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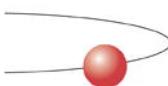
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Strategy in High-Velocity Environments

Bernd W. Wirtz, Alexander Mathieu and Oliver Schilke

While industries such as ICT and biotechnology have been characterized as high-velocity environments, in which demand, competition and technology are constantly changing, there has been little systematic empirical research focusing on the conceptualisation and operationalisation of strategy in such environments or its effect on performance. This article draws from industrial economics and the resource-based view to conceptualise strategy in high-velocity environments as a multi-dimensional construct. Additionally, the construct's positive effect on business performance is empirically proven. The article closes with managerial implications and directions for further research.

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Introduction

The rapid diffusion and unprecedented commercial use of information and communications technologies (ICT) have caused significant structural economic changes during the last few years. Some industries are particularly affected by the increasing convergence of information technology, telecommunication and media. In these environments, boundaries and industry structures are blurred, successful business models have not yet been established and the roles of the market players change continuously. The term *high-velocity environments* embraces all those characteristics and emphasises the brisk and discontinuous changes in demand, competition, regulation and technology.¹

Within this context, many start-ups, as well as projects of established companies in the internet sector, came into being. After an initially positive assessment by the stock market, a lot of those start-ups faced considerable financial distress. Many newly-founded companies experienced dramatic declines in market capitalisation and some became insolvent. Likewise, several internet efforts of established companies failed to achieve the desired results. Consequently investments in internet activities were substantially reduced.

Several authors blame the multitude of business failures on the absence of a sound strategy.² For example, Porter argues that failed companies in high-velocity environments have not embarked on a coherent long-term strategy: "Many of the pioneers of internet business, both dotcoms and established companies, have competed in ways that violate nearly every precept of good strategy."³

The developments described above have led to a vibrant discussion on the design and performance implications of strategy in high-velocity environments. While authors such as Porter suggest a modification and supplementation of these concepts, others negate the applicability of traditional strategy concepts for the turbulent environmental conditions.⁴

According to Porter, and following the concepts of industrial economics, strategy in the context of the internet must be based on the structural analysis of an industry using the five forces concept. Based on this analysis, a company chooses its unique positioning and aligns all value-added activities to reach this position. Directly referring to this line of discussion, Eisenhardt and Sull base their argument on the resource-based view, as well as complexity and evolutionary theory: "Rather than picking a position or leveraging a competence, managers should select a few key strategic processes. Rather than responding to a complicated world with elaborate strategies, they should craft a handful of simple rules."⁵ According to their point of view, the traditional concept of intended strategy as a mid-term orientated positioning based on the configuration of the value chain activities is not useful in a dynamic and complex environment where it is difficult to plan ahead.

Hence, the two positions concerning strategy in high-velocity markets are diametric: while Porter mainly argues in the tradition of the market-based, outside-in perspective that clear differentiation is a prerequisite to gain above-average rents, Eisenhardt and Sull emphasise the resource- and capabilities-based, inside-out perspective, arguing that an entrepreneurial attitude and the mastering of key capabilities will provide the necessary agility and flexibility to succeed in dynamic and complex environments. Thus it becomes obvious that the understanding of strategy in high-velocity environments differs considerably among different theory schools.

This article contributes to the academic and managerial discussion of strategy in high-velocity environments in two ways. First, a multidimensional framework for strategy in high-velocity environments is introduced and empirically validated. While many previous papers are deeply rooted in one school of thought within strategy research, the proposed approach leverages the complementary nature of the market-based and resource-based views to conceptualise a multidimensional strategy construct. Second, the influence of the strategy construct as a whole, as well as the contribution of its single dimensions on business performance, are examined. The insights from this analysis should enrich the literature on high-velocity environments by broadening the perspective of strategy and offering a framework for reconciling existing controversies in the literature. The analysis is based on an empirical survey of 210 companies from the ICT industry.

The article is organised as follows: after an introductory definition of strategy and high-velocity environments, the paper starts with a brief review of the relevant literature. Next, the research framework, including the dimensions of the model for strategy in high-velocity environments, as well as the concept of business performance, will be developed. Key information about the empirical study is then provided. A description of the empirical analysis and results — including the assessment of the individual dimensions, the model and the effect on business performance — follows. The article closes with implications for managers concerning the design of strategy in high-velocity environments as well as for academics regarding further research questions.

Concept of strategy

The term strategy is used in assorted ways in business science and practice. For the purpose of this article, strategy is defined on the business unit level as a realised pattern in a stream of decisions and actions, which aims to fulfil an organisation's objectives. By following Mintzberg in emphasising the observable, realised aspect of strategy (as opposed to the classic understanding of strategy as intended concept), this definition makes strategy measurable for the researcher.⁶

Concept of high-velocity environments

Different terms have been coined and used simultaneously to describe the competitive changes caused by information and communication technologies — for instance, "hypercompetition", "turbulent markets" or "high-velocity environments". Following Eisenhardt and Martin, we use the term high-velocity environments.⁷ The central feature of a high-velocity environment is the rapid,

discontinuous and simultaneous change in demand, competitors, technology and regulation. These characteristics indicate that information is time-sensitive and imprecise, or even unavailable. As a result, market boundaries are blurred, successful business models have not yet manifested and the roles of market players continuously change. Complex and unpredictable changes are frequent and come in the form of market jolts.⁸

The central feature of a high-velocity environment is the rapid, discontinuous and simultaneous change in demand, competitors, technology and regulation

Increased complexity entails that management has to account for a huge number of variables regarding the competitive environment when formulating strategy. Moreover, management needs to be highly flexible due to environmental dynamics and the resulting limited forecastability.⁹

Literature review

Due to the novelty of the research field, the reviewed contributions to the topic strategy in high-velocity environments are rather heterogeneous. Although the effect of strategy in high-velocity environments on firm success in terms of growth and profitability is implicitly assumed, empirical evidence for this relationship has not been established. There is a deficit of theoretically-founded, empirical, confirmatory surveys. The contributions so far are mainly conceptual, supplemented by case examples and anecdotal evidence and can be classified in two research streams.

The first primarily addresses whether traditional strategy concepts are applicable in high-velocity environments.¹⁰ While Chakravarthy asserts that existing concepts are unsuitable because of the special environmental context, others conclude that classic frameworks are still valuable in high-velocity environments. Porter states that traditional industrial economic theory maintains its relevance. However, he postulates a shift of importance from cost leadership to differentiation. The argument is mainly conceptual and relies on case study examples.

The second research stream discusses the design of strategic processes.¹¹ Eisenhardt and colleagues emphasise the increased importance of flexibility, agility, responsiveness and simple rules. Moreover, Rindova and Kotha identify the process of continuous morphing as an important means to continuously renew competitive advantage in high-velocity environments.

This review shows the prevailing opinion that the changed environmental conditions necessitate at least a modification of existing strategy concepts. So far, most conceptual and empirical approaches to modelling the strategy construct do not take into account necessary competencies and processes within the company used to cope with the dynamism and complexity in high-velocity environments. Accordingly, almost all empirical studies applying the proposed frameworks have been tested in rather stable industries and environments.¹² Thus a holistic conceptualisation and operationalisation of strategy in high-velocity environments has not been proposed. Previous surveys in high-velocity environments have only dealt with single aspects or discrete strategic processes that are analysed independently and on a case study basis.

Research framework

Our overall research framework addresses the previously-mentioned research gaps. The aim is to identify an integrative construct strategy in high-velocity environments, to assess the relative importance of complementary strategy dimensions and to analyse their impact on growth and profitability. On the theoretical basis of industrial economics and the resource-based view, and supported through interviews with top-level managers, we argue that strategy in high-velocity environments is a multi-dimensional construct based on seven correlated dimensions. While the traditional literature suggests that specific strategies may not be compatible, recent evidence shows that strategies

should be thought of as conjunctive.¹³ Thus, our conceptualisation follows the dimensional approach rather than considering strategies to be discrete categories. With regard to business performance, we make a distinction between the two dimensions of growth and profitability (see Figure 1).

Product differentiation

The strategy dimension “product differentiation” refers to the degree to which a firm differentiates itself in a competitive market by distinguishing its products and services from those of competitors through unique features.¹⁴ According to industrial economics, strategic positioning based on product characteristics can result in a competitive advantage by creating buyer value and allowing a company to command a premium price.¹⁵

Correspondent to Porter, product differentiation and strategic positioning are of great importance in high-velocity environments. This is because of the magnitude of opportunities for achieving or enhancing a unique positioning provided by information and communication technologies. The improved ability to customise product offerings and co-ordinate quality controls as well as R&D activities illustrates this point. At the same time, strategic positioning is more important in high-velocity environments as it is harder to sustain an operational advantage. The openness of the internet along with progress in software architecture, development tools and modularity let barriers to imitation disappear.¹⁶ Consequently, product differentiation is a key factor for distinguishing a company from competitors.

A prominent example for product differentiation in a high-velocity environment can be found within the mobile phone service market. Cingular Wireless, the largest mobile phone service provider in the US in terms of subscribers, has gained a position as a high-quality provider offering the most reliable network. As media convergence accelerates, the company increasingly adds

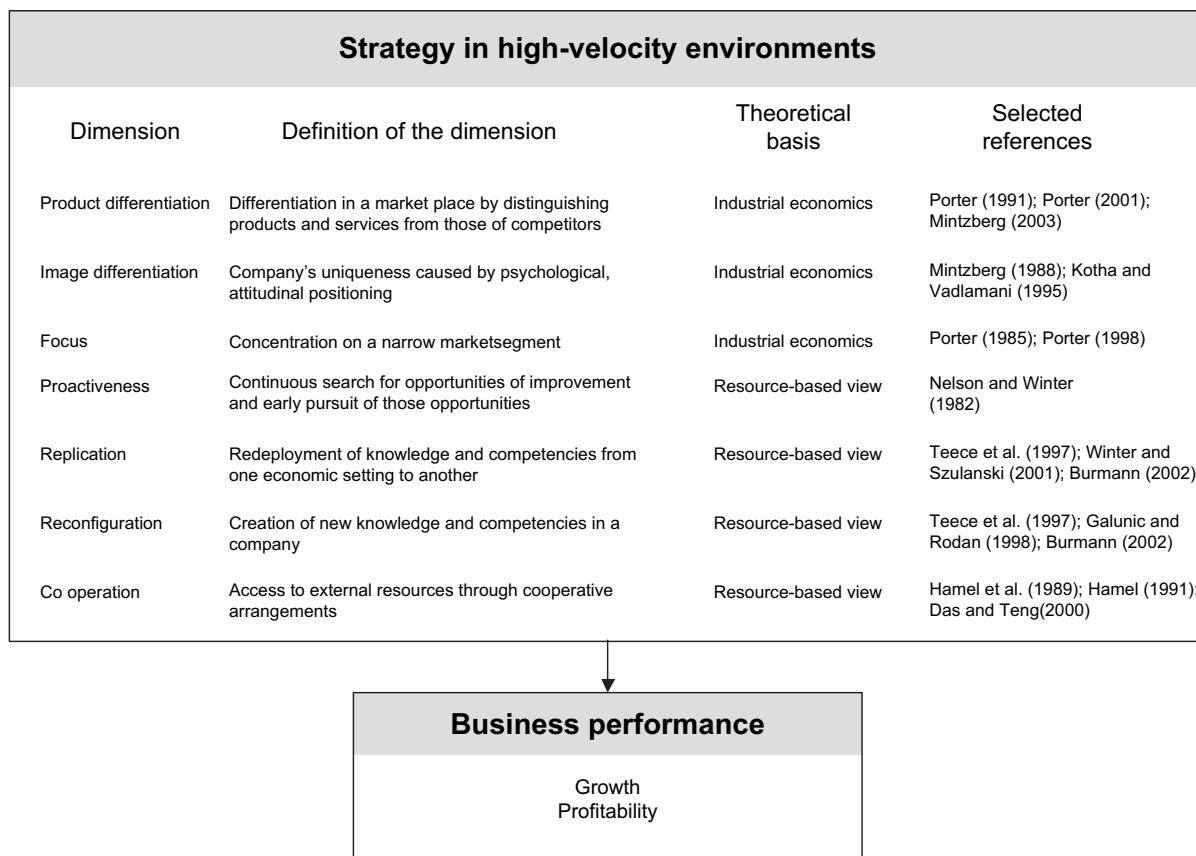


Figure 1. Research framework

internet-related features. Cingular was one of the first mobile phone service providers to add location-based services, such as navigation system capabilities and multimedia services, to some of its plans.

Image differentiation

Image differentiation indicates the degree to which a company differentiates itself through psychological, attitudinal positioning. Similar to product differentiation, it enables the company to set a price premium.¹⁷

Referring to new institutional economics, image differentiation is capable of reducing information asymmetries and uncertainty on the part of the customer. Products in high-velocity environments are particularly information-intensive. They can be regarded as experience goods and their value cannot be evaluated until used. Thus a firm's image plays an important role in the customer's purchase decision and can be regarded as a central part of strategy in high-velocity environments.

Apple, for instance, has developed an outstanding brand image in the computing and entertainment sectors. Apple stands for cool products that are stylish without being ostentatious, and fashionable yet sophisticated. In contrast to most of the competition, its advertising campaigns have little to do with technology standards, but stress design and usability. Following this approach, Apple has garnered numerous awards for brand excellence and has some of the highest margins in its sectors.

A firm's image plays an important role in the customer's purchase decision and can be regarded as a central part of strategy in high-velocity environments

Focus

The dimension of "focus" can also be derived from industrial economics as a way of strategic positioning. It refers to the degree of concentration on niche markets – e.g. a customer group, a part of the product line or a geographically-confined market. Above-average profitability results from a more efficient and effective satisfaction of the needs of the market segment compared with non-focused companies.

In the context of high-velocity environments, the focus dimension is of great importance. In these markets, there are typically a high number of young and small enterprises focusing on one particular product segment. Additionally, several larger companies are forced to concentrate on discrete products because of tight liquidity positions and a downturn of stock markets.¹⁸

Siemens is an example of a company that refused to follow this aspect of strategy for a long time. While retaining its structure as a highly-diversified corporation operating in many different product markets, the company was not able to keep pace with changing trends in the mobile phone industry. It was neither able to recognise and match the increasing demand for flip phones and built-in digital cameras, nor was it able to equip its devices with state-of-the-art software. The Siemens mobile division increasingly lost market share in the growing market, slipping to fifth place in 2005 (in terms of phones sold), and was finally divested to the Taiwanese company BenQ, which subsequently shut down the Siemens facilities in 2006.

Proactiveness

The originally evolutionary economical concept of search routines provides a theoretical basis for the strategic dimension of "proactiveness".¹⁹ Proactiveness describes the extent of continuous search for productive opportunities and innovative kinds of business activity as well as the early

pursuit of those opportunities.²⁰ Proactive companies explore trends in technology, competition and customer behaviour. The concept of proactiveness has received considerable attention in research on entrepreneurship and has been included in more recent, dynamic streams of the resource-based view.²¹

The literature emphasises the increased significance of proactive behaviour in high-velocity environments. It is argued that competitive advantage in dynamic and complex markets is only temporary. Product lifecycles and thus innovation lifecycles are extremely short, while customer needs are fluid. Hence proactive behaviour is of great importance to maintain leadership and gain first-mover advantages in high-velocity environments.

Samsung is a prominent example of a particularly proactive company. High investments in R&D have transformed the company's position in the mobile phone market from a me-too producer into a first-mover. For instance, Samsung brought the clamshell design into the mass market and at an early stage invested in the development of integrated megapixel camera-phones, as well as in display innovations. Today, Samsung has the third-largest mobile phone market share in the world. Following the dimension of proactivity, Google lets its employees dedicate 20 per cent of their time to the development of their own innovative ideas and the transformation of these ideas into productive opportunities and sustainable business concepts. The early pursuit of these ideas is demonstrated in the philosophy of Google to release Beta-versions of all services instead of following pre-defined release cycles. By leveraging the productive capabilities of its employees and pursuing these productive opportunities early, Google diversified its business in a very short timeframe and launched a multitude of innovative services around its core business, e.g. Google Earth, Google Maps and Google Alerts.

Replication

Replication – derived from the resource-based concept of co-ordination/integration – denotes the extent of efficient redeployment of knowledge and competencies from one economic setting to another.²²

Codification and transfer of knowledge are the fundamentals of replication. Knowledge codification refers to the representation of knowledge so that it can be accessed by each member of an organisation. Through codification, implicit knowledge is externalised – i. e. transformed into explicit knowledge. Knowledge transfer can be defined as the company-initiated relocation of knowledge from one type of use to another. One employee's knowledge can be made available to other members of the organisation. Thus, codification is an imperative prerequisite for the transfer of knowledge. The capability to replicate knowledge and competencies can create economic value in two ways. First, it enables fast and efficient growth through geographic and product line expansion. Second, it can be a part of organisational learning and process improvement.²³

Accordingly, replication is especially suitable for explaining competitive advantage in industries of rapid change. Fast replication of organisational skills can be crucial in outperforming competitors in such environments. Hence, replication is an essential dimension of strategy in high-velocity environments.

The relevance of the replication strategy dimension can be illustrated by the example of the semiconductor industry. Short product lifecycles persistently force firms in this industry to shift their manufacturing processes. In the past, Intel has been particularly effective in performing the required internal changes, making existing capabilities available for new product lines. Intel has successfully relied on fast development and “ramping” of new manufacturing processes to speed its introduction of improved versions of the Pentium microprocessors.²⁴

Reconfiguration

Reconfiguration refers to the extent of the creation of new knowledge and competencies in a company. Based on the resource-based view, reconfiguration capability can be described as the ability to react on the need to reconfigure the firm's asset structure and accomplish necessary internal and external transformation by learning or acquiring necessary knowledge.²⁵

The two central mechanisms for knowledge creation – and therefore for reconfiguration – are knowledge abstraction and absorption. Boisot defines knowledge abstraction as “generalising the application of newly codified insights into a wider range of situations. [...] Abstraction then works by teasing out the underlying structure of phenomena relevant to our purpose.”²⁶ The enlargement of the knowledge’s field of application also expands the company’s options. In addition, knowledge generation requires the absorption of new knowledge, i.e. its assimilation and integration with existing knowledge.

Teece et al. underline the importance of reconfiguration in high-velocity environments. They state that in rapidly-changing environments, it is pivotal to quickly accomplish strategic reconfiguration and transformation before competitors and narcissistic organisations are likely to be impaired.²⁷

Important preconditions for reconfiguration are an open corporate culture and a flexible organisational structure. For instance, Gore & Associates, a producer of fabric for the textile, telecommunications and electronics industries, has an organisational culture characterised by a high degree of empowerment and an entrepreneurial mindset. This environment motivates employees to bring in ideas for innovations and to transfer knowledge and competences to new projects.²⁸ Furthermore, a flat organisation without pre-determined channels of communication allows for quick reactions to employee proposals. These features were important in Gore’s continuous knowledge abstraction, such as transferring know-how in the manufacturing of wire and cable or developing the Gore-Tex fibre for the textile market.

Co-operation

Referring to the resource-based view of the firm, the strategic dimension of “co-operation”, or the extent to which a company maintains co-operative arrangements, is essential to gain access to external resources and competencies.²⁹ Forms of co-operation may include bilateral arrangements (e.g. joint ventures and strategic alliances) as well as multilateral agreements (e.g. strategic networks).

Co-operation plays a particularly important role when resources can only be acquired through organisational learning processes because of imperfect factor markets. These organisational learning processes can take place within the company or through collaboration (“inter-partner-learning”). As a result of “time compression diseconomies” only the latter is often appropriate in high-velocity environments.³⁰ Because of rapid environmental change, an internal accumulation of resources often turns out to be inefficient and time-consuming. Consequently, co-operation is of utmost significance in high-velocity environments.

The importance of inter-organisational co-operation is especially high for web portals, such as internet sites like Yahoo! that (directly or indirectly) provide a broad array of services and linkages to users. Co-operation can be beneficial for portals in two ways.³¹ First, the portals receive direct compensation in exchange for advertisements, promotions and other services. Second, the agreements may increase the appeal of the portal’s site by deepening its content and extending its features. Yahoo! operates hundreds of partnerships with content, service and access providers from around the world. Even the most successful companies in the internet sector may have to rely on interfirm co-operation. Because of the tremendous importance of network externalities and lock-in effects in a dynamic and complex environment – leading to increasing returns and “winner-takes-it-all-markets” – Google’s social networking platforms Orkut and Google Groups were not able to achieve the critical mass to compete against the leading platform, MySpace.³² In order to secure its revenue streams from context-based advertising, Google had to enter a \$900m co-operation deal with NewsCorp to become the exclusive search engine for MySpace.

Having illustrated each of the seven strategy dimensions and their specific relevance in high-velocity environments, it is important to note that strategy is to be perceived as a holistic concept that integrates the different perspectives. It is not sufficient for a firm to be a great differentiator without being capable of replication or co-operation. Firms need to balance their strategic orientation and put efforts into pursuing all of the dimensions previously discussed, following the example of Cisco Systems (see [Exhibit 1](#)).

Exhibit 1**Cisco's success story in a high-velocity environment***

Founded in 1984 by a small group of computer scientists from Stanford University, today Cisco Systems is the worldwide leader in networking for the internet. The company focuses on products in the field of routing and switching as well as on advanced technologies in areas such as home networking, IP telephony, network security and others.

The seven dimensions of the ***high-velocity strategy construct*** are an integral part of Cisco's success story, especially the dimensions of ***product differentiation*** and ***co-operation***. The Cisco Dynamic Configuration Tool allows for product customisation according to the individual customer needs. Product innovations are achieved through high investments in R&D as well as by relying extensively on strategic partnerships. An example is the strategic alliance with Intel. Together these companies are able to develop more reliable wireless local area networks (WLANs) and achieve higher quality services.

Another important strategy dimension for Cisco is ***replication***. For example, the knowledge database Cisco Connection Online provides customers and employees with information on network problems and corresponding solutions. In this database, network problems are collected not only in order to ensure the quality of Cisco's recent products, but also to derive ideas for new solutions.

As ***reconfiguration*** is also a key factor of the strategy, Cisco created a modular partner business model, the so-called ecosystem. The goal of the ecosystem is to ensure the transfer of existing knowledge and competences into new areas. An example is the transfer of approved software standards to new projects (e.g. Cisco IOS, an open software standard). The target groups are internal systems engineers, strategic partners and channel system engineers.

The dimension of ***image differentiation*** is guaranteed by a strong brand philosophy with clear branding guidelines for partner companies using the brand name. Cisco has established a distinct corporate identity for all communication channels. The brand identity system is made up of several proprietary copyrighted elements which can only be used in association with communications that are created and distributed by Cisco.

Since the early days of the company, ***focus*** has been a major success factor. Cisco's business always focused on networking. The firm strengthened this core business activity over the years and outsourced other areas to its strategic partners.

Finally, ***proactiveness*** has always been part of the business strategy. Cisco's reputation as a first-mover is well known. For instance, Cisco was the first company to create a complete solution for the integration of data, voice and video in one single network infrastructure. This innovation can be regarded as the starting point of multimedia applications such as video conferencing and unified messaging.

*Based on interviews with the marketing director at Cisco Systems Germany, in March 2002, supplemented by publicly available information.

Business performance: Growth and profitability

In this study, strategy is defined as a means to achieve determined goals. This understanding of strategy allows for an empirical analysis of the relationship between strategy and business performance. Our basic hypothesis is that the construct strategy in high-velocity environments contributes positively to business performance.

Business performance is defined as the degree of achievement of objectives. In a number of former studies, two central strategic objectives were used to measure performance on the business unit level: growth and profitability.³³ Growth can be used to determine effectiveness, while profitability can serve as a proxy of efficiency. Thus, the dimensions represent two pivotal characteristics of business activity.

Empirical study

Our main research aim of the empirical study was to measure the latent construct of strategy in high-velocity environments and to explore its relationship with performance using a sample of firms from the ICT sector.

Sampling frame

Data were collected by means of a survey questionnaire that was sent to 754 senior executives of companies in the ICT industry in Germany.

We decided to control for industry effects by restricting the study to the ICT industry.³⁴ A list of companies was acquired from a commercial database. Although strategy in high-velocity environments could be applied to a variety of dynamic industries, we selected ICT as it has frequently been mentioned as a prototypical high-velocity environment.³⁵ As Eisenhardt and Bourgeois point out, discontinuous change in technology, regulation, demand or competition, accompanied by inaccuracy, unavailability or simply obsolescence of information, are hallmarks of high-velocity environments.³⁶ As a consequence, nonlinear instability, unpredictability and ambiguity are also common characteristics. All of these features can be found in the ICT industry.

In recent times, the rise of the internet has been the nucleus of countless innovations and an embodiment of change, particularly for the ICT industry. Internet-related technologies had to be developed, standardised and adopted virtually at the same time in order to be instantly incorporated into new products. The accompanying change in business models could not have been more dramatic. Information could be exchanged in vast quantities in real time around the world, a fact that triggered enormous shifts towards web-based solutions, such as SAP or Oracle. At the same time, new technologies in combination with changing demand patterns have affected non-internet-related segments within the ICT industry. The following table provides examples to illustrate the rapidness of change with regard to the dimensions mentioned above as characteristics of high-velocity environments (see Table 1).

As strategic decisions are based on the perception of the dominant coalition within a firm, it was assumed that response from a top-level executive would be a good proxy. Members of the board and other employees in a leading position were considered appropriate as key informants because of their involvement in strategy decisions and formulation.

Data collection

We developed a structured survey questionnaire in four stages, including different pretests (see Appendix A). For the main study, 754 companies were contacted. The relevant key informant was identified via the database or by phone. This key informant could participate in the survey by mail, fax or online. After two follow-up calls, a response of 210 usable questionnaires was achieved, yielding a response rate of approximately 28 per cent. Respondents were mostly senior-level executives, with members of the board accounting for 61.4 per cent and other employees in a leading position accounting for 25.7 per cent.

We tested for non-response bias by comparing early and late respondents on all constructs by means of t-tests. We found no significant differences between the two groups, indicating the absence of a non-response bias.

Analysis and results

The conceptualisation and performance implications of strategy in high-velocity environments were analysed using structural equation modelling (see Appendix B for details of the analysis).

The final model is shown in Figure 2. In this model, items demonstrate reasonable reliability and validity. Significant, positive factor loadings and satisfactory global fit criteria showed that strategy in high-velocity environments was indeed a multi-dimensional construct, consisting of the seven dimensions described above. Finally, a positive influence of the construct strategy in high-velocity

Table 1. Examples for discontinuous changes in the ICT industry

Innovation/Change in	Technology	Regulation	Demand	Competition
Voice-over-IP (VoIP)	VoIP requires adaptation of the internet protocol (QoS), hardware allowing interconnection with analogue telephone networks, as well as capable compression methods to ensure acoustic quality.	Deregulation allows internet providers to offer internet access as well as VoIP solutions.	With increased competition and availability of alternative providers, customers become more price sensitive and demanding in terms of service.	Market entry of internet providers increases competition within the telephone market. Rising customer demand increases competition.
LCD-displays	Technological progress allows for bigger LCD displays with shorter switching times at lower costs.	-	Demand has increasingly shifted from CRT monitors to LCD displays.	Established producers of CRT monitors face increased competition through new market entrants.
Memory products	Advances in chip technology allow for reliable flash memory with increasing capacities for personal use. Optical media become state of the art for professional use.	-	Rising data volumes in everyday business require bigger storage capacities. Demand for storage media such as floppy disks vanishes.	Suppliers of storage products lose parts of their core business (magnetic storage media) and face severe competition from substitutes such as web-based storage options.

environments on performance was proven. There were significant path coefficients from strategy to a global assessment of business performance ($0.234; \alpha \leq 0.01$), to growth ($0.498; \alpha \leq 0.001$), and to profitability ($0.255; \alpha \leq 0.01$).

Regarding the relative influence of the seven dimensions, proactiveness has the highest importance for strategy (0.817) and, thus, also indirectly for business performance, followed by product differentiation (0.711), replication (0.589), reconfiguration (0.577), image differentiation (0.543), co-operation (0.434) and focus (0.284).

Discussion

There is little agreement as to what constitutes strategy in high-velocity industries, which generally refer to markets characterised by discontinuous change in terms of technology, regulation, demand and competition. Drawing on theories of strategic management, we developed a holistic framework for strategy in high-velocity environments, encompassing the seven dimensions of product differentiation, image differentiation, focus, proactiveness, replication, reconfiguration and co-operation. We argue that those dimensions are the cornerstones of successfully managing firms in sectors such as the internet or biotech, and that managers need to pay special attention to incorporating all of them into a sound strategic orientation.

Based on a large-scale empirical study of companies from the ICT sector, our findings support our conceptualisation of strategy in high-velocity environments. Furthermore, a positive effect of

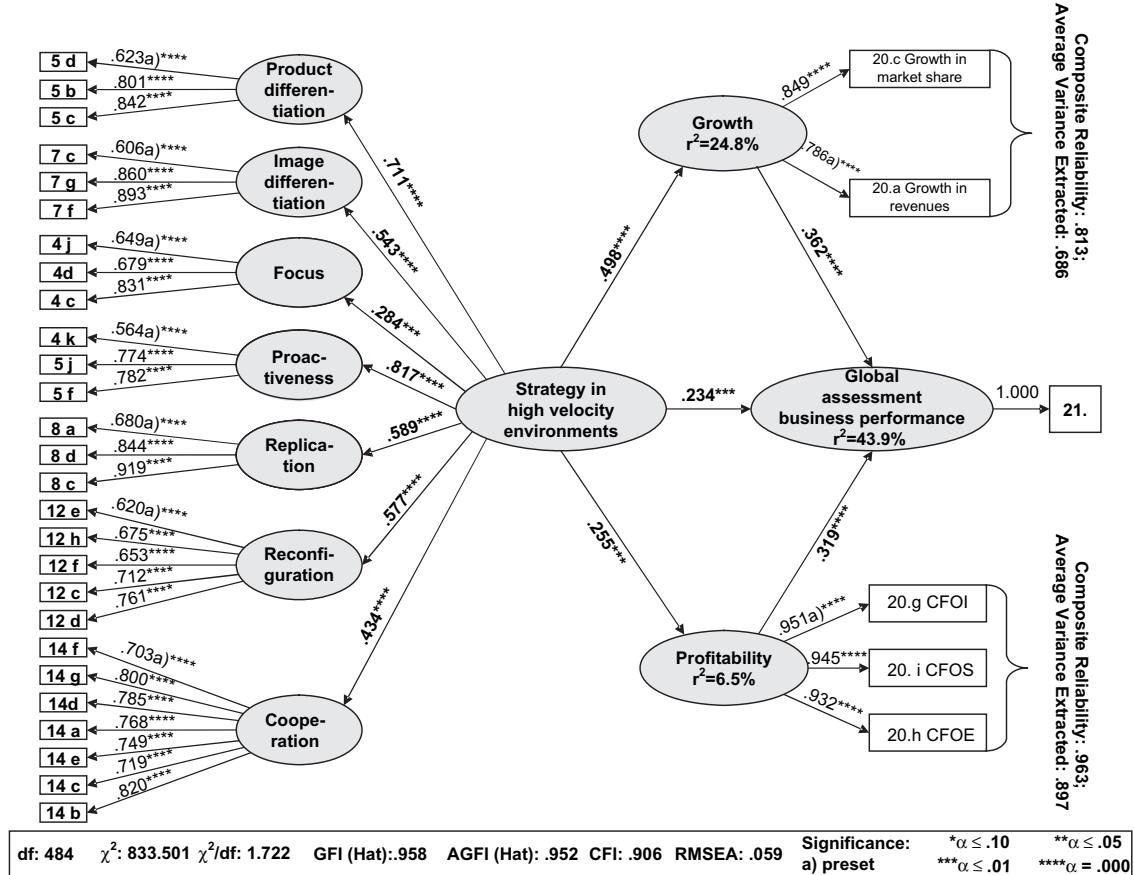


Figure 2. Second-order structural equation model: influence of strategy on business performance

the strategy construct on business performance was found. The strategy dimensions of proactiveness, product differentiation and reconfiguration have the highest performance impact, and should therefore be at the centre of top management's attention.

In the following, managerial implications as well as implications for future research will be presented in greater detail.

Managerial implications

Several implications for managers of companies in high-velocity environments can be drawn from the results of this study. Corporate alignment on an integral, multidimensional strategy continues to have a significant impact on performance, even under the turbulent and changing conditions of high-velocity environments. The empirical analysis shows that the seven strategy dimensions in their interaction strongly affect business performance.

Beyond the general effect of strategy on firm performance, as mentioned before, the method used in this study allows for the prioritisation of the seven dimensions of strategy included in our model. In this regard, the analysis indicates the relevance of the product portfolio. The dominating dimension of proactiveness emphasises, for instance, the need for a first-mover position and a great number of product innovations. As in high-velocity environments, competitive advantages do not last for a long time and product lifecycles are short, an essential precondition for the successful development of new products is to have a detailed understanding of market trends and customer preferences. In practice, first-mover advantages can only be realised by the constant monitoring of strengths, weaknesses, opportunities and threats regarding potential product markets. Given that proactiveness has a particularly high performance impact, these tasks should be on top of the management's priority list.

Product differentiation, the dimension with the second-highest impact on business performance, strongly hints to the importance of the product portfolio by highlighting the unique features and superior quality of the company's offerings. Without a clear unique selling proposition (USP), products in high-velocity environments are easily exchangeable, whereas clear USPs offer companies convincing selling and pricing arguments and help them prevent price wars with competitors. Managers should look for product features based on forward-looking technology trends, customer preferences and competitor benchmarks.

Without a clear unique selling proposition, products in high-velocity environments are easily exchangeable

Though the product-related dimensions dominate, the resource-oriented dimensions have a decisive bearing on strategy in a high-velocity environment. The reconfiguration dimension, which exhibited the fourth-largest performance impact, emphasises the importance of the “organisational knowledge” resource. Reconfiguration deals with the development of new knowledge and the application of knowledge in new domains. Successful reconfiguration is highly dependent on company culture and organisational structure. The culture needs to ensure open communication, high motivation and reasonable empowerment of the employees. Another major factor is the flexibility of the organisation in order to guarantee a fast information flow in both directions, top-down and bottom-up, and to react quickly to change requests. Workshops, cross-functional project teams and internal knowledge databases can serve as tools to encourage information flow.³⁷

Furthermore, the construct strategy in high-velocity environments can serve as a basis for an overall management framework. Following the empirically-verified sequence of the dimensions' impact on business performance, this framework can be termed ProPreRCoF (**P**roactiveness; **P**roduct differentiation; **R**epli**cation**; **R**econfigurati**n**; **I**mage differentiation; **C**o-operation; **F**ocus). By means of this framework, the company's strategic orientation can be analysed and managed regarding prioritisation, resource allocation and completeness. The framework may help executives to formulate a holistic strategy that concentrates not only on market-orientated performance, but also stresses the importance of anticipating and developing necessary resources internally and through co-operation. The integrative nature of the framework emphasises that the pursuit of market-orientated dimensions, e.g. proactiveness and product differentiation, must be accompanied by the pursuit of resource-orientated dimensions, e.g. replication and reconfiguration, to gain a sustainable competitive advantage. In order to constantly monitor the competitive advantage, ProPreRCoF can also pose as a strategic compass for strategy benchmarking. In the course of such a benchmarking project, strategic advantages, as well as strategic gaps relative to competition, must be identified and addressed.

Implications for research

Our findings have several implications for theory development in the literature on high-velocity environments. The results clearly show that in this context, strategy is neither a simple adoption of established strategies, nor do the results support the absence of strategy in favour of simple rules. Instead, strategy in high-velocity environments, as our results show, is composed of elements from both schools of strategy, market-based as well as the resource-based view. Thus our work supports the hypothesis that those theories are complementary rather than exclusive.

Another important finding of this study is that strategy in high-velocity environments has a positive and significant effect on a firm's performance. Specifically, it is found to influence both the growth and profitability of a firm. This finding is significant because the existing literature is inconclusive about the effect of a predetermined strategy in high-velocity environments. For example, Eisenhardt and

Sull conclude that strategic positioning is of little value in high-velocity environments. Our results, however, indicate that classic strategy dimensions are still valuable in those environments, but need to be augmented by resource-based aspects. Therefore this study offers much-needed empirical support for the fundamental strategy-performance link in the high-velocity context.

When interpreting the results for this study, several limitations need to be considered. First the sample frame may limit the extend to which the results can be generalised. We restricted our analysis to the ICT sector to control for industry effects in our analysis. However, there are other industries that can be classified as high velocity environments, such as the biotech industry. This industry has experienced rapid changes in demand, competition, technology and regulation. The biotech market has expanded rapidly in recent years (between 1995 and 2004, the market quintupled) and demand continues to grow. Increasing pressure from high competition and price erosions forced the convergence of the biotech and pharma industries. Moreover, political decisions regarding the regulation of genetic engineering and approval of medicaments are continuously in flux.

Although the empirical study of this article is limited to the ICT sector, there are strong commonalities across firms in different high-velocity environments. For example, many companies in such industries are young and small, and human capital represents a huge proportion of their assets. Many companies started their business on a venture capital basis and some later launched successful IPOs. Finally, in all industries, geographical clustering plays an important role. Therefore the indications coming from this study may be conveyed to other high-velocity industries. Future research could aim to test the construct strategy in high-velocity environments outside the ICT context. Likewise, a test of the model in relatively stable environments would be of interest. By comparing the potentially different parameter values, the specific characteristics of strategy in high-velocity environments could be further analysed.

Moreover because only firms based in Germany were surveyed, the findings may have limited generalisability to other countries. Further research should test the applicability of the proposed strategy construct to other countries. Any country-specific factors (cultural, economical, social and political) should be investigated.

Finally, subjective measures of strategy and performance were collected from single informants completing self-reports. This approach was chosen to generate a database that is large enough for model testing. As most companies in our sample were not publicly traded, secondary data sources did not provide sufficient information on the constructs of this study.³⁸ However, to rule out any biases associated with self-reported data, future research combining different measurement approaches is warranted.

Appendix A. Instrument development

First, multi-item scales were created on the basis of previous research on the constructs of interest. New items were developed based on the literature when existing measures were not available.

Second, 10 personal, semi-structured interviews were conducted with experts in the ICT industry. Interview partners were asked to evaluate whether the items were meaningful, understandable and valid measures of the proposed constructs in the study. Based on the interview feedback, some changes were made to the questionnaire items.

Third, the items were subjected to an item-sorting task administered by 22 academic and practical experts.³⁹ We computed two indices suggested by Anderson and Gerbing, proportion of substantive agreement and substantive validity coefficient, for each item to assess the appropriateness of the item for measuring the construct. These indices were used in a comparative manner – i.e. we rephrased and excluded items according to their performance in this item-sorting task.

Fourth, as a further pre-test, 180 companies were chosen randomly from the sampling frame. The goal of this pre-test was to examine the reliability and validity of the items. For that purpose, all items were phrased as Likert-type statements anchored by a seven-point scale, ranging from “strongly disagree” (1) to “strongly agree” (7). The preliminary questionnaire was sent to a senior executive of each company. Feedback was received from 14 companies. Based on this feedback, scale reliabilities

(Cronbach's alpha) and item-to-total correlations were calculated, and an exploratory factor analysis was performed.⁴⁰ The measurement instrument was finalised on the basis of these calculations.

Appendix B. Analysis of the research model

The statistics were calculated using SPSS 14.0 and AMOS 6.0, employing the Maximum-Likelihood Method (MLM) for estimation of parameters. We analysed our model in three stages: (a) assessment of the reliability and validity of the individual dimensions; (b) assessment of the reliability and validity of the model; (c) assessment of the effect on business performance.

Assessment of the individual dimensions

To purify the measurement model, the seven single dimensions of the construct strategy in high-velocity environments were initially analysed in isolation. To do so, Cronbach's alpha, Item-to-Total correlation, Variance Explained (exploratory), Item Reliability (confirmatory), Composite Reliability, and Average Variance Extracted were calculated.⁴¹ Regarding the threshold values for the different criteria, we followed the suggestions of Bagozzi and Yi, Bagozzi, Yi, and Phillips, and Anderson and Gerbing.⁴² Consistent with Anderson and Gerbing's suggestion for purifying the measurement model, several items were dropped.⁴³ The remaining items demonstrated reasonable reliability and validity (for details, see Table 2).

Assessment of the model

To assess the measurement model, supplementary tests were conducted. First, we performed an exploratory factor analysis with the remaining items, which identified the proposed structure with seven dimensions. Additionally, the results of a first-order confirmatory factor analysis (CFA) showed that the assumed dimensionality, as well as the assignment of the items to the different dimensions, were reproduced in the data.⁴⁴ Furthermore, discriminant validity was assessed by applying the criterion suggested by Fornell and Larcker, which is based on a comparison between the average variance extracted by the measure of each factor, and the squared correlation of that factor's measure with all measures of other factors in the model.⁴⁵ All seven dimensions were in compliance with this criterion.

Subsequently, we performed a second-order CFA to test if the identified dimensions are, in fact, constituents of the construct strategy in high-velocity environments. In this measurement model, strategy in high-velocity environments was the second-order factor of the seven first-order dimensions. All factor loadings were significant. Moreover, the predominantly excellent values of the global criteria demonstrate a good fit of the model (see Figure 3).

Assessment of the effect on business performance

Business performance was defined as a two-dimensional construct with the dimensions growth and profitability. To measure these dimensions, several items were developed and included in the survey. In addition, a global assessment of business performance in relation to the deployed resources and with regard to the intended objectives was added. To reduce the effects of consistency artefacts, we arranged the survey items so that the measures of the dependent variable (performance) follow, rather than precede, the independent variables (strategy).⁴⁶

The performance construct was subject to the same reliability and validity tests as the strategy construct. These tests showed that the business performance construct contains two dimensions. Moreover, these two dimensions are significantly related to the global assessment of performance. Furthermore, the global fit statistics indicate a good fit of the model for business performance (Reduced chi-square = 1.499; GFI = .984; AGFI = .951; CFI = .996; RMSEA = .049).

The influence of the construct strategy in high-velocity environments on business performance was analysed using a second-order structural equation model. In this model, the factor loadings of the single dimensions of strategy in high-velocity environments represent the importance of each dimension. The higher the factor loading, the higher the share of the respective dimension in the influence

Table 2. Reliability and validity of the single dimensions

Dimension	Item	Cronbach Alpha	Item-to-total correlations	Item reliability (confirmatory)	Composite reliability	Average Variance Extracted
Product differentiation	5 d: superior quality of products separates company from competition	.789	.529	.341	.813	.602
	5 b: design and functionality of product crucial for competitive positioning		.701	.701		
	5 c: company's uniqueness caused by design and functionality of products		.686	.686		
Image differentiation	7 c: promotion aims at the development of a distinctive image	.819	.553	.350	.828	.621
	7 g: use of innovative marketing methods		.730	.748		
	7 f: above average marketing competence		.745	.801		
Focus	4 j: product offerings feature a high focus	.747	.539	.410	.770	.533
	4 d: business activity focuses on a narrow, clearly defined market segment		.584	.486		
	4 c: concentration on specific products and/or customer segments		.648	.677		
Proactiveness	4 k: anticipatory and proactive market development, early pursuit of opportunities	.738	.447	.257	.748	.506
	5 j: high share of new products in sales compared to competition		.645	.699		
	5 f: first mover with regard to new product introduction		.610	.575		
Replication	8 a: knowledge codified in handbooks, data processing media and trainings	.854	.644	.475	.863	.686
	8 d: fast identification of experts due to documentation of knowledge areas		.767	.734		
	8 c: frequently used and updated central knowledge base/information system		.786	.814		
Reconfiguration	12 e: high learning skills of employees compared to competition	.810	.534	.364	.827	.494
	12 h: application of existing knowledge and competences in new problem areas		.603	.448		
	12 c: findings are dissolved from concrete setting and used in new problem areas		.602	.480		
Co-operation	12 f: fast reaction on employee proposals regarding strategic issued		.584	.434		
	12 d: involvement of employees in the discussion of new areas of application		.684	.623		
	14 f: openness and flexibility regarding inter-firm cooperation	.907	.674	.500	.909	.589
	14 g: above average number of strategic alliances		.749	.630		
	14 d: intensive R&D collaboration with other companies		.754	.624		
	14 a: cooperations for enforcement of industry standards		.721	.591		
	14 e: inter-organisational commitments to build shared competence centres		.707	.560		
	14 c: intensive use of joint development and joint production		.682	.524		
	14 b: company highly involved in a strategic network		.769	.664		

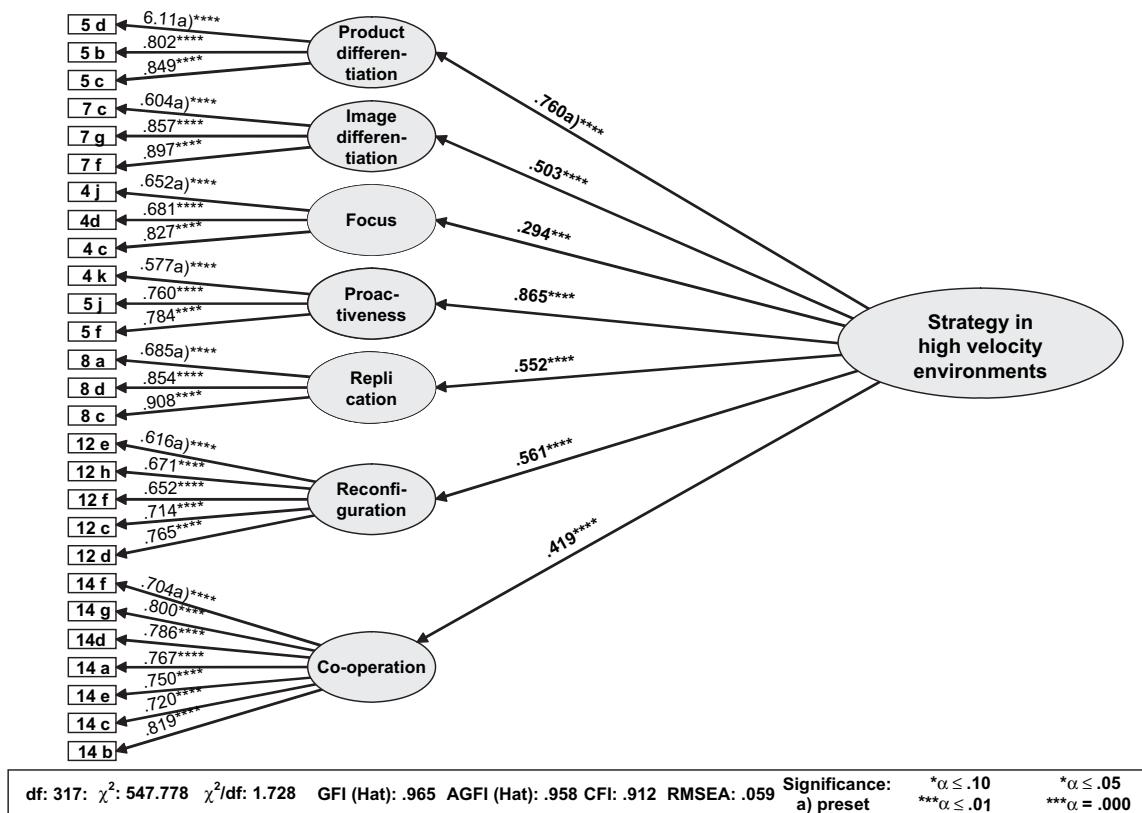


Figure 3. Second-order confirmatory factor analysis of the seven-dimensional model for strategy in high-velocity environments

of the strategy construct on performance. Figure 2 shows the second-order structural equation model for the influence of the strategy construct on business performance, as well as the corresponding fit statistics. The overall fit of the model was good, as can be seen from the values of the fit measures. Moreover, a model comparison between the original model ($BIC = 1,245.229$) and a model in which the seven dimensions are directly related to the three performance constructs ($BIC = 1,503,962$) was indicative of the superiority of the original model.

With regard to structural relations, the results indicated that the strategy construct has a significant direct effect (.234) on the global assessment of performance. Additionally, it has a significant indirect effect (.262) through two endogenous variables, profitability and growth. Thus, the direct and indirect effects can be added to a significant total effect amounting to .496. Altogether, the constructs of strategy in high-velocity environments, growth, and profitability account for as much as 44 per cent of the variance of the global performance assessment.

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