

# Competitive advantages for contractor by implementing new materials?

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# Competitive advantages for contractor by implementing new materials?

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*Nowadays, price competition plays a dominant role in the construction industry in the competition to acquire orders. This leads to companies extensively striving for cost leadership in their competitive strategy. Therefore contractors almost simultaneously attempt to implement various cost effective optimizations of their processes. In this paper we would like to address the question whether contractors can gain a competitive advantage by using innovative materials or not. We will show if innovations of suppliers result in differentiation potential or cost advantages to obtain contractors' competitive advantages using the example of the materials fiber-reinforced, self-compacting and high-strength concrete. Furthermore we will analyze and assess in depth the impact of the contrary strategic objectives of supplier and contractor to obtain competitive advantages.*

**Keywords:** price war, corporate strategy, material innovations, competitive capacity, competitive strategy.

## 1. Introduction

Apart from the market structure of the construction industry, the conflict of objectives between contractors and the suppliers also turns out to be a fundamental problem in the differentiation of the individual contractors in order to obtain competitive advantages through material innovation. While contractors try to act as the only supplier of an innovative technique in order to differ from the mass of competitors, suppliers attempt to sell great quantities and, by this means, to realize great profits.

If we want to analyze options of increasing the competitive ability of construction companies in order to obtain competitive advantages from supplier innovations, we need to study the following aspects in more detail:

- What development potential does the construction market offer, if any?
- What strategic options are available to construction companies to develop competitive advantages?
- What influence do suppliers' service and product innovations generally have on the competitive ability of construction companies?

In order to fundamentally understand the impacts of supplier innovations on the competitive ability of construction companies, it is necessary to analyze the corporate objectives of both supplier and construction companies, their interaction, and the benefit for the client. An examination of the technological, construction management and economic impacts is conducted in this paper using three innovative materials - fiber-reinforced, self-compacting and high-strength concrete – as examples.

## 2. Strategy options for contractors

Each construction company has different strategies as to how it wants to evolve with the probable potential in the local or international construction marketplace. The company's mission statement and values play an important role when it comes to selecting a company-specific strategy. But other factors, such as proprietary resources or the development of the overall market also need to be taken into consideration.

Plinke [3] indicates three basic types of strategic decisions, "Strategy cementation", "Growth strategy" and "Strategic restructuring". These three basic types are enhanced by "Strategic downsizing" as this can offer a sensible alternative in certain market situations.

A company uses a market strategy to define how it wants to position itself in the marketplace. A distinction must be made between market strategies that are chosen for the company as a whole, and those chosen for individual strategic business units (SBU). The company should aim to use its market strategy to generate a growth path in order to sustain its value. The dimensions of services / products and market as defined by Ansoff [1] are suitable for business units.

Based on this market strategy, the competitive strategy developed by Porter [4] illustrates the various ways in which a company can use its own efforts to create competitive advantages and differentiation potential from the client's perspective in the industry environment. Both the behavior vis-à-vis the competition and the resulting impact on the client need to be taken into account.

### 3. Impacts of innovative products on the players in the value creation chain

Although each new material represents a product innovation for its supplier (in this case the concrete industry), its impact on the other players in the value creation chain - companies and clients - depends on the type of change it effects to the downstream value creation phases [2] (Fig. 1).

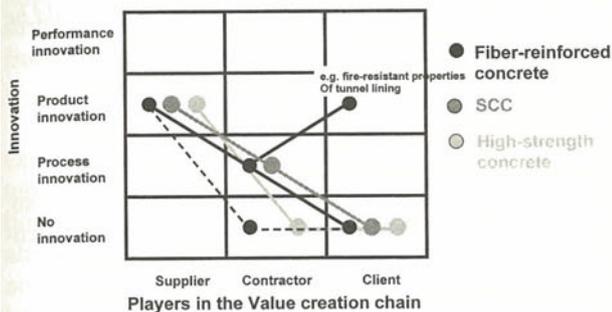


Fig. 1: Innovative products and their impact on the players in the value creation chain

For a construction entrepreneur, fiber-reinforced concrete only represents a process innovation if it eliminates the need for mat reinforcement during the performance process, since the process of producing the reinforcement mat then becomes superfluous.

Clients are only interested in results, and not in processes. If an industrial floor is being produced, the client's only interest is that the floor does not crack or sag and its durability are ensured. He does not care whether this was achieved by reinforcement mats of fibers in the concrete and will therefore not see it as an innovation.

If, in contrast, the use of plastic fibers substantially improves the fire-resistant properties of tunnel shells, this would represent a product innovation for clients, since the tunnel shell becomes safer for the users.

Certain measures need to be implemented when using SCC. The formwork has to be stronger, the workers have to be trained, and there is no longer any need for compression using mixers during the actual concreting process. As such, SCC represents a process innovation for construction entrepreneurs.

The new and improved effects of products manufactured using these innovative materials are not apparent to clients. Although they benefit from the possibly improved quality, they do not recognize these benefits at first glance, and as such these products are not genuine innovations for them.

The same applies to the use of high-strength concrete. The suppliers' product innovations do not have a tangible impact on the manufacturing and processing processes. With the exception of a few special circumstances, clients will not notice that an innovative construction material has been used.

### 4. Conclusion

The market structure of the construction industry coupled with the conflicting goals of construction companies and the construction materials industry are proving to be a fundamental problem when differentiating individual construction companies from their competitors on the basis of material innovations. The construction materials industry is characterized by an oligopolistic, nearly monopolistic supply structure, whereas construction companies with their atomistic supply structure and perfect competition among their peers having to deal with the forces of their clients and suppliers. This conflict between companies and suppliers is also underlined by the differing objectives of the two parties. Construction companies are trying to position themselves in the market as sole supplier of an innovative technology in order to prove to clients their differentiation from the competition and to set themselves apart from the crowd of atomistic suppliers, whereas suppliers try to generate large volumes of sales, large revenues and large profits and, to do so, to supply as many construction companies as possible with the same product. Following the relatively short launch phase of new materials, the competitive advantages for the individual companies in the marketplace are more or less lost, and perfect competition is re-established. Most construction companies will subsequently pursue a strategy of cost leadership. These relatively short cycles highlight the fact that the use of new and innovative materials cannot be expected to result in any lasting improvement of the competitive situation, nor, in consequence, of the economic situation of a construction company.

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# Competitive advantages for contractors by implementing new materials?

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## Abstract

Nowadays, price competition plays a dominant role in the construction industry in the competition to acquire contracts. This leads to companies extensively striving for cost leadership in their competitive strategy. Therefore contractors almost simultaneously attempt to implement various cost effective optimizations of their processes. However, in an environment of almost perfect competition these optimizations give only little reprieve even to the stronger, more flexible contractors. In this paper we would like to address the question whether contractors can gain a competitive advantage by using innovative materials or not. We will show if innovations of suppliers result in differentiation potential or cost advantages to obtain contractors' competitive advantages using the example of the materials fiber-reinforced, self-compacting and high-strength concrete. Furthermore we will analyze and assess in depth the impact of the contrary strategic objectives of supplier and contractor to obtain competitive advantages.

**Keywords:** price war, corporate strategy, material innovations, competitive capacity, competitive strategy.

# 1. Introduction

Apart from the market structure of the construction industry, the conflict of objectives between contractors and the suppliers also turns out to be a fundamental problem in the differentiation of the individual contractors in order to obtain competitive advantages through material innovation. While contractors try to act as the only supplier of an innovative technique in order to differ from the mass of competitors, suppliers attempt to sell great quantities and, by this means, to realize great profits.

If we want to analyze options of increasing the competitive ability of construction companies in order to obtain competitive advantages from supplier innovations, we need to study the following aspects in more detail:

- What development potential does the construction market offer, if any?
- What strategic options are available to construction companies to develop competitive advantages?
- What influence do suppliers' service and product innovations generally have on the competitive ability of construction companies?

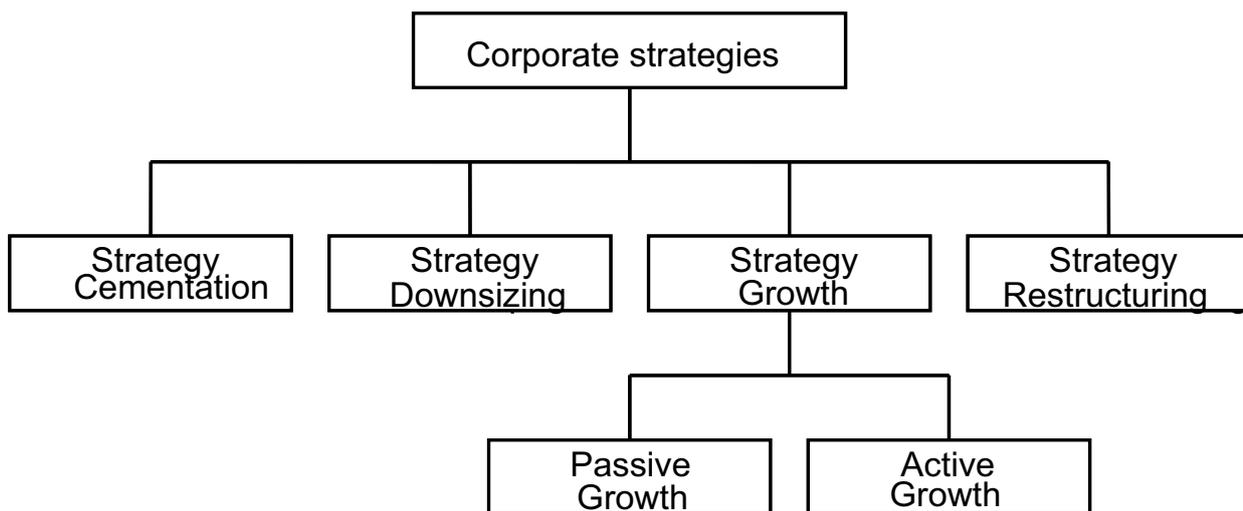
In order to fundamentally understand the impacts of supplier innovations on the competitive ability of construction companies, it is necessary to analyze the corporate objectives of both supplier and construction companies, their interaction, and the benefit for the client. An examination of the technological, construction management and economic impacts is conducted in this paper using three innovative materials - fiber-reinforced, self-compacting and high-strength concrete – as examples.

## 2. Strategy options for contractors

### 2.1 Different market development strategies for contractors

Each construction company has different strategies as to how it wants to evolve with the probable potential in the local or international construction marketplace [4]. The company's mission statement and values play an important role when it comes to selecting a company-specific strategy. But other factors, such as proprietary resources or the development of the overall market also need to be taken into consideration. It can sometimes even make more sense to close down certain areas of economic activity in order to deploy the tied resources more profitably elsewhere.

Plinke indicates three basic types of strategic decisions [6], "Strategy cementation", "Growth strategy" and "Strategic restructuring". These three basic types are enhanced by "Strategic downsizing" as this can offer a sensible alternative in certain market situations (Fig. 1).



*Fig. 1: Various market development strategies of construction companies*

In the case of "Strategy cementation" the company limits itself to continuing with its established areas of activity, as in the past. This decision often results in the company tying up further resources in this area and, in doing so, (consciously or unconsciously) excluding other areas that might offer growth possibilities.

In the case of a "Downsizing strategy", the company reduces its resource deployment and efforts in one area with, for example, little profit or growth potential, thus gaining more possibility of investing in alternative, possibly more attractive areas of business.

In the case of the "Growth strategy" a distinction must be made between active or passive growth. Active growth generally involves the deployment of considerable resources to develop a new growth path / a new area of economic activity / a new market segment and/or to expand existing market shares.

The theoretical interrelationships are illustrated in the following example [4] (Fig. 2).

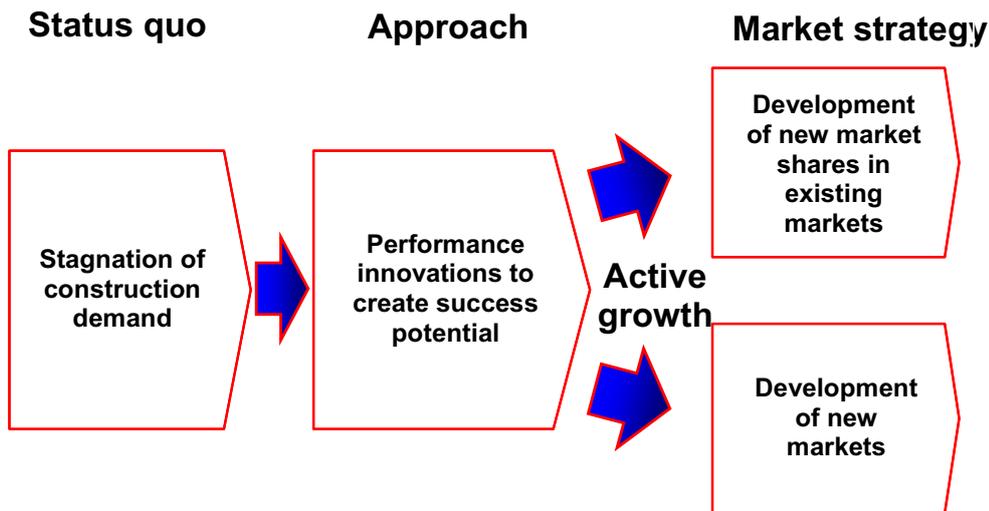


Fig. 2: From company strategy "Active growth" to market strategy

If construction demand is stagnating - which has been ever more often the case recently – and the construction company decides to create success potential by developing performance innovations, a company strategy of "Active growth" offers two possible market strategies. On the one hand the company can focus on developing new market shares in existing markets by implementing strategies to push out the competition, or alternatively it can use performance innovations to develop entirely new markets.

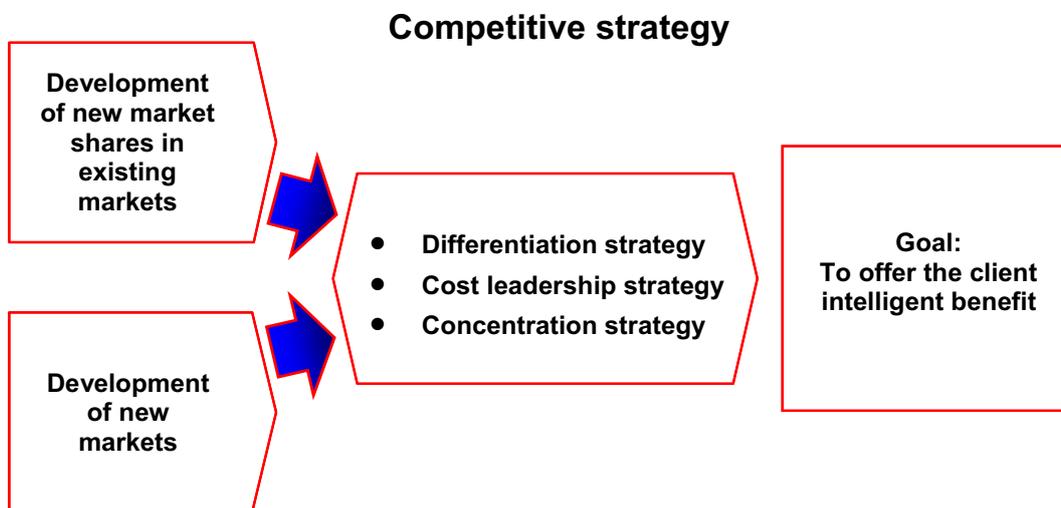


Fig. 3: From market strategy to possible competitive strategies

These market strategies result in various competitive strategies [4] (Fig. 3) vis-à-vis the competition, which will be studied in more detail later. The goal of any entrepreneurial efforts to secure a win-win situation should be to tie the client to the company by offering

him a benefit, e.g. an intelligent benefit that the competition cannot offer to the same extent.

## 2.2 From company strategy to business strategy

Following an in-depth analysis of its status quo – the so-called global analysis - every larger company forms individual strategic business areas (SBA). These SBAs are tailored fully to the clients' needs in order to ensure best possible customer support, a high degree of recognition among clients, and early order acquisition. The internal processes (business processes) are structured by forming strategic business units (SBU), whereby several areas of business can be assigned to the same business unit. Separating the overall company into smaller partial units makes it possible to react more quickly to the market and to better implement the company's mission statement and goals.

Different strategies can be defined, both for each SBA and for each SBU, whereby a distinction must be made between three separate and independent basic types of strategy [4] (Fig. 4).

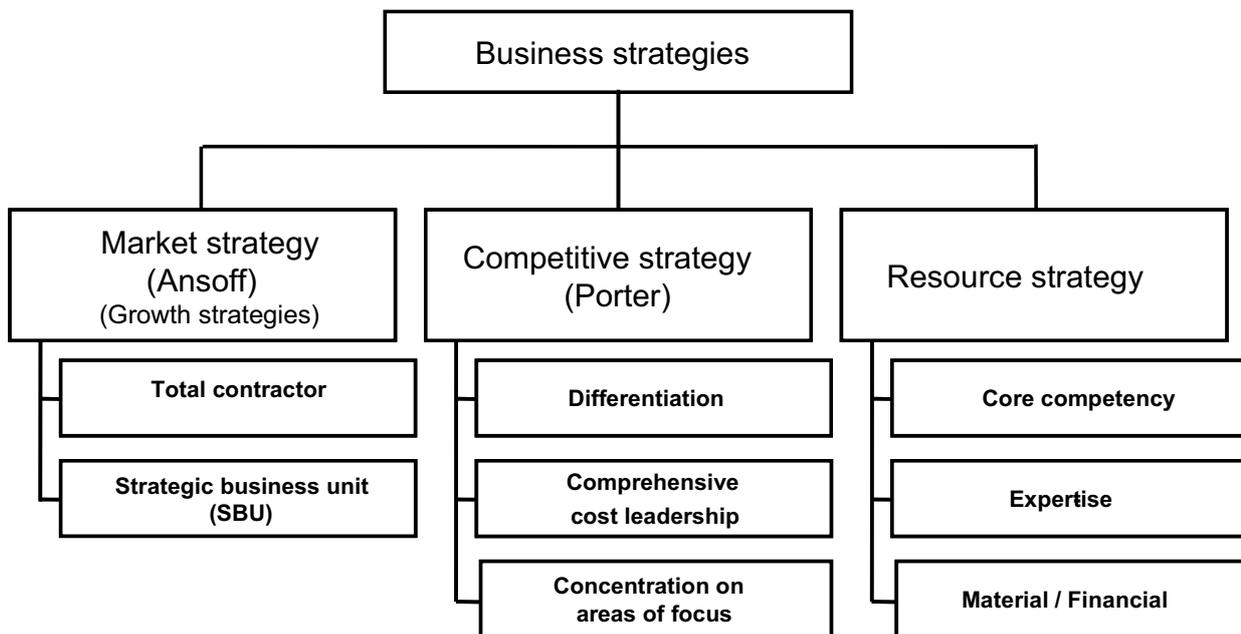


Fig. 4: Programs for securing competitive advantages

A company uses a market strategy to define how it wants to position itself in the marketplace. A distinction must be made between market strategies that are chosen for the company as a whole, and those chosen for individual SBUs. The company should aim to use its market strategy to generate a growth path in order to sustain its value. The

dimensions of services / products and market as defined by Ansoff [1] are suitable for business units.

Based on this market strategy, the competitive strategy developed by Porter [8] illustrates the various ways in which a company can use its own efforts to create competitive advantages and differentiation potential from the client's perspective in the industry environment. Both the behavior vis-à-vis the competition and the resulting impact on the client need to be taken into account.

The market and competitive strategies are implemented internally using the resource strategy with the provision of tangible and intangible resources and establishment of structures (process and organizational structures).

### **2.3 Impact of supplier innovations on construction companies**

Generally, there is no universally valid answer to the question of whether innovations by suppliers, or the concrete industry, improve the competitive ability of construction companies or not. But in order to address this issue we should first consider which products are made available to construction companies by the building materials or concrete industries.

These are primarily mass and niche products, with which the subcontractors aim to reach as large a client base and generate as high a volume of sales as possible. Wherever possible, the aim should be to acquire all prospective purchasers of the product to enable the supplier to act, ideally, as a monopolist (alone in the market) or oligopolist (only a few players in the market) [5].

The following questions need to be addressed in order to judge the impact of product developments on the competitive ability of construction companies:

- How will the new product impact the client (effectiveness)?
- How will the new product impact the competition?
- How will the new product impact the company and its process of providing products and services (efficiency)?
- How will the new product impact the general economy and environment?

These issues will be addressed using three new and innovative materials as examples.

### 3. Analysis of certain materials as examples

#### 3.1 Fiber-reinforced concrete

Fiber-reinforced concrete is a compound made of normal concrete and high-tensile fibers. Depending on the type of fiber, a distinction is made between fiber-reinforced concrete with steel fibers or with plastic (usually polypropylene) fibers. It is used as fiber-reinforced concrete formwork or as fiber-reinforced shotcrete.

In certain circumstances, the use of fiber-reinforced concrete can completely eliminate the need for reinforcement. In the case of concrete components with pure anticrack reinforcement, for example, this can possibly save up to 60% time during the work cycles (Fig. 5). Another important aspect is the fire-resistance of fiber-reinforced concrete when plastic fibers are used. By using plastic fibers the tendency for spalling is significantly reduced [7].

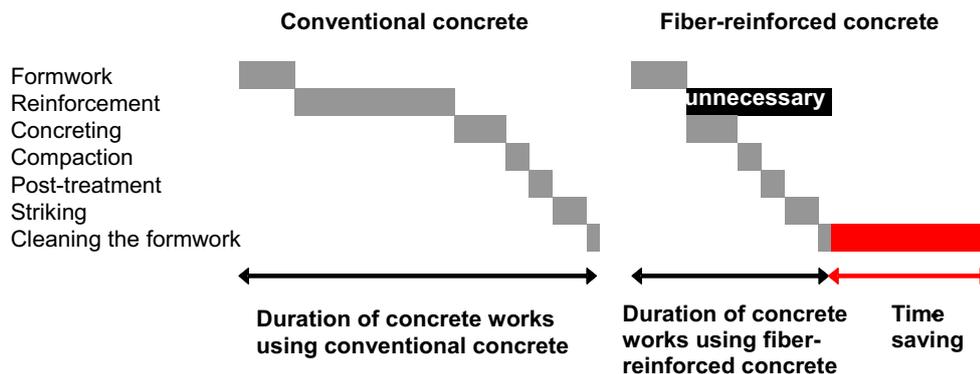


Fig. 5: Time benefit from using fiber-reinforced concrete in concrete components with pure anticrack reinforcement

#### 3.2 Self compacting concrete (SCC)

Self compacting concrete is characterized by the fact that gravity alone is sufficient for ventilation and flux up to leveling. The technology is based on highly-effective solvents that change the properties of the fine grain suspension. The suspension retains its high dynamic viscosity due to the low level of water content, ensuring that the coarser grain additive does not separate or prevent plasticity, but rather "swims" in the suspension [9].

Unlike vibrated concrete, the formwork pressure may not be reduced when dimensioning the formwork; the full hydrostatic pressure of freshly made concrete must be calculated [3]. Unlike normal concrete, the concrete is not poured from above; SCC is always pumped in from below under pressure, pushing the concrete up.

The primary benefit of SCC is that it eliminates the need for compacting, which – limited by the formwork dimensions – makes it possible to increase performance and easily concrete complicated components in areas that are difficult to access. In contrast, however, the formwork works increase as the joints and connections and the dimensional accuracy of the formwork must be performed more precisely and the vertical formwork must be dimensioned more strongly.

### **3.3 High-strength concrete**

In the case of high-strength concrete, pozzolanic additives compress the mortar structure, thus improving adhesion between the aggregate and the hardened cement. Eliminating the coarse additives further homogenizes the structure and post heat treatment improves the microstructure and accelerates the pozzolanic reaction.

The w/c ratio can be further reduced by using high-performance liquefiers, thus enabling even better improved compression strength. Research laboratories are meanwhile producing super high-strength concrete offering compression strengths of more than 240 N/mm<sup>2</sup> [9].

## **4. Impact and importance of innovative products on the players in the value creation chain**

Although each new material represents a product innovation for its supplier (in this case the concrete industry), its impact on the other players in the value creation chain - companies and clients – depends on the type of change it effects to the downstream value creation phases [5](Fig. 6).

For a construction entrepreneur, fiber-reinforced concrete only represents a process innovation if it eliminates the need for mat reinforcement during the performance process, since the process of producing the reinforcement mat then becomes superfluous.

Clients are only interested in results, and not in processes. If an industrial floor is being produced, the client's only interest is that the floor does not crack or sag, and its durability

is ensured. He does not care whether this was achieved by reinforcement mats of fibers in the concrete. Clients will therefore not see fiber-reinforced concrete as an innovation, since it does not change the utilization properties as they perceive them.

If, in contrast, the use of plastic fibers substantially improves the fire-resistant properties of tunnel shells, this would represent a product innovation for clients, since the tunnel shell becomes safer for the users.

Certain measures need to be implemented when using SCC. The formwork has to be stronger, the workers have to be trained, and there is no longer any need for compression using mixers during the actual concreting process. As such, SCC represents a process innovation for construction entrepreneurs.

The new and improved effects of products manufactured using these innovative materials are not apparent to clients. Although they benefit from the possibly improved quality, they do not recognize these benefits at first glance, and as such these products are not genuine innovations for them.

The same applies to the use of high-strength concrete. The suppliers' product innovations do not have a tangible impact on the manufacturing and processing processes. With the exception of a few special circumstances, clients will not notice that an innovative construction material has been used.

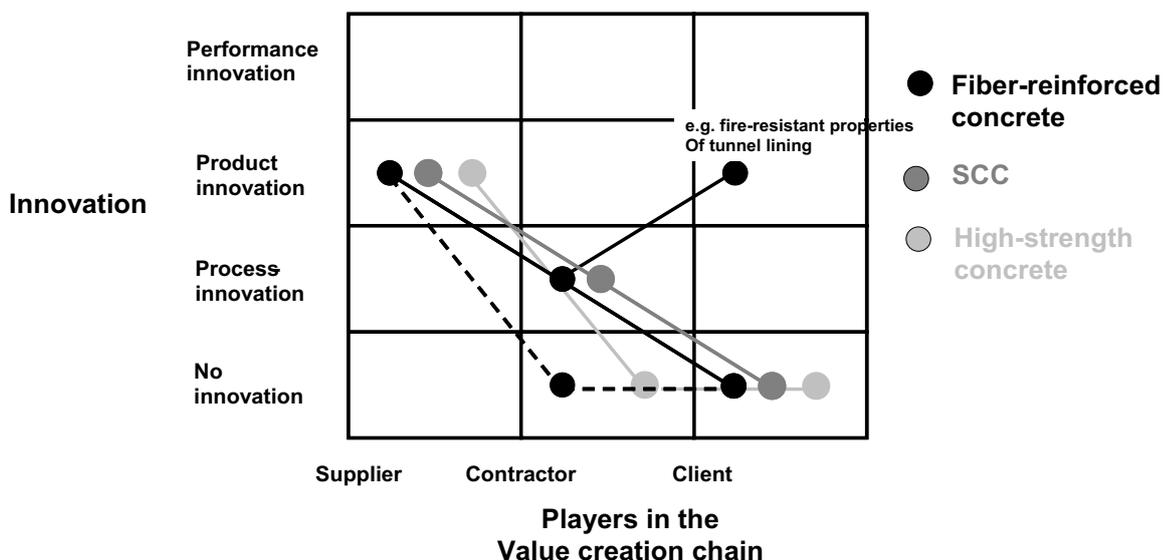


Fig. 6: Innovative products and their impact on the players in the value creation chain

If, however, recognizably new properties are generated for the clients' use – irrespective of whether conventional or innovative materials are involved – then this could be seen as a product innovation by clients as well.

At the beginning of this presentation, in section 2.3, four questions were asked to enable an evaluation of the impacts of product innovations and new materials on the competitive ability of companies. These questions are answered in summary in Table 1.

*Table 1: Evaluation of the impacts on the emergence of competitive advantages for construction companies*

	Construction method	Application	Service provision process		Customer	Competition	Environmental and economic issues	Differentiation potential for construction companies
Fiber-reinforced concrete	Shotcrete	Tunnel construction Repairs etc.	No formwork No reinforcement High (expensive) rebound	Shortens the manufacturing process Fewer work hours Higher material costs	Higher quality Higher suitability for use Higher fire safety	Easily imitated	Demolition disposal problems	Scarcely any
	Site concrete	Tunnel construction Structural engineering Industrial floors	No reinforcement	Shortens the manufacturing process Fewer work hours	Higher quality Higher suitability for use Higher fire safety	Easily imitated	Demolition disposal problems	Scarcely any
	Site concrete Sliding formwork	Tunnel construction Line structures	No reinforcement	Shortens the manufacturing process Fewer work hours	Higher quality Higher suitability for use Higher fire safety	More difficult to imitate	Demolition disposal problems	Innovation potential in terms of construction technology
SCC	Site concrete	Tunnel construction Inner-city structural engineering Special civil engineering Building repairs Structural protection	No compacting No compacting noise Simple application of concrete to structural formwork with poor accessibility	Hardly any shortening of the manufacturing process Hardly any savings in work hours Stronger vertical formwork	Minor advantages in terms of compacting quality, especially for complex components	Easily imitated	Less noise	Scarcely any
High-strength concrete	Site concrete	Structural engineering Bridge construction Tunnel construction	No material differences, unusual processing properties at the beginning		Slimmer components	Concrete technology and processing are not as easy to imitate	Neutral	For niche providers, possibly in conjunction with proposals to the entrepreneur

An economic advantage to improve a company's chances of survival in the construction industry usually only emerges during the introduction phase and at the beginning of the expansion or growth phase of such innovations (Fig. 7). At this point in time at the latest other market players recognize the advantages and adapt these materials. The individual

supplier' advantage is lost and perfect competition among suppliers is re-established in the construction market.

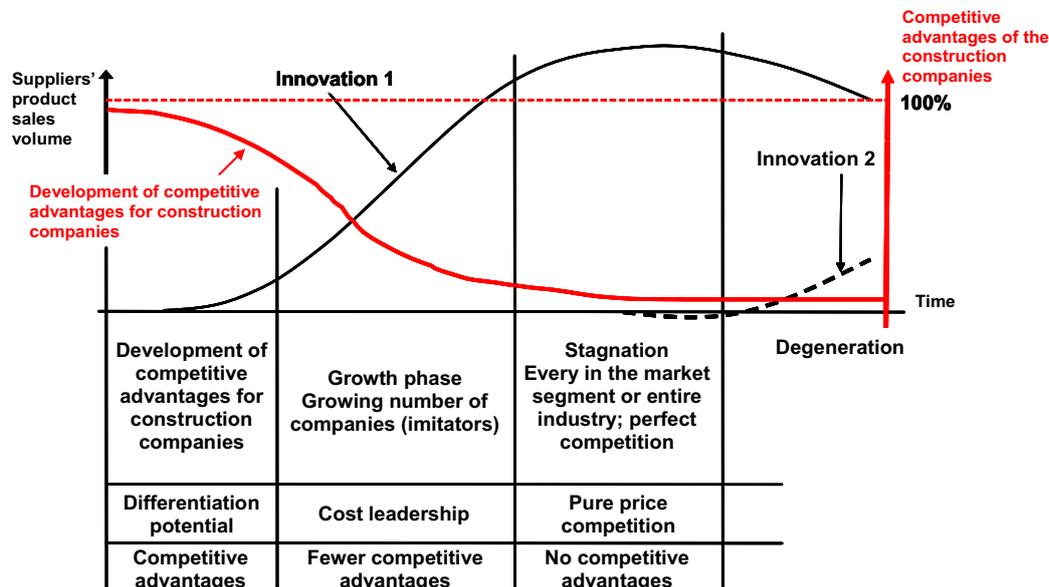


Fig. 7: Development of competitive advantages for individual companies

## 5. Conclusion

The market structure of the construction industry coupled with the conflicting goals of construction companies and the construction materials industry are proving to be a fundamental problem when differentiating individual construction companies from their competitors on the basis of material innovations. The construction materials industry is characterized by an oligopolistic, nearly monopolistic supply structure, whereas construction companies with their atomistic supply structure and perfect competition among their peers are having to deal with the forces of their clients and suppliers.

This conflict between companies and suppliers is also underlined by the differing objectives of the two parties. Construction companies are trying to position themselves in the market as sole supplier of an innovative technology in order to prove to clients their differentiation from the competition and to set themselves apart from the crowd of atomistic suppliers, whereas suppliers try to generate large volumes of sales, large revenues and large profits and, to do so, to supply as many construction companies as possible with the same product.

Following the relatively short launch phase of new materials, the competitive advantages for the individual companies in the marketplace are more or less lost, and perfect competition is re-established. Most construction companies will subsequently pursue a

strategy of cost leadership. These relatively short cycles highlight the fact that the use of new and innovative materials cannot be expected to result in any lasting improvement of the competitive situation, nor, in consequence, of the economic situation of a construction company.

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