

MASTER

**Combining goods and services in the capital goods industry
what are the effects of perceived product and service quality on brand reputation and loyalty?**

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Eindhoven, August 2014

**Combining goods and services in
the capital goods industry:
What are the effects of perceived
product and service quality on
brand reputation and loyalty?**

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“The success of your client is a success of yours”

– Harvey Specter

Preface

Before you lies the report which is the result of my graduation project in completion of the Innovation Management master at the Eindhoven University of Technology. The project has been conducted at Vanderlande in Veghel. On this note I would like to express my gratitude to all people who have made this project possible. Some persons deserve some additional acknowledgement though.

First of all, I would like to thank my supervisors. My first supervisor, Jeroen Schepers for his prompt feedback and responses. He has been a great help and really pushed me into the right direction sometimes. Second, I would like to thank Néomie Raassens for her keen insights that helped me to improve my thesis. And last but not least, I would like to thank Arthur Weesie for his full support within the company and providing me with the freedom to discover things on my own.

Second, I would like to thank all my colleagues at Vanderlande who showed interest and provided me with input for my thesis.

Third, I would like to thank my family and friends. My parents, and in particular my father and business partner who made it (im)possible for me to combine my thesis project with work for our company. I would like to thank my friends for being patient with me and for enduring my occasional whining.

Nick van de Ligt

America, August 2014

Abstract

Firms in the capital goods industry that traditionally focused on selling products, spare parts, and services face difficulties because of increasing competition and declining margins. Therefore a broad field of literature argues to offer integrated solutions, a combination of products and services, to their customers to create higher value for themselves and their customers. In this study the interplay of perceived product and service quality and its effects on the perceptual value dimensions brand reputation and loyalty are researched. Moreover, conditions under which these effects are strengthened are researched by including three moderators: customer knowledge, solution complexity, and environmental volatility. In order to test the hypotheses, data was analyzed with the Partial Least Square (PLS) method. From the results it can be concluded that both product and service quality are antecedents of brand reputation and loyalty. This means that when a customer perceives product and/or service quality as high, repurchase intentions increase. Of the two, service quality has the strongest effect on loyalty, indicating that services are increasingly important in the capital goods industry. Product quality has the strongest effect on brand reputation, which in turn is found to be an antecedent of loyalty. Finally, the findings show that low customer knowledge about the integrated solution attenuates the main effect between service quality and brand reputation.

Keywords: perceived product quality, perceived service quality, brand reputation, loyalty, integrated solutions, value, customer knowledge, solution complexity, environmental volatility

Executive Summary

This research has the aim to narrow two research gaps in marketing literature. First, there seems to be little agreement on what value is and what a product or service constitutes. The main rationale and debate, concerning this development in literature and practice, leads back to the product-service duality. In literature there seems to be a predilection for either the goods- or service-dominant logic. Rather than taking a dichotomized view of goods and services, this study integrates views from the goods- and service-dominant logic, assuming that business offerings are combinations of products and services. Second, the different conceptualizations of value in extant literature are better tailored to consumer markets or service providers rather than the capital goods industry. As firms in the capital goods industry are offering more and more services in addition to their core product, the main objective of this study is to identify to what extent product quality, and vice versa service quality, affects the perceptual value dimensions brand reputation and loyalty. The conditions under which product and/or service quality are strengthened are endeavored to be brought to surface by three moderators: customer knowledge, solution complexity, and environmental volatility. The following research question and related sub-questions are central to this study.

Combining goods and services in the capital goods industry: What are the effects of perceived product and service quality on brand reputation and loyalty?

- a. *Under what conditions does product quality have a stronger effect on brand reputation and loyalty?*
- b. *Under what conditions does service quality have a stronger effect on brand reputation and loyalty?*

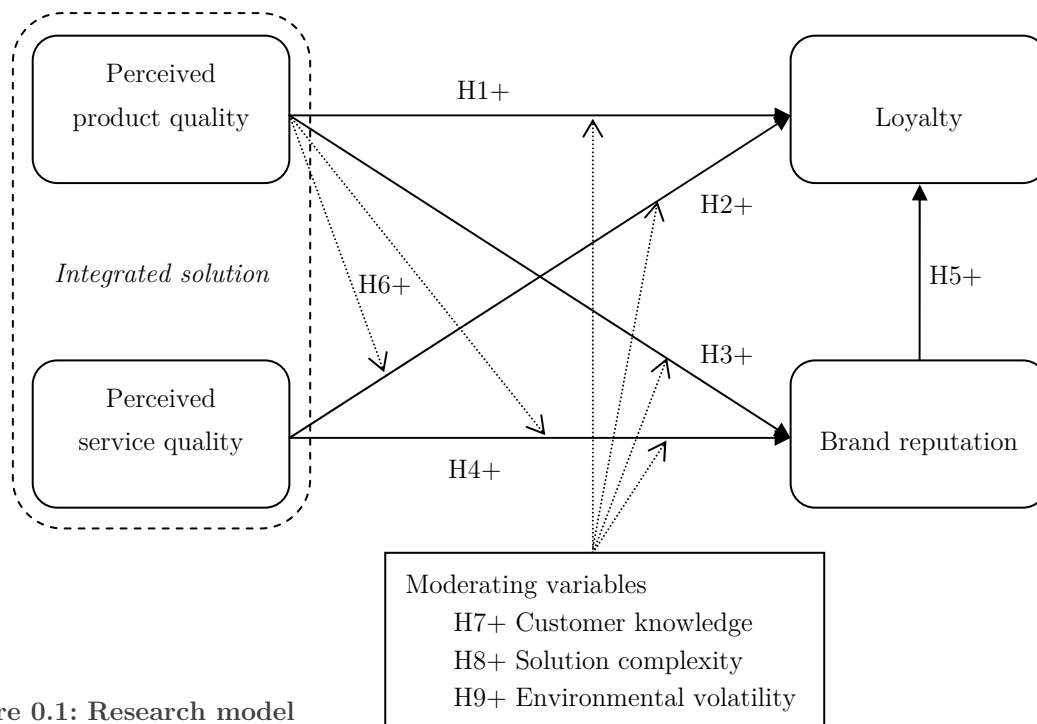


Figure 0.1: Research model

Research method

The required data for the analysis were gathered through an online survey among customers of Vanderlande in several parts of the world. Of the 35 customers that responded, 6% were located in Africa, 3% in the Middle East, 23% in the United States, 3% in Latin America, 3% in Australia, and 63% in Europe. Among the respondents 9% was at the board-level of the airport, 63% were technical or facilities managers of some kind, and 28% were project managers involved with the baggage handling system. Moreover, 60% of the airports were owned by a governmental party, 14% by a private party, and 23% by both a governmental and private party (public-private partnership).

In order to test the hypotheses, data was analyzed with the Partial Least Square (PLS) method using the SmartPLS statistical package.

Discussion and conclusion

From the results (see Table 0.1) it can be concluded that both product and service quality are antecedents of brand reputation and loyalty. However, the effects are not equal in strength. In the capital goods industry where the product is often the major part of the integrated solution, product quality is still the most important determinant for the overall perception of quality associated with the brand (i.e., brand reputation). However, service quality is the main contributor to loyalty. Especially the latter is of interest as technology gaps are narrowing, especially in mature markets, making differentiation based on product quality hard (Ulaga & Eggert, 2006). So while offering superior product quality is a must, service attributes can be used as differentiator to build valuable relationships with their customers. However, there is a caveat to this suggestion as brand reputation is mediating the effect between product quality and loyalty. Thus, because of its effect on brand reputation, product quality also has an indirect effect on loyalty, which service quality does not have, implying increased importance of product quality for loyalty creation.

Relationship	β	t-Value	Hypothesis	Supported
Product quality \rightarrow Loyalty	0.195	2.912	H1	Yes
Service quality \rightarrow Loyalty	0.511	8.219	H2	Yes
Product quality \rightarrow Brand reputation	0.741	13.674	H3	Yes
Service quality \rightarrow Brand reputation	0.147	1.928	H4	Yes
Brand reputation \rightarrow Loyalty	0.352	3.484	H5	Yes
R ² Loyalty	0.749			
R ² Brand reputation	0.648			

Table 0.1: Summary of PLS analysis Model 1

The findings of the moderator analysis suggests that low customer knowledge (i.e., airport does not perform baggage handling) has an attenuating effect on the relationship between service quality and brand reputation.

Managerial implications

By investigating the interplay of product and service quality of integrated solutions, this study draws a nuanced picture for managers having to decide what to focus on to create a strong brand reputation and customer loyalty.

First, the findings indicate that the main determinant to increase loyalty is service quality. Although the product is usually the core element for customers to purchase an integrated solution (Cater & Cater, 2010), it is shown here that after the good is purchased, customers' repurchase intentions increase through high quality services. The service perceptions of the customer are greatly dependent on the employees of the supplier. Because the installed base (i.e., product) is located at the site of the customer, it is an open field for a customer to observe the supplier. Moreover, service personnel has privileged access to the key physical aspects of the integrated solution, therefore they can best influence and shape the way customers perceive the quality of the services. Thus, service personnel of the supplier should exude trustworthiness and "think service" from the outset. An integrated solution supplier must ensure that its service staff reflects credibility and high quality on site at all times – collaborative operations cannot be based on conflicting interests.

Another important implication is that a strong brand reputation, thus, a well-known product and company name in the market, and being an innovative company, also positively influences loyalty. Managers can enhance the brand reputation by focusing on the customer's perception of product quality. As use or experience with the product enhances the perception of the product, managers can create a stronger brand reputation by demonstrating the product attributes and letting customers experience what the product can do for their business. Managers can achieve that by visiting sites of other customers, with the prospect customer, where an installed base is already in place. Another option may be to have a pilot run on site where new attributes of the product are integrated (when possible) with the existing product to demonstrate the added value. Though, the latter may be more costly and risky. Especially under circumstances of high volatility (i.e., airport is growing) is making the customer aware of the different product attributes likely to increase the brand reputation. Additionally, under these conditions service is likely to become more important in shaping the perception of the brand. Finally, when the customer has low knowledge about the integrated solution (i.e., airport does not perform baggage handling), the focus should be on the perception of the product, as these customers are having difficulties to assess service quality and therefore rely more on the product attributes of the integrated solution.

Limitations and future research directions

This thesis is subject to a number of limitations that should be taken into account while interpreting the results. The first limitation concerns the sample. This work is entirely based on one company in one industry. The specific characteristics may limit the generalization of results. Moreover, the sample size was rather small. Therefore, future research should aim for larger sample sizes and more sectors within the capital goods industry.

A second limitation is the operationalization of the moderators. From theory several assumptions were made leading to the operationalization of the moderators. However, customer knowledge for example, might be explained by other factors than performing baggage handling. It might be that level of education, or the geographic location determines customer knowledge. So, it might be interesting to look at multidimensional operationalizations of the moderators.

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1. Introduction

1.1. Research background and research question

Firms in the capital goods industry that traditionally focused on selling products, spare parts, and services face difficulties because of increasing competition and declining margins. Therefore a broad field of literature (e.g., Brady, Davies, & Gann, 2005; Ulaga & Reinartz, 2011; Windahl & Lakemond, 2010) argues to offer integrated solutions, a combination of products and services, to their customers to create higher value for themselves and their customers. Although in general current marketing literature seems to agree on this, there does not seem to be a coherent body of research (Windahl & Lakemond, 2010). For example, from a transactional approach it can be expected that the product rather than the service shapes the value perception and that the service provision is of subordinate importance. However, with the emphasis of value in specific use situations, interaction through services between the customer and the firm is expected to become more important in shaping the customer's perception of quality (Brady et al. 2005; Olivia & Kallenberg, 2003). This implies that the evaluation of the company's value does not merely rely on the assessment of the functional product, but also on the assessment of the service attributes.

This controversy might be exacerbated by two gaps intrinsic in the marketing literature on integrated solutions. First, there seems to be little agreement on what value is and what a product or service constitutes. The main rationale and debate, concerning this development in literature and practice, leads back to the product-service duality. In literature there seems to be a predilection for either the goods- or service-dominant logic, therefore it is argued that literature will never be conclusive in this discussion and such an endeavor is both unproductive and distracting (Araujo & Spring, 2006). But it is also argued that the ongoing goods versus services debate is useful and fruitful in highlighting the potential of services in marketing, however the very nature of this debate is obscuring the necessary synergies between manufacturing and service industries (Lovelock & Gummesson, 2004). Which relates to the second research gap; the different conceptualizations of value in extant literature are better tailored to consumer markets or service providers rather than the capital goods industry. As firms in the capital goods industry are offering more and more services in addition to their core product, the main objective of this study is to identify to what extent product quality, and vice versa service quality, influences the customer's perception of value. Value creation through interactions between supplier and customer will be the main point of discussion and will be the starting point of the discussion on two of its underlying dimensions, i.e., brand reputation and loyalty. The concepts of service and product quality itself have been researched and discussed rather extensively (e.g., van Riel et al. 2005; Ulaga & Chacour, 2001), but the effects of these on value dimensions such as brand reputation and loyalty for firms in the capital goods industry remain underexposed. It is argued that in order to build a strong brand reputation firms should focus on the customer's perception of both the tangible good and services (van Riel et al. 2005; Ulaga, 2003), where they add that service quality has a stronger effect on brand reputation than product quality. And brand reputation on its turn is an antecedent for loyalty. However, they performed their study in the specialty chemicals industry, so whether these findings hold for the capital goods industry can be called into question.

This study aims to contribute to the sparsely researched area of integrated solutions in the capital goods industry by addressing these two research gaps. Of focal interest is the interplay of

perceived product and service quality and its effects on the perceptual value dimensions brand reputation and loyalty. The conditions under which product and/or service quality are strengthened are endeavored to be brought to surface by three moderators: customer knowledge, solution complexity, and environmental volatility.

The following research question and related sub-questions are central to this study.

Combining goods and services in the capital goods industry: What are the effects of perceived product and service quality on brand reputation and loyalty?

- a. Under what conditions does product quality have a stronger effect on brand reputation and loyalty?*
- b. Under what conditions does service quality have a stronger effect on brand reputation and loyalty?*

It is believed that this study has important implications for practitioners for several reasons. First, a strong brand reputation is argued to be a source of sustainable competitive advantage in business markets (Mudambi, 2002). Second, a high degree of customer loyalty is fundamental to establish and maintain a long-term business relationship. Moreover, loyalty can lead to a greater market share and a higher relative price for the firm's products and services (Chaudhuri & Holbrook, 2001). But to create a strong brand reputation and attain high customer loyalty, a customer has to perceive that a firm's integrated solution is continuously offering the best alternative available, while simultaneously repudiating messages from competitors (Oliver, 1999). So, in this study the focus will be on that perception, assuming that the products and services are already developed, purchased and in use by the customer. Then, if a firm is able to consistently offer high-quality products and services, where should managers focus on when offering integrated solutions to positively influence the firm's brand reputation and customer loyalty – perceived product or service quality?

1.2. Company background and context

This thesis is conducted at Vanderlande. Vanderlande provides automated material handling systems and related services. The company operates in the markets of baggage handling at airports; automation of warehouses and distribution centers; and sorting solutions in parcel and postal facilities. This master thesis project focuses on the baggage handling department of Vanderlande. Vanderlande is world leader with over 30% market share in the baggage handling systems industry. The main target customers for Vanderlande are International and Hub- Airports and Airports with >5 million passengers per annum. The latter only covers about 600 out of 4600 airports around the world, thus Vanderlande's sales force leaves a vast potential customer base largely ignored. Still, Vanderlande does have smaller customers and is capable of supplying airport equipment to smaller airports, but this is generally not its strongest target area. The main reason for this is that in many cases these customers make a buying decision based on the initial investment. So winning a project like this is possible if a company can compete on price. However, competing on price is hard and not preferred due to Vanderlande's organization structure and size. Smaller system suppliers can offer lower prices and have therefore stronger potential to win these projects. However, within Vanderlande they are convinced that they offer superior products and related services in terms of quality. They also indicate that they have a strong company reputation and that customers therefore

(re)purchase their baggage handling systems and related services. But whether customers actually perceive it this way is not evident.

In sum, at Vanderlande they do not know how their customers perceive their products and related services in terms of quality and how that affects the company reputation and customer loyalty.

1.3. Report outline

The remainder of this report is structured as follows. Chapter 2 provides an extensive literature review and delves into the concepts of value and integrated solutions. Subsequently, hypotheses are posed in line with literature in chapter 3. The methodology for testing these hypotheses is described in chapter 4. Thereafter, chapter 5 describes the analysis and results of the research model. Lastly, chapter 6 puts forward the conclusions; theoretical and managerial implications; and limitations of the present study and future research directions.

2. Theoretical background

This chapter presents an extensive literature review. The main objective of this literature review is to identify to what extent the product quality, and vice versa service quality, influences the customer's perception of value. First, an overview of the ongoing discussion about the distinction between products and services is provided to define the concept of integrated solutions. Included is an overview of the different perspectives on integrated solutions to identify overlapping and related topics in contemporary marketing literature. Value creation through interactions between supplier and customer will be the main point of discussion.

2.1. Goods versus Services. What is a business offering?

The era that manufacturing firms solely exchange tangible goods seems to be coming to an end, instead, manufacturers are more and more moving into fields of providing services and customer solutions to distinguish themselves from competition (Ulaga & Reinartz, 2011). However, there is an ongoing discussion on what a product or service is and how they form a business offering. In what follows, different scholarly views on the goods and services debate are concisely described.

2.1.1. Round one – All offerings are services

While manufacturers have always provided customers with services, it appears that many manufacturers are increasingly recognizing services to be a differentiator for competitiveness and growth (Jacob & Ulaga, 2008). Traditionally the key starting point for marketing was the product, where services often deemed to be no more than peripheral activities that added value to the product (Araujo & Spring, 2006). Nevertheless, within marketing literature there has been a proliferation of service literature focusing on the classification of services, and the marketing implications arising from the idiosyncratic features that distinguish a service from a product (e.g., Kotler & Connor, 1977; Shostack, 1977). Intangibility, inseparability of production and consumption, heterogeneity (non-standardization), and perishability (cannot be inventoried), are pervading characteristics in literature to distinguish products from services (Zeithaml, Parasuraman, & Berry, 1985). From this perspective services are mostly defined on basis what they are not – i.e., a product (Baines, Lightfoot, Benedettini, & Kay, 2009; Rathmell, 1966).

Vargo and Lusch (2004a) contended that these four characteristics do not distinct services from goods, but only have its merit from a manufacturing point of view. Their main argument being that both services and goods render service; which they define as “*the application of specialized competences through deeds, processes, and performances for the benefit of another entity or the entity itself*” (Vargo & Lusch, 2004). From this perspective it is argued that service provision is the main driver for economic exchange rather than goods, and manufacturing firms are urged to consider themselves to be service providers. Moreover, they consider manufacturing to be a service of which the output is part of the service-provision process. In this light, goods are regarded as appliances which derive their value from their ability to provide service (Vargo & Lusch, 2004a). Consequently, the renowned service-dominant logic asserts that firms are co-creators of value, which holds that a supplier can only create value propositions because the customer determines value when a good or service is being consumed (Payne, Storbacka, & Frow, 2008). Hence, it is not only the supplier that

creates value, but both supplier and customer must engage in the process of value co-creation (Vargo & Lusch, 2004). However, specifics on how value should be co-created in the capital goods industry remain underexposed (Windahl & Lakemond, 2010). Although services have received more attention in both literature and practice, the service-dominant logic has received quite some criticism with regard to its applicability of findings for the capital goods industry, mostly as research is argued to be conducted for the services sector or consumer markets (Jackson, Neidell, & Lunsford, 1995; Windahl & Lakemond, 2010).

The service dominant logic addresses value as the extent to which a customer perceives to be better off or worse by the supplier's offering, through experiences in anyway related to consumption – so called value-in-use (Ulaga & Reinartz, 2011; Vargo & Lusch, 2004). However, Grönroos and Voima (2013) argue that value cannot be only value-in-use, because the supplier's activities before use (e.g., design, manufacturing) are involved.

2.1.2. Round two – All offerings are goods

In direct contrast to the service-dominant logic is an emerging stream of literature implying the objectification of services. Lindberg and Nordin (2008) challenge the service-dominant logic and argue that both products and services are, in order to be exchangeable, objectified by industrial buyers in the procurement process. From this point of view, the product involved in the transaction is not necessarily a physically delimited and tangible good. A product is then considered from an anthropological and legal sense, which implies that even a service without physical form can be the object of a market transaction. Indeed, from a transactional approach even integrated and customized solutions are eventually specified and described in an agreement to be tradable. Then, a service has become a thing that holds together and it can be appropriated because it has objectified properties (Callon & Muniesa, 2005).

The main business objective according to the goods-dominant logic is to sell goods with a margin as high as possible, while services consist of repairs, maintenance and delivery of spare parts. This is in direct contrast to the service-dominant logic where goods are considered means to an end instead of an end on itself (Vargo & Lusch, 2004).

The goods-dominant logic puts emphasis on value-in-exchange, i.e., value is embedded in a resource and as an output of a labor process, it exists as a singular entity at a given point in time and is exchangeable for other utilities (Grönroos & Voima, 2013). However it cannot be value-in-exchange only, because the customer's actions during use are involved. Instead of pointing out the conceptual and definitional differences between goods and services, there are views in this debate that attempt to coalesce elements from the service- and goods-dominant logic and seek a balance.

2.1.3. Round three – All offerings are combinations of goods and services

Business offerings that integrate products and services, often referred to as integrated solutions, are also extensively discussed in literature. This stream of literature seems to address the capital goods industry in particular. Yet, it uses many labels to indicate more or less the same (see Table 2.1). The general notion is to offer a customized and integrated combination of goods and services for meeting the customer's business needs (Brady, Davies, & Gann, 2005) and to facilitate exchanges that increase cost savings and/or the customer's revenue generating capability (Grönroos, 2011; Windahl & Lakemond, 2010).

This study links up with this stream of literature stating that business offerings are combinations of products and services as it seems intuitively most appropriate, extends most current research in the capital goods industry, and combines attributes from both the goods and service dominant logic (Windahl & Lakemond, 2010).

Frequently mentioned motivations to offer integrated solutions are financial, and competitive or strategic reasons (Baines, Lightfoot, Benedettini, & Kay, 2009). Financial reasons include higher profit margins and stability of income (Anderson, Fornell, & Rust, 1997). Mainly, because services are argued to be more resistant to fluctuating economies and have the potential to be a continuous source of revenue as opposed to a single transaction (Baines et al. 2009; Olivia & Kallenberg, 2003). Strategic reasons are based on commoditization of business markets. Integrated solutions allow firms to standardize services, tailored to the customer’s usage situation, and should therefore lead to a positional advantage of the firm by delivering value at a minimum cost, through repeatability and economies of scale (Ulaga & Reinartz, 2011). Furthermore, it is argued that services are harder to copy, and thus create a competitive advantage (Olivia & Kallenberg, 2003).

Source	Concept	Main view
(Brady, Davies, & Gann, 2005) (Davies, Brady, & Hobday, 2007) (Windahl & Lakemond, 2006) (Windahl & Lakemond, 2010)	Integrated solutions	Provide products and services to create unique value for each customer
(Gebauer & Fleisch, 2007)	Service business of manufacturing firms	Service management approach for manufacturing firms
(Olivia & Kallenberg, 2003)	Services in addition to an installed product base	Product-service continuum to move from product to services
(Ulaga & Reinartz, 2011)	Hybrid offerings	Products and services combined into innovative offerings
(Vandermerwe & Rada, 1988)	Servitization	Offering of market packages or bundles of customer-focused combinations of goods, services, support, self-service, and knowledge
(Hypko, Tilebein, & Gleich, 2010)	Performance based contracting	The customer purchases performance instead of capital goods
(Tuli, Kohli, & Bharadway, 2007)	Customer-supplier relational processes	A solution is a set of customer-supplier relational processes, all of which are aimed at meeting customer’s business needs

Table 2.1: Integrated solutions in the capital goods industry

Several studies point out the different degrees of integrated solutions, often depicted in matrices. Then, products and services are considered both to be heterogeneous constructs that when combined to an integrated solution move along a continuum ranging from tangible dominant goods to intangible dominant services (Olivia & Kallenberg, 2003). Windahl and Lakemond (2010) for instance, designed a four quadrants matrix based on a literature review. They use ownership of equipment; either customer or supplier, and product versus process oriented solutions as attributes to classify different types of integrated solutions. In which a fully-fledged integrated solution is a process-oriented offering where the supplier retains ownership of the equipment. Similarly, Ulaga and Reinartz (2011) distinguish four types of hybrid offerings, i.e., integrated solutions, where they also

distinguish between product- and process-oriented solutions. On the other axis, however, is the supplier's promise to either perform a deed (input-based) or to achieve certain performance (output-based). Note that, although the typology is different, both matrices are very similar. See Table 2.2 for the two matrices, including definitions, combined into one.

Supplier's promise to perform a deed / Customer owner of equipment	Services to facilitate the customer's access to the supplier's good and ensure its proper functioning during all stages of the life cycle	Services to assist customers in improving their own business processes
Supplier's promise to achieve performance / Supplier retains ownership of equipment	Services to achieve productivity gains from assets invested by customers	Services to perform processes on behalf of the customers <i>(fully-fledged integrated solution)</i>
	Product-oriented	Process-oriented

Table 2.2: Integrated solutions classification matrix (Ulaga & Reinartz, 2011; Windahl & Lakemond, 2010)

Based on a more extensive literature review; Hypko, Tilebein, and Gleich (2010) discern a conceptual framework for analyzing integrated solutions in manufacturing industries. They also include ownership of the equipment, but make a distinction between ownership during the contract period and after the contract period. Furthermore, the responsibility of operations is similar to services as in the matrix above. But, they also include more salient criteria such as the payment model (pay-on-availability, pay-per-unit, pay-on-customer's-economic-results), location of operation (customer's in-house, fence-to-fence, supplier's in-house), and the possibility to outsource certain operations to an independent third party service provider (Hypko et al., 2010).

2.1.4. Round four – All offerings are relational processes between the customer and supplier.

More recently, there is literature that argues when the service- and goods-dominant logics are juxtaposed to one another, both take a rather static and dichotomous perspective on solutions exchange (Lindberg & Nordin, 2008). In response to this, customers are argued to view offerings not as a static combination of goods and services, but rather as a set of dynamic relational processes between the customer and supplier. From this perspective literature predominantly seems to adhere to the service-dominant logic (e.g., Storbacka, 2011; Tuli, Kohli, & Bharadway, 2007) and implicitly refer to this as being the process of value co-creation. However, the view more prone to the goods-dominant logic argues that by treating services (as well as goods) as dynamic processes, the degree of objectification and relational proximity are varying over time. Figure 2.1 delineates Lindberg & Nordin's (2008) dynamic view of the service procurement process.

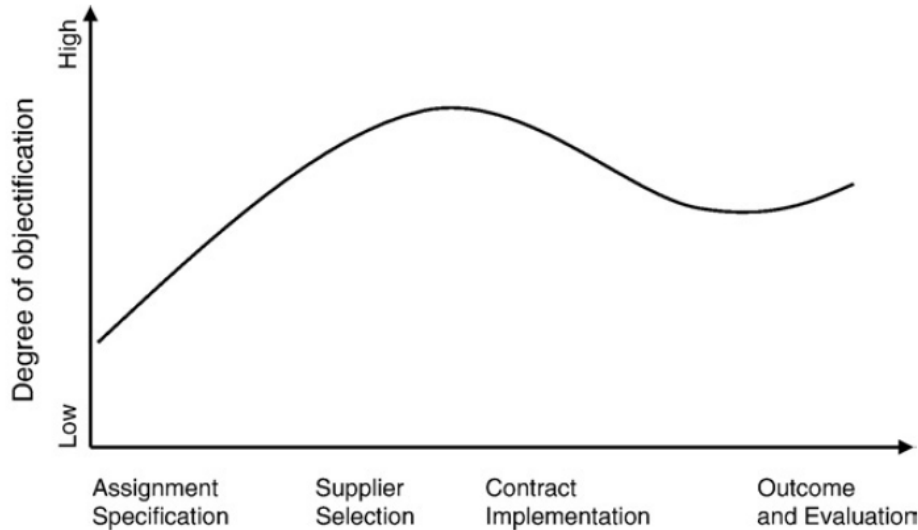


Figure 2.1: Dynamic view of service procurement (Lindberg & Nordin, 2008)

At some points in time relational proximity is prevailing while at other points a high level of objectification is more in order (Lindberg & Nordin, 2008). Relational proximity is argued to be analogous to the degree of objectification, but negatively correlated. They conclude that the services- and goods-dominant logics are not mutually exclusive but are part of a dynamic process. In reality these logics might thus be linked to each other with combinations and trade-offs between the two logics (Lindberg & Nordin, 2008).

2.1.5. *And the winner is...*

It becomes evident that value has been approached in literature from divergent perspectives, in light of the products versus services debate, four main approaches were distilled with some overlap. The ongoing products-services debate concerns what value is; how it can be created, and how it should be defined. In this study the value definition by Grönroos and Voima (2013) is adopted as it is in line with the concept of integrated solutions.

In an attempt to unite the different views on value, Grönroos and Voima (2013) propose a simplified linear process that takes place within three spheres (see Figure 2.2). Respectively, the provider sphere where value-in-exchange is created (e.g., production process); the joint sphere where value-in-exchange is considered to be a singular entity in time (e.g., production output); and the customer sphere where value is created during usage accumulated over time (Grönroos & Voima, 2013). This inclines to what early research distinguished as value derived from the transaction and value derived from the product (Frenzen & Davis, 1990). Arguably, it also relates to the dynamic relational approach of value (Lindberg & Nordin, 2008; Tuli et al. 2007).

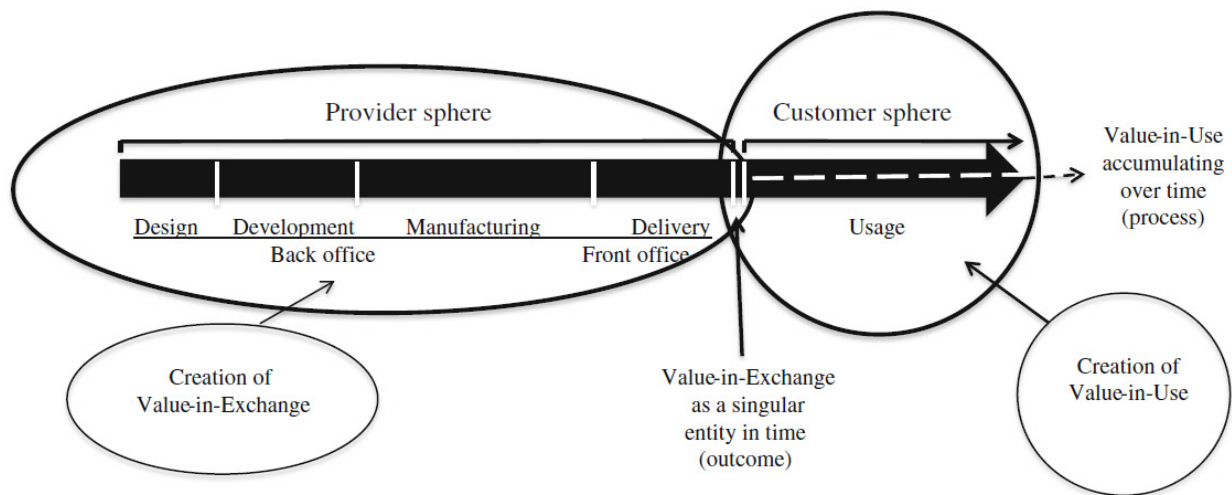


Figure 2.2: Value concept (Grönroos & Voima, 2013)

In the current study the focus is on the customer sphere, because it implies that the customer has already purchased the integrated solution and has some experience with both the product and service. It is argued that during or after use customers exhibit a propensity towards performance assessment of the integrated solution in a specific context (Gardial, Clemons, Woodruff, Schumann, & Burns, 1994). Formally, *“the customer sphere is defined as the experiential sphere, outside direct interactions, where value-in-use (real value) emerges (is created) through the user’s accumulation of experiences with resources and processes (and their outcomes) in social, physical, mental, temporal, and/or spatial contexts”* (Grönroos & Voima, 2013). Of interest is how the customer does then perceive value from the product and service it uses.

3. Hypotheses and research model

In this chapter hypotheses are posed based on literature. Moreover, several moderators are included to provide the hypotheses of the main effects with some additional context.

3.1. Hypotheses development

Commonly, the definition of quality of a product or service is concerned with the perceived judgment about its superiority or excellence (Parasuraman, Zeithaml, & Berry, 1988; Zeithaml, 1988). Yet, it has also raised discussion as to how customers assess this. The notion that customers judge excellence by comparing expected performance with received performance is widely accepted (Parasuraman et al. 1985, 1988).

In line with Ulaga (2003), product quality is defined in this study as the extent to which the firm's product meets the specifications of the customer; measured by the customer's perception of the relative superiority along three dimensions of the product – performance, reliability, and consistency over time. Service quality is in general defined as the difference between expected performance and received performance, i.e., delivering quality service means conforming to customer expectations on a consistent basis (Parasuraman et al. 1985). Service quality is argued to be more difficult to evaluate than goods, main argument being that services have limited tangible cues which goods do possess. In addition to product related services, offering quality services includes providing the customers with the right information in a timely manner, and providing the customers the opportunity to outsource specific tasks to the supplier (Ulaga, 2003).

Customer loyalty is argued to be expressed by two aspects - behavior and attitude. A frequently mentioned behavioral aspect is the re-purchase intention, i.e., the likelihood of future purchase or renewal of the firm's products and/or service contracts (e.g., Cater & Cater, 2010; Chaudhuri & Holbrook, 2001). Morgan and Hunt (1994) show that barriers, economical or technical, which make it costly or difficult to switch supplier make a customer more committed to the relationship. Thus, offering a superior integrated solution can lead to loyalty by creating a lock-in. The product is of such high quality that customers cannot turn to alternative suppliers that provide similar quality or because it would be associated with too high switching costs. Cater and Cater (2010) argue that especially in business markets customers engage in relationships with manufacturing firms for these reasons rather than more emotional factors such as trust and cooperation. So, from a behavioral sense customers may become loyal due to high switching barriers. Customers may also become loyal because they perceive high quality, have good experiences and thus want to continue the relationship (Selnes, 1993). Customers that have experience with use of a product become more confident about basing intentions of relationship continuity on an extrapolation of past quality performance (Hess, Ganesan, & Klein, 2003). Furthermore, after purchase customers were found to value the relational aspects of a business relationship more than the rational product benefits (Cater & Cater, 2010), implying increased importance of services. Thus, good experiences of past performance (i.e., high product and/or service quality) increase future repurchase intentions.

H1. There is a positive relation between perceived product quality and loyalty.

H2. There is a positive relation between perceived service quality and loyalty.

Customer loyalty in the attitudinal sense includes a level of dispositional commitment of the customer with respect to some unique value association with the firm's reputation or brand (Chaudhuri & Holbrook, 2001; Dick & Basu, 1994). The unique value associated with a firm's brand is closely related to the concept of *brand reputation*. Brand reputation has been conceptualized as a perception of quality associated with the name of a company (Aaker & Keller, 1990). Particularly in business markets, a brand is argued to be more associated with the reputation of the company than, for instance, with a specific product or service (Mudambi, 2002). In this study the attitude towards an integrated solution (i.e., reputation) is argued to be an overall evaluation of a product and/or service in the long-run. Brand reputation is therefore defined as a perception of overall quality at a higher level of abstraction than specific product or service attributes (Zeithaml, 1988), i.e., the customer's holistic perception of the additional value due to the brand reputation (Yoo, Donthu, & Lee, 2000).

Up till now, the power of brand reputation has been recognized in the consumer marketing literature (Keller, 1993), but also industrial companies are increasingly aware of their brand reputation (Mudambi, 2002). Like in consumer markets, industrial buyers are found to rate quality, reliability, and performance as primary antecedents for a strong brand reputation (Michell, King, & Reast, 2001). In particular, perceived product quality is argued to be an important antecedent for a strong brand reputation (Bendixen et al. 2004). Moreover, in spite of the predisposition to associate brand reputation in context of products, services are argued to be just as critical for brands (Berry, 2000). Rauyruen and Miller (2007) show that service quality positively influences both brand reputation and loyalty. However, just as Berry (2000) they conducted their research in a business-to-business context of a service provider.

With the emphasis of value in specific use situations, direct experience with the product and service are argued to impact brand reputation. Mainly, as experience with the product and services causes attitudes towards a brand to be more accessible from memory (Selnes, 1993). Prior impressions are easy to interpret and are held with a high degree of confidence (Herr, Kardes, & Kim, 1991). Consequently, when customers have access to credible representations of the product and/or service from experience, inferences based on perceived quality are expected to have an effect on brand reputation. More specifically, if a customer perceives high product and/or service quality, the overall perception of quality associated with the brand is expected to increase.

H3. There is a positive relation between perceived product quality and brand reputation

H4. There is a positive relation between perceived service quality and brand reputation.

Attitudes towards a brand are important as they often form the basis for a customer's behavior, e.g., brand choice (Keller, 1993). Even in business markets, where rational and systematic decision making is leading (Mudambi, 2002), brand reputation is found to be an antecedent of loyalty (van Riel et al. 2005). If customers lack the ability to evaluate the product or service based on their attributes, they are inclined to use signals or extrinsic cues to infer overall quality of the integrated solution based on what they know about the brand (Keller, 1993). This general attitude of the brand influences the customer's preference for an offering. The company brand can symbolize or convey certain performance expectations to potential customers faced with an important purchase (Mudambi, 2002). So, when a company has a strong brand reputation, it is expected to directly influence repurchase intentions (i.e., loyalty) as a risk reducer for a corporate buyer. In this case the brand reputation operates as a substitute of the integrated solution's overall quality (Selnes, 1993), and thus loyalty is expected to be driven by brand reputation.

H5. There is a positive relation between brand reputation and loyalty.

3.2. Moderating variables

Literature on integrated solutions suggests that outcomes may be contingent on a specific technological or market context (Windahl & Lakemond, 2010). A better understanding of these contingencies may provide academics and practitioners with finer-grained theories (Tidd, 2001). Therefore, several moderators relevant to Vanderlande are hypothesized. Moderators can provide deeper insights as they provide the opportunity to investigate under what conditions a relation is extremely weak or strong (Henseler & Fassott, 2010). First, as integrated solutions are posited to be business solutions that involve the integration of products and services into one package (Brady et al., 2005), the interaction effect of product and service quality will be tested to see whether there is an actual simultaneous effect. In addition, three moderators are added which account for the business context of Vanderlande. The moderators added are customer knowledge (whether the customer performs baggage handling), complexity of the integrated solution (airport size), and environmental volatility (airport growth over 2012-2013).

3.2.1. Interaction product and service quality

With integrated solutions, the firm's product and concomitant services are combined into one offering (Brady et al., 2005). It is argued that an offering may be more valuable when it includes services that are complementary to the product, mainly as they are more valuable, rare, and difficult to imitate when used in combination than when used separately (Hitt, Dacin, Levitas, Arregle, & Borza, 2000). Parallel to this reasoning, economic theory models customers' preferences with an additive utility function that links an offering's attributes to customer demand. Basically, each positively evaluated attribute of an offering increases the perception of that offering compared to offerings without the feature (Thompson, Hamilton, & Rust, 2005). Thus, if both product and services of an integrated solution are perceived as high quality, the offering should become more valuable. This suggests the following.

With higher (versus lower) perceived product quality

H6. The positive effects of perceived service quality on (1) loyalty and (2) brand reputation are strengthened

3.2.2. Customer knowledge

Customer knowledge represents a customer's accrued knowledge about how a product and service should perform (Bell, Auh, & Smalley, 2005). Generally, the customer's evaluative criteria change as they gain knowledge about a product, causing ensuing product evaluations to be based on experience and use of the product. In the present study this means whether the airport performs baggage handling itself or outsources this to a third-party ground handler, airline, or both. In Figure 3.1 the interactions within the business context of Vanderlande are depicted.

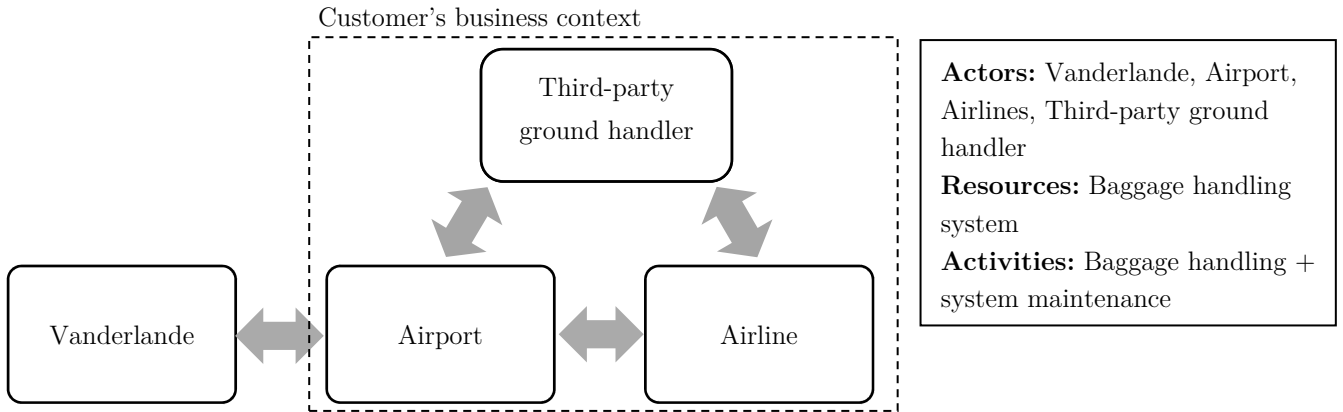


Figure 3.1: Business context of Vanderlande

In case baggage handling is performed by a third-party ground handler and/or airline, the airport only facilitates them with baggage handling equipment but does not use the equipment itself. However, in case the ground handling activities are performed by the airport, the airport facilitates the airline with baggage handling, so not only the equipment but with the full service. Thus, in this context the airport is involved with Vanderlande's baggage handling equipment on a daily basis. In a recent study Bohlmann, Spanjol, Qualls, and Rosa (2013) found that, as customers use products and gain experience, they become more knowledgeable about the solution and how its benefits address their needs. With greater knowledge, customers become more aware of the value of the product (Bohlmann et al., 2013).

On the other hand, because of the high knowledge of the product, they are also more aware of and susceptible to competitive offerings than low knowledge customers. High knowledge customers base their quality assessment of an offering on more attributes and attribute levels and use more sources (Evanschitzky & Wunderlich, 2006). Customers with low knowledge will have difficulty assessing service quality, and therefore have to rely on the relational and tangible cues of the integrated solution. Consequently, the relative importance of service attributes, such as courtesy, and responsiveness is likely to increase as customers have less experience (Chiou, Droge, & Hanvanich, 2002). High knowledge customers have the ability to see past these relational aspects of the offering and base their assessment on the core product or service attributes (Sharma & Patterson, 1999). From this perspective, for customers with high knowledge, service quality perceptions only constitute one part of the offering (the other being the product): thus, for customers with high knowledge, perceived service quality is of lesser importance in the formation of loyalty and brand reputation than product quality.

For these reasons, the following is expected.

H7: With high (versus low) customer knowledge about the integrated solution

- a. *The positive effects of perceived product quality on (1) loyalty and (2) brand reputation are strengthened.*

With low (versus high) customer knowledge about the integrated solution

- b. *The positive effects of perceived service quality on (1) loyalty and (2) brand reputation are attenuated.*

3.2.3. Solution Complexity

Closely related to customer knowledge is the concept of the solution's complexity (Andaleeb & Basu, 1994). The size of the airport¹ greatly determines what baggage handling system is in place and its complexity. The larger the airport, the more complex the solution. The perceived complexity of a product is related to the number of product attributes (Swaminathan, 2003). It is argued that customers infer product benefits from concrete product attributes (Thompson et al., 2005), consequently more product attributes positively differentiate a product from competitive products. Customers perceive the product with more attributes (i.e., more complex) to be superior in their mental representations (Brown & Carpenter, 2000).

Moreover, it is argued that the core competency of the supplier is knowledge about product technology and the technology of use. The supplier is likely to have experts on its staff that can tackle complex technical issues (Achrol & Kotler, 1999). The customer is argued to focus on the perceived qualities of the supplier; they believe that the supplier can be relied upon in terms of the provision of services (Ganesan, 1994). Therefore, it is proposed here that with increased solution complexity the customer's belief that the supplier has the required expertise and reliability to perform the job effectively also increases (Neu & Brown, 2005).

Given these reasons, the following is expected.

H8: With higher (versus lower) complexity of the integrated solution

- a. The positive effects of perceived product quality on (1) loyalty and (2) brand reputation are strengthened.*
- b. The positive effects of perceived service quality on (1) loyalty and (2) brand reputation are strengthened.*

3.2.4. Environmental volatility

Environmental volatility refers to the extent to which market and demand changes are rapid (Ganesan, 1994). High volatility would indicate a high growth figure of the airport, i.e., how much the airport has grown in number of passengers in 2013 in comparison to 2012. In this case airports may need to expand in the near future, or should at least consider this, and become more efficient in daily operations to keep up.

Under high volatility, customers are pressured to expand or to become more efficient. These customers need up-to-date technological capabilities to compete with international firms in their domestic and global markets, and to be able to process the increased market demand (Hitt et al., 2000). Therefore these customers are likely to enhance their technological know-how more quickly by selecting a business partner that has a leading edge product. A customer can learn from the supplier to build their own technological capabilities (Hitt et al., 2000). In addition, they seek for business partners with competences that can be leveraged in an alliance, present in services that are complementary to the product. These services are intangible in nature and often based on tacit knowledge of the supplier's employees which makes it difficult to imitate. Therefore, if a customer perceives high product and/or service quality, the greater the likelihood that the customer believes that it has identified the supplier that is able and motivated to support them (Wathne & Heide, 2004). Therefore the following is expected.

¹ Airport size is defined as the number of passengers enplaned and deplaned plus direct-transit passengers – as generally accepted in the industry.

H9: With higher (versus lower) environmental volatility

- a. The positive effects of perceived product quality on (1) loyalty and (2) brand reputation are strengthened.
- b. The positive effects of perceived service quality on (1) loyalty and (2) brand reputation are strengthened.

3.3. Research model

In Figure 3.1 the summary of the hypotheses.

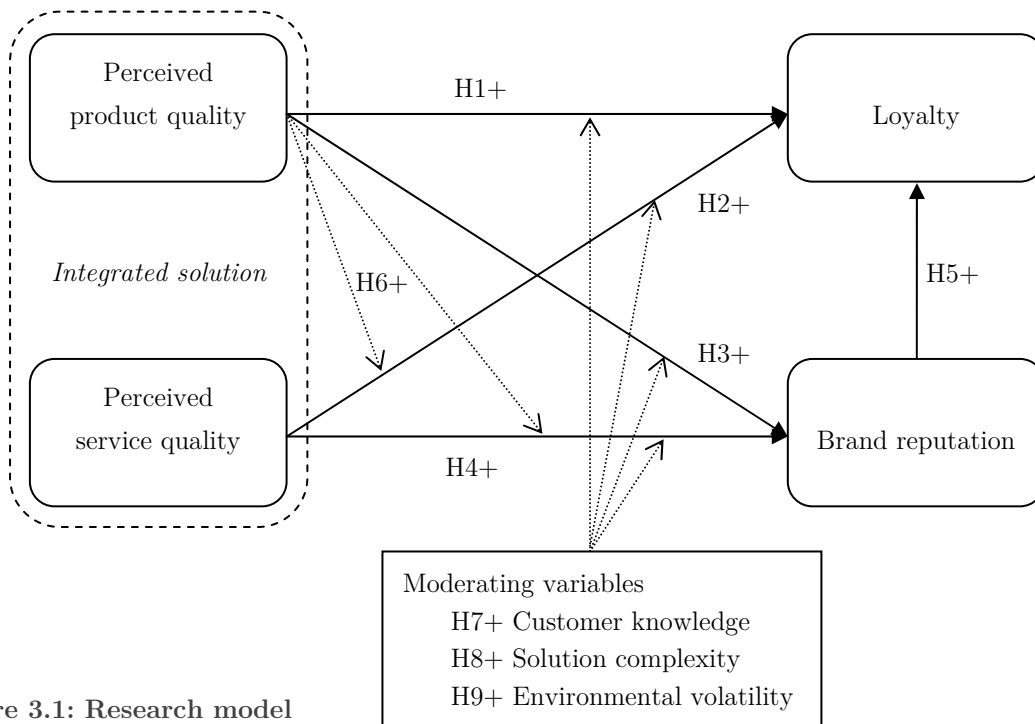


Figure 3.1: Research model

4. Methodology

This chapter describes the techniques applied to collect the data and operationalize the constructs. First the sampling procedure is described. Thereafter, the sample characteristics, the measurement method and measures. Subsequently, the dataset is examined for outliers and missing data. Lastly, the validity and reliability of the measures are discussed.

4.1. Sampling procedure

Empirical data were gathered through an online survey among customers of Vanderlande in several parts of the world. These customer contacts were retrieved from Vanderlande's CRM system. Because the research is concerned with the interplay between product and service quality, customers with a baggage handling system of Vanderlande and associated services were selected from the database. The database also contained unsuitable contact persons, e.g., contact persons not working at the airport anymore, or airport contacts with a baggage handling system from another firm than Vanderlande. To ensure content validity 18 sales managers were asked to share suitable customer contacts or check the list retrieved from the database corresponding to their area. This resulted in 123 contacts to whom the questionnaire was sent, ranging from 3 to 36 contact persons per sales manager.

All customers received an invitation via email to fill in the questionnaire. This email contained a hyperlink to the online survey (see Appendix A). Subsequently, a reminder email was sent a week after the first invitation. Because of a low response rate, two weeks after the reminder, a second reminder email was sent. In the end, 35 customers participated in the survey, yielding a net response rate of 28.5%.

4.2. Sample characteristics

Of the 35 customers that responded, 6% were located in Africa, 3% in the Middle East, 23% in the United States, 3% in Latin America, 3% in Australia, and 63% in Europe. Among the respondents 9% was at the board-level of the airport, 63% were technical or facilities managers of some kind, and 28% were project managers involved with the baggage handling system. Moreover, 60% of the airports were owned by a governmental party, 14% by a private party, and 23% by both a governmental and private party (public-private partnership).

4.3. Measurement

The constructs were operationalized with multi-item scales. The respondents had to indicate to what extent they agreed with a set of statements using a seven-point rating scale ranging from 1 – strongly disagree, to 7 – strongly agree. All the scales were based on items from existing empirical studies, increasing construct validity (Hair, Black, Babin, & Anderson, 2010). In addition, two items were added to the service scale in consultation with employees of Vanderlande. See Table 4.1 for the complete list of scale items.

To obtain data input for the moderators several questions were included at the start of the questionnaire. The airport growth figures of the airports were retrieved from the database of 'Mombberger Airport Information', a well-respected source of information within the industry.

Because brand reputation is a dependent variable composed of two dimensions, two base models were tested to increase understanding of the effects. Model 1 considered brand reputation as a second order construct, so both dimensions (*product* and *corporate* brand reputation) were combined into one construct. Model 2 considered corporate brand reputation and product brand reputation as separate constructs. After testing these two base models, the moderators were tested in Model 1. Each moderator was tested separately.

Lastly, the main effects were tested one-sided whereas the moderators and the slopes of the interaction effects were tested two-sided. The main effects are considered to have clear directional effects, proven in earlier studies with proven measures. The reason to test the moderators and slopes two-sided is that they are tested with measures that are not used before, thus these are non-proven measures. The advantage of one-sided testing is the improvement in power to reject the null hypothesis if it is truly false. However, the disadvantage of one-tailed testing is that it has a more extensive null hypothesis, thus the ability to detect unexpected results and making inferences on the underlying structure can be restricted when the null hypothesis is not rejected (Pillemer, 1991). If an effect would turn out to be significant in the opposite direction than hypothesized, a two-sided tests allows for an interpretation, whereas the one-sided test does not (Kimmel, 1957).

4.4. Outliers and missing data

The data was assessed visually for univariate outliers using boxplots. Product and service quality were considered for outliers since some customers that filled out the questionnaire had some incidents with either the baggage handling system or Vanderlande employees. These are considered outliers as this data is subject to an *extraordinary event* (Hair et al., 2010). These cases were considered to be such a confounding factor that these were removed to improve interpretability of the data for the research objectives here. Three cases were removed in consultation with the Vanderlande staff. This left 32 cases to base the analysis on.

In order to test the randomness of missing data Little's MCAR test was performed on the data. If the Chi-square is significant ($p < .05$) it can be concluded that the missing data is non-random (Hair et al., 2010). SPSS was used to assess this. The missing data is non-significant ($p = 0.306$). Since the data sample is small already, it was opted to apply mean substitution – an imputation technique allowed if missing data are random and relatively few data is missing (Hair et al, 2010). Coincidentally, the datasets with outliers also happened to have the most missing values. In the end, for 1% of the data mean substitution was applied.

4.5. Validity and reliability

To assess the validity of the measures confirmatory factor analysis was conducted for all construct measures. The factor loadings are presented in Table 4.2. Two items were removed as they did not meet the cutoff-value of 0.7. All other loadings are above the cutoff-value, thus indicating convergent validity. Moreover, the composite reliability values were all well above 0.7 and the AVE values were all above 0.5 (Hair et al., 2010). Lastly, the Cronbach's α was considered. A Cronbach's α score of

0.7 or higher is indicative of uni-dimensionality of the construct (Cortina, 1993). All the construct measures are above 0.7 providing further evidence of convergent validity.

The criterion by Fornell and Larcker (1981) was used to assess the discriminant validity. The square root of the AVE for each construct should exceed the correlation coefficient between any two constructs. In the diagonal of the main constructs in Table 4.2 the AVE values are presented. All constructs passed the test, but must be noticed that the perceived product quality and product brand reputation constructs are on the edge of acceptable limits (square root of AVE = 0.911 compared to the correlation coefficient of 0.867).

Harman's one factor test was used in order to check for common method bias. With SPSS an un-rotated factor analysis was run with a restriction to extract only one factor. The factor extracted explained 41.8% of the variance. Since no majority is explained by a single factor it can be assumed that common method bias is not a significant concern (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003).

Scale item	Factor Loading	Mean	Standard deviation
Product quality ($\alpha=0.95$; CR=0.95)			
<i>Adapted from Eggert, Ulaga, & Schultz (2006)</i>			
Vanderlande's BHS is a high quality product	0.85	6.00	0.92
Vanderlande's BHS meets our quality standards/is compliant	0.94	5.79	1.23
Vanderlande's BHS is reliable	0.91	5.73	1.38
Vanderlande provides consistent product quality over time	0.92	5.84	1.16
Vanderlande BHS provides value for money	0.92	5.48	1.21
Service quality ($\alpha=0.94$; CR=0.97)			
- Service support			
<i>Adapted from Eggert, Ulaga, & Schultz (2006)</i>			
Vanderlande provides us with good services	0.91	5.51	1.52
Vanderlande is available when we need information	0.94	5.54	1.36
Vanderlande provides us with appropriate information	0.94	5.71	1.07
Vanderlande responds fast when we need information	0.89	5.46	1.40
<i>Adapted from van Riel, de Mortanges, & Streukens (2005)</i>			
The technical support of Vanderlande's baggage handling system is excellent	0.86	5.40	1.19
- Employees			
<i>Adapted from Cronin & Taylor (1992)</i>			
When Vanderlande promises to do something by a certain time, it does so	0.92	5.34	1.57
You receive prompt service from Vanderlande employees.	0.92	5.60	1.37
Employees of Vanderlande are always willing to help you	0.80	5.94	0.94
Vanderlande employees are cooperative with respect to operations at our airport (item removed)	0.62	5.80	0.93
<i>Items created in consultation with employees of Vanderlande</i>			
Vanderlande employees always finish their job on site before they leave	0.79	5.03	1.64
Vanderlande employees adapt well to the local culture	0.76	5.74	1.12
Brand reputation			
<i>Adapted from van Riel, de Mortanges, & Streukens (2005)</i>			
- Product brand equity ($\alpha=0.88$; CR=0.92)			
Vanderlande's baggage handling system has a good reputation	0.95	6.00	0.87
Vanderlande's baggage handling systems are well-known in the market	0.90	6.12	1.02
Rate Vanderlande's baggage handling system on a scale (1 to 7)	0.83	5.77	1.33
- Corporate brand equity ($\alpha=0.80$; CR=0.86)			
The fact that Vanderlande produced the baggage handling system certainly adds value to me (item removed)	0.65	5.55	0.84
Vanderlande is a financially stable company	0.71	5.91	1.01
Vanderlande is an innovative company	0.79	6.20	0.68
Vanderlande is a leading edge supplier	0.79	6.09	0.82
Vanderlande is a well-known name around the world	0.75	6.26	0.70
Loyalty ($\alpha=0.87$; CR=0.86)			
<i>Adapted from van Riel, de Mortanges, & Streukens (2005) and Selnes (1993)</i>			
We intend to do business again with Vanderlande in the future	0.88	5.80	1.02
Probability to choose Vanderlande again when buying a new baggage handling system and/or related service	0.95	5.59	1.29
If another person asked your advice, how likely is it that you would recommend Vanderlande	0.85	5.91	1.04

Table 4.1: Measures

	M	SD	1	2	3	4	5	6	7
Main constructs									
1. Loyalty	5.86	0.96	0.781						
2. Corporate brand reputation	5.88	0.87	0.387*	0.677					
3. Product brand reputation	6.11	0.65	0.707**	0.588**	0.830				
4. Service Quality	5.55	1.10	0.725**	0.117	0.446*	0.924			
5. Product Quality	5.73	1.14	0.655**	0.455**	0.867**	0.360*	0.697		
Moderators									
6. Customer knowledge	N.A.	N.A.	-0.279	-0.151	-0.246	-0.222	-0.233	1.000	
7. Complexity	14.6 mil	14.3 mil	0.069	0.145	0.041	0.192	0.002	0.309	1.000
8. Environmental volatility	3.41	4.75	-0.075	-0.121	-0.047	-0.072	-0.067	-0.034	-0.111

** Correlation is significant at the 0.01 level (two-sided)

* Correlation is significant at the 0.05 level (two-sided)

Table 4.2: Correlation matrix (Pearson), means, and standard deviations

5. Data analysis and Results

In order to test the hypotheses, data was analyzed with the Partial Least Square (PLS) method using the SmartPLS statistical package. Main reason to opt for this method is the relatively small sample size² for which it is suitable (Chin & Newsted, 1999). A common rule of thumb is to have at least 10 respondents for every predictor variable. That would imply that the 32 respondents are sufficient for the minimum requirement of 30 here. Furthermore, PLS is argued to be a robust technique for theory development where exploratory models are tested and validated (Henseler, Ringle, & Sinkovics, 2009).

First the analysis and results of the two structural models are discussed, thereafter the analysis and results of the moderators.

5.1. Analysis of two structural models

The results of model 1 are presented in Table 5.1. From this table it can be concluded that all hypotheses are supported. Overall the model explained 74.9% of the variance in loyalty and 64.8% in brand reputation.

Relationship	β	t-Value	Hypothesis	Supported
Product quality \rightarrow Loyalty	0.195	2.912	H1	Yes
Service quality \rightarrow Loyalty	0.511	8.219	H2	Yes
Product quality \rightarrow Brand reputation	0.741	13.674	H3	Yes
Service quality \rightarrow Brand reputation	0.147	1.928	H4	Yes
Brand reputation \rightarrow Loyalty	0.352	3.484	H5	Yes
R ² Loyalty	0.749			
R ² Brand reputation	0.648			

Table 5.1: Summary of PLS analysis Model 1

Product and service quality are both antecedents of loyalty in support of H1-2, where perceived service quality has the strongest effect of the two. Moreover, both perceived product and service quality are antecedents of brand reputation, in support of H3-4. Product quality has the strongest effect of the two. Finally, brand reputation positively influences loyalty, in support of H5.

Sobel's test for mediation (Sobel, 1982) was used to examine whether brand reputation is significantly mediating the relationship between product quality and loyalty. The results indicate that this is indeed the case (t-Value = 2.96 and $p < .01$). As the relation between product quality is also significant as a direct effect, brand reputation is partially mediating the relationship. The same test was used to examine whether brand reputation is also significantly mediating the relationship

² Because of a small sample size it was informally examined whether results with a non-parametric approach are the same. Kendall's Tau correlations were compared with the PLS results. With non-parametric results (see Appendix B), almost all hypotheses found full support, H4 finds partial support (in line with results of Model 2). However, H5 finds full support with the Kendall's Tau correlations, whereas it finds partial support in Model 2. These results are an additional indication for the supported hypotheses of the PLS analysis. Therefore it is safe to say that all main effects find support.

between service quality and loyalty. The results indicate that this is not the case (t-Value = 1.57 and p = n.s.).

To increase the understanding of the effects, the second model was tested. Overall the model explained 72.8% of the variance in loyalty, 38.6% in corporate brand reputation, and 77.3% in product brand reputation. Logically, in line with Model 1, H1-2 were supported as these relations were no different from Model 1. Full support was found for H3 but only partial support was found for H4-5. The effect of service quality on corporate brand reputation is significant, however, the effect is negative and thus not in support of the hypothesis. The effect of product quality on brand reputation and loyalty is significant and in line with the discriminant validity test, it shows here that the t-statistic is very large between product quality and product brand reputation.

Relationship	β	t-Value	Hypothesis	Supported
Product quality → Loyalty	0.245	2,474	H1	Yes
Service quality → Loyalty	0.538	7.794	H2	Yes
Product quality → Brand reputation			H3	Yes
Product quality → Corporate brand reputation	0.238	1.704		Yes
Product quality → Product brand reputation	0.811	18.161		Yes
Service quality → Brand reputation			H4	Partial
Service quality → Corporate brand reputation	-0.193	1.828		No
Service quality → Product brand reputation	0.157	2.423		Yes
Brand reputation → Loyalty			H5	Partial
Corporate brand reputation → Loyalty	0.092	1.516		No
Product brand reputation → Loyalty	0.201	1.704		Yes
Product brand reputation → Corporate brand reputation	0.879	6.333		
R ² Loyalty	0.728			
R ² Corporate brand reputation	0.386			
R ² Product brand reputation	0.773			

Table 5.2: Summary of PLS analysis Model 2

In sum, when comparing the results from Model 1 and 2, it appears that all the hypotheses find support in Model 1. Hypotheses 4 and 5 find only partial support in Model 2.

5.2. Analysis of moderators

The moderators have the aim to provide additional context to the results found in the first model. Thus, the main objective is to detect interaction effects. For this goal, the two-stage approach is recommended to assess the significance of an interaction effect (Henseler & Chin, 2010). This means that the scores for the latent variables are calculated and saved for further analysis. Subsequently, an interaction term is built up as the product of the exogenous variable (the calculated scores) and the moderator variable. Then the interaction term and the standardized variable scores of the exogenous and moderator variable are used as independent variables in the regression on the endogenous variables. The results of the analysis of the moderators are presented in Table 5.3. It shows that hypotheses H7-b2, H8-a1, H9-a2 and H9-b2 are significant.

In order to gain more insight into the underlying structure of the significant moderating effects, simple slope analyses (Aiken & West, 1991) were performed. The simple slopes are depicted in Figure 5.1 to Figure 5.4.

Interaction	Loyalty		Brand reputation		Hypothesis	Supported
	β	t-Value	β	t-Value		
Product quality \times Service quality	-0.050	0.353			H6-1	No
Product quality \times Service quality			0.143	0.990	H6-2	No
Product quality \times Customer Knowledge	0.674	1.060			H7-a1	No
Product quality \times Customer Knowledge			-0.506	0.777	H7-a2	No
Service quality \times Customer Knowledge	-0.074	0.839			H7-b1	No
Service quality \times Customer Knowledge			-0.213	2.001	H7-b2	Yes
Product quality \times Solution complexity	0.176	2.544			H8-a1	Yes
Product quality \times Solution complexity			-0.021	0.227	H8-a2	No
Service quality \times Solution complexity	0.089	1.094			H8-b1	No
Service quality \times Solution complexity			-0.201	1.744	H8-b2	No
Product quality \times Volatility	-0.086	1.650			H9-a1	No
Product quality \times Volatility			0.223	3.651	H9-a2	Yes
Service quality \times Volatility	0.089	1.627			H9-b1	No
Service quality \times Volatility			0.202	2.472	H9-b2	Yes

Table 5.3: Summary of PLS analysis moderators

Figure 5.1 shows that, in support of hypothesis 7-b2, at low customer knowledge (i.e., airport does not perform baggage handling) the relationship between service quality and brand reputation is attenuated ($\beta = 0.294$, $p < .05$). For high customer knowledge the slope is almost flat and not significant, indicating that there is no interaction effect.

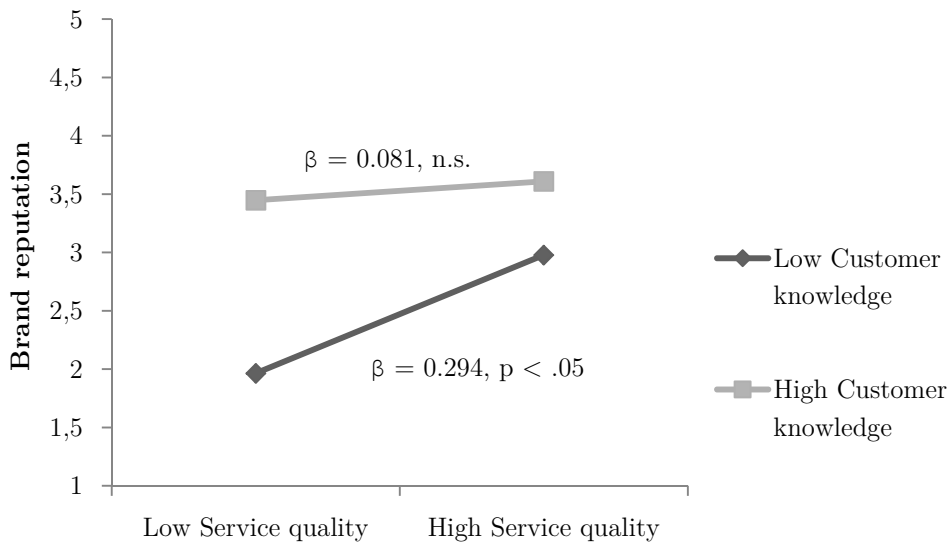


Figure 5.1: Interaction plot H7-b2

Figure 5.2 shows directional support for hypothesis 8-a1, but the slope is not significant. This indicates that with high complexity (i.e., one standard deviation above the mean) the relationship between product quality and loyalty is likely to be strengthened. For low complexity the slope is almost flat and not significant, indicating that there is no interaction effect.

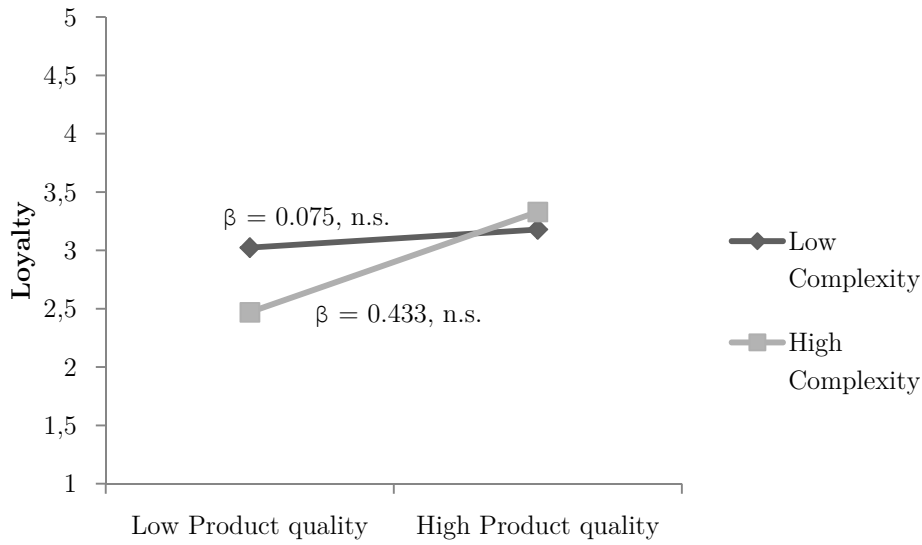


Figure 5.2: Interaction plot H8-a1

Figure 5.3 shows that with high environmental volatility (i.e., one standard deviation above the mean) the relationship between product quality and brand reputation is marginally more likely to increase. However, the slopes are not significant, indicating only partial support for hypothesis 9-a2.

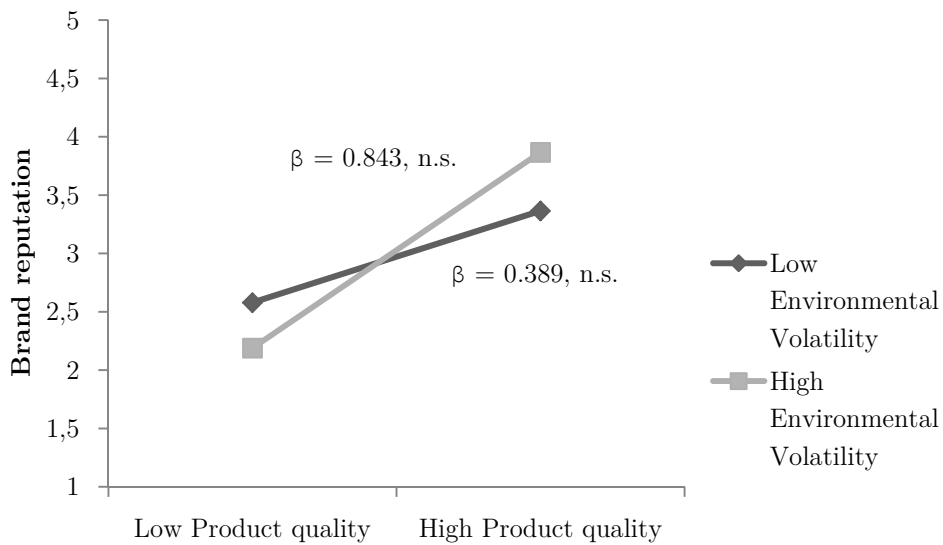


Figure 5.3: Interaction plot H9-a2

Figure 5.4 shows that for high environmental volatility (i.e., one standard deviation above the mean) the relationship between service quality and brand reputation is likely to be strengthened. This is in partial support of hypothesis 9-b2. Moreover, it indicates that with low levels of environmental volatility (i.e., one standard deviation below the mean) the effect is likely to be attenuated.

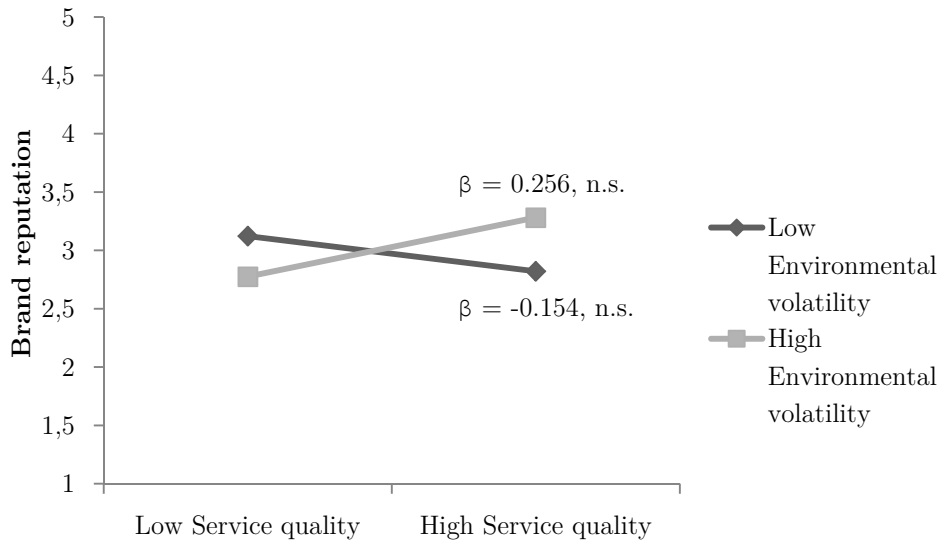


Figure 5.4: Interaction plot H9-b2

6. Discussion

This chapter discusses the main conclusions that can be drawn from this research and presents an answer to the main research question from chapter 1. This chapter concludes by elaborating on the limitations and future research avenues.

6.1. Conclusion

The aim of this study is to increase the understanding of the interplay between perceived product and service quality in the capital goods industry and its effects on brand reputation and loyalty. To unravel the conditions under which these effects are strengthened or attenuated, three moderators were added to the research model: customer knowledge, solution complexity, and environmental volatility.

Combining goods and services in the capital goods industry: What are the effects of perceived product and service quality on brand reputation and loyalty?

From the results it can be concluded that both product and service quality are antecedents of brand reputation and loyalty. However, the effects are not equal in strength. In the capital goods industry where the product is often the major part of the integrated solution, product quality is still the most important determinant for the overall perception of quality associated with the brand (i.e., brand reputation). However, service quality is the main contributor to loyalty. Especially the latter is of interest as technology gaps are narrowing, especially in mature markets, making differentiation based on product quality hard (Ulaga & Eggert, 2006). So while offering superior product quality is a must, service attributes can be used as differentiator to build valuable relationships with their customers. However, there is a caveat to this suggestion as brand reputation is mediating the effect between product quality and loyalty. Thus, because of its effect on brand reputation, product quality also has an indirect effect on loyalty, which service quality does not have, implying increased importance of product quality for loyalty creation.

In addition, after closer scrutiny it became evident that product quality is an antecedent of both product and corporate brand reputation. Service quality has a positive effect on product brand reputation but not on corporate brand reputation. These findings are contrary to the earlier findings in literature stating that brand reputation in business markets is associated with the company rather than with specific products (Mudambi, 2002). But it may be explained by the fact that Vanderlande is well-known for its baggage handling systems in the studied segment, therefore customers may associate its product directly with the company.

Under what conditions does product quality have a stronger effect on brand reputation and loyalty?

Although no significant slopes were found for the interaction effects with product quality, the direction of the slopes indicate that there still might be some effects. Under conditions of high complexity the relationship between product quality and loyalty is likely to be strengthened. Thus,

as the product becomes more complex, the customer is likely to perceive higher product quality, and becomes more loyal.

The results indicate that under circumstances of high environmental volatility the relationship between product quality and brand reputation is likely to increase. Under high volatility, customers are pressured to expand or to become more efficient and are therefore likely to pay increased attention to the product already in place, leading to higher perceived product quality.

Under what conditions does service quality have a stronger effect on brand reputation and loyalty?

The findings suggest that low customer knowledge (i.e., airport does not perform baggage handling) has an attenuating effect on the relationship between service quality and brand reputation. These customers find it difficult to assess service quality because of their lack of knowledge and therefore rely more on the product attributes of the integrated solution.

Moreover, service quality is likely to have a stronger effect on brand reputation in case of high environmental volatility. When a customer perceives high service quality, the likelihood that the customer believes that the supplier is able and motivated to support them increases (Wathne & Heide, 2004), leading to a stronger brand reputation.

6.2. Theoretical implications

From a theoretical perspective, this research has the aim to narrow two research gaps in marketing literature. First, the literature review addressed different scholarly views on value and what a product or service constitutes. Rather than taking a dichotomized view of goods and services, this study integrates views from the goods- and service-dominant logic, assuming that business offerings are combinations of products and services. The results show that with the product being a large part of the integrated solution, it is hard for manufacturing firms to disregard the goods-dominant logic. In addition, the findings suggest that services are indeed increasingly important in the capital goods industry. Thereby, this study extends the work by Windahl & Lakemond (2010) and corroborates their argument that firms in the capital goods industry should combine both logics.

Second, by providing empirical support for the positive effects of product and service quality on brand reputation and loyalty, this study is among the first to address this combination of relationships in context of the capital goods industry. This study contributes to literature on customer loyalty, as the results indicate that customers in the capital goods industry indeed seem to value the relational aspects of the offering (Cater & Cater, 2010). However, contrary to literature findings so far (e.g., Mudambi, 2002; van Riel et al., 2005), the results suggest that brand reputation in business markets is not always associated with the company. Firms in the capital goods industry may be well-known for their product, therefore customers seem to relate the product directly with the company name.

6.3. Managerial implications

By investigating the interplay of product and service quality of integrated solutions, this study draws a nuanced picture for managers having to decide what to focus on to create a strong brand reputation and customer loyalty.

First, the findings indicate that the main determinant to increase loyalty is service quality. Although the product is usually the core element for customers to purchase an integrated solution (Cater & Cater, 2010), it is shown here that after the good is purchased, customers' repurchase intentions increase through high quality services. The service perceptions of the customer are greatly dependent on the employees of the supplier. Because the installed base (i.e., product) is located at the site of the customer, it is an open field for a customer to observe the supplier. Moreover, service personnel has privileged access to the key physical aspects of the integrated solution, therefore they can best influence and shape the way customers perceive the quality of the services. Thus, service personnel of the supplier should exude trustworthiness and "think service" from the outset. An integrated solution supplier must ensure that its service staff reflects credibility and high quality on site at all times – collaborative operations cannot be based on conflicting interests.

Another important implication is that a strong brand reputation, thus, a well-known product and company name in the market, and being an innovative company, also positively influences loyalty. Managers can enhance the brand reputation by focusing on the customer's perception of product quality. As use or experience with the product enhances the perception of the product, managers can create a stronger brand reputation by demonstrating the product attributes and letting customers experience what the product can do for their business. Managers can achieve that by visiting sites of other customers, with the prospect customer, where an installed base is already in place. Another option may be to have a pilot run on site where new attributes of the product are integrated (when possible) with the existing product to demonstrate the added value. Though, the latter may be more costly and risky. Especially under circumstances of high volatility (i.e., airport is growing) is making the customer aware of the different product attributes likely to increase the brand reputation. Additionally, under these conditions service is likely to become more important in shaping the perception of the brand. Finally, when the customer has low knowledge about the integrated solution (i.e., airport does not perform baggage handling), the focus should be on the perception of the product, as these customers are having difficulties to assess service quality and therefore rely more on the product attributes of the integrated solution.

6.4. Limitations and Future research directions

This thesis is subject to a number of limitations that should be taken into account while interpreting the results. The first limitation concerns the sample. This work is entirely based on one company in one industry. The specific characteristics may limit the generalization of results. Moreover, the sample size was rather small. Therefore, future research should aim for larger sample sizes and more sectors within the capital goods industry.

A second limitation is the measurement of the dependent variables. Loyalty and brand reputation were measured based on the customers' perceptions, rather than using objective measures like brand equity. So, if customers indicate that they intent to do business with Vanderlande in the future, this is no guarantee that they actually will.

A third limitation is the operationalization of the moderators. From theory several assumptions were made leading to the operationalization of the moderators. However, customer knowledge for example, might be explained by other factors than performing baggage handling. It might be that level of education, or the geographic location determines customer knowledge. So, it might be interesting to look at multidimensional operationalizations of the moderators.

A fourth limitation is that the study does not feature repeated measures. Because this study focused on value in use, it may be interesting to investigate whether the quality perceptions change

over time. One can imagine that these perceptions are dynamic and that they evolve over time. This would increase the understanding of the dynamic nature of value.

A fifth limitation, closely related to the fourth, concerns *incidents* which were not formally controlled for in the present study. The known cases with incidents were simply removed from this study. But, incidents that significantly changed the perception may be an interesting variable to add to the research model. But also, how these incidents were solved by the supplier in the past; was the incident/complaint handled with care and did that restore or improve the quality perceptions?

A sixth limitation is the high correlation between product quality and product brand reputation. Although the test for discriminant validity was passed, it was on the edge. Moreover, loyalty correlated also quite highly with all the constructs. Thus, other measures of the constructs or more multidimensional measures may solve this issue.

Lastly, this study did not consider the different degrees of integrated solutions. One can imagine that customers perceive service quality differently in case the service offering consists only of repair and maintenance, in contrast to the case where suppliers perform tasks on behalf of the customer. Thus, making a distinction among the different degrees of integrated solutions, like Ulaga and Reinartz (2011), and Windahl and Lakemond (2010) did (see Table 2.2), may increase comprehension.

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Appendices

A. Customer survey Vanderlande

Customer survey Vanderlande

Dear customer,

Thanks again for participating in this study. This survey will take about 5 minutes to complete.

This brief survey deals with how you perceive the quality of Vanderlande's baggage handling system and related services. Your opinion is of great value to Vanderlande to improve its products and services. All answers will be kept confidential.

Best regards,

Nick van de Ligt

1. Who performs baggage handling at your airport (multiple answers possible)?

Airport

Airline(s)

Third party ground handler(s)

2. Roughly how many passengers do you handle per year?

3. Who is airport owner?

Governmental party

Private party

Both governmental party and private party

4. The following statements are concerned with Vanderlande's Baggage Handling System (BHS). Please indicate per item to what extent you as a customer agree or disagree

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
Vanderlande's BHS is a high quality product	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande's BHS meets our quality standards/is compliant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande's BHS is reliable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande provides consistent product quality over time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande BHS provides value for money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fact that Vanderlande produced the BHS certainly adds value to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande's BHS has a good reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande's BHSs are well-known in the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. The following statements are concerned with Vanderlande's services and employees. Please indicate per item to what extent you as a customer agree or disagree

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
Vanderlande provides us with good services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande is available when we need information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande provides us with appropriate information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande responds fast when we need information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The technical support of Vanderlande's BHS is excellent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When Vanderlande promises to do something by a certain time, it does so	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive prompt service from Vanderlande employees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employees of Vanderlande are always willing to help you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande employees are cooperative with respect to operations at our airport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande employees always finish their job on site before they leave	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande employees adapt well to the local culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. The following statements are concerned with Vanderlande's overall reputation
Please indicate per item to what extent you as a customer agree or disagree

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
Vanderlande is a financially stable company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande is an innovative company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande is a leading edge supplier	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanderlande is a well known name around the world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We intend to do business again with Vanderlande in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Please indicate per item

	Very unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Very likely
Probability to choose Vanderlande again when buying a new baggage handling system and/or related service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If another person asked your advice, how likely is it that you would recommend Vanderlande	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Please rate the reputation of Vanderlande's baggage handling system on a scale (1 to 7)

	1	2	3	4	5	6	7
1 indicates a very poor reputation, 7 indicates a very good reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure A.1: Web lay-out survey

B. Non-parametric correlations

	1	2	3	4	5
Main constructs					
1. Loyalty	1,000				
2. Corporate brand reputation	0,293*	1,000			
3. Product brand reputation	0,555**	0,437**	1,000		
4. Service Quality	0,485**	0,111	0,426**	1,000	
5. Product Quality	0,507**	0,307*	0,599**	0,345**	1,000

** Correlation is significant at the 0,01 level

* Correlation is significant at the 0,05 level

Table B.1: Correlation matrix (Kendall's Tau)