



The impact of product superiority on customer satisfaction in project management

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Abstract

This paper investigates direct and moderating role of product superiority between project management and customer satisfaction. The data comes from customer satisfaction surveys conducted for a Fortune 500 company in building control systems industry. Data was aggregated over 18 consecutive months with 3129 surveys completed. Results showed that product superiority in project management has a significant direct impact on perceived customer satisfaction throughout the project. Furthermore product superiority somewhat strengthens the relationship between the project management stages and customer satisfaction. Due to this dual impact of the product superiority on the project management and customer satisfaction relationship, product superiority is a *quasi-moderating* variable in statistical terms. The results also suggest that product superiority, being a precursor for customer satisfaction, has lower impact on customer satisfaction than the actual project management aspect. This may be an indication of the higher service rather than product oriented nature of the system delivery projects.

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1. Introduction

The importance of customer satisfaction in product and service industries is known to be vital for a firm's success in today's competitive marketplace in business-to-business marketing (Austen et al., 2012; Homburg and Rudolph, 2001). Customer satisfaction is determined by a number of factors including a consumer's determination in purchasing a product, their social bond with the organization and the connection created on a personal level in the industrial markets (Abdul-Muhmin, 2005; Tikkanen and Alajoutsijärvi, 2002).

It has also been shown in multiple studies that one of the main reasons a new product succeeds in the marketplace is due to product superiority (Flint et al., 2011; Slater et al., 2014). Product superiority can be defined as the differentiation in characteristics found between similar products that leads to one

product being perceived to be of higher value and/or quality to the customer both in consumer (Kotler et al., 2013) and industrial contexts (Flint et al., 2011; Stock et al., 2001). However, product superiority has a different impact when the service resulting in the end product is also a part of the customer's satisfaction assessment (Rushton and Carson, 1985).

The service and product aspects are interrelated and are thus frequently present in the project management context. The service part includes the start and end times of the project, and includes a number of different phases (Garrison et al., 2012), while the physical product is the end installation outlined in the customer's contract (Maloney, 2002). The manager of the project must keep his or her crew within the budgeted costs and planned time frames set out in the proposal for the customer (Maloney, 2002; Yaghootkar and Gil, 2012). If the goals of installation and budget are met the question then is, is the customer satisfied due to the product superiority? How does this impact the customer's satisfaction with the project's management? In other words does product superiority have

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a direct impact on customer satisfaction or does product superiority just strengthen the relationship between project management stages and customer satisfaction, or maybe both are happening at the same time?

Initially this paper discusses what project management is and its stages, followed by the importance of customer satisfaction in this context. Product superiority is then examined as a key benchmark for determining customer satisfaction. As regards to the product superiority, the prior research is scarce in examining the direct relationship present between product superiority and customer satisfaction as well as the moderating impact of product superiority in the relationship between project management and customer satisfaction. For example Hsieh et al. (2008) discuss the moderating effects of market orientation and launch proficiency on the product advantage–performance relationship, but neither the direct or moderating impact of product superiority on customer satisfaction is addressed. The authors refer to the discussion by Pelham and Wilson (1996) that the quality–profitability relationship is significantly influenced by market orientation, and further that “firms attempting to create quality or advantageous products do not necessarily garner new product success unless they also focus on customer needs”. Later on in the Hsieh et al. (2008) article various writers claim also that “customer orientation averts firms from being blindfolded by pursuing absolute technical advantage in products (Bowman & Faulkner, 1994; Higgins and Shanklin, 1992) and provides a better understanding of its customers (Gatignon and Xuereb, 1997). This subsequently leads to greater customer acceptance and satisfaction, market shares, and eventually financial performance.” The authors conclude that customer centric measures are important for the new product success, and also that overemphasizing product superiority at the expense of customer acceptance and satisfaction, is perhaps not the right way to go. Obviously these conclusions are interesting, but context of the research referred above is not project management, and thus drawing meaningful conclusions should be done with caution.

The gap in the current literature indicates a need to pursue this topic. The purpose of this paper is to develop a hypothetical framework to show the relationship between dimensions of project management, throughout the project lifecycle, regarding customer satisfaction and product superiority. The focus of this research is the installation of building control systems such as heating, cooling, security and ventilation structures installed by a Fortune 500 company (Fortune Magazine, 2014) delivering system delivery projects for its relatively large customers in the U.S. The projects studied here were the installation of new or retrofit heating, ventilation, air conditioning, and security systems that it manufactured and delivered to the client organizations. To analyze this topic, a questionnaire based on empirical evidence was used. We have focused on two main research goals. The first goal is to investigate the direct impact of product superiority on customer satisfaction, and the second goal is to examine the possible moderating impact of product superiority on the relationship between project management and customer satisfaction.

2. Literature review

2.1. Project management

Project management has been defined by Oisen (1971) as, “Project Management is the application of a collection of tools and techniques (such as the CPM and matrix organization) to direct the use of diverse resources towards the accomplishment of a unique, complex, one-time task within time, cost and quality constraints. Each task requires a particular mix of these tools and techniques structured to fit the task environment and life cycle (from conception to completion) of the task.”

The definition of project management today also takes into account stakeholders’ benefits and satisfaction, while also focusing on the completion of the traditional project’s goals time and cost (Atkinson, 1999). Project management is viewed as a complex task that includes, but is not limited to the collection of knowledge for the project, scheduling and deadline setting, making key decisions and identifying project priorities, and the overall information system in the project (Söderlund, 2004). Söderlund (2004) adds that the project management unit should also be accountable for the total commitment, participation and education required during the project’s life cycle. The intricacy of defined tasks present in project management is wide-ranging; communication with stakeholders may, however, add complexity to the project management.

2.2. Project management: The point of view of the study.

Project management typically involves several different stakeholders: the customer, the company and the manager of the project (Li et al., 2013; Olander, 2007; Yang and Peng, 2008). The project manager is the liaison between the customer and the company, whom he or she is employed for, and must strive to meet the expectations of all key stakeholders.

In the study by Olander (2007) a stakeholder impact analysis index was developed to indicate and determine whether a stakeholder was a proponent or opponent to the project. He postulated that this index could be used by project managers to define a stakeholder’s role in the project and subsequently, the manager’s behaviors. McManus (2002) proposed that project management stakeholders would often have conflicting objectives and views with one another (Li et al., 2013). The identification of these opinions in relation to the overall goals of the project may pose a challenge to the manager, as not all of them may be met in a satisfactory manner for all stakeholders (Li et al., 2013). Therefore, managers should try to focus solely on their significant and legitimate stakeholders to increase the likelihood of the project’s success (Post et al., 2002).

The extant literature has typically investigated the variables related to project success from the project team’s or project manager’s perspectives (Belassi and Tukel, 1996; Pinto and Mantel, 1990). In spite of the fact that customer satisfaction is considered a vague concept in project management (Ahola et al., 2008), how customers perceive the project delivery and its’ outcome is a vital issue for the management team of the project. Thus, it is not surprising that the continuous

assessment of customer satisfaction has been found to be fundamental in project management (Loo, 2002). For this reason paying attention to the customer’s perceptions of the project performance during the various project phases as antecedents of customer satisfaction is the focal point of the study.

2.3. Project management phases

In project management customers voice their opinions of the project supplier’s functioning during consecutive stages in system delivery projects. Extant literature identifies different numbers of successive stages in projects. The aim of the “phasing” of the project is the reduction of risk and uncertainty inherent in every project (Browning et al., 2002), thus enabling better project management and control (de Vries, 2004). The Project Management Institute (2013), for example, identifies the stages as initiating, planning, executing, controlling and monitoring, and closing. By definition all these stages include multiple sub-stages, which can then consist of multiple activities. Furthermore the nature of the project has an impact on the contents of various stages and activities performed during the project. For example Haverila et al. (2013) summarize the contents of the project management stages in Table 1.

On the basis of the variability present in different types of projects, researchers have identified a variety of stages in project management. Typically the number of stages is four (Ahuja et al., 1994; Turner, 1999), five (Hodgson, 2002; Pellegrinelli, 1997; Raz and Michael, 2001) or six (Ibbs and Kwak, 2000; Munns and Bjeirmi, 1996). Without going into too much detail, regarding what is actually happening in the various stages of the project cycle, it is stated here that initially five stages were used in this research. Whether the customers also perceived these five stages is another matter and will be discussed later (see Appendix A for the questionnaire of the research). Previous literature (e.g. Haverila et al., 2013) has discussed this issue in more detail. It is claimed that the measurement of customers’ assessments of the successfulness of the project can only be measured after the project, and furthermore that measures regarding client acceptance and client consultation are among the key factors in terms of customer satisfaction in project management (Pinto and Mantel, 1990).

In conclusion, the precise number of stages in a project is dependent upon the nature and complexity of the project. The extant literature expectedly has not come to a conclusion on

the number of stages applicable to all types of projects. As aforementioned, this research initially used five stages in the project. These five stages are generally in agreement with the Project Management Institute (2013) framework. These phases were:

- pre-proposal,
- proposal,
- installation,
- commissioning and start-up, and
- completion and warranty.

2.4. Customer satisfaction in project management

Customer satisfaction (or dissatisfaction) can be defined as the customer’s perception of a product’s qualities matching (or failing) their preconceived expectations (Kotler et al., 2013). Customers compare the product’s performance against an internal standard. They are satisfied when the product exceeds this standard, and disappointed (or dissatisfied) when it falls below it. Specifically in project management, customer satisfaction has been met when a project meets pre-defined goals, such as ending by a certain date within budget (Fortune et al., 2011; Leung et al., 2004; Yaghootkar and Gil, 2012). Furthermore, in the case of the building control systems company of this study, maintenance and monitoring are large aspects of their project management process. It is even more important to understand how to measure customer satisfaction, as the long-term satisfaction of their customers is a key goal of their business and subsequent profits.

Customer satisfaction in project management directly impacts the likelihood of receiving a new project, and the level of satisfaction in the current project (Ahmed and Kangari, 1995; Maloney, 2002; Yang and Peng, 2008). It becomes pivotal that the product is delivered on time and within budget, so as to generate a profit for the company and also satisfy the customer (Fortune et al., 2011; Maloney, 2002).

In the case of the construction industry, which is related to the facilities management installation projects of this research as neither typically include maintenance and operations, Maloney (2002) contended that total project management, including the physical product as well as the service delivery, should be reflected upon when customer satisfaction is being measured. Five specific dimensions were determined to play an important role when evaluating customer satisfaction including cost, project management, contractor/customer relationship, prepared/skilled workforce and safety. This range of dimensions

Table 1
Summary of the project stages.

Phase	Pre-proposal	Proposal	Installation	Commissioning and start-up	Completion and warranty
Actions	1. Financial feasibility 2. Project scope (business requirements) 3. Request for proposal	4. Time frame, cost, quality, and scope 5. Vendor selection 6. Contract	7. Installation	8. Release to the customer’s use 9. De-bugging 10. Maintenance requirements	11. Final documentation 12. Signing off 13. Final invoice 14. Warranty period
Throughout the project	Client acceptance measures				

identifies the complexities dealt with in project management and how difficult it may be to measure subsequent customer satisfaction (Atkinson, 1999; Yang and Peng, 2008). The study by Ahmed and Kangari (1995) identified six client-satisfaction factors, including quality, cost, time, communication skills, response to complaints and client orientation. These variables were determined to be important when conducting a survey to define and measure the client-satisfaction levels in the construction industry. Furthermore, they established that when client satisfaction was evaluated in a survey, all of the 6 factors were equally important. Maloney's study in 2002 adds to the evidence presented by Ahmed and Kangari (1995) regarding the factors required to measure customer satisfaction. However, among the 11 identified determinants by Maloney (2002) and Ahmed and Kangari (1995), only those related to costs overlap clearly between the two studies. Cost is only a portion of the overall satisfaction experienced by a customer in a complex product offering, such as in project management (Fortune et al., 2011; Kotler et al., 2013). Cost variation only becomes pivotal to a product when that is the only way to differentiate the product/service offering in the market place. However, the range of aspects found in project management means that customer's requirements are diverse; customer satisfaction may be lost (or gained) during any phase or goal in the project (Yang and Peng, 2008).

Customer satisfaction in project management is typically measured at the end of a project, after the customer has committed most of their money. Torbica and Stroh (2001) argue that by measuring satisfaction only in the later stages of project management, important information might be lost (Li et al., 2013). They contend that customer satisfaction should be measured during the early stages in project management as well as at the end. This total measurement gives companies more knowledge regarding where they need to improve their customers' satisfaction (Li et al., 2013). Torbica and Stroh (2001) conclude that a customer survey conducted as mentioned would lead to the improved customer satisfaction, as weaknesses in the company's project management process could be identified and immediately rectified. An increase of product quality translates into future projects for the company, which should lead to positive implications such as increased revenue and profit (Kärnä, 2014).

2.5. Customer satisfaction implications

Without a question, customer satisfaction is a key driver of financial performance (Eklöf et al., 1999; Ittner and Larcker, 1998; Matzler et al., 2004). It has been claimed in these studies and many others that satisfaction leads to increased loyalty, reduced price elasticity, increased cross-buying, and positive word of mouth. As the customer gained more satisfaction or "payment equity" (Bolton and Lemon, 1999) in their purchases, the amount of money the customers were willing to pay for the product increased also. Thus, the company with the highest customer satisfaction levels would enjoy the greatest economic gains (Williams and Naumann, 2011).

2.6. The product element in project management: Is product superiority important and is there possibly a moderating impact?

Product superiority has received quite a bit of attention in research related to new product development projects, but this is not the case in terms of project management. This evident lack of research might be due to the fact that many project management companies deliver solutions, i.e. combinations of products and services, which extend to post implementations activities (Brady et al., 2005). In the study by Oliver (1999) it was concluded that the number one reason that customers are satisfied, is due to the superiority of the product they have acquired; the product is the basis of all business. Whether it is tangible goods or intangible, such as a service or experience, product superiority is fundamental in any economy (Garrison et al., 2012; Kotler et al., 2013).

Extensive studies have been performed to determine best practices leading to product superiority (Cooper, 1996; Cooper, 1998). To actually obtain product superiority, successful systems have been identified to include such methods as: strong R&D, robust product identity, working with the customer, a defined deadline process, a focus on quality and a thorough, yet flexible overall system (Cooper, 1996). Businesses that follow the practices listed previously are more likely to enjoy customer satisfaction and thus increased sales.

The strength of a firm's customer satisfaction has been shown to impact long-term profitability in a company. In the study conducted by Anderon and Sullivan (1993), they showed measuring respondent's satisfaction, expectations, perceived quality, repurchasing intentions, ease of recognizing quality and degree of confirmation/disconfirmation (C/D) that customer satisfaction also has an positive impact on repurchase intentions. Furthermore, the elasticity of the repurchase intentions was reduced in companies with high customer satisfaction. Elasticity in this case, refers to the amount of variability (repurchase intentions) that will occur when a variable (customer satisfaction) shifts slightly (Anderon and Sullivan, 1993). This may lead to long-term security in sales, due to a firm's reputation for high customer satisfaction; firms with highly satisfied customers have higher retention of their customers due to the superior quality of their products (Anderon and Sullivan, 1993).

Customer satisfaction, and the subsequent impact on a business's financial success were shown to vary if a company was more product or service based (Nilsson et al., 2001). After measuring the results of a national quality survey for 482 companies in Sweden, Nilsson et al. (2001) found that there was a stronger cause and effect relationship between customer satisfaction and business results in product-dominated firms. While in the same study, the companies in the service industry showed a more complex relationship between customer satisfaction and business success because the customers themselves are part of the service (Nilsson et al., 2001). Furthermore, they concluded that customer satisfaction played a larger role in the product industry rather than service. This finding is imperative for this study in the project management industry because its' offerings consists of both product and service

components. Additionally, the significance of Nilsson et al.'s (2001) findings indicates that product superiority is an antecedent indicator of customer satisfaction. If the product's superiority is more important than the service aspect in project management, then the results of our research may become important when measuring customer satisfaction in the industry.

It is also possible, in addition to the direct impact of the product's superiority on customer satisfaction, that the product's superiority moderates the relationship between project management and customer satisfaction. However, the moderating aspect of product superiority on customer satisfaction has not been researched; other variables have been shown to play a moderating role on customer satisfaction. In the study by Suh and Youjae (2006), they tested the moderating role that product involvement plays upon customer satisfaction and, subsequent, loyalty relationship. Product involvement can be defined as the general interest or awareness a consumer has for a product class (Kotler et al., 2013). It has been suggested that an increased level of product involvement will cause a consumer to spend more time gathering information, regarding the product, before making a decision concerning which item to purchase (Celsi and Olson, 1988). Low product involvement occurs in products that are simple and their efficacy leads to customer satisfaction (or dissatisfaction) directly after its use (Suh and Youjae, 2006). The customer's past experience with the product is the main indicator of satisfaction and ensuing repurchase intentions. However in complex or ambiguous products that exhibit high involvement, the customer relies on more outside information, rather than just product usage, to determine their satisfaction levels (Suh and Youjae, 2006). This means that the customer's attitudes towards the company's corporate image and advertisements are more central in determining their overall satisfaction with the product.

A critical indicator of customer satisfaction that is often overlooked in project management is the project's goals and if the original goal is achieved (Dvir and Lechler, 2004). In the study by Dvir and Lechler (2004), the authors found that changes in project goals, rather than specific plan changes, have the highest negative impact on customer satisfaction. They used a detailed questionnaire measuring several variables on both a successful and failed project, in a pair-like manner, for 448 projects. They showed that traditional planning, which focuses on tangible success factors such as budget and schedule goals, may not always result in a successful project in the customer's point of view (Dvir and Lechler, 2004). This indicates that customers find the most value in the pre-determined goals of the project, rather than the method in which it was conducted (the outlined plans). The study by Dvir and Lechler (2004) is extremely relevant to our study as the goal of the project may also be defined as the end product; the completed project.

3. Hypotheses

The previous stage in this research project indicated that the customers in fact perceived there to be three stages in the

system delivery project (please see the "Analytical techniques" part in the "Research methods" section). On the basis of this and the Literature review the theoretical framework of the study is demonstrated in Fig. 1.

On this basis the hypotheses of the research are the following:

- H1.** The better the perceived product superiority the stronger is the customer satisfaction in project management.
- H2.** The better the perceived product superiority, the stronger the relationship between perceived project management performance in the pre-installation (pre-proposal and proposal) stage and perceived customer satisfaction.
- H3.** The better the perceived product superiority, the stronger the relationship between perceived project management performance in the installation stage and perceived customer satisfaction.
- H4.** The better the perceived product superiority, the stronger the relationship between perceived project management performance in the post-installation stage and perceived customer satisfaction.

4. Research methods

4.1. The firm

The focus of our project management study is the installation of building control systems such as heating, cooling, security and ventilation structures installed by a Fortune 500 company (Fortune Magazine, 2014). The projects studied here were the installation of new or retrofit heating, ventilation, air conditioning, and security systems that it manufactures, delivers and operates for the client organizations. It is noteworthy that the maintenance aspect of the business, which is not a part of project management, is covered under the so-called "planned service agreement" that follows most installation projects. The data in this research project relates, however, only to the installation, and not to the maintenance and operations parts. The firm has operations in over 100 countries, with over 100,000 customers worldwide, and delivers thousands of complete system delivery projects to its customers every year. The firm had a variety of improvement initiatives in place, such as customer relationship management and Six Sigma process improvement, to constantly improve its performance.

4.2. The sample

Since the firm had a threshold minimum revenue levels for its projects, most of the projects were for large customer facilities and thus accounts of a smaller size were screened out indicating a degree of similarity in terms of size. Before the initiation of each system delivery project a formal contract was signed between the customer and the project delivery organization. This contract specified the project parameters including scope of work, milestones, project schedule, and cost.

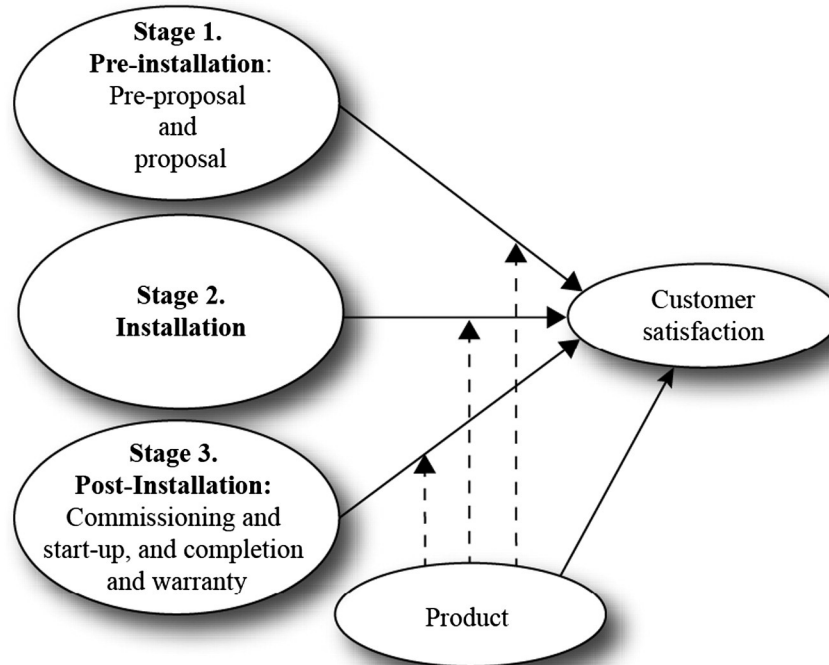


Fig. 1. The theoretical framework of the study.

Furthermore, the contract also specified the key contact person in the customer organization. This person was typically the person in charge of over-seeing the project and was usually a facilities manager. Approximately 80% of respondents had this title, with most of the other respondents being a type of engineer.

When the contract was started, the respondent to the survey was informed personally that a customer satisfaction survey would be done within 30 days after the project's completion. As a result, response rates for the survey were 60–65% each month. Within 30 days of signing off on the project, the person's name went into a sample frame for further research purposes. Every month the sample frame was then sent to a market research company. The market research company did not provide any financial or other incentive for the respondents to respond. The research firm made an effort to reach all customers by telephone, fax or email. The data in this research comes from respondents located in the United States. For the purposes of this study, data was aggregated over 18 consecutive months. During this period, 3129 surveys were completed.

4.3. Questionnaire development

The questionnaire was developed through a multi-stage process by an experienced marketing research firm in which one of the researchers of this research project acted as the principal investigator. The questionnaire development process proceeded as follows:

1. Qualitative in-depth interviews were conducted with a sample of 20 customers. During these interviews the

respondents were asked to recognize the key drivers of satisfaction in a system delivery project. A variety of questions were asked to get more detailed responses.

2. The results of these qualitative interviews were then converted into actual research questions.
3. These questions were then grouped into various project management stages by the project delivery firm. In the questionnaire these stages were not, however, disclosed to the respondents.
4. This set of questions was then circulated to an executive steering committee in the project delivery firm for review and modification.
5. The market research firm then reviewed existing approaches in both commercial and academic research.
6. The final version of the questionnaire was then created.

The questionnaire consisted of a total of 16 independent project management items, two dependent customer satisfaction items, and 4 product items. The customer satisfaction construct consisted of a linear aggregation of two questions: overall satisfaction, and met expectations. The assessment of customer satisfaction can be done from two temporal positionings, i.e. a priori (before) or alternatively a posteriori (after) the actual purchase. In the a priori assessment, the objective is to measure attitude. While adversely in the a posteriori, the objective is to measure satisfaction and related measures. In this case both satisfaction and met expectations are post-decision variables. This approach is consistent with other previously conducted research (Barry et al., 2008; Gruca and Rego, 2005; Zeithaml, 1988). Similarly a linear aggregation on the four product related questions was applied.

The project management phases were pre-proposal, proposal, installation, commissioning, and completion and warranty phases (see [Appendix A](#) for the detailed list of the questions). Since the survey was mainly administered by phone, a five-point response scale was used. Most of the performance assessment questions used the response scale of “Excellent-Very Good-Good-Fair-Poor” to measure the customer’s perceptions of the supplier’s project management performance. A “Don’t Know” option was available for all questions.

4.4. Analytical techniques

In the previous phase of this research project ([Haverila et al., 2013](#)) an exploratory factor analysis of the independent variables was conducted. The rationale to use EFA has been explained in detail in that study. The results of the previous study indicated that:

“Although the senior executives in the supplier firm distinguished between “pre-proposal” and “proposal” phases, the customers conceptualized these as a single factor. Similarly, the executives distinguished between the “commissioning and start-up” phase and the “completion and warranty” phase. However, the customers conceptualized these as a single factor. So, customers conceptualize a project as consisting of three phases, everything leading up to, and including, the proposal as the first phase. The second phase is the actual installation, with all items loading as expected. The third phase is everything that happens after the installation is finished. Although this firm installed 5–10,000 systems each year, the executives did not accurately perceive the way that customers conceptualized the projects.”

[Table 2](#) summarizes these findings as follows.

In order to investigate the direct relationship between product superiority and customer satisfaction a simple linear regression analysis was conducted. Since there was no evidence in the prior research on the approach for applying linear aggregation on the four product related questions 3, 4, 5 and 6 ([Appendix A](#)), an exploratory factor analysis (EFA) was applied in order to make sure that the items correlated with each other. On the basis of the results in [Table 3](#), the decision to use the linear aggregation method for the product related questions can be deemed as appropriate due to high factor loadings, acceptable communality values as well as acceptable item reliability values as measured with the [Cronbach \(1951\)](#) ([Hair et al., 2006](#)).

The data was then entered into stepwise regression models to examine the main relationships depicted in [Fig. 1](#).

Specifically, the factors that emerged from the EFA as conducted in the prior research ([Haverila et al., 2013](#)) were introduced as independent variables that predicted variation in satisfaction. The product’s role was introduced as a moderating variable influencing the linkage between the independent and dependent variables as well as directly impacting customer satisfaction.

4.5. Methodological limitations

A feasible limitation for the methodology of this research project may be the perception that the marketing research firm acted as the principal investigator in the project. This may potentially cause some bias for the results of this research. One of the researchers with a PhD in marketing acted, however, as the principal investigator in the marketing research firm with an aim to minimize these kinds of issues of bias. Thus the researcher of this paper had access to raw data. Furthermore, the authors of this paper have done all of the analysis for this research paper.

Another methodological limitation is the fact that only one person in the customer firm was interviewed in this research project. In spite of the fact that this is a relatively standard practice in customer satisfaction surveys also in the B-to-B context the use of multiple knowledgeable members of the customer organization to offset the biases of individual respondents probably would reduce measurement error ([Slater and Narver, 1994](#)). It is possible that key persons’ perceptions in a systems delivery project may be biased due to the fact that an individual member may not be fully informed of the extent to which the other members’ preferences have been satisfied ([Austen et al., 2012](#)). It is noteworthy here, however, that the interviewed person was, as stated earlier, in charge of over-seeing the project, usually a facilities manager, and thus should be best informed about the status of the project. Normally there are a number of people involved in industrial buying decisions or industrial project management. Typically industrial buying decisions have been classified as straight rebuy, modified rebuy or new task ([de Boer et al., 2001](#)). The purchasing situation here is likely a modified rebuy or maybe a new task meaning that there likely are multiple people involved in the purchasing decision. Therefore, interviewing multiple people in the purchasing organization may be warranted as a more complete view of customer’s perceptions as there might not be a linear relationship between individual and buying center satisfaction ([Austen et al., 2012](#)). Another related but unquestionably more challenging idea might be in finding out the more specific role of the people involved in the project as they might be influencers, users, decision makers, purchasers or

Table 2
The project management stages in the prior study by [Haverila et al., 2013](#).

Stages as perceived by	Stages				
Project management company	1. Pre-proposal	2. Proposal	3. Installation	4. Commissioning and start-up	5. Completion and warranty
Respondents	1. Pre-proposal and proposal		2. Installation	3. Commissioning and start-up, and completion and warranty	

Table 3
Factor loadings, communalities and item reliability as measured with Cronbach alpha for the product related items.

Variable	Factor loading	Communality	Cronbach alpha	Cronbach alpha for the entire set	Eigen value/ variance
Q3	0860	0779	0794	0839	3.36/55.92%
Q4	0871	0794	0793		
Q5	0793	0673	0806		
Q6	0659	0537	0818		

gatekeepers (Bendixen et al., 2004; Homburg and Rudolph, 2001).

5. Results

5.1. Descriptive statistics

The means and standard deviations of project management stages 1, 2 and 3, customer satisfaction, and product superiority factor were calculated to describe the nature of the data. All correlations between the factors in Table 4 are significant probably due the large number of observations (N = 3129).

5.2. Regression analyses

The results of the exploratory factor analysis in the previous study (Haverila et al., 2013) revealed that stage 1 (pre-installation) was a composition of variables 7, 8, 9, and 10 (see Appendix A), stage 2 (installation) was a composition of variables 11, 12, 13, 14, and 15, and finally the stage 3 (post-installation) was a composition of variables 16, 17, 18, 19, 20, 21 and 22. The exploratory factor analysis met the normal requirements for a satisfactory factor analysis including sufficient factor loadings (>0.50), communalities (>0.50), and variance explained (>0.60). None of the variables showed significant cross-loadings (Hair et al., 2006).

On the basis of the model in Fig. 1 for customer satisfaction, we regressed the three independent variables of perceived

project management performance in the different stages and the product superiority variable on the dependent variables with a regression analysis. These results are presented in Table 5.

The model presented in Table 5 indicates significant linear relationship between the three stages of project management, product superiority and customer satisfaction ($p < 0.001$) explaining 45.2% of the variance, and the stage 3 (post-installation) having the strongest influence on customer satisfaction due to the highest beta value. Also the product superiority appears to significantly contribute towards customer satisfaction in the project management context. Thus Hypothesis 1 is supported. The variance explained (45.2%) indicates that 25.8% of the standard deviation is explained indicating that in addition to the project management variables and product superiority there are other things in play in explaining customer satisfaction (e.g. relationship quality, price, communication). It is also noteworthy that the purpose of this research was not to discover the best possible model explaining customer satisfaction in the context of system delivery projects but rather to investigate the direct and moderating roles of product superiority.

As regards to the other research questions (Hypotheses 2, 3 and 4), i.e. the moderating impact of the product superiority between the stages of the project management performance and customer satisfaction, it appears that when the first moderating Product term variable was added to the model, the beta score was low, but in spite of this the R-Square did increase significantly (Table 6).

When the second moderating Product term variable was added to the model of customer satisfaction (Table 7), the beta scores were again quite low, and again R-Square increased significantly (0.001). The impact, however, was also small.

When the third moderating Product term variable was added to the model of customer satisfaction (Table 8), the beta scores were again low, and again the R-Square did increase significantly (0.001). The impact, however, was also small.

In all three cases, in comparison to Table 5, where the product superiority was an integral part of the model, the R^2 decreased when only the one of the stages with product superiority as a moderator was introduced to the model. Also,

Table 4
Descriptive statistics and correlation coefficients between the independent, dependent aggregated factor variables, and moderating product variables.*

Factor	Aggregated factor mean	S.D.	Stage 1: Project management performance during the pre-installation	Stage 2: Project management performance during installation	Stage 3: Project management performance during post-installation	Customer satisfaction	Product superiority
Stage 1: Project management performance during the pre-installation	3.75	0.76	1.000				
Stage 2: Project management performance during installation	3.47	0.85	0.778*	1.000			
Stage 3: Project management performance during post-installation	3.57	0.77	0.752*	0.797*	1.000		
Customer satisfaction	3.75	0.71	0.617*	0.671*	0.623*	1.000	
Product superiority	3.72	0.71	0.661*	0.663*	0.702*	0.529*	1.000

* $p < 0.001$.

Table 5
Regression analysis for customer satisfaction, and product superiority.

	Customer satisfaction		
	Beta	t	p
Project management performance during stage 1: Pre-installation	0.120	31.80	***
Project management performance during stage 2: Installation	0.194	28.10	***
Project management performance during stage 3: Post-installation	0.361	35.92	***
Product superiority	0.452	-22.74	***
R ²	0.452		
Adjusted R ²	0.451		
F	644.08		

Standardized coefficient betas are shown.
***p < 0.001.

the small drop in the adjusted R² in all cases indicates that there was a relatively small number of coefficients in the model and also that the sample size was adequate (Nau, 2015). The relatively high F value in all cases on the other hand indicates that the systems delivery project data used in this research fits the regression model well.

6. Discussion

Hypotheses 1 through 4 were accepted in our study as in each model’s case a highly significant p-value (p < 0.001) was exhibited in Tables 5 through 8. However, as indicated in Table 5, the most significant p-value and the highest R² (0.451) was seen in the Hypothesis 1 scenario of product superiority acting as a direct impact on customer satisfaction together with the three project management stages. Hypothesis 1 was one of the main questions in the study aiming to determine if product superiority played a direct role in customer satisfaction and the project management relationship. This higher significance indicates that product superiority plays a greater, and more direct

Table 6
Moderated regression results for customer satisfaction: Introduction of moderating Product term 1.

	Customer satisfaction		
	Beta	t	p
Project management performance during stage 1: Pre-installation	0.377	25.7	***
Project management performance during stage 2: Installation	0.278	19.6	***
Project management performance during stage 3: Post-installation	0.410	29.00	***
Project management performance during stage 1* Product superiority	0.094	8.19	***
Project management performance during stage 2* Product superiority			
Project management performance during stage 3* Product superiority			
R2	0.375		
Adjusted R2	0.374		
F	467.90		

Standardized coefficient betas are shown.
***p < 0.001, and *p < 0.05, ns = non-significant.

Table 7
Moderated regression results for customer satisfaction: Introduction of moderating Product term 2.

	Customer satisfaction		
	Beta	t	p
Project management performance during stage 1: Pre-installation	0.351	24.8	***
Project management performance during stage 2: Installation	0.311	21.0	***
Project management performance during stage 3: Post-installation	0.401	28.4	***
Project management performance during stage 1* Product superiority			
Project management performance during stage 2* Product superiority	0.100	8.7	***
Project management performance during stage 3* Product superiority			
R ²	0.376		
Adjusted R ²	0.376		
F	471.46		

Standardized coefficient betas are shown.
***p < 0.001, and *p < 0.05, ns = non-significant.

role for the customer perceptions in the project management relationship, rather than a moderating one as indicated with Hypotheses 2–4.

In order for managers to garner high customer satisfaction in all stages of the project management lifecycle, product superiority needs to be a high and vital priority. However the changes in R² scores, seen after the addition of the product superiority variable in the moderating models, was somewhat unexpected and has resulted in interesting conclusions as a whole.

The second main research question we focused on was the moderating aspect of product superiority on the project management and customer satisfaction relationship. Specifically, we investigated the moderating role that product superiority may play on each separate stage of the project lifecycle:

Table 8
Moderated regression results for customer satisfaction: Introduction of moderating Product term 3.

	Customer satisfaction		
	Beta	t	p
Project management performance during stage 1: Pre-installation	0.346	24.4	***
Project management performance during stage 2: Installation	0.268	18.8	***
Project management performance during stage 3: Post-installation	0.422	29.3	***
Project management performance during stage 1* Product superiority			
Project management performance during stage 2* Product superiority			
Project management performance during stage 3* Product superiority	0.067	5.63	***
R ²	0.368		
Adjusted R ²	0.367		
F	454.05		

Standardized coefficient betas are shown.
***p < 0.001, and *p < 0.05, ns = non-significant.

pre-installation, installation and post-installation. These questions are reflected in *Hypotheses 2–4*, respectively. As aforementioned, each model was significant, but the low change in the R^2 score shows that product superiority is not as critical in its moderating role and may be concluded to have a weak impact. The strongest R^2 ($R^2 = 0.376$) value was seen in *Table 7* for the installation phase. However, this R^2 value was only 0.08 higher than the lowest score, as seen in *Table 8* (post-installation).

The results of our study point to a number of contributions to this field of research. First, product superiority plays a strong, direct role in customer satisfaction and ultimately project success in project management. Second, we demonstrated that although product superiority plays a weak role as a moderator, this role does not vary between project management phases. The findings will be discussed below. Third, maybe somewhat surprisingly the role of project management, i.e. the service component, seems to play a much stronger role in the context of systems delivery projects than the product component. Fourth, it appears that due to the lack of the moderating impact of product superiority, the customers quite possibly perceive the product to be an essential part of the project, and not as an external factor moderating the relationship.

6.1. Product superiority has a direct impact on customer satisfaction in project management

The results showed that product superiority in project management has a direct impact on the perceived customer satisfaction in the context of system delivery projects. Many earlier studies have shown the importance of product superiority, which results in multiple aspects of business success (Cooper, 1994; Cooper, 1996; Kleinschmidt and Cooper, 1987; Oliver, 1999) ranging from customer satisfaction, loyalty, and market advantage to increased profits. We compliment the pre-existing product superiority research by showing the direct correlation that product superiority has on customer satisfaction. Nilsson et al. (2001) showed in their study that customer satisfaction was a more critical aspect for product-dominated companies, rather than service-based firms. However, as project management consists of both service and product based components, these results reflect ours in this study. The results suggest that product superiority is a precursor for customer satisfaction in the project management industry having lower impacts on customer satisfaction than the actual project management side. This may be an indication of the more service than product oriented nature of the system delivery projects. These findings can be used for future customer satisfaction studies in the industry; questions should emphasize perhaps more on the product superiority in the different project management contexts as our study indicates as the product's superiority has a strong influence on customer satisfaction.

Furthermore, our focus on the influence product superiority has upon customer satisfaction is reflected in the study by Dvir and Lechler (2004). The authors indicated that the greatest customer satisfaction was seen when the original goals of a project were met, rather than the method in which they were

achieved (Dvir and Lechler, 2004). These original goals may be viewed as the physical product and the method as the service in project management. This study supports Nilsson et al.'s (2001) conclusions that customer satisfaction is more important in product-based companies as Dvir and Lechler (2004) also showed that the product (original goal) was most critical to customers.

The incorporation of the conclusions found in Nilsson et al.'s (2001) analysis combined with that of Dvir and Lechler's (2004) validates our study's results; product superiority has a very important role in predicting and resulting in customer satisfaction in project management.

6.2. Product superiority as a poor moderator on customer satisfaction in project management

As indicated previously, there is a gap in both the customer satisfaction and project management research regarding the impact of product superiority. However, in terms of the moderating impact it may continue to be a less researched area as our results indicated that product superiority was a poor moderator. Furthermore, it has been shown that researchers do not enjoy studying weak and/or irrelevant results, as it is harder to draw meaningful conclusions (Jenkins, 1996). The moment product superiority was added to the model in a moderating role, the correlation as well as significance of the models decreased. This is a perhaps somewhat unexpected result as in *Hypothesis 1*, product superiority was shown to have such a strong direct impact on the customer satisfaction and project management relationship.

Although, these results may be explained by the statistical nature of the moderating variable in our study: product superiority. "A moderator variable has been defined as one which systematically modifies either the form and/or strength of the relationship between a predictor and a criterion variable," (Sharma et al., 1981, p. 291). In this case, product superiority is specifically a type of quasi-moderator, which influences the form of the relationship between the predictor and criterion variables while being a predictor variable simultaneously (Helm and Mark, 2012; Sharma et al., 1981). The indication of weaker correlations may therefore be explained by the fact that product superiority is a poor moderator on the relationship in question (Helm and Mark, 2012). However, this inadvertently strengthens our main results, that it is a strong predictor variable for customer satisfaction; the weak results in *Hypotheses 2–4* support that of *Hypothesis 1*.

7. Conclusions, limitations and future research

This paper examined the direct and/or moderating impact product superiority had on customer satisfaction in system delivery project management. Past research has indicated extensively the importance of customer satisfaction in business, which ranged from customer loyalty, increased sales and profit margins to long-term partnerships with clients. However, the role that product superiority plays on this critical indicator of

business success (customer satisfaction) has not been extensively researched. Furthermore, the research of product superiority has been scarce in the product management literature. Based upon past studies, it has been indicated that the actual product offering is a direct antecedent for customer satisfaction, although it does not have such a strong relationship in service-based companies. Through the results in our study, we showed that product superiority has a strong direct impact on customer satisfaction throughout the product management lifecycle. However, product superiority was also shown to be a weak quasi-moderating variable, as the explaining power of the models reduced in comparison to the direct impact of product superiority model once product superiority was placed in a moderating role. This weaker result strengthens the support for the direct significance of product superiority in project management.

Future research should focus on if a difference exists in customer satisfaction between the project lifecycle stages in project management. This study found significance in the process as a whole, but the identification of differences between the stages would provide more information for project managers as it shows specifically where customers find the most importance in a project.

Furthermore, as these system delivery projects have a long life span, most of the interactions (based upon time) occur with the customer in the third (post) phase of project management. This somewhat differs from other forms of project management such as building construction, which do not typically interact with the customer extensively after the project is completed to the contract's specifications (Torbica and Stroh, 2001). However in the case of systems delivery projects, the post phase of project management is integral to the long-term relationship with the customer. Therefore, future research should aim to identify if product superiority still plays a direct role in customer satisfaction at various time intervals after the completion of the project (1 year, 3 years, etc.). Previous research has shown that customer satisfaction does not play as important role in service-based firms as in product-based firms; however, in the long time periods present for the study company, the service factor may become more relevant and discernible. Also examining the role of price, as having direct and/or moderating role in explaining customer satisfaction similarly to the impact of product superiority in this research, would be an interesting research venue. Finally it would be fascinating to examine the direct and moderating impact of product superiority on the project management and customer satisfaction relationship between customers who perceived to receive a truly excellent product (perceptions exceeding the value of 4.00 in this research) and customers perceived to receive less than excellent product.

Another vital theme that should be researched in regards to our study is the breakdown of product superiority. Project management consists of both service and product aspects. Does product superiority combine both of these parts equally? Is there a difference in how project managers view the subject in comparison to customers? The dissection of product superiority may further clarify why it is a poor quasi-moderator in our study and help managers achieve the desired higher customer satisfaction ratings.

Limitations of our study mainly focus upon the treatment of the product superiority variable. Its role as a quasi-moderator indicates its use both as a predictor variable and a term variable that impact the predictor–criterion relationship (Sharma et al., 1981; Helm and Mark, 2012). Product superiority's weak role as a moderator may be due to the fact that no real moderator is present at all in our study. This result could have been avoided by conduction of a Chow test in order to determine if regression coefficients differ across subgroups (project phases) (Sharma et al., 1981). If no significant difference was found, then the aspect of product superiority as a moderator could possibly be redundant.

In addition having multiple respondents respond to the survey in the customer organization would potentially have eliminated bias in terms of the respondents' role in the customer organization due to the fact that typically multiple persons with different roles are involved the B-to-B decision making. Also another limitation may be the perception that the marketing research firm acted as the principal investigator in the project in this research project. Due to the fact that one of the authors of this paper acted as a principal investigator in the marketing research firm alleviated the impact of this limitation.

Conflict of interest

There is no conflict of interest.

Appendix A. The questionnaire

A.1. Introduction (read to the respondent)

Our records indicate that you have completed or are in the process of completing an installation project with our company. We are calling you to identify how our company can better serve your needs. We would like to ask a few questions about the recent installation project.

A.2. Questions

1. Thinking about your overall experience with the company during the past 12 months, how satisfied are you in doing business with the company?
 - 5 Very satisfied
 - 4 Satisfied
 - 3 Neither satisfied nor dissatisfied
 - 2 Dissatisfied
 - 1 Very dissatisfied
 - 0 DON'T KNOW/REFUSED
2. Considering the company's overall performance, would you say that the company has:
 - 5 Significantly exceeded your expectations
 - 4 Somewhat exceeded your expectations
 - 3 Met your expectations
 - 2 Somewhat below your expectations
 - 1 Significantly below your expectations
 - 0 DON'T KNOW/REFUSED
3. How would you rate the company on overall product quality?

- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
4. How would you rate the company's products for dependability?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
5. How would you rate the innovativeness of the company's products?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
6. How would you rate the company's products and parts for availability when you need them?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
7. How would you rate the company for providing advice and suggestions regarding the development of specifications for your project?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
8. How would you rate the company for attending meetings/site visits – doing everything necessary to understand the project requirements?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
9. How would you rate the company in demonstrating knowledge and expertise to show understanding of the customer's business?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
10. How would you rate the company for delivering a proposal that meets the intent of your company's specifications?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
11. How would you rate the company for creating and communicating a reliable project schedule?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
12. How would you rate the company for meeting milestones as specified by the project schedule?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
13. How would you rate the company for committing the appropriate resources to complete the project as scheduled?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
14. How would you rate the company's personnel for communicating effectively throughout the phases of this project?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
15. How would you rate the company personnel for coordinating their work with other contractors (or the owner's staff)?
5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
16. How would you rate the quality of the installed systems?
5 Excellent
4 Very good
3 Good
2 Fair

- 1 Poor
0 DON'T KNOW/REFUSED
17. How would you rate the company for conducting proper checkout and demonstration of the system?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
18. How would you rate the company for efficiently diagnosing and correcting start-up problems?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
19. How would you rate the company for informing you of the warranty process for this project?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
20. How would you rate the company for resolving warranty issues as defined by the warranty process?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
21. How would you rate the company for providing complete, final documentation – including “as built” drawings, as per the project schedule?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED
22. How would you rate the company for working with all parties to resolve building control problems including deficiency items?
- 5 Excellent
4 Very good
3 Good
2 Fair
1 Poor
0 DON'T KNOW/REFUSED

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