

Carsten Hentrich / Michael Pachmajer

d.quarks

The Path to Digital
Business



For several years now, **Dr. Carsten Hentrich** and **Michael Pachmajer** have been assisting companies with their move into the digital age. As Directors at PwC's consulting branch, they are responsible for the firm's digital transformation practice with a particular focus on the Family Business and Medium-Sized Companies segment.

Hentrich and Pachmajer are consultants »with the digital touch.« Having won their professional spurs during the New Economy years, they know very well that it takes more than enthusiasm to master digital transformation: It takes a sound strategic foundation. It also takes new forms of collaboration and participation, breaking down disciplinary barriers and putting an end to silo thinking.

Besides international consultancies, both authors have worked at large corporations before. Capitalizing on their extensive expertise and experience, they merge technology with digital business models and corporate change – a unique combination that makes them thought-leading experts on digital transformation.

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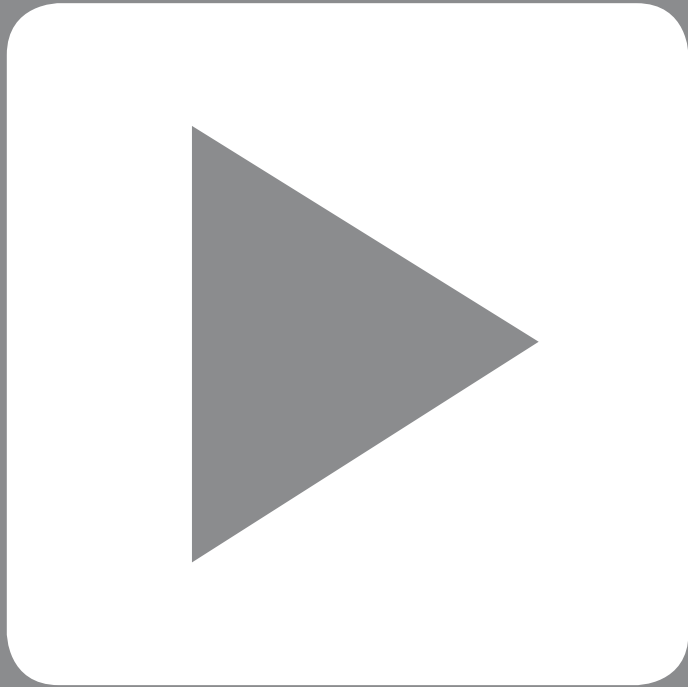
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GETTING ON THE ACCELERATOR TRACK

It's the moment of truth. Scientists are staring at a wall full of screens, transfixed. Will modern physics manage to push open the doors to a new era? Then, all of a sudden, everyone in the room bursts into cheers. For years and years they have worked towards this goal – and now, on September 10, 2008, the moment has finally come: Particle physics has entered a new era. It all begins with a tiny, inconspicuous dot. Just a brief blink on the screens of the control room – and everyone is swept up in a wave of enthusiasm. How can such a simple event provoke such a strong response? Actually, the pipsqueak is a giant. What it shows is that at this very moment, a proton beam has completed a circular track in the *Large Hadron Collider* (or LHC) for the first time. A total of twenty-seven kilometers – a good sixteen miles – in the world's most powerful particle accelerator. Here, protons are made to collide at unprecedented experimental speeds. Using this new power, scientists seek to discover elementary particles yet unknown. Since the 1950s, there has been particle physics research in Geneva, Switzerland. The launch of the LHC – one of the greatest scientific projects of all time – marked a turning point, because proton collisions can open new perspectives and might even help answer some of the fundamental questions of modern physics. Questions about the origin of matter, consistent ways to deal with fundamental forces, new forms of matter, and new dimensions of time and space. Who knows – in the end, particle physicists might find answers to questions they have not even thought to ask.

Now what has all of this got to do with us? We are no particle physicists, nor are we seeking to discover the origin of matter. We are consultants assisting clients in questions of digital transformation. We have developed an approach that can speed up your progress on the path to digital business. To this end, we focus our attention on the fundamental particles of a digital company – the digital quarks. When visiting

CERN in Geneva, we realized that for all intents and purposes, what we do is basically the same as what the LHC scientists do. Their approach is similar to the one we use for the digital transformation of companies. We explore the basic design of digital business models. This enables us, and the companies we advise, to create what might be referred to as »new forms of matter« – that is, new forms of companies.

We are Carsten Hentrich and Michael Pachmajer. For several years now we have been assisting large corporations and mid-sized family businesses with their move into the digital age. We show them opportunities and approaches, and, above all, we ease their fears. We are familiar with the fears that digital change instills, we are aware that many CEOs and company owners associate digital change with a loss of control – and we witness how companies, in particular many mid-sized businesses, are hesitant to tackle the issue. We are talking about companies here that operate very successfully in their niches, perhaps even as world market leaders, and are now faced with a new situation. They would like to continue the traditions of their companies, which are often family-owned, and they know it won't be possible if they refuse to deal with digitalization. At the same time, they are unsure as to what could be the appropriate approaches and methodologies to address digital change. It is not that they lack ideas. On the contrary: Many companies have great ideas for digital business models but don't know how to get started, what capabilities they will require and to what extent they will need to change in order to implement these ideas. Digitalization, after all, means change – and change triggers anxiety and disruption.

A Plan Is Needed

Everybody talks about digital transformation, and there is hardly an industrial fair, conference or meeting where the subject is not addressed. Still, many companies dread the actual change. Apart from fear, there are further reasons for avoiding making the transition: Companies lack a navigator for digital change, or a directory if you will. They need a transformation roadmap for rebuilding their businesses, a blueprint for their redesign, and, as we've said before, simply the courage to begin.

This is quite surprising, as German companies are actually known to puzzle over key issues, refusing to give up until they have found the perfect solution. Not so with digital transformation. Faced with this all-important issue, they seem hesitant. That is why we want to offer help – by providing something like a roadmap for the changes needed, an easy-to-understand model of the digital elements required in companies. Our model should give leaders the courage to tackle digital transformation in their own companies. It will help master the transition. At the same time, it is not simply a set of instructions you just need to follow, checking off item after item, to be rewarded with a digital company in the end. It is more like a map showing you all the avenues, roads and footpaths that exist, setting out the diversity of the digital landscape. The beauty of it is that it keeps opening new perspectives while providing orientation and direction at all times.

○ Speeding Through the Tube

We've nurtured the idea for our model for a very long time. We've tested, weighed up, and analyzed. The »awakening« occurred when we were at CERN in Geneva. A team colleague had got us an appointment there, which turned out to open a whole new world for us. We entered a large hall where parts of the acceleration ring were displayed. Studying the true-to-scale exhibits, we were able to see what particular components work together to allow particles to move through the »tube« at a tearing pace. There are radiofrequency cavities, which provide the particles with the energy needed for acceleration. Large magnets make sure that the particles remain on track. In other words, there is something in the acceleration ring that provides orientation. This was when our idea was born.

In digital transformation, too, it is important to stay on track. In the particle accelerator, there are certain points where particles collide, triggering new developments. It is the same with companies: The »collision« of different skills and experiences, capabilities and disciplines triggers the creation of new ideas. For instance, we have repeatedly witnessed how companies that had managed to build teams across disciplines – across silos, if you will – then »discovered« completely new business models. Last

but not least, the particle accelerator also has detectors capturing information and responses. In our »particles model,« those would be customer information and customer feedback.

So there we were, standing in CERN, discussing and developing an analogy to our consulting work. Once we had delved into the world of particles physics, we suddenly realized: What we do is basically the same.

○ Getting Particles to Gain Momentum

What is particle acceleration all about? What's the secret behind it? It is about using enormous speed and energy to make fundamental particles visible, or rather, expose them, and identify each of them individually. It is about using the collision of two particles to create events that provide new insights into the structure of matter. What we did is transfer the quarks model from particle physics to digital transformation. The fundamental particles described here – for the first time in literature – are the components of digital transformation. Our model shows how to make use of them in companies' change processes.

To create our model, we started by identifying the particles that represent the fundamental components of a company, and which follow certain basic laws. We realized that it is always the same particles that appear in digital business models. Over time, we had set up quite a stable model in which we observed only marginal changes. Having evolved through years of observation, experiences from countless projects, and scientific insights, the model now is of considerable value when it comes to securing companies' future viability. Now, to get to the crucial point: We want to enable the particles to gain momentum – and thus help to accelerate companies' digital transformation. This also means that, by way of acceleration, the particles existing in traditional companies can be transformed into something new.

In analogy to the quarks of the standard model from elementary particle physics, the name we gave »our« quarks was **d.quarks** – or **digital quarks**.

○ What Exactly Is a d.quark?

The term »d.quark« refers to a capability that a company needs to organize, outsource, or develop when implementing a digital business model. d.quarks are the components of digital change. Over time, we have identified several hundred d.quarks; we have put them in a hierarchical order and made them manageable. Each of these particles helps accelerate the digital transformation. In this book, we have collected the forty-six most important d.quarks. Using various case examples, we show how companies can build digital business models with these particles. The forty-six d.quarks described here have proved their value in client companies we have served – not least because we are able to very precisely assign them to five archetypical digital business models. We have found that the different ideas for digital business models that we have collected can be broken down into five categories. In view of our physics-based model, we have chosen the term »accelerator track« to describe the five business model archetypes: To reach the level of energy required in the CERN LHC, protons have to be accelerated to increasing energies. This happens in the so-called pre-accelerators. With this pre-accelerator/accelerator structure in mind, we found analogies with different types of business models in the digital era.

Any given company is on one of the five accelerator tracks. It is on the first track when it begins adding new digital services to its physical product by using new technologies and data. We refer to this track as Technology-Enabled. The second track is called Transaction-Oriented: Companies on that track have a range of products or devices that perform automated transactions. In the next two tracks, Customer Experience and Solution-Oriented, companies begin using digital customer profiles to gain more knowledge about their customers. The purpose is to assume customers' perspectives to be able to provide personalized offerings and integrated end-to-end solutions in one comprehensive customer experience. The fifth track is called Open Digital: Companies on this track have begun to build a complete digital ecosystem, allowing their suppliers, partners, and customers to develop their own new digital business models either on their own or jointly with them. In this book, we describe each of these accelerator tracks, how d.quarks are used in each of them, and what impact they have.

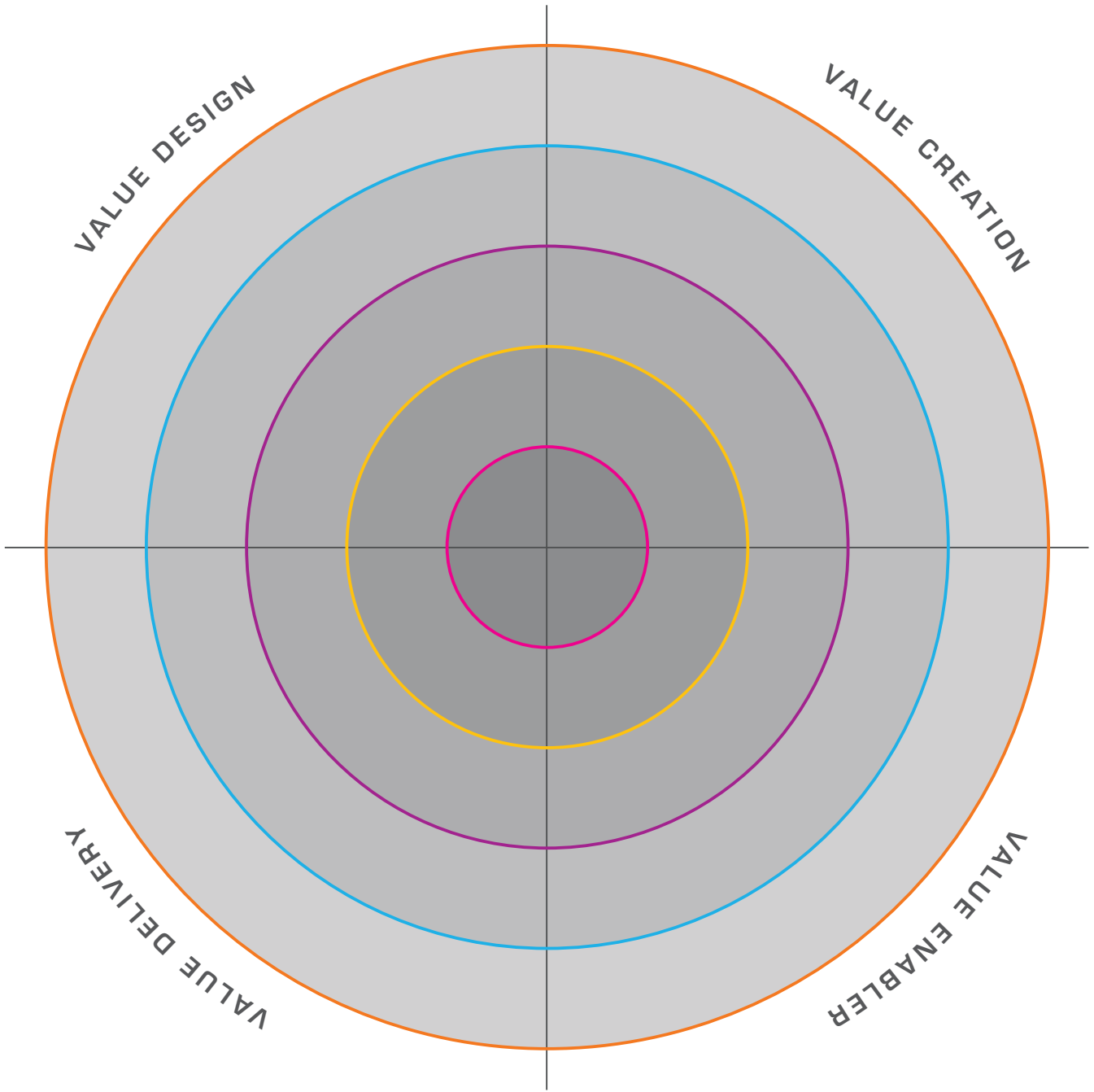
The basic structure of our d.quarks model is visualized in the graph on the next page. In the following chapters, we will enter our d.quarks in each of the five accelerator tracks. On both the last page of the book and the back cover, you can find an overview of all d.quarks and accelerator tracks.

Accelerator tracks might also be understood as phases that companies go through, as they do not necessarily have to stay in one track all the time. Neither do they have to complete one track after another to gain digital maturity and get on the next track. It is certainly possible to skip a track or two and leap directly to the fourth or fifth. It is not the accelerator tracks that build upon one another but the respective d.quarks. What particular d.quarks you use in your company generally depends on your strategy, existing market pressures, and customer expectations. Through acceleration, the d.quarks generate new things; at the same time, they move on guided tracks, which provides some level of certainty in various respects. They also provide safety. They follow certain laws, build upon one another, and contribute their share towards a successful digital transformation.

In that sense, they provide conviction. And courage.

○ **Discovering New Things Through the Collision**

Our »particles model« provides companies with the certainty they need to tackle digital transformation. That is why the model is in great demand; many companies apply it already. The request by many customers to summarize our ideas in an aggregate model inspired us to write this book. What follows also provides some insight into our ongoing observation process. While we do not want to overstrain the analogy, intelligent »particle physics« helps us discover things that nobody knew about before – provided one is willing to accelerate particles with lots of energy, then make them collide. In short: Companies that manage to accelerate digital transformation will have the chance to unlock potential previously unimagined, and to discover new business models. We are well aware – and this is another point we have in common with CERN scientists – that as digitalization progresses, we will need further d.quarks currently



- Accelerator track 1: Technology-enabled
- Accelerator track 2: Transaction-oriented
- Accelerator track 3: Customer Experience
- Accelerator track 4: Solution-oriented
- Accelerator track 5: Open Digital

unknown to us. We keep discovering new d.quarks as it is – and we witness how, by applying them, new business models emerge. The forty-six d.quarks described here provide a good start. We are confident that after reading this book you will know what particles you need for digital transformation and how to keep them on the right track without risking deviations. So we hope this book will provide an impulse for entrepreneurs to discover and accelerate the particles required for successful digital transformation.

○ Two Types of Logic, One Model

The developments leading to our discovery of the d.quarks began with our observing companies that were well on their way to digital transformation. What we saw was technology on the one hand, and a new, customer-focused business model on the other. But that observation was not all it took. Rather, our model of digital transformation was the result of a long phase of observing and understanding. We started by asking: What is it that makes the Googles, Facebooks, and Amazons of this world so successful? What's so special about them? We observed how Google and Amazon intertwined their customer data and service offerings with new technologies, but how could we translate this in a way relevant to traditional businesses? How could we map the impact of the new technologies on their business models? How could we link the new digital business models with technologies such as social media, mobility, the Cloud, data analytics, or the Internet of Things? We screened the digital business models that existed and tried to discern recurrent patterns. We read lots of books about the subject and sought guidance from relevant publications on business capabilities, such as Michael Porter's *Competitive Advantage*, Dorothy Leonard's *Wellsprings of Knowledge*, and *The Next Revolution in Productivity* by Ric Merrifield et al. We considered a range of scientific approaches. We looked at related architectural concepts, such as TOGAF (The Open Group Architecture Framework) and SOA (Service-Oriented Architecture), and implemented them in practice. We evaluated our extensive experiences from and observations of transformation projects, both successful and failed.

What we realized was that in traditional companies, there are two kinds of logic: structural and cultural. Structural logic encompasses all technologies and processes, while cultural logic refers to the organization and its people. One thing became very clear: What distinguishes the new digital companies from traditional ones is that they combine the two types of logic with one another. To do that, you need the will to collaborate, to understand your counterpart, and to interlink the different perspectives.

Having realized that, we still lacked a framework that would integrate both types of logic. Many times before we had observed companies apply traditional approaches to managing change. There were process-driven approaches where business processes were directly linked to supporting IT systems. These approaches – which usually required extended project durations – would involve a tedious process of aligning organizational requirements with IT systems. And then there were technology-driven approaches, where substantial costs and time were invested in implementing new technologies without ever questioning the value they brought to the business. What the two approaches have in common is that they create uncertainty. Also, they both lack the flexibility to adapt to digital change with sufficient speed.

Technology alone is not enough. It does support and enable business models, that much is clear. The key question, however, is how IT operations are organized and what the processes look like. Also, what people you need and how they work together.

All of a sudden we realized: All of this relates to capabilities. *They* are the integrative concept that unites the two kinds of logic. To implement new, customer-centered digital business models, you need special capabilities. Capabilities form small, distinct units based on the technology, related processes, people and competencies, and the organization. Capabilities have a modular design, almost like Lego bricks; they can be developed quickly and are easy to identify without requiring lengthy, elaborate analyses. Also, digital transformation can be launched with a very limited number of capabilities – for instance, in a pilot project – that can be expanded later.

So this is how it happened: the discovery of our d.quarks. Next, we developed a first model, carried out client projects and workshops with experts, and worked to

define what particular capabilities – or d.quarks – were needed for what kinds of digital business models.

○ **Customers Contributed Their Share**

In essence, capabilities pave the way to the digital enterprise. Capabilities are what companies need to have, promote or acquire to succeed in the digital age. The key question here is: What capabilities do companies need to be able to develop digital business models safely – that is, at a calculated risk? This question was decisive for building our model. And we kept finding new capabilities as we intensified our research. Our clients provided valuable help. We noticed that they were usually quick to understand our model, and that we were able to apply it quite easily in the first projects. In no time at all we could derive blueprints and transformation maps, thereby visualizing the routes of change. Also, we were able to refine and adjust our model based on client feedback, developing it into a stable, future-proof methodology. We uncovered more and more capabilities, more and more components the faster we progressed.

○ **A Systematic Path to the Digital Organization**

The d.quarks represent recurring digital capabilities. Some appear in differing constellations; some build on one another. There are d.quarks that have external effects – on customers, on the market – and there are some that work internally, in the company itself. Under no circumstances, however, do they represent an end in themselves. They are always needed to implement the digital strategy of a company. There are d.quarks that companies need to shape the digital value design; others are needed to ensure digital value creation; there are some that are needed to ensure value delivery to the customer; and finally there are d.quarks providing the basis for enabling new value creation – the so-called value enablers. Each d.quark comprises four elements that define its character: organization, people & competencies, processes, and technology. A simple example might help explain the structure of a d.quark.

To outline the principle, let's take a non-digital particle: the coffee-selling capability. Picture yourself in one of Vienna's famous coffee houses. Imagine dimmed lights, red-velvet-covered chairs, and a waiter serving a »Mélange« or another of the city's traditional coffee specialties. Time seems to stand still. But what exactly is the key here? How can this capability be described in terms of the four characteristics of organization, people & competencies, processes, and technology?

○ What Does a Data Science Barista Do?

Well, to sell coffee the first things you need are a coffee machine, coffee beans, and a cash register (= technology). Then you need staff who know how to operate the coffee machine and the cash register (= people & skills), as well as a structured process for preparing and selling your coffee specialties (= processes) and clear structures and responsibilities for your sales staff and the people preparing the coffee drinks, providing rules to ensure their most effective collaboration (= organization). In a next step, the business model which the »coffee-making« capability is embedded in is accelerated through an energetic impulse. This may be caused by the desire to create a coffee house experience akin to coming home. When you get home from work, your partner or family know exactly what you like to drink, and they also know what time you usually get home. So they can prepare your favorite coffee drink just at the right time.

This is precisely how digitalization can provide customers with an enhanced individual customer experience when visiting a Vienna coffee house. A customer may, for instance, use a coffee app to find the next coffee house more quickly, or she may order her favorite drink online. When stepping inside, she may even be recognized as the person who has ordered that drink, and served instantly. In other words, the customer and her consumption habits will be known. Payment is cash-free, using her mobile device and personal online account. For the Vienna coffee house to implement this digital business model, it will need the particle – the capability – related to automatic data analysis and interpretation, or the handling and real-time evaluation of customer profile data. To build these capabilities, you need someone with mathematical-statistical skills,

someone capable of developing and implementing the algorithms to find out which customer likes to have which coffee drink at what time of day. Let's call this person, or rather, this new role, the Data Science Barista (people & skills). Working at the Digital Coffee Lab, the Barista is a member of a network of other Data Science Baristas, a knowledge- and experience-sharing community. People in that lab test various new coffee drinks together with customers, and they develop new services around their core product: coffee. To do that, they need a creative environment. Rather than a secluded room in an unknown location, this should be a place linked directly to the coffee house, designed as an open-plan experience world, a lab for the senses (organization).

On the technology side, the Vienna coffee house will need a platform for real-time data analysis, allowing it to develop algorithms and carry out complex computing operations, and thus to derive customer insights from customer data (technology). As the latter are personal data, they will comprise lots of information on the habits and interests of each individual coffee house patron. For the coffee house, they represent a key asset worth protecting. Therefore, along with the data analysis capabilities described, new data quality and data protection processes will be required (processes).

And this, precisely, is the point that marks the digital transformation at the Vienna coffee house.

Now let's refine the d.quark by structuring it in terms of the four characteristics mentioned: While both the people & skills element and the technology element have an accelerating effect on the organization and add new momentum, the organization and the processes elements provide guidance, structure, and stability within the change process. By describing the characteristics, we achieve a better understanding of the impact of the d.quark, and we know exactly what needs to be done in order to build the new capability in the company. This enables us to explore for each d.quark, those existing and those yet to be introduced, whether and to what extent the required qualities are already present in the organization – and thus to evaluate its current level of maturity in the organization.

In the project context, the level of maturity of d.quarks is determined for all four characteristics. In other words, we will first identify the level for each individual characteristic, then determine an aggregate level of maturity for the entire d.quark.