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The Impact of Business to Consumer E-Commerce on Organizational Structure, Brand Architecture, IT Structure, and their Interrelations**

Abstract

Previous research on e-commerce has analyzed its influence on organizational structure, brand management, and IT structure separately. Drawing on transaction cost theory, we analyze the simultaneous impacts of business-to-consumer (B2C) e-commerce on organizational structure, brand architecture, and IT structure. We survey 49 chief marketing officers (CMOs) and 49 chief information officers (CIOs) of 64 out of the 100 most important consumer brand companies in Austria. We show that the amount of change in all three structural elements increases as the importance they attach to B2C e-commerce grows. Furthermore, the amount of change in both brand architecture and organizational structure and in brand architecture and IT structure are significantly linked to each other, even after we control for the importance of B2C e-commerce. We find mixed results for the hypothesis that higher levels of importance of B2C e-commerce enhance the dependence of the marketing-related IT structure on changes in brand architecture.

JEL-Classification: D23, M31, 033.

Keywords: Adaptation; Brand Architecture; E-Commerce; IT Structure; Organizational Structure.

1 Introduction

Ever since the hype about the "New Economy" and e-commerce start-up enterprises settled, both management and academic research have become interested in the impact of e-commerce on those companies that have supplemented their offline outlets with

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online initiatives. Thus, previous research has examined the interplay of e-commerce and organizational structure (Mayer-Guell (2001); Rasheed and Geiger (2001)), processes (Garicano and Kaplan (2001); Krovi et al. (2003)), and the IT structure of the company (Earl and Khan (2001); Varadarajan and Yadav (2002)). In marketing research, a growing stream of research examines the influence of e-commerce on brand management (Berthon et al. (1997); Chandon et al. (1997); Ind and Riondino (2001); Varadarajan and Yadav (2002)) and customer relationship management (Bradshaw and Brash (2001); Clemons et al. (2002); Diller (2001)).

In most cases the focus of these studies is directed towards only one of these aspects. We believe that considering them in isolation fails to meet the requirements of managerial practice. Rather, companies need to take into account that the nature of their e-commerce strategies might simultaneously affect organizational structure, brands, and technology. Concerning branding strategies, previous research on the impact of e-commerce on brands has examined how the Internet affects the management of individual brands. However, our paper is based on the notion that e-commerce impacts not only individual brands, but also a company's entire brand architecture.

Thus, this paper adds to the growing body of research on the impact of e-commerce in two ways. First, we analyze the impact of B2C e-commerce on a company's entire brand architecture, which includes both the number of brand names a company uses for its product range and target groups or target markets and the internal and external relations among these brands (Aaker and Joachimsthaler (2000a, 134); Laforet and Saunders (1999); Kapferer (1999, 187)). Second, our paper simultaneously explores the impact of B2C e-commerce on the amount of change in organizational structure, brand architecture, and IT structure as well as its influence on the interrelations among these three structural elements. Studying the simultaneous impact of B2C e-commerce on different structural elements is, to the best of our knowledge, a novel approach, one which responds to managers' need to address the impact of e-commerce on organizations holistically.

Drawing on previous research, our theoretical approach, which we present in Section 2, is grounded in transaction cost theory. We argue that (a) organizational structure, IT structure, and brand architecture need to be designed in a manner that minimizes transaction costs while trading off savings in transaction costs for a potential increase in production costs and reductions in the accumulation of strategic resources (Bauer (1997); Windsperger (2001)); that (b) B2C e-commerce substantially alters the level and structure of the transaction costs relevant to these three structural elements; and theoretically conclude that (c) the scope of the changes in organizational structure, IT structure, and brand architecture and the interdependence among them increase as the importance of B2C e-commerce to the company grows. We test our hypotheses in a study conducted among 98 chief marketing officers (CMOs) and chief information officers (CIOs) of 64 out of the 100 most important consumer brand companies in Austria (Section 3). We report the results in Section 4. In Section 5 we discuss implications for future research and managerial decision-making in the area of e-commerce.

2 Theoretical Background and Hypotheses

2.1 Transaction costs and intra-organizational structures

According to transaction cost theory, choosing the most efficient form of inter-organizational and intra-organizational structures compromises the efficiency of different forms of governance structure in terms of production and transaction costs (Coase (1937)). Generally speaking, transactions costs include *ex ante* costs of initiation (search and information costs), agreement (e.g., costs of negotiations and reaching an agreement) and *ex post* costs of control and adjustment (Picot et al. (1997)). These costs are dependent on the kind and frequency of transactions, on the asset specificity of the investments in the transactional relationship of both partners, and on environmental uncertainty (Rindfleisch and Heide (1997); Williamson (1991)). Efficient governance structures minimize the sum total of transaction and production costs and maximize the accumulation of strategic resources, such as knowledge or non-imitable transaction networks (Bauer (1997); Windsperger (2001)).

Chandler (1962/1991, 14) defines organizational structure as the "design of the organization through which the enterprise is administered". The transaction costs relevant to the composition of the organizational structure are rooted in the internal transactions between divisions (e.g., of different products), functions, and geographic units of the organization (Chandler (1962/1991); Windsperger (2001)). Previous research clearly shows that transaction costs exert a significant influence on the design of organizational structure, particularly on the choice between functional and divisional structures (Malone (1987); Windsperger (2001)); and on the intra-organizational level of centralization compared to the autonomy of divisions (Argyres (1996); Dorestani (2004); Jost (2000, 279); Rao (2003, 141); Galbraith (1974); Thompson (1967)) and geographic units (Castellani and Zanfei (2004); Rugman and Verbeke (2005)).

Further, transaction cost theory does not perceive firm boundaries as a given, but considers them to be the result of a trade-off between those transaction costs and production costs that arise from coordination by hierarchy, market, or various hybrid forms. Looking at organizational structures from such a broad perspective, research shows that the following activities are also dependent on transaction costs: make-or-buy decisions in the widest sense, i.e., outsourcing or integrating functions (Levy (1985)), especially research and development (Robertson and Gatignon (1998); Schilling and Steensma (2002)) and distribution (Rindfleisch and Heide (1997)), portfolio and diversification decisions (Bergh and Lawless (1998)), and the form of international market entry (Bradley and Gannon (2000); Brouthers and Brouthers (2000)).

The IT structure of an organization includes IT components, the human IT infrastructure, and both shared IT services and shared and standard applications. While IT components refer to the "technologists' view of the infrastructure building blocks", the human IT infrastructure denotes the "intelligence to translate the IT components into services the user can draw upon". Shared IT services correspond to "the users' view of the infrastructure" and shared and standard applications refer to the "fairly stable uses of these services" (Weill and Vitale (2002, 18)). Dimensions of the IT structure include, for example, IT

planning, IT security, technology integration, and data administration (Lewis and Byrd (2003)).

The design of the IT structure, defined in terms of the degree of process centralization and network capabilities, might take the form of (a) centralized computing[1], (b) decentralized computing (i.e., isolated IT structures, for example for different divisions), (c) a central processor that maintains control over the processes ("hub-and-spoke computing"), (d) distributed computing (direct interaction without the aid of a central processor), and (e) cooperative computing using a client-server computing structure (Fiedler et al. (1996)). Essentially, systems can be separated by divisions or countries, but client-server solutions are widely used despite the additional efforts required for architecting and tuning (Aries et al. (2002)). As previous research shows, the optimization of the IT structure depends on the transaction costs of those processes that are carried out electronically or are supported by IT (cf. Clemons and Row (1991)). In particular, decisions regarding the degree of centralization in the IT structures of product divisions and geographical units (Evaristo et al. (2005); Karake (1996)), and the use of a component-based IT structure (Fan et al. (2000); Fingar (2000); Larsen (2000)), depend on the level and structure of costs of electronically mediated transactions. For example, decentralization increases when communication among the multitude of operating systems is constrained. Meanwhile, in the late 1990s, falling transaction costs led to a recentralization of IT structures (Evaristo et al. (2005)).

In this paper we confine our examination to the marketing-related IT structure, which we define as those parts of the IT structure that support external transactions with customers or internal transactions that are directly linked to these customer-oriented external transactions.

We note that since firm boundaries are not perceived as given in transaction cost theory, both the intra- and inter-organizational structuring of processes plays an important role in the design of the IT structure, as is the case with the organizational structure. For example, Smith and Rupp (2003) show that make-or-buy decisions on IT functions are a matter of transaction costs. However, the main focus in our paper is on intra-organizational aspects of the IT structure.

When we consider brand architecture, which can be regarded as the structural link between the internal organization and the customer, the transaction costs incurred by the customer have to be taken into account in addition to the internal and external transaction costs incurred by the company (Erdem (1998); Esch (2004, 256); Meffert et al. (2002); Smith and Park (1992)). We note that we are aware that the interrelations among organizational structure, brand structure, and IT structure are embedded in corporate strategy (Wolf and Egelhoff (2001)), and corporate culture. For ease of illustration in this analysis we use a structural lens.

1 Here, the notion of a centralized IT structure does not include the central control of external processes. Rather, it includes isolated processors and databases that are accessible either directly or by using terminals.

Given a certain number of products, target groups, and target markets, brand architecture addresses the question of how many brands are optimal for both customers and companies. The spectrum of possibilities ranges from a pure umbrella-brand strategy[2], in which all offerings are sold under one brand name to all target groups and in all geographic markets of the company; and mixed branding (Keller (2003))[3], in which all offerings bear an individual brand name in addition to the umbrella brand; to a strategy of completely separate brands for individual offerings, target groups, and markets[4].

Within the framework of transaction cost theory, brands can be considered a means of reducing the transaction costs incurred by both customers and companies. Efficient brand architecture management refers to the distribution of transaction costs between the company and its customers in a way that minimizes total transaction costs (Pfeiffer (2002, 134); Strebinger and Treiblmaier (2004b)). Customer-based transaction costs include *ex ante* costs of information search and thinking (Schmidt and Spreng (1996); Shugan (1980)), which, in turn, can be divided into a product-related and an image-related component (Schweiger and Mazanec (1981)); and *ex post* costs attributable to the operations risk (for example, the risk of the company delivering poor quality) and the risk of opportunistic behavior on the part of the company once the customer is bound to it, such as in complex services (Clemons et al. (1993); Bauer (1997, 206); Kapferer and Laurent (1983; 123)). Company-based transaction costs comprise the external transaction costs of brand communication for building and maintaining brand awareness and brand image (Keller (2003)), the costs of giving detailed product information, concluding the contract, and settling the transaction, the costs of the operation failure and opportunism on the part of the consumer. Company-based transaction costs also include the internal transaction costs of coordinating brand positioning across products, target groups, and target markets for those areas in which the company follows a strategy of umbrella or mixed branding and the costs of coordinating different brands within a portfolio of individual brands (Meffert et al. (2002)).

Previous research has shown that an umbrella-brand strategy typically lowers the company's external communication costs relative to individual brands (Erdem and Sun (2002); Smith and Park (1992); Tauber (1988)) and reduces customers' *ex post* transaction costs (Dacin and Smith (1994); Strebinger (2004b); Wernerfelt (1988)). At the same time, an umbrella brand increases the *ex ante* costs of information search and thinking on the part of the consumers. The more products and target groups are pooled under one single brand name, the less diagnostic is, *ceteris paribus,* the information about the specific benefits of the brand (Anand and Shachar (2004, 150); Kapferer (1999, 191)), because very broad corporate brands require a comparatively abstract positioning (Esch and Bräutigam (2001)). Furthermore, umbrella-branding strategies require a higher level of coordination and integration among the different units of the company, which results in higher internal coordination costs (Malone (1987); Meffert et al. (2002)). Depending on factors such as the amount and structure of heterogeneity within the portfolio of products, target groups, and target

2 Called "Corporate Umbrella Brand" (Kapferer (1999, 188), or "Branded House" (Aaker and Joachimsthaler (2000b)).

3 Also called "Dual Branding" (Laforet and Saunders (1994)).

4 Called "Product-Brand Strategy" (Kapferer (1999)), or "House of Brands" (Aaker and Joachimsthaler (2000b)).

markets of the company, and the synergies within this portfolio (Kapferer (1999, 254); Köhler (2001); Sattler et al. (2002)); the ratio of search, experience, and credence qualities (Kaas (2001)); the ratio of functional, experiential, symbolic, and relational consumer benefits (Park et al. (1991); Strebinger (2004b)); and the level and structure of communication costs for brand building and product information in the industry, the optimal brand architecture minimizes the sum of transaction costs of the customer and the company.

Since the three structural elements depend on different kinds of transaction costs, many companies develop their organizational structures, IT structures, and brand architectures along different structural patterns. For example, a company might follow an umbrella-brand strategy (brand architecture) coupled with an internal organizational structure divided along different product divisions, and an IT structure that follows a regional pattern. However, since the efficiency of each of the three structural elements depends on transaction costs, a change in the level and the structure of transaction costs triggers a change in the relative efficiency of governance structures (Brynjolfsson et al. (2004)).

2.2 Overview of The effects of e-commerce on transaction costs

We define e-commerce as the total of all applications that pertain to online communications and transactions (OECD (2000)). This definition encompasses the communication between organizations and customers over the Internet, the completion of one-time or ongoing online transactions (Albers et al. (2001)), and e-CRM systems with an online interface.

We confine our investigation to consumer markets, since business-to-business (B2B) relations are frequently characterized by a small number of customers and a strong emphasis on personal contacts between customers and salespeople as their means of marketing communication (Reinartz et al. (2004, 297)). Therefore, brands are typically less important in B2B marketing than in B2C markets.

Previous theoretical work and empirical research clearly indicate that B2C e-commerce has the capacity to alter the structure and level of internal and external transaction costs incurred by the company as well as those incurred by the consumer. The precise impact of B2C e-commerce on transaction costs depends on many factors, which include, among others, product digitizability (Khan and Motiwalla (2002); Lee (2001); McKinnon and Forster (2000); Varadarajan and Yadav (2002)), product complexity and sensitivity (Diller (2001); Udo (2001)), product tangibility (Citrin et al. (2000); Varadarajan and Yadav (2002)), or industry structure characteristics such as market thinness or customer dispersion (Varadarajan and Yadav (2002)). *Table 1* summarizes the impact of e-commerce on external and internal transaction costs incurred by the company and the transaction costs incurred by the consumer. The table data distinguish – if necessary and applicable – between fixed and variable costs (Picot et al. (1997)) and focus on situations in which a company uses its traditional offline brand(s) in the online world rather than on pure e-brands. We make assumptions (in brackets) where, to our knowledge, no published research is available.

Table 1: E-Commerce and changes in transaction costs

External transaction costs incurred by the company		
	Changes induced by B2C e-commerce	
Type of Transaction Cost	Fixed Costs	Variable Costs per customer/ transaction
Communication costs of building and maintaining brand awareness and brand image	(0)	-/+ Strebinger and Treiblmaier (2004a)
Costs of giving detailed product information and advice	-- Lee (2001)	-- Evans and Wurster (1999); Tapscott (1996)
Contract conclusion and payment	++ Gribbins and King (2004); Wright (2002b)	-- Barua et al. (2001); Domowitz (2002); Gribbins and King (2004)
Transaction settlement (e.g., transport costs) • physical products • digital products	 -- Khan and Motiwalla (2002) -- Khan and Motiwalla (2002)	 ++ McKinnon and Forster (2000) -- Hippner (2004); Lee (2001); Wright (2002a)
Costs due to operations and opportunism risk	Not applicable	(-/+)
Internal transaction costs incurred by the company		
Type of Transaction Cost	Fixed Costs	Variable Costs per transaction
Data acquisition Data analysis for individual customers/ products/countries Data exchange among different divisions, departments or countries Data management	+ Chen et al. (2000); Gardner (1998); Inmon (2000)	-- Bakos (1998) -- Rayport and Sviokla (1995) -- Fiedler et al. (1996, 18); Torre and Moxon (2001) -- Pula et al. (2003)
Transaction costs incurred by the consumer		
Type of Transaction Cost	Fixed Costs	Variable Costs
Getting a market overview (suppliers, product attributes) and heuristic processing of information	-- Schmitz (2000) ++ Hummel (2002); MacDonald and Oetinger(2002)	Variable costs per supplier: -- Rasheed and Geiger (2001)
Search for detailed information and decision costs and systematic processing	Not applicable	Variable costs per product/supplier: -- Devaraj et al. (2002); dependent on the need for tactile input: Citrin et al. (2000)
Transaction settlement	Fixed costs of getting familiar with an ordering system: ++ Aberg and Shahmehri (2000); Clemons et al. (2002); Gebauer (1996, 149); Johnson et al. (2003); Lee and Cunningham (2001)	Variable costs per transaction: -- Johnson et al. (2003); Kalakota and Robinson (1999)
Costs due to operations and opportunism risk	Not applicable	-/+ Mukherjee and Nath (2003); Varadarajan and Yadav (2002) + Bauer (2004); Kwak (2001); Udo (2001); Merrilees and Fry (2002); Urban et al. (2000)

+ (++) ... (strong) increase in costs; - (--) ... (strong) decrease in costs; 0 ... no changes in costs

2.3 Effects of B2C e-commerce on Organizational Structure, Brand Architecture and IT structure: Hypotheses

As far as internal transaction costs among different departments, product divisions and country units of the company are concerned, the provision of an adequate infrastructure needed for gathering, analyzing, exchanging and managing data leads to an increase in fixed internal transaction costs (Chen et al. (2000); Gardner (1998); Inmon (2000)). Variable internal transaction costs usually decline due to lower variable costs of gathering data (Bakos (1998)), efficient ways of data analysis (Rayport and Sviokla (1995)), cross-national data exchange (Torre and Moxon (2001)), and to more efficient and effective data management (Pula et al. (2003)).

From a transaction-cost perspective, these effects exert an influence on the organizational structure, since the existing structure fits the level and structure of internal transaction costs before e-commerce is introduced. Previous research clearly shows that the realization of potential reductions in transaction costs is not solely in the sphere of the IT structure, but requires that the entire organizational structure be reorganized, i.e., processes that are not electronically mediated also need to be reengineered (Gardner and Ash (2003); Rajola (2003); Reinartz et al. (2004)). Falling variable internal transaction costs are beneficial to the organizational structures that are associated with high transaction costs (i.e., functional or cooperative structures) compared to organizational structures that keep the number of internal transactions low by clearly separating product divisions or geographic units[5]. Thus, B2C e-commerce fosters the emergence of organizational structures that focus on customer relationships, thereby transcending the borders of product groups or country groups (Johnson and Whang (2002); Rajola (2003); Wright (2002a)). The higher fixed costs of internal transactions might alter the optimal organizational structure, if, to benefit from economies of scale, they require internal mechanisms of cooperation or the hierarchical coordination of various parts of the organization[6].

Summarizing our theoretical reasoning, previous research has shown that the organizational structure should be designed in a manner that reduces transaction costs to a minimum, and that B2C e-commerce substantially alters the level and scope of transaction costs relevant to the organizational structure. As Sampson (2003) points out, as the direction of these changes in organizational structure is difficult to predict. However, since these changes are stronger, the more important B2C e-commerce is to the company, we hypothesize:

H1: *The more important B2C e-commerce is to the company, the larger is the degree of change in the organizational structure of the company.*

Since brand architecture is affected by changes in any of the three types of transaction costs, B2C e-commerce exerts a complex influence on brand architecture. Several effects

5 For a theoretical discussion see Malone (1987) and Windsperger (2001).

6 Further, changes in transaction costs can shift the organization's boundaries, for example by disintermediating or reintermediating the structure of distribution (Domowitz (2002); Nissen (2000)).

suggest that B2C e-commerce can benefit brand architectures that are strongly integrated, i.e., umbrella branding or mixed branding, relative to brand architectures that are not integrated, and maintain separate brands for different product divisions or countries.

First, lower internal variable transaction costs, in particular for the exchange of customer data (Bakos (1998); Pula et al. (2003); Rayport and Sviokla (1995); Torre and Moxon (2001)), are conducive to a stronger integration of the brand architecture in the form of mixed or umbrella branding, since these branding strategies rely heavily on internal coordination.

Second, e-CRM has the potential to positively affect the magnitude of synergies through cross-selling or up-selling among different products and services offered by the company (Clemons and Row (1991, 284); Rajola (2003); Skiera and Garczorz (2000)), thus lowering the external transaction costs incurred by both business units (Clemons and Row (1991); Kendrick and Fletcher (2002)) and the customer (Motz (1998, 165)). These effects might entail a stronger integration in the brand architecture if, for example, a company (e.g., "Starwood Hotel and Resorts Worldwide") with a portfolio of brands (e.g., "Sheraton", "Westin", "Four Points", "St. Regis") wants to reward customer loyalty across different brands or make the benefit of improved service quality visible to customers (e.g., the "Starwood Preferred Guest" program) (Strebinger and Treiblmaier (2004a)).

Third, compared to purchasing in the offline world, the transaction costs incurred by consumers who are familiarizing themselves with a new online ordering or payment system are higher than offline, because of typically rather complex systems (Aberg and Shahmehri (2000); Lee (2001)). Once the consumer is familiar with the online ordering system of a particular supplier, the variable costs of transaction settlement (e.g., online banking, purchasing a DVD online) are frequently lower than in the offline world (Albers et al. (2003, 636); Kalakota and Robinson (1999)). This altered ratio of fixed-to-variable costs of transaction settlements leads to a stronger "lock-in effect", which works in favor of the online vendors with whom the consumer is already familiar (Johnson et al. (2003); cf. Skiera and Garczorz (2000)), thus benefiting broad brands as opposed to separate brands for different product categories. We note that this assumption holds even if brands A and B objectively share the same ordering and payment procedure, as consumers might suspect that different brands have different systems and might not visit the online shop of brand B at all, even though they are familiar with brand A's system.

Finally, large or broad brands are in a more favorable position than are smaller brands when it comes to risk costs (Dacin and Smith (1994); Wernerfelt (1988)), since trust is of paramount importance in online transactions (Bauer (2004); Brynjolfsson and Smith (2000); Kwak (2001); Merrilees and Fry (2002))[7] and customers grant "credit" to a brand when they collect points in customer loyalty programs (Danaher et al. (2003); Strebinger and Treiblmaier (2004a)).

7 Other authors argue that the vast amount of information allows for comparisons among competing goods and services and thus improves transparency, thereby lowering the risk of bad delivery and opportunistic behavior on the part of the supplier.

On the other hand, some of the effects that B2C e-commerce exerts on transaction costs point towards a stronger differentiation of the brand architecture, i.e., a higher number of separate brands for a given portfolio of products, target groups, and target markets.

First, the Internet can make it easier for consumers to get a market overview and compare prices, which might lead to lower fixed costs for the total purchasing transaction and to lower variable information costs per brand (Schmitz (2000))[8]. The Internet significantly reduces search costs for systematically examining the offerings of a single vendor, since it cuts down search time and enables users to perform targeted information searches (Devaraj et al. (2002)). These reduced costs increase the optimal size of the consumer consideration set (Hauser and Wernerfelt (1990)), i.e., the number of brands consumers consider for purchase, which in turn puts smaller brands, and therefore more strongly integrated brand architectures, in a better position.

Second, B2C e-commerce radically changes the level and structure of the company's external transaction costs that arise from customer interactions. Although the influence of the Internet on building and sustaining brand awareness and brand image is discussed controversially (Strebinger and Treiblmaier (2004a)), it acts as a communication channel that makes information searches fast and easy, thus reducing the company's costs of providing customers with product information and advice (Evans and Wurster (1999)). In some cases, it is possible to replace face-to-face information from qualified sales personnel with the self-service information provided by the Internet (Diller (2001); Lee (2001)), which in turn reduces fixed external transaction costs per brand (e.g., for sales staff, bricks-and-mortar outlets) and variable external transaction costs per customer (cf. Tapscott (1996)). This cost reduction might benefit a brand architecture with a higher number of separate brands, since this type of branding strategy is inherently more sensitive to the level of external transaction costs.

Overall, limited empirical research in the area of consumer non-durables (Danaher et al. (2003); Degeratu et al. (2000)) and the number of arguments seem to favor a stronger integration in brand architecture. Nevertheless, we do not make predictions as to the direction of the changes that B2C e-commerce triggers in brand architecture, since the relative impact of the effects discussed differ according to the weight consumers attach to factors such as ease of information gathering, trust, or price. Therefore, we confine our study to a prediction of the influence that B2C e-commerce exerts on the degree of change in the brand architecture.

Related previous research suggests that brand architecture should be designed in a manner that reduces the sum of transaction costs of the company and the consumer to a minimum, and that B2C e-commerce substantially alters the level and structure of all kinds of transaction costs relevant to brand architecture. On an individual level, theoretically the changes in transaction costs could cancel out each other, leaving the optimal brand architecture of a particular company unchanged by e-commerce. However, on an

8 Some authors assume that costs for getting a market overview increase due to the information overload on the Internet (Hummel (2002, 723); MacDonald and Oettinger (2002)).

aggregate basis, B2C e-commerce should create variations in the differences between the transaction costs in the era before and after the introduction of e-commerce, rendering the changes in brand architecture predicted by H_2 observable empirically.

Since the changes in the level and structure of transactions costs are stronger, the more important B2C e-commerce is to the company, we hypothesize that:

H2: *The more important B2C e-commerce is to the company, the larger is the degree of change in the brand architecture of the company.*

B2C e-commerce has its most immediate influence on a company's IT structure. It is capable of supplementing or partly substituting all stages of transactions with final consumers, which requires adaptations of the internal IT structure that can support customer-centered processes in a company as much as possible (Fingar (2000); Earl and Khan (2001)).

In addition, research finds that consumers' expectations have changed. For example, consumers expect companies that use an Internet-based communication strategy and that present or sell their products on their Web sites to reply instantly to inquiries or complaints (O'Neill et al. (2003)).

This special influence of B2C e-commerce on the design of the IT structure is evident primarily from the changes in the demands made on data exchange among companies, and on the electronically mediated handling of transactions (Domowitz (2002)) and communication processes (Malone (1997)). Cross-functional cooperation and data transfer possibilities are determined by the distribution of fixed versus variable costs of electronically mediated transactions (Khan and Motiwalla (2002); Johnson and Whang (2002)), a proportion that is altered by e-commerce. The standardization of communication protocols and interfaces enables companies to exchange data easily and cost-effectively both within the organization and outside its borders (Kulkarni and Heriot (1999)). These changes, together with companywide access to shared databases, eliminate the need for companies to complete the tasks of data storage and data analysis in a redundant manner. Thus, companies can use leaner IT systems, which, as they are shared by different parts of the company, decrease fixed costs[9].

However, as a consequence of the increasing interconnectedness of different parts of an organization, the dependency on jointly used technology components or IT services rises, which calls for a closer alignment of technical and human IT resources. This effect should apply in particular to the marketing-related IT structure, which is characterized by a multitude of IT-supported transactions with mostly anonymous customers (Earl and Khan (2001)). Since the need for changes gets stronger, as the importance of B2C e-commerce to the company grows, we hypothesize that:

9 Additional synergies might be achieved by a central reporting system, as the applications of the central unit are accessed by so-called "thin clients", which perform merely input and output functions (Walsh (2003)).

H3: *The more important B2C e-commerce is to the company, the larger is the degree of change in the marketing-related IT structure of the company.*

Previous research indicates that the design of the IT structure depends on the design of the organizational structure (Ahituv et al. (1989); Fiedler et al. (1996)). Ahituv, Neumann, and Zviran (1989), who analyze the relations between various organizational attributes and the deployment of hardware resources, find that hardware distribution depends heavily on the distribution of the decision-making process. By comparing IT structures and organizational structures of 313 firms, Fiedler, Grover, and Teng (1996) find that centralized computing is related to functional organizational forms with low integration and centralized decision-making, but decentralized computing is often used together with product organizations with decentralized decision-making. Furthermore, they state that centralized cooperative computing is related to functional organizational forms with high integration, while distributed cooperative computing is related to both matrix and product organizations with high integration.

Therefore, we hypothesize that changes in the organizational structure are accompanied by corresponding changes in the marketing-related IT structure:

H4: *The higher the degree of change in organizational structure, the greater is the change in the marketing-related IT structure of the company.*

E-commerce also increases the proportion of electronically mediated transactions within an organization. Therefore, e-commerce raises the specificity of investments in organizational and IT structures (Bauer (1997); Clemons and Row (1991)). Thus, e-commerce calls for more coordination among organizational processes (as mirrored by the organizational structure) and the marketing-related IT structure (Fassot (2001); Fiedler et al. (1995); Piccoli et al. (2003); Reinecke and Köhler (2004); Zentes and Schramm-Klein (2004)).

In a survey among 310 CIOs, Weiber and Adler (2002) find that the primary reason why investments in e-commerce related infrastructure did not pay off was that the companies had failed to align their organizational processes with their IT structures. Similarly, Reinartz et al. (2004) report that the impact of investments in e-commerce-related IT structure on corporate performance was higher if corresponding organizational changes had been implemented. Therefore, we hypothesize an interactive effect between the importance of B2C e-commerce and the degree of change in the organizational structure on the degree of change in the marketing-related IT structure:

H5: *The relation between organizational structure and marketing-related IT structure strengthens as the importance of B2C e-commerce to the company increases.*

Similarly, the brand architecture must not be designed without taking into account the design of the organizational structure, since these two structural elements share several internal processes. For example, an empirical study by Laforet and Saunders (1994) shows a close relation between organizational structure and brand architecture regarding the branding of different products and services. Similarly, Douglas et al. (2001) find a signifi-

cant relation between organizational structure and the design of a company's international brand architecture. Therefore, we hypothesize that, in general:

H6: *The higher the degree of change in organizational structure, the larger is the change in the brand architecture of the company.*

H_6 postulates a main effect of changes in the organizational structure on the changes in the brand structure. However, the strength of this relation is not independent of the importance of B2C e-commerce. E-commerce typically increases the proportion of processes used by both brand architecture and organizational structure. The frequency of cross-product and cross-country internal transactions is increased when a firm capitalizes on the reduction in variable transaction costs because of a more customer-oriented organizational structure compared to predominantly divisional or geographic structures of organizations. In turn, the learning effects this process brings about facilitate the internal coordination of external brand communication. Therefore, with B2C e-commerce, companies with an appropriate organizational structure and brand architecture can benefit from both lower internal and lower external transaction costs (Strebinger and Treiblmaier (2004a)).

In terms of transaction cost theory, this effect implies that the specificity of organizational and brand-related investments rises as the importance of e-commerce to the company grows. Therefore, we hypothesize that:

H7: *The relation between organizational structure and brand architecture strengthens as the importance of B2C e-commerce to the company increases.*

Thus, H_7 postulates that the importance of B2C e-commerce and the degree of change in the organizational structure interactively affect the amount of change in the brand architecture.

Brand architecture exerts a significant influence on the marketing-related IT structure, since the latter supports electronically mediated external transactions with customers (e.g., when processing orders) or internal transactions directly linked to these customer-oriented external transactions (e.g., internal exchange of customer data)[10]. For instance, a brand architecture with separate brands for different product divisions triggers a different electronically supported flow of information than does an umbrella-brand strategy (cf. Malone (1987); Strebinger and Treiblmaier (2004a)). Thus, we hypothesize that changes in the brand architecture go hand in hand with changes in the IT structure:

H8: *The higher the degree of change in brand architecture, the larger is the change in the marketing-related IT structure of the company.*

10 We consider the brand architecture to be the element that determines the structure, and the marketing-related IT structure to be at the receiving end. This view is shared by the large majority of CIOs and CMOs surveyed in the course of a qualitative pre-study and the quantitative study reported later.

If a company attaches particular importance to B2C e-commerce, there is a sharp rise in the proportion of those internal and external marketing-related transactions that are electronically mediated. This increase in the ratio of marketing transactions supported by IT to marketing transactions not supported by IT leads to a stronger interdependence of IT structure and brand architecture. For example, if a large proportion of these transactions is to be supported by IT, then restructuring external transactions with customers by using a brand for more than one product requires fundamental changes in the IT structure[11]. Thus, if B2C e-commerce is highly important to a company, the firm must align brand management and the marketing-related IT structure more closely than in the past (Gurau et al. (2003); Pula et al. (2003); Strebinger and Treiblmaier (2004a)). Therefore, we hypothesize that the importance of B2C e-commerce and the degree of change in the brand architecture have an interactive effect on the degree of change in the IT structure:

H9: *The relation between the brand architecture and marketing-related IT structure strengthens as the importance of B2C e-commerce to the company increases.*

3 Method

3.1 Data Collection

Our sample of companies consists of the Top 100 consumer brand companies in Austria, as measured by their cumulative spending on advertising in the period from 2000 to 2002, according to Media FOCUS Research. In our opinion, expenditures on traditional advertising media are the best publicly available measure for assessing the significance of a company as a consumer brand entity[12].

To improve the reliability of the measures taken, we attempted to interview both the CMO and the CIO of each company and to gather additional information on their respective departments in separate questions (Bruggen et al. (2004)). Since the respon-

11 See Rajola (2003) for a documentation of cases from the Italian banking industry.

12 In combination with this choice, the sample of Austrian companies offers several advantages that improve the overall generalizability of the study: (a) a dispersed distribution of company sizes: in addition to large enterprises our sample also included smaller and medium-sized companies, such as Red Bull or Palmers, a producer of lingerie (Palmers, Wolford, P2 etc.); (b) a mixture of international headquarters of Austrian enterprises doing business internationally, (e.g., ERSTE Bank, the leading bank in Central and Eastern Europe, Austrian Airlines Group, Telekom Austria, Austrian Tourism Service etc.), regional headquarters (for subsidiaries of global companies, such as the Coca Cola Company, IBM or Henkel KGaA, which use Austria as a base for their activities in Central and Eastern Europe), and companies that operate predominantly locally (e.g., Austrian Railways, Austrian Postal Service) or act as local subsidiaries of global companies (e.g., Mercedes-Benz Austria, T-Mobile, Allianz); (c) To many internationally operating companies, Austria serves as a test market for continental Western Europe, which indicates that the behavior of Austrian consumers is fairly representative, (Strebinger (2004a)); (d) Austria is among the leading countries in terms of Internet use. According to a survey by Arthur D. Little (2004), 19% of Austrian households had Internet access via broadband in the year 2003 (USA 23%, UK 14%, Germany 9%). Similarly, in a comparison of e-CRM quality in B2C service industries in Germany, Switzerland, the United Kingdom, and Austria, Austria ranks second behind Switzerland (Reinecke and Köhler (2004)).

dents were geographically dispersed, we conducted the interviews by telephone. In a first step, we identified the CMOs and CIOs and followed up with the actual interview.

3.2 Measures

To ensure that the respondents had a common understanding of brand architecture and marketing-related IT structure, we clearly defined these concepts when they were first mentioned in the interview. Subsequently, we measured changes in the organizational structure, the brand architecture and the marketing-related IT structure as global changes on a four-point scale ranging from "very strong" to "very weak"[13]:

"If you think of the past three years and the next three years: Would you say that the [structural element] of your organization is subject to very strong, rather strong, rather weak or very weak changes?"

To assess the importance of B2C e-commerce, we decided – based on theoretical considerations – to use the three indicators "importance of the Internet as a communication channel", "importance of the Internet as a transaction channel", and "importance of e-CRM":

"If you think of the importance of [indicator] for doing business with consumers and if you compare it to [alternatives]. Would you say that the [indicator] could be regarded as very important, rather important, rather unimportant, or very unimportant to the success of your company?"

Furthermore, we asked the respondents to directly assess the interplay of marketing-related IT structure and brand architecture (CMO and CIO), brand architecture and organizational structure (CMO only), and marketing-related IT structure and organizational structure (CIO only) by indicating which of the following answers best described the situation in their company: (a) "Changes in [structural element 1] cause changes in [structural element 2]"; (b) "Changes in [structural element 2] cause changes in [structural element 1]"; (c) "Both changes are interdependent"; or (d) "Changes occur to a large extent independently".

The questionnaire also contained several measures concerning cross-selling and up-selling activities of the company (CMO), communication and IT synergies between products and divisions (CMO, CIO), database management and e-CRM systems (CIO), the company's brand architecture online and offline (CMO), and the IT structure in general (CIO).

13 These three global indicators combine the overall development of the three structural elements from the perspective of the respondents. We decided not to calculate summary indices, e.g., by adding up individual measures, as their individual contributions to the overall change would have been difficult to assess due to the complex interactions between different measures that had emerged from a qualitative pilot study. Furthermore, for each structural element, we decided to use a single global indicator rather than multiple global indicators because of the respondents' time constraints. However, to increase the reliability of this indicator, two informants (CIO and CMO) were surveyed from as many companies as possible.

4 Results

Out of the 100 companies contacted, a total of 51 CMOs and 51 CIOs of 67 completed the interview. We had to exclude three companies from the analysis due to missing data. The remaining 64 companies are distributed approximately evenly across fast-moving consumer goods (17), consumer durables (10), retailing companies (12), financial services (11), and other service industries (14).

We interviewed both the CMO and the CIO of 34 companies. In these cases, to increase their reliability (Bruggen et al. (2002)), where appropriate, we averaged the answers to identical questions. Because the items measuring the importance of B2C e-commerce exhibited sufficiently high correlations, we combined them into a single measure (α = .78).

For testing our hypotheses we use a stepwise procedure. In step 1, we analyze the influence of the importance of B2C e-commerce, as we expect it to impact all three structural elements (see H_1 to H_3). Therefore, we regress the amount of change in organizational structure (OS), marketing-related IT structure (IS), and brand architecture (BA) on the importance of B2C e-commerce (WECOMM).

In step 2 (H_4 to H_7), we regress the step 1 residuals of the degree of change in brand architecture (BA1) and marketing-related IT structure (IS1) on the step 1 residuals of the amount of change in organizational structure (OS1), and an interaction term of the step 1 residuals of the amount of change in organizational structure and the mean-centered importance of B2C e-commerce (WECOMMC).

In step 3 we put H_8 and H_9 to the test by regressing the step 2 residuals of the degree of change in the marketing-related IT structure (IS2) on the step 2 residuals of the amount of change in brand architecture (BA2), and an interaction term of the step 2 residuals of the degree of change in brand architecture (BA2) and the mean-centered measure of the importance of B2C e-commerce. This stepwise procedure prevents us from capitalizing on spurious correlations due to factors common to both the independent and the dependent variables. The procedure also minimizes multicollinearity between the predictors in step 2 and step 3 and partials out the crucial sources of nonrecursivity in hierarchically lower regression analyses.

Table 2 shows the mean values and correlations of the variables enrolled in this stepwise procedure. In an exploratory analysis, the perceived changes in brand architecture turn out to be significantly weaker than changes in both organizational structure [t (1,63) = 10.01, $p < 0.001$] and marketing-related IT structure [t (1,63) = 4.7, $p < 0.001$], which in turn is perceived to change to a lesser degree than organizational structure [t (1,63) = -3.898, $p < 0.001$].

Table 2: Means and Correlations of Variables in Regression Analyses

	Mean (S.D.)	1	2	3	4	5	6	7	8	9
1 WECOMM	6.63 (2.07)	1.000								
2 OS	1.83 (.60)	.337[c]	1.000							
3 BA	2.69 (.64)	.248[b]	.386[c]	1.000						
4 IS	2.23 (.71)	.470[c]	.217[a]	.327[c]	1.000					
5 OS1	0.00 (.57)	.000	.94[c]	.321[c]	.062	1.000				
6 BA1	0.00 (.62)	.000	.312[b]	.969[c]	.217[a]	.332[c]	1.000			
7 IS1	0.00 (.63)	.000	.066	.239[a]	.882[c]	.070	.246[b]	1.000		
8 BA2	0.00 (.58)	.000	.000	.899[c]	.252[b]	.000	.928[c]	.286[b]	1.000	
9 IS2	0.00 (.60)	.000	.000	.265[b]	.853[c]	.000	.274[b]	.967[c]	.295[b]	1.000

WECOMM: Importance of E-Commerce (3 highest importance score possible – 12 lowest importance score possible); OS: Amount of change in organizational structure (1 very weak – 4 very strong); BA: Amount of change in brand architecture (1 very weak – 4 very strong); IS: Amount of change in marketing-related IT structure (1 very weak – 4 very strong); OS1, BA1, IS1: Unstandardized residuals of OS, BA, IS after accounting for WECOMM; BA2, IS2: Unstandardized residuals of BA1, IS1 after accounting for WECOMMC, OS1, and WECOMMC*OS1

[a] $\alpha \leq .10$

[b] $\alpha \leq .05$

[c] $\alpha \leq .01$

To account for the characteristics of the dataset, we used three methods of estimation in addition to ordinary least squares (OLS) tests. The methods are weighted least squares (WLS) tests to handle potentially different error variances between companies for which we had one informant and companies with two informants; ordered logit estimates in order to deal with a potentially non-interval scale type of the dependent variables; and two different bootstrap estimates using the sequential quadratic programming algorithm to deal with the relatively small sample size. The appendix contains the results of all analyses.

Because the additional estimation techniques yield results substantively identical to the OLS estimates, we report only the OLS estimates. We assume that our measures approximate interval-scale type data, especially as they mainly consist of compound measures from multiple informants or of different items (cf. Bandalos and Finney (2001)).

4.1 Step 1: The impact of B2C e-commerce on the degree of change in organizational structure, brand architecture, and the marketing-related IT structure (H1 to H3)

The three separate regressions of step 1 support H_1 to H_3 (see *Table 3*): The stronger the stated importance of B2C e-commerce, the stronger are the changes in organizational structure (b = 0.099 (0.035), t (1,62) = 2.819, $p < 0.01$), the changes in the brand architecture of the company (b = 0.077 (0.038), t (1,62) = 2.020, $p < 0.05$), and the changes in the marketing-related IT structure (b = 0.161 (0.038), t (1,62) = 4.196, $p < 0.001$).

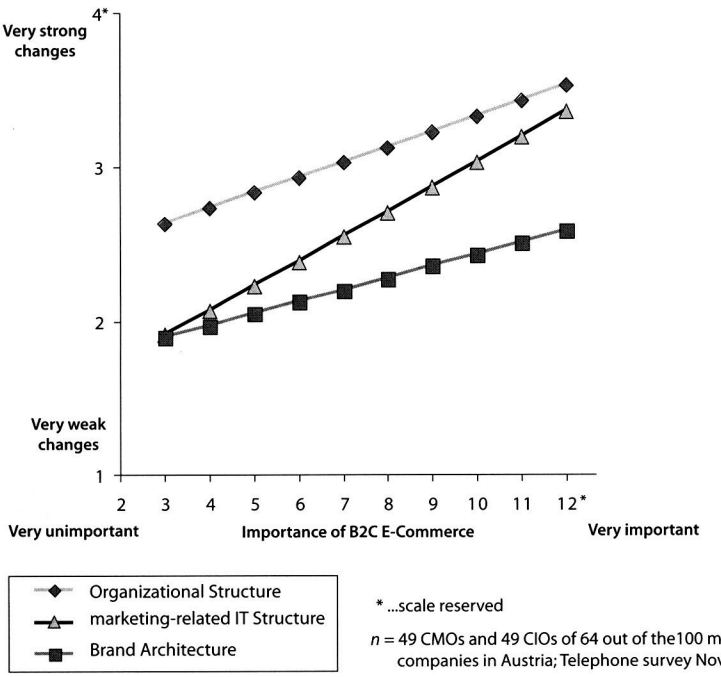
Table 3: Results of OLS

		OLS		
	Model Information	$F(df), p, r^2$		
Dependent Variable	Parameter Information	*b* (*S.E.*)	*t*	*p*
OS	Model	$F(1,62)=7.944, p=.006, r^2=.114$		
	Constant	1.175 (.242)	4.850	<.001
H_1	WECOMM	.099 (.035)	2.819	.006
BA	Model	$F(1,62)=4.080, p=.048, r^2=.062$		
	Constant	2.181 (.264)	8.249	<.001
H_2	WECOMM	.077 (.038)	2.020	.048
IS	Model	$F(1,62)=17.610, p<.001, r^2=.221$		
	Constant	1.161 (.267)	4.356	<.001
H_3	WECOMM	.161 (.038)	4.196	<.001
IS1	Model	$F(3,60)=1.392, p=.254, r^2=.065$		
	Constant	.000 (.077)	.000	1.000
H_4	OS1	.176 (.146)	1.204	.233
	WECOMMC	.013 (.038)	.351	.727
H_5	OS1 * WECOMMC	-.120 (.061)	1.965	.054
BA1	Model	$F(3,60)=3.241, p=.028, r^2=.139$		
	Constant	.000 (.074)	.000	1.000
H_6	OS1	.294 (.139)	2.110	.039
	WECOMMC	-.009 (.037)	-.255	.799
H_7	OS1 * WECOMMC	.082 (.058)	1.429	.158
IS2	Model	$F(3,60)=2.685, p=.055, r^2=.118$		
	Constant	.000 (.073)	.000	1.000
H_8	BA2	.311 (.127)	2.441	.018
	WECOMMC	.001 (.036)	.042	.967
H_9	BA2 * WECOMMC	.102 (.070)	1.455	.151

WECOMM: Importance of E-Commerce (3 highest importance score possible – 12 lowest importance score possible); WECOMMC: WECOMM (mean-centred); OS: Amount of change in organizational structure (1 very weak – 4 very strong); BA: Amount of change in brand architecture (1 very weak – 4 very strong); IS: Amount of change in marketing-related IT structure (1 very weak – 4 very strong); OS1, BA1, IS1: Unstandardized residuals of OS, BA, IS after accounting for WECOMM; BA2, IS2: Unstandardized residuals of BA1, IS1 after accounting for WECOMMC, OS1, and WECOMMC*OS1

Figure 1 depicts the OLS estimates, which illustrate the impact exerted by the importance of B2C e-commerce on the level of change in the three structural elements (H_1 to H_3). For ease of illustration, both scales have been reversed in *Figure 1*.

Figure 1: OLS Estimates for H_1 to H_3



4.2 Step 2: The impact of the degree of change in organizational structure and its interaction with the importance of B2C e-commerce on the degree of change in brand architecture and the marketing-related IT structure (H4 to H7)

After controlling for the effect of B2C e-commerce on all three structural elements, we find that the first regression of step 2 does not support H_4. The main effect exerted by the step 1 residuals of the degree of change in organizational structure has no significant effect on the step 1 residuals of the degree of change in the marketing-related IT structure (b = 0.176 (0.146), $t(1,61)$ = 1.204, p > 0.23).

However, this finding should be interpreted in light of the interaction term of these residuals with the mean-centered measure of the importance of B2C e-commerce, which is marginally significant in the direction expected by H_5 (b = -120 (0.061)[14],

14 The negative sign of the interaction term indicates that if e-commerce is highly important, then organizational structure has a stronger influence on marketing-related IT structure.

t (1,61) = 1.965, p > 0.06). As the importance of e-commerce rises, the link between organizational structure and marketing-related IT structure tends to strengthen, even after we control for direct effects of e-commerce on both organizational and IT structure. The main effect and the interaction effect offer the interesting insight that only if B2C e-commerce is highly important is there typically a positive correlation, and therefore a great need for coordination between changes in the organizational structure and changes in the marketing-related IT structure.

We note that apart from small, separate adaptations attributable to e-commerce in each of the two structural elements, there is even a reduced need for coordination, if B2C e-commerce has only little importance to the company. In this case, more changes in the organizational structure are accompanied by a reduction in the degree of change in the marketing-related IT structure, and vice versa. This finding is consistent with the predictions of transaction cost theory, since the nonspecificity of changes in the IT structure for changes in the organizational structure, which is postulated if B2C e-commerce is of little importance, does not rule out a compensatory relation between the two. However, to explain this finding further assumptions are required. An example would be capped resources for organizational change, so that a company not driven by e-commerce might in the period under review implement significant changes either in the organizational structure *or* in the IT structure, but not both.

An analogous regression on the relation between brand architecture and organizational structure lends support to H_6. Even after we control for the common factor e-commerce, the degree of change in brand architecture increases as the amount of change in organizational structure rises (b = 0.294 (0.139), t(1,61) = 2.11, p < 0.04). There is no significant change in the impact of organizational structure on brand architecture as B2C e-commerce rises in importance (interaction term: b = 0.082 (0.058), t(1,61) = 1.429, p > 0.15). H_7 thus receives no support from our data.

Figure 2 summarizes these results, using bold arrows to depict significant effects, thin arrows for marginally significant effects, and dotted arrows for insignificant effects.

4.3 Step 3: The impact of the degree of change in brand architecture and its interaction with the importance of B2C e-commerce on the degree of change in marketing-related it structure (H8 and H9)

We find a significant main effect of IT structure when we regress the step 2 residuals of the degree of change in marketing-related IT structure on the step 2 residuals of the degree of change in brand architecture and its interaction with the mean-centered measure of B2C e-commerce. Even after we control for the importance of B2C e-commerce and changes in the organizational structure, the amount of change in the marketing-related IT structure increases as the amount of change in brand architecture increases (b = 0.311 (0.127), t(1,61) = 2.441, p < 0.02), corroborating H_8. Again, the interaction term (corresponding to H_9) turns out to be nonsignificant (b = 0.102 (0.07), t(1,61) = 1.455, p > 0.15).

However, another test that focuses on the direct assessment of the interplay of brand architecture and marketing-related IT structure partly supports H_9. By using a median split, we divide the companies into one group that considers B2C e-commerce to be of higher importance and another group to which B2C e-commerce is of lower importance.

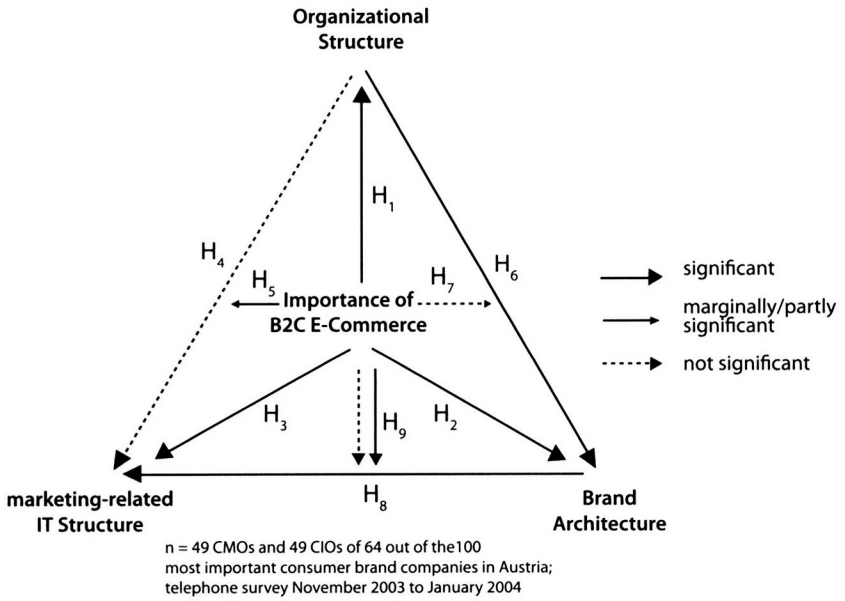
To circumvent small cell sizes, we merge all answers indicating a relation between brand architecture and marketing-related IT structure into a single group, regardless of the direction of this relation stated by the respondents. Of those respondents who perceived a relation between brand architecture and marketing-related IT structure, 71% of the CIOs and 72% of the CMOs indicated that the direction of the influence was from brand architecture to IT structure.

Since our responses come from both CIOs and CMOs but cannot be integrated by averaging, we conduct separate chi-square tests for these two groups of respondents. While 68.2% of the CIOs of companies that consider B2C e-commerce highly important, perceive an interdependence of brand architecture and marketing-related IT structure, only 34.6% of the CIOs of companies that consider B2C e-commerce to be of little importance affirm such a relation (continuity-corrected $\chi^2(1) = 4.112$, $p < 0.05$). This finding is in line with the predictions of H_9. We find no such effect when we analyze the responses of the CMOs (high importance of e-commerce: 41.7%; low importance of e-commerce: 32%; continuity-corrected $\chi^2(1) = 0.164$, $p > 0.69$).

The two tests of H_9 are not comparable for three reasons. First, after controlling for the importance of B2C e-commerce, for the changes in the organizational structure, and for the interaction of these two variables, step 3 of the regression-type analysis includes only the residuals of brand architecture and marketing-related IT structure. Second, the regression-type analysis assumes a directional relation between brand architecture and marketing-related IT structure, but the χ^2-type analysis contrasts any kind of perceived interdependence between the two structural elements with perceived independence. Third, the regression-type analysis uses a sample that is slightly different (including an additional 16 companies) from each of the two χ^2-type analyses. Nevertheless, the χ^2-type analyses suggest that CIOs are more aware of an e-commerce-induced interplay of brand architecture and marketing-related IT structure than are CMOs.

Figure 2 integrates the results of our hypothesis testing. The figure also accounts for the mixed results concerning H_9 by supplementing the dotted arrow (for the nonsignificant results of the regression-type analysis) with a thin arrow (for the partial support provided by the χ^2-type analysis among CIOs).

Figure 2: The Impact of Business-to-Consumer E-Commerce on the Degree of Change in Organizational Structure, Brand Architecture, and IT Structure and their Interrelations



n = 49 CMOs and 49 CIOs of 64 out of the100 most important consumer brand companies in Austria; telephone survey November 2003 to January 2004

5 Summary and Discussion

Building on transaction cost theory and on data from a study among 98 CMOs and CIOs of 64 of the Top 100 consumer brand companies in Austria, this study is the first to analyze the simultaneous impacts of B2C e-commerce on the three interdependent entities of organizational structure, brand architecture, and marketing-related IT structure. Our study highlights how the relations evolve among these entities, depending on the importance of B2C e-commerce to the company. In line with the predictions of transaction cost theory, our results show that:

(1) The degree of change in organizational structure, brand architecture, and marketing-related IT structure increases as the importance of B2C e-commerce grows.
(2) Brand architecture and organizational structure are interlinked, even after we control for the importance of B2C e-commerce.
(3) The impact of changes in organizational structure on the marketing-related IT structure tends to increase as the importance of B2C e-commerce grows.
(4) Brand architecture and the marketing-related IT structure are related to each other, even after we control for the importance of B2C e-commerce, degree of change in the organizational structure, and the interaction of the two.

The data do not support the hypothesis that a high importance of B2C e-commerce strengthens the link between organizational structure and brand architecture. Interpreting this finding in light of transaction cost theory suggests that B2C e-commerce does not cause an increased interdependence among other processes used by the organizational structure and the brand architecture beyond the need for separate adaptations in each. Also, our analyses show mixed results concerning the relation between brand architecture and marketing-related IT structure if B2C e-commerce is highly important to the company. Although partial results do not support a general strengthening of the relation, they do indicate that in the view of CIOs, a high importance of e-commerce strengthens the relation of brand architecture and marketing-related IT structure. Future research is needed to analyze the causes of these divergent results.

From a practitioner's point of view, the results show that e-commerce alters the marketing-related IT structure as well as the organizational structure and the company's brand architecture, although the latter change might be less obvious to management. These results show that companies need to integrate technological, organizational, and brand-related aspects into the design and conceptualization of their e-commerce endeavors. This integration is particularly important for the interdependence of the organizational structure and the marketing-related IT structure, which e-commerce seems to strengthen.

Our study is also new in that it looks at the simultaneous impacts of e-commerce on various structural aspects of companies. The strength of the changes in the marketing-related IT structure depends to a greater extent on the importance of e-commerce than does the strength of the changes in organizational structure, although in absolute terms the strength of the changes in the marketing-related IT structure is lower than the perceived changes in the organizational structure (cf. *Figure 1*).

The importance of e-commerce to the company explains 22.1% of changes in the marketing-related IT structure, 11.4% of changes in the organizational structure, and only 6.2% of changes in the brand architecture. There are several explanations for this. For one, the three structural elements might undergo changes to differing extents. An indication of this is that e-commerce endeavors typically affect large parts of the marketing-related IT structure, but only a subset of the transactions mirrored by the organizational structure. Also, the brand architecture has to meet customer demands. For another, differences in how the three structural elements are affected might also reflect differences as to whether the changes are planned. Our data do not shed light on whether *a priori*, proactive management, or *ex post*, reactive management, is responsible for the changes in the three structural elements that e-commerce reinforces.

Although the impact of e-commerce on the IT structure is usually anticipated and thus well planned, in many companies it is only after a certain time lapse that managers become aware that e-commerce also requires simultaneous changes in the organizational structure. The link between e-commerce and the structure of the communication flows between companies and consumers, which is mirrored by the brand architecture, appears to be the least obvious to managers. The differing results among CIOs and CMOs regarding the impact of e-commerce on the relation between brand archi-

tecture and IT structure strongly suggest that subjective perceptions play an important role in this relation.

Third, the varying strength of the impact of e-commerce might also be a reflection of how easily changes can be made to the three elements. IT structure, organizational structure, and brand architecture have each developed over the years, and now unify various layers of previous corporate growth. They presumably vary as to their adaptability to changing environments. Therefore, it is conceivable that managers do not differ in their willingness to adapt the three systems to the requirements imposed by e-commerce, but in their abilities to implement these changes.

While changes in the IT structure are for the most part associated with technical and financial needs, changes in the organizational structure or brand architecture typically face emotional resistance from those concerned. Before making changes to the brand architecture, companies should bear in mind that consumers as "cognitive misers" are skeptical towards changes to brands (Bauer et al. (2004)). Although optimizing the brand architecture would be a viable option in view of the changed transaction patterns between customers and companies, it always has to be balanced against the costs resulting from such a change and in particular, against the danger of jeopardizing the company's brand equity when migrating brands.

It is evident from our sample that Austrian banks and telecommunication companies, which were the first ones to capitalize on the opportunities provided by e-commerce (in a broad sense), have already implemented numerous changes to their organizational structures and brand architectures.

The method and the conceptual limitations of this study call for future research in this area. Longitudinal studies can shed light on whether organizational structures and brand architectures basically react less strongly or just with a greater time lag to the internal and external transaction structures altered by e-commerce than marketing-related IT structures. The present measures of subjective perceptions on the importance of e-commerce and the changes in organizational structure, IT structure, and brand architecture should be supplemented with objective measures. Also, it would be desirable to include additional factors influencing the three structural elements and the strength of their interrelations.

Within these limitations, our results call for a systematic and simultaneous management of the changes in organizational structure, brand architecture, and marketing-related IT structure that e-commerce induces.

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Appendix

Results of OLS, WLS, Ordered Logit, and Bootstrap Estimates

		OLS			WLS			Ordered Logit[15]			Bootstrap Estimates 1			Bootstrap Estimates 2		
	Model Information	*F(df), p, r^2*			*F(df), p, r^2*			*χ^2(df), p, Nagelkerke pseudo r^2*			Starting values of SQP algorithm: OLS estimates			Starting values: mean of dependent variable for constants, 0 for all other parameters		
Dependent Variable	*Parameter Information*	*b (S.E.)*	*t*	*p*	*b (S.E.)*	*t*	*p*	*b (S.E.)*	Wald	*p*	*b (S.E)*	95 % trimmed range		*b (S.E)*	95 % trimmed range	
OS	Model	$F(1,62) = 7.944$, $p = .006$, $r^2 = .114$			$F(1,62) = 6.691$, $p < .012$, $r^2 = .083$			$\chi^2(1) = 4.953$, $p = .026$, $r^2 = .079$								
	Constant	1.175 (.242)	4.850	<.001	1.194 (.221)	4.870	<.001				1.175 (.267)	.636	1.665	1.175 (.259)	.631	1.658
H_1	**WECOMM**	**.099 (.035)**	**2.819**	**.006**	**.091 (.032)**	**2.587**	**.012**	**.262 (.119)**	**4.839**	**.028**	**.099 .041)**	**.023**	**.184**	**.099 (.041)**	**.022**	**.184**
BA	Model	$F(1,62) = 4.080$, $p = .048$, $r^2 = .062$			$F(1,62) = 4.068$, $p = .048$, $r^2 = .062$			$\chi^2(1) = 4.180$, $p = .041$, $r^2 = .065$								
	Constant	2.181 (.264)	8.249	<.001	2.173 (.241)	8.155	.000				2.181 (.251)	1.693	2.675	2.181 (.249)	1.675	2.662
H_2	WECOMM	.077 (.038)	2.020	.048	.077 (.035)	2.017	.048	.231 (.113)	4.145	.042	.077 (.038)	-.001	.150	.077 .038)	.004	.153
IS	Model	$F(1,62) = 17.610$, $p < .001$, $r^2 = .221$			$F(1,62) = 20.427$, $p < .001$, $r^2 = .248$			$\chi^2(1) = 15.761$, $p < .001$, $r^2 = .225$								
	Constant	1.161 (.267)	4.356	<.001	1.078 (.212)	4.094	<.001				1.161 (.252)	.664	1.655	1.161 (.259)	.685	1.658
H_3	WECOMM	.161 (.038)	4.196	<.001	.170(.038)	4.520	<.001	.477 (.123)	14.980	<.001	.161 (.038)	.088	.233	.161 (.039)	.085	.237
BA1	Model	$F(3,60) = 3.241$, $p = .028$, $r^2 = .139$			$F(3,60) = 3.082$, $p = .034$, $r^2 = .134$			$\chi^2(3) = 9.554$, $p = .023$, $r^2 = .130$								
	Constant	.000 (.074)	.000	1.000	.000 (.073)	.004	.997				.000 (.074)	-.148	.148	.000 (.075)	-.146	.139
H_6	OS1	.294 (.139)	2.110	.039	.309 (.139)	2.226	.030	.816 (.405)	4.050	.044	.294 (.147)	.015	.584	.294 (.148)	.017	.578
	WECOMMC	-.009 (.037)	-.255	.799	-.006 (.037)	-.176	.861	-.030 (.103)	.085	.771	-.009 (.035)	-.075	.059	-.009 (.034)	-.076	.059
H_7	OS1 * WECOMMC	.082 (.058)	1.429	.158	.071 (.060)	1.187	.240	.271 (.167)	2.634	.105	.083 (.062)	-.038	.207	.083 (.062)	-.0290	.212

15 Thresholds not reported in this table.

		OLS			WLS			Ordered Logit			Bootstrap Estimates 1			Bootstrap Estimates 2		
	Model Information	*F(df), p, r^2*			*F(df), p, r^2*			*χ^2(df), p, Nagelkerke pseudo r^2*			Starting values of SQP algorithm: OLS estimates			Starting values: mean of dependent variable for constants, 0 for all other parameters		
Dependent Variable	*Parameter Information*	*b (S.E.)*	*t*	*p*	*b (S.E.)*	*t*	*p*	*b (S.E.)*	Wald	*p*	*b (S.E)*	95 % trimmed range		b (S.E)	95 % trimmed range	
IS1	Model	$F(3,60) = 1.392$, $p = .254$, $r^2 = .065$			$F(3,60) = 1.437$, $p = .241$, $r^2 = .067$			$\chi^2(3) = 4.897$, $p = .179$, $r^2 = .069$								
	Constant	.000 (.077)	.000	1.000	.001 (.073)	.019	.985				.000 (.078)	-.147	.156	.000 (.000)	.000	.000
H_4	OS1	.176 (.146)	1.204	.233	.187 (.140)	1.325	.190	.546 (.402)	1.849	.174	.176 (.150)	-.113	.473	.176 (.150)	-.102	.481
	WECOMMC	.013 (.038)	.351	.727	.006 (.037)	.149	.881	.058 (.103)	.318	.573	.013 (.039)	-.068	.089	.013 (.038)	.067	.087
H_5	OS1 * WECOMMC	-.120 (.061)	1.965	.054	-.123 (.063)	-1.948	.056	-.355 (.168)	4.492	.034	-.120 (.063)	-.215	.038	-.120 (.063)	-.215	.0357
IS2	Model	$F(3,60) = 2.685$, $p = .055$, $r^2 = .118$			$F(3,60) = 2.165$, $p = .102$, $r^2 = .098$			$\chi^2(3) = 4.878$, $p = .181$, $r^2 = .065$								
	Constant	.000 (.073)	.000	1.000	.010 (.071)	.140	.889				.000 (.074)	-.140	.148	.000 (.071)	-.142	.133
H_8	BA2	.311 (.127)	2.441	.018	.271 (.123)	2.138	.037	.630 (.360)	3.057	.080	.311 (.148)	.001	.579	.311 (.144)	.029	.585
	WECOMMC	.001 (.036)	.042	.967	.004 (.036)	.119	.905	-.040 (.099)	.161	.688	.001 (.033)	-.064	.065	.001 (.034)	-.067	.066
H_9	BA2 * WECOMMC	.102 (.070)	1.455	.151	.089 (.070)	1.279	.206	.268 (.197)	1.855	.173	.102 (.070)	-.021	.250	.102 (.071)	-.025	.250