant, even though their pricing might influence the behaviors of the competitors, as with constant pricing strategies companies are able to capture higher margins. Constant pricing generates early cash-flows over future ones which is preferable under the uncertainty of random competitive market entries (Rubel, 2013). Keeping the pricing constant can influence the bid/no bid decision making of an incumbent company. As constant pricing can increase the margins it is more lucrative for the company to bid in the first place.

3.3.2. Product

The factors that are related to the requested product offer or project are grouped into the product category. With a novel product or application the supplier might be able to use higher pricing when determining the value of the product to the customer. This might give an advantage for the bidding company and increase the interest in bidding. In addition to this the specific customer requirements can set boundaries on what companies can bid if the requested products are not standard items but customized. The compatibility of the offered products can also have an effect on the bid/no bid decision making. These three factors are further discussed in the following paragraphs.

3.3.2.1. Novelty of the products

Pricing of a novel product is challenging as the possible market might be ill-defined, future applications unforeseen and competitors´ capabilities unpredictable. Short product life cycles and

high market failure rate of new products make the pricing even more difficult as the manufacturer might have to consider wide margins of error in the forecasts of demand (J. Dean, 1969). Pricing decisions concerning new products can have a static perspective by setting prices at high-, medium- or low level when entering the market. Decisions can also be based on dynamic perspective with skimming and penetration strategies (Rao, 1984). All these decisions and practices are dependent on the product´s life-cycle stage (Wasson, 1976). Bijmolt, Van Heerde, and Pieters (2005) found out that price elasticities are stronger in the product´s introduction stage than in the mature stage, thus affecting the pricing. B. G. Kingsman and de Souza (1997) found out in their research through interviews with company cost estimators that the product life cycle was one of the factors that affected the initial evaluation and the bid/no bid decision making. The decisions involved considering higher price level for the product that is technically more advanced than those normally produced in order to cover risk of adverse cost variations and time delays during manufacturing due of the complexity of the product. The requested product can be so novel that the company is not sure if it is capable of supplying the product in the needed timeframe. Or the manufacturing expenses of the novel product are not clear or much higher than the product from the previous product generation. Therefore the degree of novelty of the requested products can be an important factor in the bid/no bid decision making.

3.3.2.2. Rigidity of the customer product specifications

Kelly and Coaker (1976) cites the most frequent reason that did not allow the buying organization to accept the lowest bid in the competition as a situation where the offer by the supplier did not meet the customer specifications. Fulfilling the customer requirements in product specifications is also essential in the telecommunication industry as customers have different operational and performance requirements that need to be taken into account. Wanous et al. (2000) found out that the factor rigidity of specifications has a moderate to high importance in the bid/no bid decision making and Shash (1998) ranked the factor clearness of work´s specifications in the third position among 16 different factors. Based on these previous studies it can be argued that the product specifications are important in the initial bid/no bid decision making.

3.3.2.3. Compatibility

The importance of interchangeability with or duplication of existing equipment by the customer should not be undervalued in the bidding process (Kelly & Coaker, 1976). If systems are compatible and several suppliers offer compatible products for customers, the competition moves to

emphasize costs and specific performance characteristics of the components (Katz & Shapiro, 1994). Katz and Shapiro (1994) found out that compatibility decreases competition in the early phases of the product life-cycle, but increases it in the later phases as the compatibility prevents one company to have the control of the market. In some bids the compatibility can be an advantage as the bidding company is able to provide similar products as the competitors and compete more with the pricing than product performance characteristics. On the other hand, offering non compatible products can be a way to highlight the performance and value of the offered product even though there is a risk that the customer might turn to the competitor´s product offering. Therefore the compatibility of the offered products can be an important factor already in the bid/no bid decision making.

3.3.3. Market

The factors that are related to the competitive environment are discussed in the following paragraphs. First the factors that relate to the competition are explained followed by factors that have in the previous studies been identified to have a strategic importance in the bid/no bid decision making.

Companies follow competitors in order to understand how much competitors charge for their equivalent products and services (Abratt & Pitt, 1985). Combining this information to the market position information, companies have the possibility to assess their own position in the market (Ingenbleek, Debruyne, Frambach, & Verhallen, 2003). According to Paranka (1971) the investigation of expected competition is crucial for an effective pre-bid analysis. Several authors have identified different factors that measure the importance of competition in the bid/no bid decision making in different industries. The number of competitors, the market area and the market share of the bidding company can influence the decision making. These factors are discussed in the following paragraphs.

3.3.3.1. Competition in the market

The number of competitors in a certain market can have an effect on the level of competition. If the incumbent supplier is competing on a market with few other smaller suppliers the price levels might be close to each other while comparing to competition in a market where several major competitors are trying to achieve market leadership. Paranka (1971) points out that knowing the expected competition is crucial for the pre-bid analysis to be effective as for example previous competitive

bids will lure competition to supply similar products to the customers. Wanous et al. (2000) and Egemen and Mohamed (2007) investigated the importance of the number of competitors in the market for the bid/no bid decision making. Both studies concluded that the number of competitors does not have high importance in the bid/no bid decision making in construction business. However, Ahmad (1990), M. King and Phythian (1992), B. G. Kingsman and de Souza (1997) and Paranka (1971) consider the number of competitors and degree of competition as important part of their decision making models. As the manufacturer operates in a competitive environment and is currently facing competition from large Asian manufacturers, the number of competitors is rising in each market and influencing the strategic decision making and pricing of the manufacturer. Therefore it can be argued that the number of competitors is an important already in the bid/no bid decision making.

3.3.3.2. Market area

Egemen and Mohamed (2007) theorized that the location of the request would contribute to the profitability of the request but did not find scientific support for their assumption. Ahmad (1990) however found out that the location is important for the bid/no bid decision making. In this study the focus is on the EMEA region that contains several market areas that differ from each other. Therefore it would be reasonable to argue that also the market area, or more specifically the country, would have importance in the bid/no bid decision making.

3.3.3.3. Market share

Egemen and Mohamed (2007) did not find market share to be among the important factors that influence the bid/no bid decision making. However, Lin and Chen (2004) considered market position as an important part of their bid/no bid decision model. As the focus of this paper is in the EMEA region which contains several different markets, the market share of the company in different areas places the company into different positions. Therefore the importance of the market share in a particular market for the bid/no bide decision making is of great interest.

Strategic considerations regarding the market situation concentrate on the opportunity under analysis and possible other opportunities available in the market. The operating company has to make strategic decisions between the opportunities and realize which of them would be the most beneficial for the company itself. In the following paragraphs the factors total value of the bid and the availability of other projects in the market are discussed.

3.3.3.4. Total value of the bid

The total value of the request can have an effect on the bid/no bid decision making. When a customer submits a request for quotation (RFQ) for products based on certain levels of quantities and conditions the new request will be considered and evaluated. If the production capacity of the bidding company is full, the customer has no strategic importance for the manufacturing company and the quantities in the customer request are small, the supplier company might decide not to bid on the request. If the customer submits an updated RFQ with new set of conditions or raises the existing order quantities in the request, a new evaluation could be needed. If the updated RFQ contains new products, or both, new quantities and new products, the total revenue of the opportunity increases and request might become more interesting for the bidding company to bid for. Therefore, the total value of the request can have an effect on the bid/no bid decision making of the supplier company.

According to study results from Wanous et al. (2000) the size of the opportunity is the fourth important factor to have moderate to high importance in the bid/no bid decision making. Egemen and Mohamed (2007) found out that the size of the opportunity is the most important factor in bid/no bid decision making. These results indicate that the total value of the bid can have great importance in the decision making process.

3.3.3.5. Availability of other projects in the market

Wanous et al. (2000) and Egemen and Mohamed (2007) investigated the importance of other profitable projects within the market for the bid/no bid decision making but did not find significant results. However, it seems reasonable to assume that if there are several other requests or projects available, the bidding company can choose the ones that would be most profitable for the company and decide not to bid on requests that would not benefit the company. Paranka (1971) states that by winning a contract the company can create awareness of the company products among other potential users and that way acquire new opportunities. B. G. Kingsman and de Souza (1997) consider in their model the opportunity to acquire new users for a recently developed technology as a factor influencing the bid/no bid decision making. Therefore the availability of other requests or projects in the market can be important in the bid/no bid decision making.

3.3.4. Customer

Many of the previous research papers that have focused on large projects have emphasized factors that express the financial capabilities of the customers. Financial resources and prompt payment habits of the customers are important for every industry to operate, but when the customer requests are smaller than for example large construction projects, other factors become as important. In the following paragraphs factors relating to customer characteristics and customer relationship are discussed.

Customers can be divided into different categories by the supplier in order to distinguish them from each other and serve them the best possible way. In the following the customer price sensitivity and customer´s sourcing strategy are discussed as a basis for the supplier company to decide whose requests the company should pay more attention to.

3.3.4.1. Customer price sensitivity

Price sensitivity is "the relative consciousness of customers regarding price levels when making purchase decisions" (Morris & Joyce, 1988). The price sensitivity is related to the elasticity of demand as it reflects customers´ price behavior by measuring the percentage change in item´s unit sales generated by one percent change in its price (Morris & Joyce, 1988). Previous research has concentrated on several factors that determine elasticity of demand. The elasticity differs over product´s life cycle and product categories (Bijmolt et al., 2005; Tellis, 1988) and between different countries (Tellis, 1988). Demand will be more inelastic for products which have unique attributes, have few substitutes on the market, are difficult to compare with competitors products, have high switching costs and rely on price to express a high quality image (Morris & Joyce, 1988). The requests that come from customers that are known by the supplier company and that have previously shown how they value the products and services provided, without paying too much attention to the pricing issues, are most likely to be bid by the supplier company. Therefore it can be hypothized that the price sensitivity of the customer will be important in the bid/no bid decision making.

3.3.4.2. Sourcing strategy

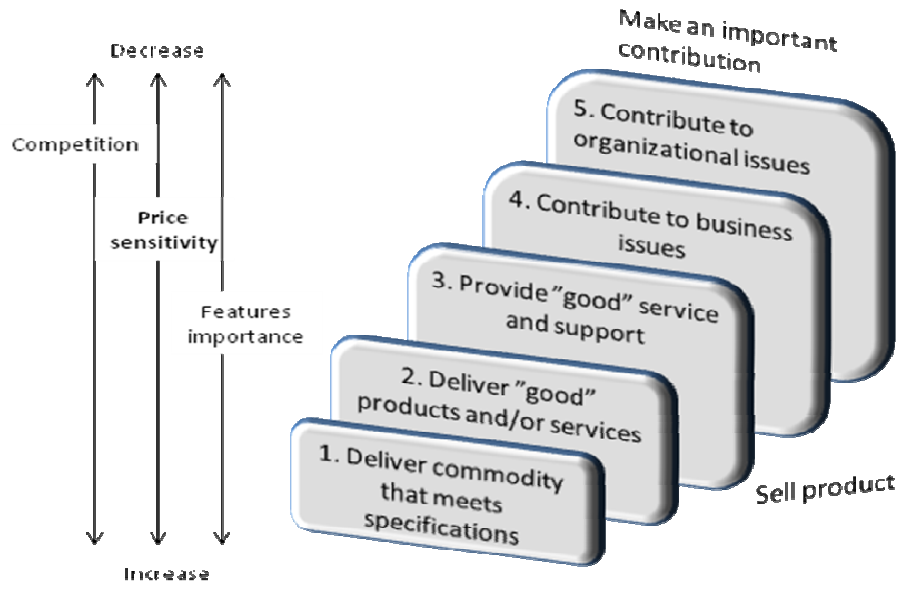
Customers might re-organize their sourcing strategies and make changes into their existing relationships which results in a higher competition inside an industry. Intensified industry competition moves pricing in the direction of costs while the demand is gradually more saturated.

Reasons for customers to reorganize their sourcing strategy are many fold. The customer can concentrate on the items that have the most significant impact on the total cost of goods sold and this way retain the control over the most strategic components. The customer might follow the innovation potential of the suppliers and reorganize the suppliers according to their future relationship importance. Other reasons for the reorganization of the supplier base can be environmental and employment issues as well as how well the existing suppliers are able to provide information in shifts in the economy (Choi & Linton, 2011). Depending on the needs of the customers these issues can bring new opportunities for the suppliers or tighten the existing competition. Customer can evaluate its vendors and make a difference between good and marginal suppliers by analyzing the suppliers with a rating system (Kortge & Okonkwo, 1993). If the bidding company is aware of the analysis systems and the criteria used by the customer it is possible for the supplier to evaluate its own position and the customer-supplier relationship from the buyer´s perspective and advance on the rating list. The customer might inform the suppliers of the upcoming re-organizations and that way increase the interest of the suppliers to bid for the request in order to acquire a certain share of the supply. Therefore the sourcing strategy of the customer can have high importance in the bid/no bid decision making of the supplier company.

3.3.4.3. Current relationship

The importance of close, collaborative, reciprocal and trusting relationships where both parties have the opportunity to benefit from the relationship have become the focus of customer relationship management. For example, the lean approach supports the idea of reducing the number of suppliers and concentrating more on partnerships with long-term perspective (Cox, 1999; Monczka, 2009). A Buy-Sell Hierarchy model by Miller (2006) explains how competition, pricing and product features have an effect on the customer-supplier relationship and expectations about it. The Buy-Sell Hierarchy model considers how the customer perceives the supplier. The sales team and the management of the supplier organization need to evaluate the relationship from the customer perspective. Evaluating the relationship on a five level continuum (Figure 4) from being a commodity provider (Level 1) to a strategic partner (Level 5), the supplier is able to consider customers not just by the size of the customer, but by the value of the relationship to the customer. Furthermore, as the price sensitivity of the customer correlates with the relationships status, the supplier is able to strategically consider proper pricing practice for each customer relationship (Smith, 2012).

Figure 4: Buy-Sell Hierarchy derived from Miller



Source: Miller (2006)

Lowe and Parvar (2004) considered the current relationship with the customer as an important part of their conceptual decision to bid model while Wanous et al. (2000) considered the relations with the customer as a third important factor to affect bid/no bid decision making. The current relationship with the customer, whether the relationship is a partnership, historical collaboration or new relationship, can influence the bid/no bid decision making of the supplier company as the more established the relationship is the more important it becomes to the bidding company.

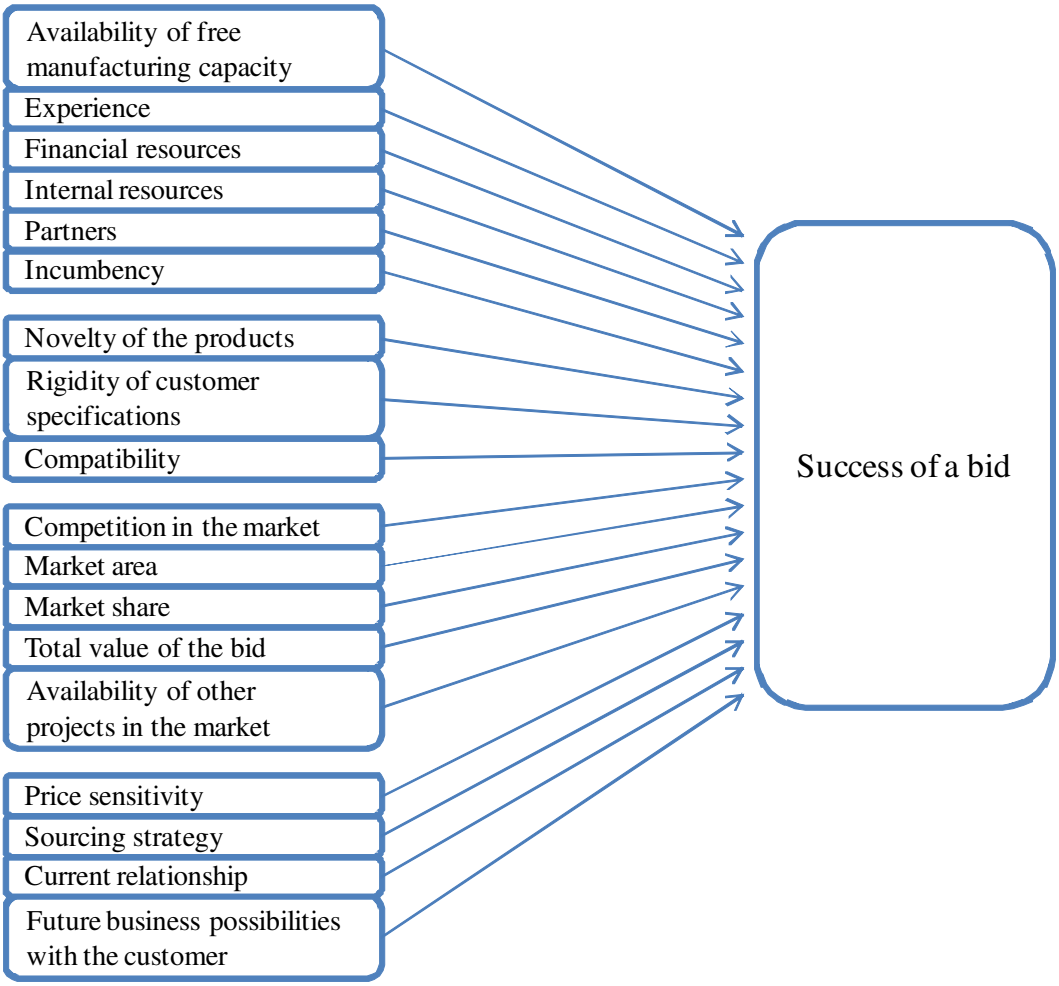
3.3.4.4. Future business possibilities with the customer

Several research papers emphasize the potential to have future business transactions with the customer after bidding for the first opportunity (Cova et al., 2000; M. King & Phythian, 1992; B. G. Kingsman & de Souza, 1997; Phythian & King, 1992; Shash, 1998). Egemen and Mohamed (2007) included the factor relating to upcoming profitable projects with the client into their model for bid/no bid decision making and concluded that larger-size contractors take strategic issues into consideration already in the bidding decision process. Paranka (1971) argues that after winning a bid the company will most likely receive repeat orders from the customer. In the case of small urgent request the customer will most likely contact a reliable supplier that have previously provided excellent performance and also include the supplier into future tender requests because of

the previous experience with the supplier. Based on this it can be argued that the future business possibilities with the customer can have an importance in the bid/no bid decision making.

This research paper builds on the previous literature and proposes that each of the factors that have been identified to influence the bid/no bid decision making in construction and electro-mechanical industries, also influences the bid/no bid decision making of a telecommunication system solution manufacturer in telecommunication industry. Furthermore, as each of the factors have been identified to be related to the bid/no bid decision making, this study elaborates on this and hypothesizes that there is a relationship between each of the factors and the success of a bid. This hypothesis is illustrated in Figure 5.

Figure 5: Variables influencing the success of a bid in telecommunication industry



4. Research methodology

In this chapter the research methodology of this paper is explained. First, the sampling of respondents is discussed followed by the data collection methods. The final part of this chapter concentrates on the data analysis procedures used in this research.

4.1. Sampling

The interest of this study is to examine the factors influencing the success of bids in manufacturing companies of the telecommunication industry. This research concentrates on one telecommunication system solution manufacturing company and its customer enquiry assessment process in the EMEA region (Europe, The Middle East and Africa) within the telecom sales business. In collaboration with this manufacturer, this research paper examines the factors that should be taken into account when making bid/no bid decisions.

To answer the research questions this study has two different approaches. First, this study examined the factors that influence the bid/no bid decision making in telecommunication industry by indentifying the critical factors through literature research. Second, this study examined which of the factors described earlier influence the success of bids. To answer the research question, altogether 115 employees of a manufacturing company from different departments (sales, marketing, quotations, commercial operations, business operations, and product line management) were contacted and requested to fill in a questionnaire. These employees had been identified according to their position and responsibilities in the company to be involved in the bidding processes and therefore have the required information to complete the questionnaire. The respondents were responsible of the market areas, customer relationships, offered product lines, commercial operations and the actual bid and quotation processes of each individual bid and therefore these respondents had more specific information of the particular market situations, products and customer relationships in each case.

4.2. Data collection

This research takes a historical look and examines how the factors indentified in previous studies influence the success of the bids placed earlier by the manufacturer. The research question of this study concentrates on examining which factors influence the success of bids and therefore to measure the influence of the factors on the success of the bids a questionnaire was used. A copy of this questionnaire can be found from the Appendix (10.1. Appendix: Questionnaire). The respondents were requested to consider one successful and one unsuccessful bid that they were familiar with and name those bids in the beginning of the questionnaire. After this the respondents were requested to rate the factors separately on both bids. In the questionnaire the respondents were presented 18 statements that described the factors indentified from the literature. The respondents were requested to indicate to what extent he or she agrees with the statement when considering the successful bid and the unsuccessful bid. The closed-ended statements were presented in matrix question formats that have the same response categories. The respondent were able to choose an option from a five point response category; “Strongly Disagree”, “Disagree”, “Neither Agree nor Disagree”, “Agree” and “Strongly Agree” (Babbie, 2010).

For example, in the case of the competition in the market, it can be assumed that the more competitors are in the market, the higher is the competition. Higher number of competitors increases the number of offers of similar products to the customer and thus tightens the competition (Paranka, 1971). Regarding the factor “competition in the market” the respondents were requested to express to what extent they agreed with the statement “The competition in the market concerning the bid was fierce at the time of making the bid” when they considered the successful bid and unsuccessful bid separately. This generated information of the actual bidding situation and the market where the bid was made. This information was used for further analysis.

To exclude the effect of other variables on the relationship between the factors and the success of the bids some additional information was collected in the questionnaire. These control variables were the current department of the respondent in the manufacturing company, the current position in the organization and the years of employment the manufacturing company. The departments in the company were sales, marketing, business operations, quotations, pricing office and product line management. The respondents worked in the following positions in the organization: vice president, director, manager, specialist and coordinator. The years of employment in the company were

divided between 1-5 year, 6-10 years, 11-15 years, 16-20 years, 21-25 years, 26-30 years and above 30 years. The respondents were requested to indicate their department, position and years of employment in the end of the questionnaire according to the above mentioned options.

An online survey portal was used to build the questionnaire, collect the responses and generate raw data for further analysis. Before sending the questionnaire website link to the respondents, the questionnaire was pretested by two persons outside the manufacturing company and by one person in management position in the manufacturing company. The aim was to test if the questionnaire in general and the statements in particular were understandable and possible to answer (Babbie, 2010). This pretesting provided valuable feedback concerning the length of the entire questionnaire, the wording of the statements and the selection of answer options. All received feedback was considered and incorporated into the questionnaire in order to avoid ambiguous statements.

Reliability of the data refers to the extent to which the data collection techniques or analysis procedures will yield consistent findings. In this study the observer error was minimized as the data was collected with a questionnaire. Observer bias that refers to different ways of interpreting the replies was also low as the scale for responses was fixed and the data was analyzed with a statistical program. Participant error, which refers to a situation where a questionnaire that is completed by respondents at different times of the week yields different results, and participant bias, which refers to respondents answering what respondents thought their bosses wanted them to say, are threats to reliability as well (Saunders, 2009). To minimize the participant error, the questionnaire was available for the respondents for 14 days so that majority of the respondents would have had the possibility to answer the questionnaire and share their knowledge. The possible participant bias was minimized by informing the respondents that the questionnaire is entirely anonymous so that the answers could not be linked to any individual respondent.

4.3. Data analysis

After the data collection a general analysis of the gathered data was conducted. First the data set was checked for possible errors, missing values and outliers. Second, the response rates were calculated and the characteristics of the respondents were analyzed. Third, correlation coefficients were calculated. Fourth, contingency tables of the different variables indentified from the literature concerning successful and unsuccessful bids were formulated and analyzed. This was followed by

two-sample t-test for the difference between two means. Before further analyses, a factor analysis was done to check how the variables load on different factors.

Fifth, logistic regression analyses were conducted in order to find out which variables contribute to the probability of a bid to be successful. Logistic regression is used to describe data and to explain the relationship between one dependent variable and one or more independent variables. As logistic regression does not assume a linear relationship between the dependent and independent variable it is suitable for a dependent variable with two categories (Burns, 2009). The dependent variable in this study is dichotomous variable having two values, successful or unsuccessful bid, so it is possible to use logistic regression to make further analysis (De Veaux, 2008). Logistic regression has become an important modeling tool in science, economics and industry as many response variables are dichotomous and researchers are interested to model data like these (Davis, 1997; De Veaux, 2008). This supports the usage of logistic regression approach in this study as well.

In logistic regression analysis the independent variables do not need to be interval, normally distributed, linearly related or of equal variance within each group. However, a case can only be in one category, in this study either successful or unsuccessful, and every case must be a member of one of the groups. In logistic regression a minimum of 50 cases per predictor is recommended because maximum likelihood coefficients are large sample estimates (Burns, 2009).

Logistic regression assumes that P(Y=1) is the probability of the event occurring and therefore the dependent variable must be coded accordingly. The desired outcome of the dependent variable, which in this study is a successful bid, is coded as “1”. Unsuccessful bid is therefore coded as “0” (Davis, 1997). As the bid can only be either successful or unsuccessful, logistic regression thinks in likelihood of the bid being successful. If the likelihood of the bid being successful is greater than 0.5 it is assumed to be successful, if it is less than 0.5 the bid is assumed to be unsuccessful (Burns, 2009).

Instead of adding all independent variables into the model at once, in the first analysis the variables that load on the same factors are added into the analysis separately as combined factors. In the second logistic regression analysis groups of variables are added into the analysis in order to investigate if the model is better when a group of variables is included or left out of the model. This hierarchical entry of variable groups is based on the above mentioned factor analysis. The variable

groups form sets of variables that load on the same factor. First the constant model is calculated, after which the variable groups are added in to the model one by one. In the final model all variables are included in the model. In the following chapter the results of these analyses are explained in more detail.

5. Results

In this chapter the results of the data analysis are presented. First the overall response rates and characteristics of the respondents are summarized. After this the answers of respondents for each individual variable for successful and unsuccessful bids are considered and the results of an independent two-sample t-test for the difference between two means are analysed. The t-tests were conducted to see if there is a statistically significant difference between the means of successful and unsuccessful bids when considering the different variables indentified from the literature.

After analysing the answers for each variable and the t-test results for the difference between two means, the results chapter continues with the logistic regression analyses. The results are summarised from a step by step procedure where the independent variables from different groups indentified with factor analysis were added into the regression analysis.

5.1. Response rate and characteristics of the respondents

The initial request to participate in the research was sent to 115 respondents by using personalized emails (10.2. Appendix: Personalized email invitation to participate in the research). After 5 days a reminder was sent to the respondents (10.3. Appendix: Reminder to participate in the research). Overall 72 employees out of 115 responded to the questionnaire generating an overall response rate of 62.6%. From these 72 responses 56 contained sufficient data that could be used for further analysis resulting in a response rate of 48.7%. As each of the 56 respondents considered one successful and one unsuccessful bid the result was 112 different bids with analyzable data.

16 out of the 72 respondents indicated in the beginning of the questionnaire that they are not able to name one successful and one unsuccessful bid which they could think while considering the

statements presented in the questionnaire. Therefore these 16 responses did not contain any data that could have been used in the analysis.

Table 2 summarizes the characteristics of the 56 respondents that provided data for further analysis, compared with the characteristics of the 72 respondents who replied to the questionnaire. Almost 34 percent of the respondents were from the Sales department and 30 percent were from the Product Line Management department. Sales people are involved in the bidding processes from the beginning to the end as they usually receive the initial request from the customers and are also involved in the final submission of the offer to the end customer. As Product Line Managers are responsible of the particular product lines they are also involved from the beginning when confirmations are needed on particular production dates or quantities, or when modified solutions are needed. Therefore these two departments have more employees than other smaller departments which explain the higher participation from these functions. The function "Other" that was the third biggest group of respondents, constituting 16% percent, included employees from Application Engineering, Strategy, Customer Experience, Commercial and Market Development departments. 51.8 percent of the respondents were Manager level employees and 62.5 percent of the respondents had worked for the manufacturing company 1 to 10 years.

Table 2: Characteristics of the respondents

	56 respondents with data		All 72 respondents	
Function	Frequency	Percentage	Frequency	Percentage
Sales	19	33,9%	25	34,7%
Marketing	6	10,7%	6	8,3%
Product Line Management	17	30,4%	23	31,9%
Quotations	1	1,8%	1	1,4%
Business Operations	3	5,3%	3	4,2%
Pricing Office	1	1,8%	2	2,8%
Other	9	16,1%	12	16,7%
	56	**100%**	**72**	**100%**
Position	Frequency	Percentage	Frequency	Percentage
Vice President	3	5,4%	4	5,6%
Director	10	17,8%	13	18,1%
Manager	29	51,8%	38	52,8%
Specialist	10	17,8%	11	15,3%
Coordinator	1	1,8%	1	1,4%
Other	3	5,4%	5	6,9%
	56	**100%**	**72**	**100%**
Years of Employment	Frequency	Percentage	Frequency	Percentage
1-5 years	21	37,5%	24	33,3%
6-10 years	14	25,0%	15	20,8%
11-15 years	5	8,9%	9	12,5%
16-20 years	8	14,3%	10	13,9%
21-25 years	7	12,5%	10	13,9%
26-30 years	0	0,0%	1	1,4%
31 years and more	0	0,0%	0	0,0%
Blank	1	1,8%	3	4,2%
	56	**100%**	**72**	**100%**

5.2. Correlations, response summaries and t-tests for the difference between two means

In Table 3 the correlation coefficients of the factors identified from the literature are shown. Majority of the correlations are weak and close to 0 which indicates the absence of linear relationship. However, incumbency has positive linear relationships with several factors of which

the strongest positive statistically significant relationship is with market share ($r = .504$, $p < .01$). This confirms that there is a relationship between being an incumbent supplier on a market and market share in a particular market. Financial resources and internal resources have a moderate, positive and statistically significant relationship ($r = .455$, $p < .01$) as well as financial resources and partners ($r = .343$, $p < .01$), and internal resources and partners ($r = .482$, $p < .01$). This shows that different company resources that are needed for manufacturing correlate with each other.

Table 3: Pearson correlation coefficients of the factors identified from the literature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Free manufacturing capacity	-	.067	.030	.090	.129	.193*	-.001	.002	-.020	-.013	.104	.324**	.072	.171	.130	-.072	-.091	-.035
2. Experience		-	.268**	.247*	.190*	.190*	-.018	.077	.403**	-.124	.006	.268**	.053	.213*	-.022	-.041	.195*	.049
3. Financial resources			-	.455**	.343**	.286**	.086	.079	.290**	-.087	-.063	.244*	.072	-.035	-.103	-.061	.011	.083
4. Internal resources				-	.482**	.316**	.019	.050	.440*	.044	.143	.173	-.001	-.048	-.072	-.098	-.043	.087
5. Partners					-	.276**	.268**	.090	.306**	-.064	.039	.274**	.003	.009	-.047	-.164	.038	.256**
6. Incumbency						-	.055	-.006	.423**	-.020	.066	.504**	.083	-.171	-.052	-.119	.258**	.175
7. Degree of novelty							-	.452**	.185	-.122	.155	.265**	.025	.166	-.032	.079	.022	.117
8. Rigidity								-	.141	.064	.328**	.338**	.032	.056	.079	.069	.012	-.047
9. Compatibility									-	-.013	.000	.324**	.039	-.044	.005	-.120	.163	.215*
10. Competition										-	.128	.076	.120	-.114	.159	.176	.024	.138
11. Market area											-	.151	.083	.093	.199*	.119	.147	.151
12. Market share												-	.175	.123	.029	.077	.237*	.219*
13. Total value													-	.172	.039	.093	.104	.174
14. Other projects														-	.090	.052	.013	.104
15. Price sensitivity															-	.198*	-.077	.043
16. Sourcing strategy																-	.016	.039
17. Relationship																	-	.409**
18. Future projects																		-

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

The division of answers of the respondents for each independent variable were calculated and analysed separately for successful and unsuccessful bids by creating contingency tables and boxplot figures. The percentages of answers for each answer option were compared between successful and unsuccessful bids to investigate if there is a difference between the answers or if the answers reflect a value that should be given a special attention to.

After this a two-sample t-test for the difference between two means was conducted. This was carried out to investigate if there is a statistically significant difference between the mean values of successful and unsuccessful bids. First, Levene´s test was checked to see if equal variance is assumed or not. Second, the t-value and its level of significance were observed. Third, based on the significance of the t-value it was concluded that there was, or there was not, a statistically significant difference between the mean values of successful and unsuccessful bids when considering the independent variable in question. In table 4 the mean values of the successful and unsuccessful bids, differences in the mean values, the t-values and their significance levels are summarised. In the following paragraphs the main findings from the contingency tables and t-tests are shortly presented.

The answers for the independent variable free manufacturing capacity indicated that for the majority of the bids there were free manufacturing capacity available in the manufacturer´s plants. The t-value was not significant which showed that there was no statistically significant difference between the means of successful and unsuccessful bids when considering the availability of free manufacturing capacity at the manufacturer´s plants.

The independent variable experience refers to knowledge and skills gained from previous bids that helped to win the bid in question. In 80.4 percent of the successful bids and 64.8 percent of the unsuccessful bids the experience was available (combined responses for Agree and Strongly Agree answers). In the two-sample t-test the t-value of 2.562 was significant ($p = 0.012$). According to the answers the bids for which the manufacturer was able to use previously gained experience for were more often successful in the end.

When considering the independent variable financial resources 69.1 percent of the successful bids and 69.8 percent of the unsuccessful bids had the necessary financial resources available (Agree and Strongly Agree answers combined). Furthermore, in the two-sample t-test the t-value of 0.602 was

not significant. These results indicate that for the majority of both successful and unsuccessful bids there were the necessary financial resources available to win the bid.

The independent variable internal resources refer to qualified employees, plants and equipment that are available to win a bid. For 89.1 percent of the successful bids and for 69.3 percent of the unsuccessful bids there were the necessary internal resources available (Agree and Strongly Agree answers combined). Moreover, the t-test for the difference between the two means had a t-value of 2.842 which was significant ($p = 0.006$) and thus indicating a statistically significant difference between the means. These results imply that for successful bids the internal resources were available more often than for the unsuccessful bids.

For 65.4 percent of the successful bids and for 33.9 unsuccessful bids there were the necessary partners, such as qualified subcontractors and material suppliers, available to win the bid (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of 3.078 was significant ($p = 0.003$) which means that there was a statistically significant difference in the means of successful and unsuccessful bids when considering the existence of necessary external partners. These results indicate that in majority of the successful bids the relationships with the qualified subcontractors and material suppliers were already established when making the bid, while for unsuccessful bids this was not the case.

For 68.5 percent of the successful bids and 48.1 percent of the unsuccessful bids the manufacturer had an established position in the industry that made it possible to win the bid (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of 2.902 was significant ($p = 0.005$) showing that there was a statistically significant difference between the means of successful and unsuccessful bids when considering the manufacturer´s established position in the industry. This indicates that in areas where the manufacturer had an established position in the industry, the bids were more often successful.

45.5 percent of the successful bids and 46.3 percent of the unsuccessful bids contained products with high degree of novelty (Agree and Strongly Agree answers combined). 34.5 percent of the successful bids and 35.2 percent of the unsuccessful bids did not contain products with high degree of novelty (Disagree and Strongly Disagree answers combined). The t-value of 0.235 was not significant which means that there was no statistically significant difference between the means of

successful and unsuccessful bids when considering the degree of novelty of the products offered in the bids.

54.6 percent of the successful bids and 53.7 percent of the unsuccessful bids were based on rigid customer specifications (Agree and Strongly Agree answers combined). The two-sample t-test with t-value of 0.228 which was not significant shows that there was no statistically significant difference between the means of successful and unsuccessful bids when considering the rigidity of customer specifications. This indicates that the rigidity of customer specifications does not differ between successful and unsuccessful bids.

90.9 percent of the successful bids and 51.9 percent of the unsuccessful bids contained products that were compatible with the customer specifications (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of 5.219 was significant ($p < 0.001$). It can be concluded that there was a statistically significant difference in the means of successful and unsuccessful bids when considering the compatibility of the offered products. The products offered by the manufacturer to the customer were compatible with the customer specifications more often in successful bids than in the unsuccessful bids.

81.5 percent of the successful bids and 92.4 percent of the unsuccessful bids were made for a market where the competition was fierce at the time of making the bid (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of -1.240 was not significant and therefore it can be concluded that there was no statistically significant difference between the means of successful and unsuccessful bids when considering the competition in the market.

60 percent of the successful bids and 52.8 percent of the unsuccessful bids were made for a customer market area that had regulatory and other special requirements in place (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of -0.077 was not significant. There was no statistically significant difference between the means of successful and unsuccessful bids when considering the regulatory and other special requirements in the market area where the bid was made.

42.6 percent of the successful bids and 17.3 percent of the unsuccessful bids were made for a customer market where the manufacturer had one of the largest market shares in the region

concerning the bid (Agree and Strongly Agree answers combined). 35.2 percent of the successful bids and 65.4 percent of the unsuccessful bids were made for a market where the manufacturer did not have one of the largest market shares in the region (Disagree and Strongly Disagree answers combined). In the two-sample t-test the t-value of 3.182 was significant ($p = 0.002$) which means that there was a statistically significant difference between the means of successful and unsuccessful bids when considering the market share of the manufacturer in the region of the bid. Bids were more often unsuccessful in regions where the manufacturer did not have one of the largest market shares.

69.1 percent of the successful bids and 64.1 percent of the unsuccessful bids had a high total Euro value (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of 0.625 was not significant which means that there was no statistically significant difference in the means of successful and unsuccessful bids when considering the total Euro value of the bid offered by the manufacturer.

50.9 percent of the successful bids and 43.4 percent of the unsuccessful bids were made for a region where there was not high number of other projects available at the time of making the bid (Disagree and Strongly Disagree answers combined). Furthermore, in the two-sample t-test the t-value of -1.084 was not significant.

81.9 percent of the successful bids and 81.1 percent of the unsuccessful bids were made for customers that were highly sensitive to price (Agree and Strongly Agree answers combined). The t-value of -0.587 was not significant which indicates that customers are overall highly price sensitive and no significant division can be made between successful and unsuccessful bids.

69.1 percent of the successful bids and 64.1 percent of the unsuccessful bids were made for customers whose strategy was to limit the number of suppliers (Agree and Strongly Agree answers combined). The t-value of 0.746 was not significant. The percentages and mean values indicate that in majority of the successful and unsuccessful bids the customers´ strategy was to limit the number of suppliers.

70.9 percent of the successful bids and 50.9 percent of the unsuccessful bids were made for customers that the manufacturer had an established relationship with (Agree and Strongly Agree

answers combined). In the two-sample t-test the t-value of 3.144 was significant ($p = 0.002$). To conclude, there was a statistically significant difference between the means of successful and unsuccessful bids when considering the relationship with the customer. Moreover, successful bids were more often related to established relationships with the customers.

In 87.1 percent of the successful bids and 54.7 percent of the unsuccessful bids the manufacturer expected the customer to request more bids in the future (Agree and Strongly Agree answers combined). In the two-sample t-test the t-value of 4.389 was significant ($p < 0.001$). As a conclusion, there was a statistically significant difference between the means of successful and unsuccessful bids when considering the expectations of the manufacturer that the customer will request more future bids after the current bid.

To summarize, statistically significant differences between the means of successful and unsuccessful bids were detected for independent variables experience, internal resources, partners, incumbency, compatibility, market share, relationship and future projects (Table 4).

Table 4: The mean answers of respondents for successful and unsuccessful bids, the difference between the means, t-values and the significance of two-sample t-test

Variable	Mean value of successful bids	Mean value of unsuccessful bids	Mean difference	t-value	Sig. (2-tailed)
Free capacity	3.55	3.64	-0.096	-0.555	p = 0.580
Experience	4.09	3.61	0.478	2.562	p = 0.012
Financial resources	3.85	3.75	0.100	0.602	p = 0.548
Internal resources	4.18	3.69	0.490	2.842	p = 0.006
Partners	3.73	3.13	0.595	3.078	p = 0.003
Incumbency	3.93	3.24	0.685	2.902	p = 0.005
Novelty of the products	3.20	3.15	0.052	0.235	p = 0.814
Rigidity of specifications	3.51	3.46	0.046	0.228	p = 0.820
Compatibility	4.25	3.37	0.884	5.219	p < 0.001
Competition	4.07	4.25	-0.171	-1.240	p = 0.218
Market area	3.44	3.45	-0.016	-0.077	p = 0.939
Market share	3.09	2.31	0.785	3.182	p = 0.002
Total value	3.84	3.72	0.119	0.625	p = 0.533
Other projects	2.58	2.79	-0.211	-1.084	p = 0.281
Sensitivity	4.15	4.25	-0.100	-0.587	p = 0.558
Sourcing strategy	3.82	3.66	0.158	0.746	p = 0.457
Relationship	3.95	3.21	0.738	3.144	p = 0.002
Future projects	4.20	3.43	0.770	4.389	p < 0.001

5.3. Factor analysis

To assess the variables based on literature research and to analyse how these variables reflect the variations in fewer unobserved variables, a factor analysis was conducted. First a factor analysis that was based on principal component analysis with direct oblimin rotation was conducted. With eigenvalue greater than 1.0, the variables were free to load on factors. The results showed that the variables loaded on 7 different factors with cumulative variance explained as 64.54%, but that the loadings started to level off after the third factor (10.4. Appendix: Factor analysis – Scree plot). In this analysis a direct oblimin rotation was used which is an oblique rotation method that assumes that the factors are correlated. If the correlations among the factors exceed .32 there is an overlap in variance among factors and oblique rotation should be used. In the analysis between the 7 different factors the correlation matrix for correlations among the factors indicates that the highest

correlation is .158 which is below .32. This indicates that orthogonal rotation method could be used as well (Brown, 2009).

The next factor analysis was a principal component analysis with varimax rotation method which is an orthogonal rotation method that assumes that the factors are uncorrelated. The variables were forced to load on three factors and the variables were grouped together according to the factor loadings which exceeded .5. The variables experience, other projects, price sensitivity, free manufacturing capacity, sourcing strategy, competition and total value of the bid were excluded from the analysis as their factor loadings were lower than .5. Table 5 below shows the factor loadings of the variables for each factor. The Kaiser-Meyer-Olkin value was .626 which is above .6, and Bartlett´s Test of Sphericity was significant (< .001) indicating that factor analysis can be continued. The three factors explained 38.388 percentage of the variance.

The first factor contained company and resource related variables and had Cronbach´s alpha of .748. The second factor contained variables referring to product specifications and had Cronbach´s alpha of .572 while the third factor contained customer relationship related variables and had Cronbach´s alpha of .567. Cronbach´s alphas for these groups of variables were higher than when using the groups of variables identified from the literature (Cronbach´s alpha for the company related variables was .64, for the product related variables .52, for the market related variables .38 and for the customer related variables .33).

For the dataset to be reliable Cronbach´s alpha should be greater than .7. However, the questionnaire was fairly short (in order to increase the interest of the respondents to answer the questionnaire) and the factors identified from the literature were measured with only one statement each, which can affect the Cronbach´s alpha and result in lower value (Cortina, 1993).

The reasoning for the usage of factor analysis where the variables were forced to load on three different factors lies in the possibility to form groups of variables with the highest possible Cronbach´s alpha values. However, this particular analysis has some drawbacks when compared to other factor analysis options. The total cumulative variance explained by the factors is higher for factor analyses where the variables are forced to load on four different factors (45.471% of variance explained cumulatively) or where the variables are free to load on any factors as long as eigenvalue is 1.0 (64.54% of total variance explained cumulatively). Same applies for the communalities as in

the analysis where the variables are forced to load on three different factors the communalities range from .163 to .608, while in the analysis where factors are forced to load on four different factors the communalities range from .200 to .703 and in the analysis where the variables are free to load on any factor (as long as eigenvalue is 1.0) the communalities range from .304 to .812.

The total variance explained and the communalities indicate that in the analysis where the variables are forced to load on three different factors the common factors explain less of the variance than in the other analyses. However, as indicated above, in this analysis the internal reliabilities are higher for the variable groups forming the factors. These three groups of variables that form the three factors named company and resources, product specifications and customer relationship, are used in the hierarchical logistic regression analysis that is explained in more detail in the next chapter.

Table 5: Factor analysis

	Component 1	Component 2	Component 3	Cronbach´s alpha	Name of the factor
Internal resources	.690			.748	Company and resources
Partners	.676				
Financial resources	.631				
Compatibility	.696				
Incumbency	.647				
Market share	.533				
Rigidity		.704		.572	Product specifications
Degree of novelty		.609			
Market area		.527			
Relationship			.691	.567	Customer relationship
Future projects			.690		

Varimax rotation
Cumulative variance explained: 38.388%

5.4. Logistic regression analyses

In this chapter the logistic regression analyses are presented. First, a hierarchical logistic regression analysis is conducted by adding factor 1, factor 2 and factor 3 from the factor analysis as predictors. After this a second, more detailed hierarchical logistic regression analysis is done by adding all of the variables identified from the literature as predictors in three different groups.

The logistic regression begins with the constant model before any coefficients are entered into the equation. This constant model will be compared to the other models including the predictors. The goal is to find out if the model with the predictor groups is more appropriate. The results for the constant model suggest that if we did not know anything about our variables and only guessed that the bid would be unsuccessful, we would be correct 50.9 percent of the time. After the constant model the control variables function, position and years of employment of the respondent are added into the model. In the next three phases the predictors factor 1, factor 2 and factor 3 are added into the analysis in separate steps, creating 4 different models.

The overall significance of the model can be described by the model Chi-square (Burns, 2009). The null hypothesis is that adding new variables to the model has not significantly increased the ability to predict if a bid is successful or not (Wuensch, 2011). Therefore a significant result is desired in order to increase the predictive ability of the model. The Chi-square value increases towards the final fourth model and in the three last models, with factors as predictors, the Chi-square values are significant. Although there is no close equivalent to the coefficient of determination R^2 in logistic regression there are some other statistics that provide information concerning the model. The smaller the value of the -2 Log Likelihood statistics is, the better the model, as the -2 Log Likelihood measures how poorly the model predicts (Wuensch, 2011). In this test the -2 Log Likelihood value decreases towards the final model. The fourth model has the lowest -2 Log Likelihood value of 109.920 indicating that the final model is the best prediction. Cox and Snell´s R-Square value demonstrates what percentage of the variation in the dependent variable is explained by the logistic model. The Cox and Snell´s R-Square value increases towards the final fourth model in which 30.8 percentage of the variation in the dependent variable is explained by the logistic model. The Nagelkerke´s R-Square value indicates the strength of the relationship between the predictors and the prediction. In the fourth model the Nagelkerke´s R-Square value of 0.411 suggest a weak relationship of 41.1 percentages between the predictors and the prediction. In the final model, overall 74.1 percent of the cases were correctly classified. This shows an improvement when compared to the previous models with lower overall percentages (Burns, 2009). The factor 1, named company and resources, contributes significantly to the prediction in three of the models. In the final fourth model, which has the highest Cox & Snell´s R-Squared and Nagelkerke R-Squared values and the highest classification accuracy, factor 1 ($p < .001$) and factor 3 ($p < .001$) contribute significantly to the prediction while factor 2 does not.

In the final fourth model, the Exp(B) value of 5.390 for the factor 1 ($p < .001$) suggests that when company and resource related variables increase with one unit (e.g. a response moving from Agree to Strongly Agree answer option), the odds ratio is more than 5 times as large and therefore a bid is 5 more times likely to belong to the successful bid group. The Exp(B) value of 3.246 for the factor 3 ($p < .001$) suggest that when the customer relationship variables increase with one unit, the odds ratio is more than 3 times as large and the bid is 3 more times likely to belong to the successful bid group. The test statistics for this logistic regression analysis are summarized in Table 6.

Table 6: Logistic regression analysis results with factors

		Model 1			Model 2			Model 3			Model 4		
	Variable	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
	Constant	.045	1.211	1.046	-5.655	2.016	.003	-5.016	2.113	.007	-7.225	2.433	.001
Control variables	Function												
	Sales	.018	.627	1.019	.372	.734	1.451	.407	.744	1.502	.281	.787	1.324
	Marketing	.183	.792	1.201	-.244	.938	.783	-.279	.947	.757	-1.146	1.028	.318
	Product Line Mngt	-.009	.642	.991	-.127	.749	.881	-.124	.758	.883	-.164	.821	.849
	Quotations	.045	1.595	1.046	-.301	1.717	.740	-.390	1.716	.677	.723	1.816	2.061
	Business Operations	.051	1.001	1.053	-1.130	1.121	.323	-1.179	1.140	.308	-1.125	1.261	.325
	Pricing Office	-.022	1.598	.978	-.873	1.688	.418	-1.006	1.697	.366	-.811	1.835	.444
	(base = Other)												
	Position												
	Vice President	.064	1.436	1.066	.081	1.644	1.084	-.021	1.639	.979	-1.161	2.016	.313
	Director	.131	1.143	1.140	.086	1.310	1.090	.120	1.309	1.127	-.871	1.648	.418
	Manager	.034	1.049	1.035	.003	1.210	1.003	.010	1.208	1.010	-.455	1.546	.634
	Specialist	.010	1.134	1.010	.267	1.290	1.306	.265	1.289	1.304	-.489	1.637	.613
	Coordinator	-.003	1.755	.997	-1.068	1.862	.344	-.866	1.886	.421	-.101	2.447	.904
	(base = Other)												
	Years of employment	-.033	.174	.967	-.019	.198	.982	-.044	.201	.957	-.100	.221	.905
	Factor 1 Company and resources				1.603**	.391	4.970	1.754**	.430	5.777	1.685**	.471	5.390
	Factor 2 Product specifications							-.338	.302	.713	-.661	.356	.516
	Factor 3 Customer relationship										1.177**	.336	3.246
	-2LL	149.541			126.917			125.632			109.920		
		$x^2 = .142$, df = 12, p = 1.000			$x^2 = 22.766$, df = 13, p = .045			$x^2 = 24.051$, df = 14, p = .045			$x^2 = 39.763$, df = 15, p < .001		
	Cox & Snell´s R-Squared	0.1%			19.0%			20.0%			30.8%		
	Nagelkerke R-Squared	0.2%			25.3%			26.6%			41.1%		
	Hosmer & Lemeshow test	p = 1.000			p = .055			p = .369			p = .285		
	Classification accuracy	50.9%			72.2%			67.6%			74.1%		

*p < .05. **p < .01.

However, as the factor 1 and the factor 3 contain several variables it is difficult to understand and explain which aspects of the factors influence the success of bids and to what extent. Therefore in the following hierarchical logistic regression analysis all the 18 variables identified from the

literature are added into the model in three different groups based on the factor loadings in the factor analysis. Table 7 shows the group division of the variables from the initial factor analysis.

Table 7: Groups of variables from the initial factor analysis

Group 1	Group 2	Group 3
Experience	Free manufacturing capacity	Competition
Financial resources	Degree of novelty	Total value
Internal resources	Rigidity	Relationship
Partners	Market area	Future projects
Incumbency	Other projects	
Compatibility	Price sensitivity	
Market share	Sourcing stragegy	

The logistic regression analysis begins with the constant model after which the control variables are added into the model creating the first model (table 8). After this the three groups of variables are added into the analysis in separate steps, altogether creating four different models. In the first model none of the control variables contribute significantly to the prediction. In the second model where group 1 variables are entered into the model, variable compatibility has a significant value (B = .694, Exp(B) = 2.002, p = .042). In the third model where group 2 variables are entered into the model, variables compatibility (B = .934, Exp(B) = 2.544, p = .029) and market share (B = .742, Exp(B) = 2.100, p = .021) contribute significantly to the prediction.

In the fourth and last step the group 3 variables are added into the fourth model. The model chi square has 30 degrees of freedom, a value of 65.238 and a probability of $p < 0.001$. We can reject the null hypothesis and conclude that the predictors have a significant effect and create a different model. The -2 Log Likelihood value has decreased to 73.392 indicating an improvement in the model when compared to the previous models. Cox and Snell´s R-Square value is 0.479 indicating that 47.9 percent of the variation in the dependent variable is explained by the logistic model. The Nagelkerke´s R-Square value of 0.639 indicates a moderately strong relationship of 63.9 percent between the predictors and the prediction. The Hosmer and Lemeshow goodness-of-fit test statistic is 0.403 which is greater than 0.05 indicating that there is no difference between observed and model-predicted values and that the model´s estimates fit the data at an acceptable level. In this final model 4, 88 percent of the cases were correctly classified for the successful bid group and 84

percent for the unsuccessful bid group. Overall 86 percent of the cases were correctly classified. This shows an improvement when compared to the previous models with lower overall percentages. The classification plot output from SPSS provides a visual demonstration of the correct and incorrect predictions. A U-shaped distribution would indicate that predictions are differentiated as cases would be clustered at each end of the prediction, for clearly successful and unsuccessful predictions (Burns, 2009). For the final fourth model the classification plot figure is closer to a U-shaped than normal distribution which indicates that the predictors are well-differentiated (10.5. Appendix: Logistic regression - Observed Groups and Predicted Probabilities). Another measure of the goodness-of-fit in logistic regression is the receiver operating characteristic (ROC) curve. This curve is based on the simultaneous measure of sensitivity (true positive) and specificity (true negative) for all cut off points (Zhou, 2011). For the final model 4 the area under the ROC curve is .918 with 95 percent confidence interval (.860, .976). This area is significantly different from 0.5 as $p < .001$ which indicates that the logistic regression classifies the group significantly better than by chance (10.6. Appendix: Logistic regression – ROC curve).

In the final model that contains all the variables, financial resources ($B = -1.094$, $Exp(B) = .335$, $p = .035$), compatibility ($B = 1.122$, $Exp(B) = 3.072$, $p = .029$), competition ($B = -1.271$, $Exp(B) = .281$, $p = .023$) and future projects ($B = 1.652$, $Exp(B) = 5.217$, $p = .009$) contribute significantly to the prediction, but the other independent variables do not contribute as they are non-significant (Table 8).

Table 8: Logistic regression analysis results with groups of variables

		Model 1			Model 2			Model 3			Model 4		
	Variable	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
	Constant	-.290	1.253	.748	-5.982	2.866	.003	-3.385	4.063	.034	-4.671	5.608	.009
Control variables	Function												
	Sales	.422	.710	1.524	1.287	1.028	3.620	1.415	1.174	4.115	1.799	1.481	6.043
	Marketing	.486	.846	1.627	-.200	1.124	.819	.048	1.260	1.049	-1.136	1.614	.321
	Product Line Mngt	.342	.720	1.408	.564	1.039	1.758	.507	1.146	1.661	.765	1.423	2.150
	Quotations	.564	1.648	1.758	1.003	2.246	2.726	.615	2.239	1.849	3.432	2.538	30.924
	Business Operations	.445	1.061	1.561	.352	1.465	1.422	.013	1.586	1.013	.259	2.013	1.296
	Pricing Office	.442	1.642	1.556	.330	2.086	1.391	.751	2.144	2.119	.251	2.941	1.285
	(base = Other)												
	Position												
	Vice President	.320	1.454	1.377	1.003	1.878	2.727	-.538	2.156	.584	.092	3.146	1.097
	Director	.123	1.153	1.131	.400	1.542	1.492	-.485	1.812	.616	-1.097	2.627	.334
	Manager	.149	1.054	1.161	-.042	1.475	.959	-.519	1.716	.595	-.537	2.489	.585
	Specialist	-.090	1.145	.913	-.251	1.633	.778	-.530	1.842	.589	-1.301	2.697	.272
	Coordinator	-21.194	40192.970	.000	-22.439	40192.970	.000	-21.937	40192.970	.000	-18.054	40192.970	.000
	(base = Other)												
	Years of employment	-.061	.180	.941	-.076	.236	.927	-.038	.282	.962	-.258	.361	.772
Group 1	Experience				.178	.301	1.195	.205	.343	1.227	.070	.400	1.072
	Financial resources				-.766	.393	.465	-.768	.426	.464	-1.094*	.520	.335
	Internal resources				.321	.405	1.379	.284	.442	1.328	.887	.616	2.428
	Partners				.489	.312	1.631	.614	.340	1.847	.405	.429	1.500
	Incumbency				.213	.248	1.237	.022	.290	1.022	-.074	.360	.928
	Compatibility				.694*	.341	2.002	.934*	.427	2.544	1.122*	.515	3.072
	Market share				.478	.246	1.613	.742*	.321	2.100	.660	.418	1.935
Group 2	Free manuf. capacity							-.201	.340	.818	.159	.464	1.172
	Degree of novelty							-.239	.310	.787	-.737	.414	.479
	Rigidity							-.313	.332	.731	.023	.418	1.023
	Market area							-.026	.272	.974	-.463	.344	.630
	Other projects							-.448	.337	.639	-.664	.410	.515
	Price sensitivity							-.218	.335	.804	-.249	.402	.779
	Sourcing strategy							.324	.278	1.382	.450	.345	1.569
Group 3	Competition										-1.271*	.560	.281
	Total value										-.087	.359	.917
	Relationship										.494	.321	1.639
	Future projects										1.652**	.629	5.217
	-2LL	136.471			102.103			94.748			73.392		
		$x^2 = 2.158$, df = 12, p = .999			$x^2 = 36.526$, df = 19, p = .009			$x^2 = 43.881$, df = 26, p = .016			$x^2 = 65.238$, df = 30, p < .001		
	Cox & Snell´s R-Squared	2.1%			30.6%			35.5%			47.9%		
	Nagelkerke R-Squared	2.8%			40.8%			47.4%			63.9%		
	Hosmer & Lemeshow test	p = 1.000			p = .238			p = .100			p = .403		
	Classification accuracy	53%			79%			77%			86%		

*p < .05. **p < .01.

6. Discussion

The findings of this research paper suggest that only four out of the eighteen different variables identified from the literature contribute significantly to the prediction of a bid being a successful bid. A test of the full model against a constant only model was statistically significant, indicating

that the predictors as a set reliably distinguished between successful and unsuccessful bids (chi square = 73.392, $p < 0.001$ with df = 30). The Wald criterion demonstrated that variables financial resources, compatibility, competition and future projects made a significant contribution to the prediction. In the following paragraphs these variables are discussed in more detail starting with the variable future projects which had the highest predictive value.

6.1. Future business possibilities with the customer

The future business possibilities with the customer relates to the potential new business transactions with the customer after bidding for the first opportunity. The results from the two-sample t-test for the difference between two means show that there is a significant statistical difference between the mean answers of the respondents when considering the expectations for possible future bids requested by the customer for successful and unsuccessful bids. Based on the results it can be argued that in the case of successful bids the manufacturer had more often expected future bids to be requested by the customer at later point.

In the final model of the logistic regression analysis the Exp(B) value of 5.217 for the variable future projects ($p = .009$) indicates that when the expectations for future business possibilities with the customer increase with one unit (e.g. a response moving from Agree to Strongly Agree that the manufacturer expected more future bids to be requested by the customer after the current bid), the odds ratio is more than 5 times as large and therefore a bid is 5 more times likely to belong to the successful bid group. The logistic regression analysis results indicate that bids after which the manufacturer expected to receive more future bid requests from the customer were 5 more times likely to be successful.

Based on the logistic regression results is can be concluded that future business possibilities have an influence on the bid´s success and should therefore be regarded as an influencing factor in the bid/no bid decision making as well. The results of this paper follow the conclusions of Egemen and Mohamed (2007) who found out that larger-size companies consider strategic considerations already in the bidding decision process, especially issues related to foreseeable future market conditions. From management point of view this means that future business possibilities should be taken into consideration when preparing a bid for the first opportunity by looking at the possibilities available in a long-term period. This usually means developing the customer relationship with a

long-term perspective. The Pearson correlation coefficients in the present study showed that there is a significant and relatively strong positive correlation between the relationship with the customer and possible future projects. According to this as the relationship with the customer becomes more established the more future business possibilities can be expected and vice versa. Relationships can be based on repeated transactions over time without close interaction, or relationships can be developed over time towards mutually beneficial partnerships (Anderson, 1990). An empirical study by Kalwani (1995) shows that the rate of sales in growth does not decrease for a supplier company that maintains a long-term relationship with selected customers. Instead, suppliers with long-term relationships are able to achieve the same level of growth as companies that employ a transactional approach in their selling operations. Kalwani (1995) found out that these companies are able to reduce costs over time through better inventory utilization and reductions in selling, general and administrative costs. These results imply that focusing on customer tender enquiries from which future business opportunities can be expected, and fostering trusting relationships can be beneficial in the long-term.

6.2. The compatibility of the products offered

The compatibility of the products offered refers to the degree of compatibility of the offered products with the customer specifications. The results from the two-sample t-test for the difference between two means show that there is a significant statistical difference between the mean answers of the respondents when considering the compatibility of the products in the successful and unsuccessful bids. According to the results successful bids contained products that were more compatible with the customer specifications than unsuccessful bids.

In the final model of the logistic regression analysis the Exp(B) value of 3.072 for the variable compatibility ($p = .029$) implies that when compatibility increases with one unit (e.g. a response moving from Agree to Strongly Agree that the products offered by the manufacturer to the customer were compatible with the customer specifications), the odds ratio is 3 times as large and therefore a bid is 3 more times likely to belong to the successful bid group. This indicates that the more compatible the products in the bid are with the customer specifications, the more likely the bid is to be successful.

To ensure that the offered products are compatible with the customer specifications management needs to make sure that engineering and product line management are involved in the bidding process from the beginning so that the company is able to offer products that fulfil the needs of the customer. This means tight cross departmental cooperation inside the company but also cooperation with external partners. As the Pearson correlation results of this study show there exists a significant positive correlation between compatibility of the products and company resources, more precisely financial resources, internal resources and external partners. This can be explained by cooperative activities among different organizational departments. As the manufacturer´s organisation consists of several departments in different sizes and functions, there is a need for a project organizer of the bidding process who knows in more detail which departments need to be involved and to what extent. This way the bidding process in general, the timing and the decisions made are monitored, written down and executed by the responsible party.

6.3. The availability of adequate financial resources

The availability of adequate financial resources relates to the financial resources of the bidding company that make it possible for the company, first to bid, and second to manufacture the requested products. The results from the two-sample t-test for the difference between two means show that there is no statistically significant difference between the mean answers of the respondents when considering the availability of adequate financial resources for winning the bid. This indicates that similar financial resources are available for all bids.

In the final model of the logistic regression analysis the Exp(B) value of 0.335 for the variable financial resources ($p = .035$) implies that when financial resources increase with one unit (e.g. a response moving from Agree to Strongly Agree that the manufacturer had the adequate financial resources available to win the bid), the odds ratio decreases with 66.5 percent and therefore it is less likely that a bid belongs to the successful bid group.

Previous studies (Cova et al., 2000; Egemen & Mohamed, 2007; Lowe & Parvar, 2004); Wanous et al., 2000) have considered financial resources as an important factor in the bid/no bid decision making. Egemen and Mohamed (2007) found out that the strength of the firm, partly measured by the financial status of the company, is one of the most important factors in the bid/no bid decision process. The results of this paper indicate that the financial resources have a significant influence on

the success of a bid and should be taken into consideration in the bid/no bid decision making. However, the results show that the better the availability of financial resources the less successful a bid is. This can be interpret in a way that a strong financial situation can have a negative influence on the need to win new bids and how much consideration is given to a bid and the bidding process. Large established companies such as the manufacturer usually have a secure financial situation that helps the company to survive in different markets longer than smaller competitors. This can also generate a secure and comfortable feeling inside the company as winning every bid is not necessarily needed. Large established companies are usually also more bureaucratic and therefore not able to response to the needs of the customers as quickly as necessary. This was also indicated by one of the respondents who commented that the manufacturer´s internal decision making is slow and that the company is too complex which makes operations "even more complicated by requiring too many executive approvals". To avoid problems like these the management should streamline the decision making and point out to the customer the benefits of strong financial background.

6.4. Competition in the market

The variable competition in the market relates to the number of competitors and degree of competition in the particular market where the bid was made by the manufacturer. The results from the two-sample t-test for the difference between two means indicate that there is no statistically significant difference between the mean answers of the respondents when considering the competition in the market where the bids were made. This demonstrates that the competition in different markets is fierce and even in markets where bids are successful the competition is high.

In the final model of the logistic regression analysis the Exp(B) value of 0.281 for the variable competition ($p = .023$) imply that when competition increases with one unit (e.g. a response moving from Agree to Strongly Agree that the competition in the market concerning the bid was fierce at the time of making the bid), the odds ratio decreases and therefore a bid is less likely to belong to the successful bid group. In other words, in a market where the competition is fiercer, the odds of a bid to be a successful bid are lower by 71.9 percent. Therefore the odds of a bid being a successful bid are lower in a market where there is fiercer competition.

These results are in line with the decision making models by Ahmad (1990), M. King and Phythian (1992), B.G. Kingsman and de Souza (1997) and Paranka (1971) who consider the number of

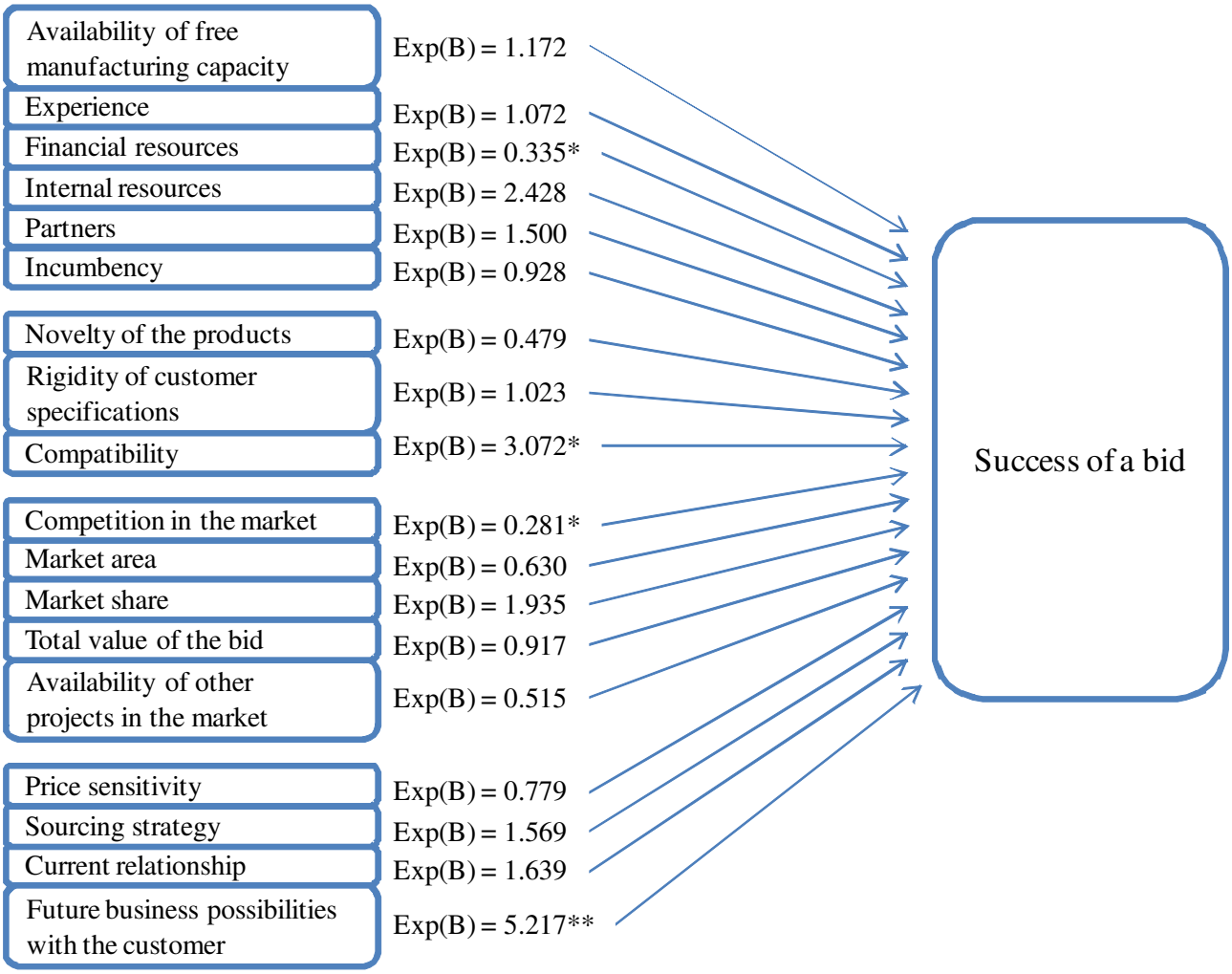
competitors and the degree of competition as important elements of their models. First of all identifying the competitors is important. As large Asian manufacturers are entering the European, Middle East and African markets with competitive offerings, the manufacturer´s management needs to emphasize the importance of following the moves of competitors, their strategies and approaches. The manufacturer has to know what is offered by the competitors and how they are organized in different markets. Finding this information can be done by using public information and industry networks. Furthermore, collecting competitive information for example concerning products offered by competitors, pricing and contract terms, the manufacturer is prepared for competition already from the start of the bidding process. Knowing the risks associated with the competitors, for example frequent delays in the supply, the manufacturer can highlight these risks to the customer and stand out with positive differentiators in the offer.

6.5. The role of the other variables in the final model

The other independent variables were non-significant which implies that they do not contribute significantly to the prediction. However, the logistic regression calculates odd ratios, Exp(B), for all variables which indicate the relationship between the independent variables and the prediction. If the value of Exp(B) exceeds 1 then the odds of an outcome occurring increase. If the value is less than 1 then any increase in the predictor leads to a drop in the odds of the outcome occurring. As can be seen from the table 8, experience of the manufacturer, internal resources, partners, the market share, free manufacturing capacity, rigidity of the customer specifications, the sourcing strategy and the current relationship have a positive relationship with the success of the bids. One unit increase in the independent variable leads the bid to be more successful by the amount indicated by the odds ratio Exp(B). For the variables incumbency of the manufacturer, novelty of the products offered, market area restrictions, the availability of other profitable projects, price sensitivity of the customer and the total value of the bid have a negative relationship with the prediction. This means that one unit change in the independent variable leads to a decrease in the bid success. The decrease in success as percentage can be calculated by multiplying the odds ration Exp(B) by hundred and deducting hundred from the result. As an example, when considering market area restrictions the logistic regression results indicate that one unit increase in the market area restrictions leads the odds of the bid being a successful bid to lower by 37 percent. However, as these results are not significant the odds ratios should be interpret with caution. The final model is

illustrated in the figure 6 with the Exp(B) values that can be interpreted in terms of the change in odds.

Figure 6: Variables influencing the success of a bid and odds ratios from logistic regression



* p < .05, ** p < .01

7. Conclusions and implications

The purpose of this research paper was to investigate factors that have been considered important by previous studies in the bid/no bid decision making and examine which of these factors influence the success of a bid in the telecommunication industry. Based on these the following research question was formulated:

Which factors influence the success of a bid of a telecommunication system solution manufacturer in the EMEA region?

In order to answer the research question a literature review was conducted on the theories and the underlying factors that influence the bid/no-bid decision making. Theoretical frameworks of thirteen different articles were considered and factors that appeared in these publications were used in the theoretical model of this paper. Altogether 18 factors were selected to fit the bid/no-bid decision making of the telecommunication industry. These factors were divided into company, product, market and customer related factors. Company factors were free manufacturing capacity, experience, financial resources, internal resources, partners and incumbency of the bidding company. Product related factors were the degree of novelty of the products offered, rigidity of the customer specifications and compatibility of the product offered. Market related factors were competition in the market where bids were made, market area restrictions, market share of the bidding company, total value of the bid offered and other available projects in the market. Customer related factors were price sensitivity of the customer, sourcing strategy of the customer, the current relationship with the customer and possible future projects available after the first bid.

The influence of these factors on the success of a bid was measured with a questionnaire that was answered by 56 respondents who had been involved in the bidding processes of one telecommunication system solution manufacturer. The respondents identified 56 successful and 56 unsuccessful bids previously made by the manufacturer and expressed how each of the factors related to a particular bidding situation. The answers were analysed by creating contingency tables and conducting two-sample t-tests for the difference between the mean values of successful and unsuccessful bids. Furthermore, a logistic regression analysis was conducted to predict which factors influence the success of a bid for 112 bids using 18 different independent variables as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between successful and unsuccessful bids. The overall prediction success was 86 percent. In the full model four variables contributed significantly to the prediction. These variables were future business possibilities with the customers, competition in the market, the availability of the adequate financial resources and the compatibility of the products offered. In the following paragraph the main results of this research paper are summarized from a management point of view.

7.1. Managerial implications

According to the logistic regression analysis four different variables contributed significantly to the prediction the model. The significant role of the future business possibilities with the customer imply that companies operating in the telecommunication system solution manufacturing industry should acknowledge the possibilities for future transactions already from the first bid, and value and build the customer relationships with a long-term perspective. Moreover, the manufacturer needs to highlight the importance of cooperation between departments inside the company as well as cooperation with the external partners. Using the extensive cooperation to ensure that the offered products are compatible with the customer specifications can increase the possibilities for successful bids. Furthermore, ensuring adequate financial resources to prepare a bid and manufacture the offered products is essential. However, the manufacturer should not let the size of the company blind the operations, but help to stay focused and aware what is happening in the markets. Finally, the manufacturer should also focus on the competition in the different markets as this study shows that competition influences the success of bids negatively. By following what competitors do in the markets and what do they offer can prepare the company to make a bid that will be successful.

In the following paragraph the main contributions to theory by this research paper are presented.

7.2. Contribution to theory

The bid/no-bid decision making processes discussed in the literature review chapter showed several different theoretical approaches to explain the decision making processes and the factors influencing the decision making. Several of the frameworks were based on questionnaires or interviews answered by employees of large and medium sized organizations (Ahmad, 1990; Egemen & Mohamed, 2007; M. King & Phythian, 1992; B.G. Kingsman and de Souza, 1997). These studies provided an extensive list of factors that should be taken into consideration in the bid/no-bid decision making of the bidding companies. Two of the studies provided practical evidence on which variables to concentrate (Paranka, 1971; Lowe, 2004). None of the studies provided a quantitative analysis of the factors and their influence on the successfulness of bids. However, Lowe (2004) identified significant factors in the decision to bid process by investigating past bid/no-bid decisions of an UK based construction company by using logistic regression

analysis. One of the significant factors identified by Lowe (2004) was the competitive environment, reflecting similar aspects as the variable competition in the study at hand.

The present study shows that there are a smaller number of variables that have significant influence on the success of a bid and therefore this study implies that it is of most importance to take these variables into close consideration in the bid/no-bid decision making. Following the management science approach this paper introduces different factors that can be identified and measured, and finally combined with management perception in the decision making processes. Concentrating first on these most influential variables (the future business possibilities, competition in the market, availability of adequate financial resources and the compatibility of the products offered) the companies in the telecommunication industry can save resources and analyse customer tender enquiries faster. As the previous bid/no-bid decision making models and the factors influencing the decision making have mostly been generated to fit the needs of construction industry, the present study contributes to the theory by presenting factors that have been studied quantitatively and showed to influence the success of bids in the telecommunication system solution manufacturing industry. Furthermore, while in Ahmad´s (1990) model the factors had individual worths that were weighted, the present study introduced a flexible way for management to evaluate the influence of the factors on the success of the bids by using the odds ratios from the logistic regression.

8. Limitations and further research

In this chapter the limitations of the present study are discussed. After this possible further research approaches are presented.

Validity refers to whether the findings are really what they appear to be about (Saunders, 2009). Even though great consideration was taken when designing the operationalization of this research, there exist some threats to construct validity. In order to keep the questionnaire short and to get as many respondents as possible to answer the questionnaire, each variable was measured with only one statement for both successful and unsuccessful bid. This however creates a mono-operation bias that lowers the construct validity. Single operations under represent constructs and may contain irrelevancies. To increase the construct validity the items should be measured with multiple operationalizations (Shadish, 2002). This would create more robust measures and also influence the internal consistency of the questionnaire (Tavakol, 2011). As the statements were all worded in one

direction this can create a monomethod bias to the construct validity (Shadish, 2002). In addition to adding more operationalizations to each construct positive and negative wordings should be used.

The validity of the questionnaire statements is a question of the degree to which a measure captures what it is intended to measure (Tavakol, 2011). The questionnaire statements can be interpreted differently because of the wordings of the statements. Some of the statements include words that are not exhaustively explained. As an example a statements that measures the influence of the total value of the bid offered to the success of the bid "The total value of the bid offered was high". As the word high is not explained the respondents can interpret this differently and thus one respondent can consider a range of values that another respondent would never consider to belong to a group of high values. This ambiguous wording can create differences in the considerations of the respondents.

Furthermore, it is impossible to indicate how much thought each respondent has put in the answering process and if the respondents have been thinking within the full context of the situation. The respondents may have interpreted the statements differently even though the meanings of the statements were assessed by 3 test persons before launching the questionnaire. There also exists a possibility for researcher imposition where the researcher is making his own assumptions what is important and what is not, and therefore the questionnaire may be missing something that is of importance to the subject of interest. Moreover, as the respondents were requested to think of a bid that they have been involved with or that they know, the information the respondents provided was highly subjective.

One of the limitations of this study is the sample of bids identified by the respondents. As the bids considered by the respondents represent bids of an incumbent manufacturer with global operations the results might not be generalisable, for example, to the operations of a single more focused manufacturer. As the results of this research present the operations of an incumbent manufacturer it is questionable if the results can be generalized to the entire industry. However, as there are several established fiber optic communications system solutions manufacturers operating in the industry the results of this research can reflect the average outcomes of the industry. But as the bids of only one organization were considered in this paper there is a need for further research that would take into consideration the bids of several manufacturers from the industry.

Concerning further research and quantitative data collection methods, different information concerning bids, markets and customers should be collected when the bids are prepared and delivered to the customer. By collecting the information in real time there is no need to rely on the memory of respondents.

Another approach for investigating the factors influencing the success of bids is to conduct semi constructed interviews with employees that are highly involved in the bidding processes. This method would yield broader information that could then be analyzed in detail and compared to quantitative studies available.

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10. Appendices

10.1. Appendix: Questionnaire

(Text removed for confidentiality purposes)

The purpose of this questionnaire is to understand the factors that influence the success of a bid. The questionnaire results and the corresponding analysis will provide (text removed for confidentiality purposes) a fresh organizational insight into the factors that influence the success of a bid. Therefore your feedback is highly appreciated.

Throughout this questionnaire you will be asked to consider two different bids (two different offers made by (text removed for confidentiality purposes) to the end customers) and rate the factors related to these bids. You can decide yourself which bids to consider.

However, the first bid should be successful: a bid that (text removed for confidentiality purposes) won and that generated an order. The second bid should be unsuccessful: an opportunity that (text removed for confidentiality purposes) lost to a competitor. In naming the bids you can use for example the name of the project to indicate which bid you refer to (you can also use the name of the customer, the offered products or the size of the bid when differentiating between the bids).

Before continuing to the questionnaire, please consider which bids you are going to include into the questionnaire and reserve approximately 5 minutes to complete the questionnaire.

Thank you!

Please name a successful bid that you have been involved with / are familiar with:
Please name an unsuccessful bid (opportunity lost to competition) that you have been involved with / are familiar with:

Please indicate to what extent you agree with the following statements by choosing the most suitable option from the given alternatives for both the successful and for the unsuccessful bid:

Factors relating to the manufacturer:

1. The availability of free manufacturing capacity at the manufacturer´s plants

"There was free manufacturing capacity available in the plants at the time of making the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

2. The experience of the manufacturer from previous bids/projects

"The manufacturer had the necessary experience (knowledge and skills from previous bids) to win the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

3. The financial resources of the manufacturer needed to implement a bid

"The manufacturer had the adequate financial resources available to win the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

4. The internal resources of the manufacturer needed to implement a bid

"The manufacturer had the necessary internal resources (qualified employees, plants and equipment) to win the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

5. The partners of the manufacturer needed to implement a bid

"The manufacturer had the necessary external partners (qualified subcontractors and material suppliers) to win the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

6. Manufacturer´s established position in the telecommunication industry

"The manufacturer had a well established position in the industry (incumbent position) that made it possible to win the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

Factors relating to the products:

7. The degree of novelty of the products offered

"The products requested by the customer had a high degree of novelty"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

8. The rigidity of customer product specifications

"The product specifications by the customer were highly rigid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

9. The compatibility of the offered products

"The products offered by the manufacturer to the customer were compatible with the customer specifications"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

Factors relating to the market:

10. The number of competitors in a market

"The competition in the market concerning the bid was fierce at the time of making the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

11. The market area

"The customer market area had regulatory and other special requirements"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

12. The market share

"The manufacturer had one of the largest market shares in the region concerning the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

13. The size of the opportunity

"The total value of the bid offered by the manufacturer was high"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

14. The availability of other projects in the market

"There were a high number of other profitable projects available in the region concerning the bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

Factors relating to the customers:

15. The price sensitivity of the customer

"The customer was highly sensitive to price"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

16. The sourcing strategy of the customer

"The sourcing strategy of the customer was to limit the number of suppliers"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

17. The current relationship with the customer

"The manufacturer had an established relationship with the customer"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

18. Future business possibilities with the customer

"The manufacturer expected more future bids to be requested by the customer after this bid"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

General information:

Please choose the function you work at:

- Sales
- Marketing
- Product Line Management
- Quotations
- Business Operations
- Pricing Office

- Other (Please Specify):

Please specify your position in the organization:

- Vice President
- Director
- Manager
- Specialist
- Coordinator
- Other (Please Specify):

Please indicate the years of employment in:

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- 31 and above years

If you have any questions, feedback or something to add, please feel free to use the text box below:

If you are interested in receiving a copy of the survey results, please leave your email address in the field below:

Thank you for taking the survey. Your response is highly appreciated.

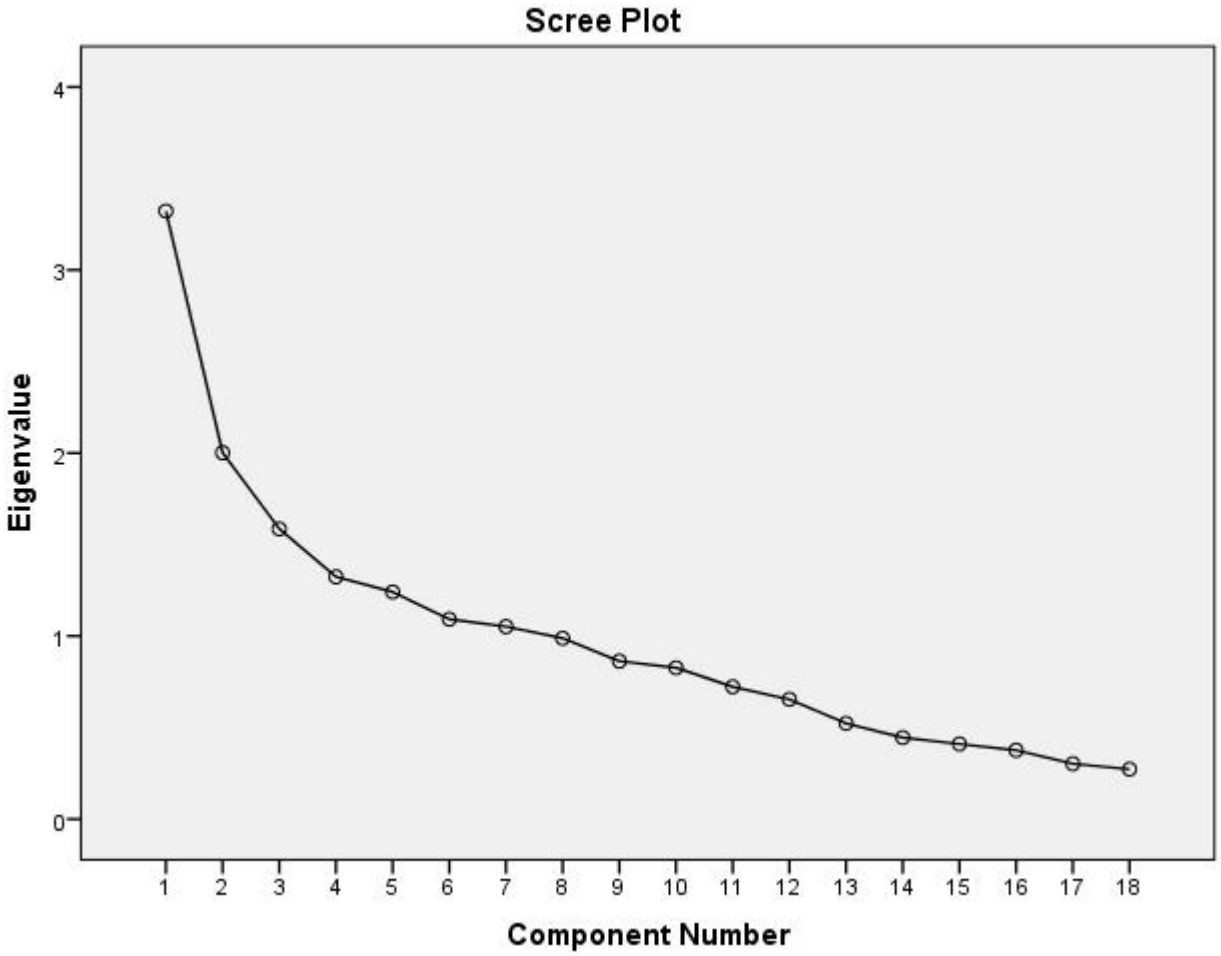
10.2. Appendix: Personalized email invitation to participate in the research

(Text removed for confidentiality purposes)

10.3. Appendix: Reminder to participate in the research

(Text removed for confidentiality purposes)

10.4. Appendix: Factor analysis – Scree plot



10.5. Appendix: Logistic regression – Observed Groups and Predicted Probabilities

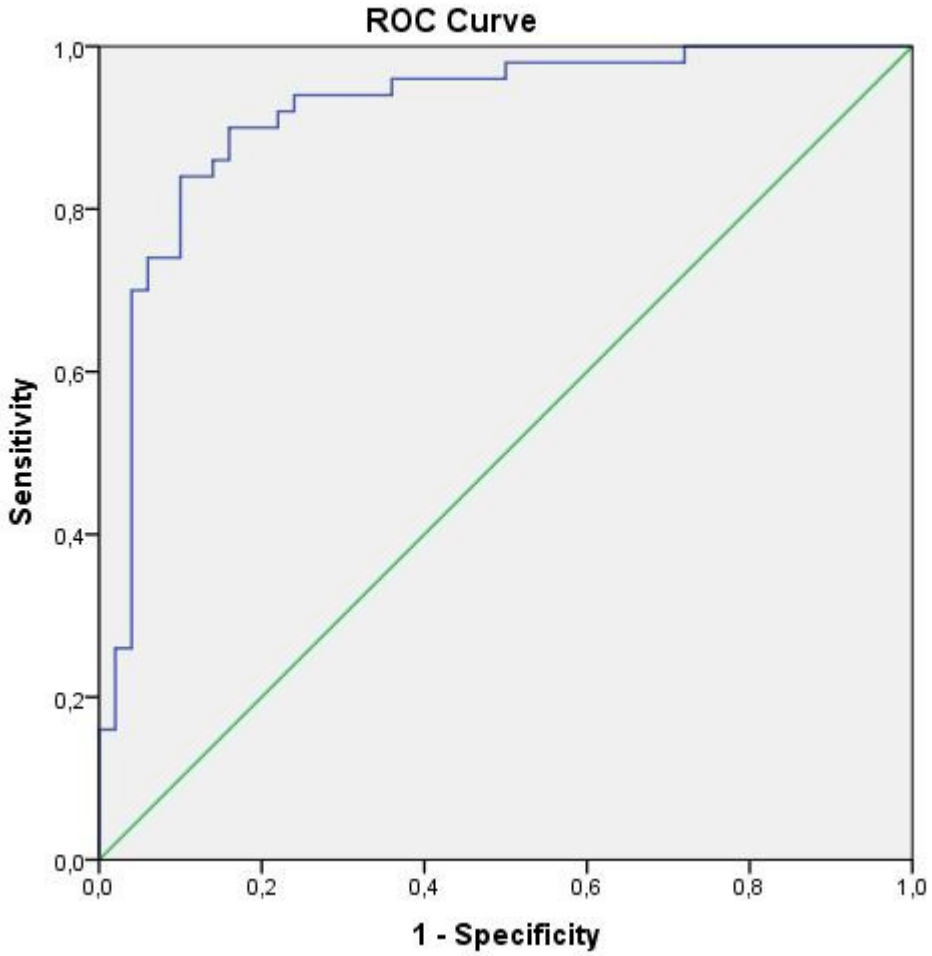
```
               Step number: 1

               Observed Groups and Predicted Probabilities

      16 +                                                                                                    +
         I                                                                                                    I
         I                                                                                                    I
F        I                                                                                                    I
R     12 +                                                                                                    +
E        I                                                                                                    I
Q        IU                                                                                                   I
U        IU                                                                                                   I
E      8 +U                                                                                                   +
N        IU                                                                                                   I
C        IU                                                                                                   I
Y        IU                                                                                                   I
       4 +U           U                                                                                   S   +
         IUU  U       U                                                          S        S         S S   S  SI
         IUU SU       USU U        U                           S               S S      S S  S      S S SSSSSSI
         IUUUUU U U U UUU UU U  S UU   UU U  S    US  UU U SS  U U U S  S   SS UUU S S  S SS SSSSS SSSS USUSSSI
Predicted ---------+---------+---------+---------+---------+---------+---------+---------+---------+----------
  Prob:   0       ,1        ,2        ,3        ,4        ,5        ,6        ,7        ,8        ,9         1
  Group:  UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS

          Predicted Probability is of Membership for Successful bid
          The Cut Value is ,50
          Symbols: U - Unsuccessful bid
                   S - Successful bid
          Each Symbol Represents 1 Case.
```

10.6. Appendix: Logistic regression – ROC curve



Area Under the Curve

Test Result Variable(s): Predicted probability

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
,918	,029	,000	,860	,976

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5