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## IT-Based Competitive Advantage: A Cross-Case Comparison of Business Software Usage

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### Abstract

The value contribution of IT is at the heart of the IS discipline's research. Value generation in itself, however, does not necessarily translate to competitiveness. A key question has been whether organizations can realize temporary or sustainable competitive advantage through the use of business software. Applying theories of strategic positioning and the resource-based view, this paper presents findings from 10 case studies and evaluates to what extent the value contribution from IT investments can lead to (sustainable) competitive advantage. While all of the case studies report value contribution and a state of process excellence, actual competitive advantages are found to be only temporary, with one exception. In conclusion, we review competitive advantage theory and its taxonomy. The results lead us to call for a refinement of taxonomy and a paradigm shift.

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## 1. Introduction

The topic “value contribution from IT investment” has been in the focus of research for more than three decades, and a plethora of research has been conducted to understand and evaluate the link between IT investment and organizational performance (reviews by [1,2,3]).

Information Systems (IS) has evolved into a reference discipline, as [4] point out, with a defined body of knowledge and a shift from techno-centric to a “balanced technology/organizational/management/social focus”. However, the question of IT value as one of the most important socio-technical aspects of information systems usage has not come of age, but remains largely unsolved. We believe this situation is rooted in the complexity of the different angles in the literature as described in the following paragraphs.

Firstly, benefits from IT investments are diverse in nature. They span the quantitative, economical benefits of cost savings and return on investment perspectives as well as qualitative benefits, intangible value that is hard to pinpoint. A single taxonomy is unable to comprehensively evaluate this multitude, and still, after decades of research, “in many cases our measurement instruments are too blunt to capture it” as [5] admit.

Secondly, the actual locus of value creation is hard to determine precisely. Benefits take form on the process level, as well as on the business unit, division, organizational and cross-organizational levels, and benefits are also inter-dependent and can serve as catalysts for aggregate benefits [6]. Most of the earlier research has focused on the aggregate, organizational level [7], but the process level offers another valuable perspective.

Thirdly, organizations undertake a variety of IT initiatives, aiming for benefits realization both isolated and in concert. Attributing IT-based value to the concert of initiatives faces similar challenges as determining the locus of value creation. Thus, research focused on a single initiative’s contribution can deliver complementary, valuable insight [2].

Finally, “there is a difference between creating value and creating differential value” [5]. As Hitt and Brynjolfsson [8] have pointed out, value created can raise productivity and consumer surplus without positively affecting organizational performance. In other words, does IT investment lead to competitive advantage? While there is a lot of evidence that IT does, in fact, create value [5], especially the question of competitive advantage has fuelled a long-term debate among scholars that continues to this day. In his thought-provoking article, Carr [9] argued that value is competed away and information technology is a commodity, easily acquired and duplicated. Clemons and Kimbrough [10] stated that information systems are a requirement for enterprises to succeed in the marketplace, which led them to formulate the strategic necessity hypothesis. They concluded that IT-based competitive advantage is limited to cases of first mover effects, when competition is slow to respond and customers face switching costs [10,11], a notion which puts IT advantages in a niche. Seddon [12] agrees with Carr’s commodity verdict and draws upon Porter [13], who stated “competitive strategy is about being different.”

But is this really the case? Should we understand IT investments as commodity, which cannot lead to competitive advantage? In this paper, we address this question by analyzing ten case studies and applying Porter’s theory of positioning and the resource-based view (e.g. [14]).

The remainder of this paper is structured as follows: In the next section, we explain our analytical lens and research design. Following that, we present the findings from the case studies and examine whether competitive advantage could be identified. In conclusion, we discuss the implications and call for a more refined taxonomy.

## 2. Background of Empirical Study

### 2.1. Analytical Lens

The conflicting positions regarding the value contribution of IT can result from the different perspectives embraced by their discussants. The perspectives are insofar incommensurable as they draw upon different theories: Whereas [9] and Seddon's (2005) arguments are based on Porter's theory [15] of positioning, Mata [16], Wade and Hulland [17] and other researchers use the resource-based view of the firm (e.g. [14]).

Porter posits that enterprises achieve competitive advantage by pursuing one of three generic strategies: cost leadership, differentiation, or segmentation, i.e. focusing on one of the strategies in a market niche. Companies that excel in this strategic positioning can achieve sustainable competitive advantage, by which Porter explains long-term superior performance, but their position is endangered by their competitors' attempts at imitation. This forces the organization to continually enhance its competitive positioning through innovation.

Resource-based view, on the other hand, attributes competitive advantage to resource allocation [14]. Enterprises acquire resources and form resource bundles to create economic value and capture rents, i.e. producer surplus. If they are able to generate greater economic value than the marginal, i.e. break-even, competitor, they have a competitive advantage [18]. Thus, multiple enterprises can have competitive advantages simultaneously, and compete by utilizing, enhancing and defending their sources of advantage. To sustain a competitive advantage, it has to be valuable, rare, imperfectly imitable and adequately utilized by the organization (VRIO framework, [14]). Thus, in the theory of the resource-based view, competitive advantage is embedded within an organization.

In order to join the perspective of value-questioning (e.g. [9]) and value-affirmation (e.g. [19]), we draw upon both theories: Porter's theory [15] of positioning informs our understanding of how value creation supports the generic strategies and, thereby, serves as a foundation for competitive advantage. Using resource-based view, we evaluate the specific resource, especially concerning imperfect imitability and, hereby sustainability.

### 2.2. Research Background and Approach

On the organizational level, as aggregate corporate performance, IT investment has been researched extensively (e.g. [20]). The results have become known as *productivity paradox* [21] because the studies have not confirmed the expectations of a positive correlation between IT investment and corporate performance. Although later contributions (e.g. [8]) have reported a productivity relation, evaluating value creation on the aggregate level remains problematic *per se*, because opposite or unconsidered effects can compensate and negate each other, and lead to inaccurate results [7]. Recently, Doherty and Terry [22] have called for a change in perspective: a focus on the individual IT initiative and its impact. Because IT is embedded in the organization and the processes of business units, successfully identifying, describing and evaluating potential sources of competitive advantage requires the examination on the *business unit* and *process* levels. The case study as a research method embraces this perspective and can offer a more thorough qualitative understanding, albeit at the expense of quantitative focus. Based on this logic, we use the case study research method to evaluate and compare IT-based competitive advantage in ten organizations by examining a single IT initiative's value contribution per case. We draw upon Eisenhardt [23] and Miles and Huberman [24], who recommend intra-case analysis and cross-case comparison to support validity.

### 2.3. Data Collection and Analysis

To identify IT-based value creation, findings from ten enterprises were studied. Cases were selected from an existing pool by qualitative sampling [24]. We purposefully selected cases from companies of different sizes, industries and different levels of the supply chain that had all successfully introduced and customized ERP software in the last five years. In cross-case analysis, typical patterns, common practices and differences were identified and described using structural coding. The code structure was taken from Porter's process model [15] and is described below.

The case studies had been written based on interviews with project managers responsible for introducing the business software. The case studies follow the eXperience methodology for writing case studies that has been used in case study research on an international level for more than ten years [25]. The authors of the case studies visited the companies and conducted interviews that lasted between two to four hours. Additionally, they had access to project documentation. They documented the findings in the case study protocols. After approval by the project managers, the case studies were coded and analyzed to identify and locate benefits that occurred from the software introduction. Following Porter [15], the case studies were grouped according to whether the benefit could be attributed to a *primary activity*, such as marketing and sales or a *support activity*, such as firm infrastructure.

All of the case studies examine companies using standard business software, in most cases an ERP system. This is insofar beneficial, as the solutions are commercially available and, before being configured or customized to the specific companies' requirements, are standardized, off-the-shelf components. This allows us to critically examine the argument that the availability and diffusion of IT leads to its commoditization as infrastructure component, and negates it as a source of competitive advantage.

### 3. Findings from the Case Studies

The studied companies are from a variety of industries, covering production, retail, wholesale and services. They range from small businesses to national market leaders with more than one million customers. *Table 1* provides an overview of the characteristics of the cases. Of the ten companies, six realize the value in *primary activities*, and in each case, the benefits concern the marketing and sales activities [15]. The other companies' value was identified in *support activities*, and range from procurement to accounting and controlling. Note that in several cases, these activities create additional advantages in sales and marketing, as well, but are carried out in business units and processes, which are part of support activities. During the coding process, the benefits were assigned to one of three emerging functional areas: (1) IT-supported *sales*, (2) customer *web interface*, or (3) *product data* management. The following paragraphs discuss the identified benefits that the companies achieved with their IT projects in more detail.

Table 1. Overview of the selected cases (source: www.experience-online.ch)

No.	Company	Industry (SIC)	Activity	Value Element Identified	Area
1	Valenzi	Food (2030)	Primary	Information in order process	Sales
2	John	Sports toys (3944, 3949)	Primary	Order verification (EDI transfer)	Sales
3	Niggemann	Food retail, wholesale (5400, 5150)	Primary	Order entry	Sales
4	Freitag	Apparel and retail (2300, 5600)	Primary	Product configuration	Web interface
5	buch.ch	Online book store (5900)	Primary	Online community (library)	Web interface
6	kdmz	Printing (2750, 2790)	Primary	Recommendation system	Web interface
7	Scott Sports	Sports products (3949)	Support	Product catalogue	Product data
8	Ziehl-Abegg	Fans and drives (3564)	Support	Product configuration	Product data

No.	Company	Industry (SIC)	Activity	Value Element Identified	Area
9	ARP Datacon	Wholesale office equipment (5045)	Support	Multi-channel integration	Product data
10	Rotronic	Wholesale office equipment (5045)	Support	Multi-supplier catalogue	Product data

### 3.1. IT-Supported Sales

Cases 1 to 3 (Valenzi, John and Niggemann) exemplify the importance of information for the sales process. The three companies commonly describe their value as being able to quickly, competently and flawlessly serve their customers. Thus, the value elements address a classic function of customer relationship management. The case studies demonstrate the importance of electronic networking: The three companies use EDI, and one company (John) receives 100% of their orders via EDI. Niggemann describes itself as “EDI-ready”, and assumes this capability will increasingly become a requirement of customers and suppliers alike. Valenzi’s EDI implementation conforms to the food industry’s legal requirements of batch tracing, but also brings improved product quality control and process efficiency. They argue that these benefits enable them to shift the sale negotiations from price-driven to quality-driven and their competitors have not been able to realize similar effects yet. Niggemann delivers fresh products on short notice. Their claim is that no competitor delivers as fresh, requiring an efficient sales process, mostly handled on telephone. With information from the ERP system, Niggemann’s sales personnel is able to access all relevant information, an ability that supports their key competitive advantage. John’s customers are large retail chains with many branch stores each, resulting in a large number of orders. By changing order entry from manual to 100% EDI, the individual branches can now order on a daily basis. All three companies create value through enhancing their sales process with IT to increase customer loyalty. While cost savings apply, their main focus is to use business software to increase quality in sales, and hereby outperform their competition. Thus, their value element contributes to *differentiation*.

### 3.2. Customer Web Interface

Cases 4 to 6 (FREITAG, buch.ch, kdmz) highlight how specific functions of web-based e-commerce solutions can enable companies to generate new value with Internet shops. FREITAG’s plastic messenger bags have become design icons, displayed in New York City’s Museum of Modern Art since 2003. By introducing 360° views in their web shop, FREITAG has reduced returns by 70%. Overall, with the new web shop, online sales have doubled within the first two years, and the same number of employees is now able to handle more than twice the amount of orders. The company in case 5 (buch.ch) is in competition with numerous other online bookstores, including Amazon. By integrating their web shop with a functionally rich community platform, the company increases customer interaction and loyalty. Although international players, such as Amazon and others have invested in their own communities, buch.ch operates the first and largest book community in their market, Switzerland. With the help of the community, buch.ch can gain insight into their customers’ preferences. The web shop of kdmz (case 6) handles 50% of all incoming orders, and includes a recommendation system, which is tightly integrated in the backend ERP solution. This offers kdmz continuous learning by analyzing their customers’ behavior. Though from different industries, the three cases have in common that they use additional functionality to gain customer insight. By understanding customer behavior and preferences, marketing activities and product range can be targeted to developing individualized offerings. Thus, the three companies differentiate through improved customer web interfaces, and their value element addresses *differentiation*.

### 3.3. Product Data Management

Managing product data remains a challenge for enterprises, particularly with fast-moving product ranges and input data from multiple sources. The companies studied in cases 7 to 10 regard improvements in product data management as mission critical. Case company 7 (Scott Sports) produces winter, motor and cycling sports equipment. Its customers, distributors and retailers worldwide, can access an integrated solution, which increases supply chain transparency. It includes information on current inventory items, as well as self-service functions. Self-services greatly reduce administrative work for customer service (estimated at 15% per order) and sales (25%), as well as for the customer's buying agent (30%). Through the platform, the manufacturing team has access to planning data between 30 and 45 days earlier in their eight-month production cycle, resulting in better capacity planning, as well as improved product availability.

The company studied in case 8 (Ziehl-Abegg) produces fans, drives and motors for various fields of application, including elevators and escalators. To create customer-individual bids and to re-use components, the company's solution allows it to use tabular layouts of properties for parts, according to DIN 4000.

Case company 9 (ARP Datacon) sells a variety of IT products in mail order trade, consolidating more than 20,000 products from more than 600 suppliers. The company's solution includes international multi-channel integration, which enables the company to serve a customer with personalized data specific to the customer account, no matter whether the customer contacts the company via phone, web shop, mail order catalogue or in the company's retail store. In addition, large customers can partially outsource their procurement process through vendor-managed inventory. ARP Datacon perceives their solution as contributing to customer loyalty.

Rotronic's (case 10) computer equipment and peripherals business represents 50% of the company's revenues. The company imports approximately 1,500 products from 150 suppliers, and some of the products are contract manufactured according to Rotronic's specifications. Its customers range from small retailers to key accounts. The product range is fast moving and competitive pressure is immense. To allow Rotronic to offer a large product range, the company's multi-supplier catalogue consolidates product data from multiple suppliers to create a virtual product range with drop-ship logistics. This allows Rotronic to quickly expand their operations when needed, without having to conduct significant investment in inventory.

The four cases describe how different approaches to achieve improved product data management can support competitiveness. Whereas the first two cases' main focus is on *cost leadership*, ARP Datacon and Rotronic can contribute to both *cost leadership* and *differentiation*.

### 3.4. Evaluation of Potential Competitive Advantage

In this section, we evaluate whether the identified IT-based *value elements* meet the criteria for competitive advantage. This is examined by applying the resource-based view's *VRIO framework* [14]. An overview of the results can be found in *Table 2*.

Firstly, the *VRIO framework's* criterion of *value* is met in all cases. The companies have consciously made targeted investment decisions to realize the identified value elements through process improvements. The project managers are able to point out the specific benefits in detail. Even though the majority of companies refrain from performing sophisticated ROI calculations, almost all of the firms achieve a value based on cost savings or differentiation.

Secondly, the criterion of *rarity* is fulfilled as well. Even though the technological foundations of the generated value are commercially available as standard software applications, the company-specific implementation is not. In fact, while the Valenzi (case 1) solution conforms to the food industry's regulatory requirements, this does not imply that its competitors are able to offer their customers the same level of convenience in the order process.

Thirdly, the criterion of adequate *organizational* use is met in all the cases. All companies have adapted processes and report improved business operations. In some cases, organizational changes were implemented. Thus, all studied companies have aligned their organization with their IT investment.

Fourthly, the *VRIO framework's* criterion of *imperfect imitability* determines a competitive advantage's sustainability or mere temporary existence. Barney and Clark [14] define several barriers for imitation: (1) *unique historical conditions*, (2) *causal ambiguity*, (3) *social complexity* and (4) *non-substitutability*. Most participating companies did not specify having used a unique historical opportunity – with the exception of Buch.ch, which lead the way with a community. The first mover advantage may have contributed to the fact that no other local competitor has established such a community.

No company can claim causal ambiguity: the functionality and technological components used in the projects can be identified and acquired by competitors. Similarly, the criterion of *social complexity* is hard to justify given the value element's specific, focused nature. Even though a sales process is socially complex, the projects' value is achieved through concrete process improvements. These can lead to increased efficiency and can enhance the sales process by offering valuable information. However, in none of the cases we were able to identify a resource that implies an inimitable value element. Nevertheless, because each solution's individual implementation is defined in social context, it cannot be imitated without significant effort and results in a more or less pronounced advantage. But they do not serve as the basis of a *sustainable competitive advantage*. On the contrary, some of the solutions aim at imitation, for instance in outsourcing or when connecting to large retail customers, where the initiator explicitly seeks diffusion.

Finally, the question of *non-substitutability* remains, which, in its broad meaning, eludes a final, long-term assessment. There is a multitude of IT-based initiatives to support business and sales processes that aim at increased customer loyalty, process efficiency or realizing cost savings. More narrowly understood as applicable to the specific value element, however, only the different technological components and functions seem substitutable. In this understanding, however, the source of advantage is commercially available and, hence, imitable. Thus, substitutability in the narrow sense is not sufficient.

In summary, only one of the studied companies can fulfill the criteria for sustainable competitive advantage, whereas the other value elements can generate only temporary competitive advantage. Still, this represents a positive contribution to the respective company's market position and can be a vantage point for the continual improvement through innovation that Porter [15] postulates.

If corporate performance is not understood as the result of a dominant factor affecting all divisions, but as the sum of process excellence in many particular areas, process optimization is not an alternative to pursuing competitive advantage – rather, it becomes the means to achieve it.

Table 2. Strategic contribution and potential competitive advantage in the case companies

Company	Value Element Identified	Strategic Contribution	Valuable	Rare	Imperf. Imitable	Organization
Valenzi	Information depth in order process	Differentiation	✓	✓	✗	✓
John	EDI order verification	Differentiation	✓	✓	✗	✓
Niggemann	Order entry	Differentiation	✓	✓	✗	✓
Freitag	Product configuration	Differentiation	✓	✓	✗	✓
buch.ch	Online community (library)	Differentiation	✓	✓	✓	✓
kdmz	Recommendation system	Differentiation	✓	✓	✗	✓
Scott Sports	Product catalogue	Cost leadership	✓	✓	✗	✓
Ziehl-Abegg	Product configuration	Cost leadership	✓	✓	✗	✓
ARP Datacon	Multi-channel integration	Both	✓	✓	✗	✓
Rotronic	Multi-supplier catalogue	Both	✓	✓	✗	✓

#### 4. Conclusion and Limitations

Do we have to agree with Carr's argument [9] that information technology's role is that of an infrastructure, not contributing to competitiveness? Is corporate culture left as the sole source of competitive advantage? The findings from our research indicate the answer depends on the perspective taken. If Seddon summarizes "[...] ERP systems are an unlikely source of competitive advantage [...]", his point is that "[i]t is not clear that ERP systems enable firms to offer value propositions [...] that differ significantly from their competitors" (2005). He concedes, however, that they are a "[...] source of operational effectiveness" with "[...] benefits such as superior information, productivity improvements and process improvements [...]". This last observation is in line with our reasoning: competitive advantage can take various forms, depending on the firm's business model and other factors, such as competitive intensity. A multitude of projects introducing process improvements can enable an enterprise to successfully defend or enhance its market position. Whether this is caused by a planned or an emergent strategy – it can contribute to creating a culture of process excellence (for a discussion of process excellence refer to [25]). To subsequent observers studying the aggregate company, this culture may appear as the actual source of competitive advantage.

In summary, our findings indicate that IT-based competitive advantage can be identified. The cases studied fulfill the formal requirements for *competitive advantage*, although, with one exception, they don't qualify as *sustainable*. At the same time, focusing on competitive advantage entails challenges, in itself: After three decades, the term (*sustainable*) *competitive advantage* remains elusive, because of its blurred taxonomy. Barney and Clark [14] are aware of this lack of definition. Concerning *rarity* of resources, for instance, they admit: "How rare a [...] resource must be [...] is a difficult question." In a state of blur, the debate over the identification of sustainable competitive advantage shifts to corporate culture as an intangible asset (2007), which can fulfill the strict criteria of causal ambiguity and social complexity. In this context, however, competitive advantage eludes an economical metric to explain its creation. We continue to study and describe its results, without being able to evaluate, understand and substantiate its existence. A more specific taxonomy could help to avoid the vagueness, and, potentially, the controversy.

In conclusion, we have to point out several limitations of our study. Even though the paper draws upon an established approach for explorative case study research (*eXperience* method) and integrates theoretical frameworks, its results are subject to the usual limitations of small samples, which do not support generalization. To augment external validity, sample size needs to be increased in future studies. However, the ten case studies provide strong evidence across the cases, and the access to project documentation served to additionally triangulate the evidence. Finally, the publication of the case descriptions in the *eXperience* database was approved by the companies. This allows us to use them for scientific discussion and constitutes an additional layer of credibility in our data source.

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