

HOW TO READ THE DIGITAL TRANSFORMATION?

A working paper from the SKOLKOVO Institute
for Emerging Market Studies (IEMS)



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Dear colleagues,

We would like to present the report *How to Read the Digital Transformation*, dedicated to the key issues of digital technologies penetrating all aspects of modern business. The report was prepared by the experts of the SKOLKOVO Institute for Emerging Market Studies based on the analysis of both international and Russian experience in the field.

Digital transformation poses a new challenge for Business Schools all over the world. On the one hand it has to be at least as prominent in the teaching curriculum as it is high on the business executives' agendas. On the other hand: how would you teach a subject that is constantly evolving, and where many leading practitioners and researchers would often dramatically disagree on the phenomena and the trends?

The answer of SKOLKOVO Business School is to combine in-depth primary research projects with the constant interaction with top market practitioners. Last year we have released our study of the Digital Life of the Russian Megapolices, where we made an attempt to model and quantify the penetration of digital technologies in everyday life. The analysis of the digital trends was also part of our study of emerging markets *The Four Domains of Growth*.

The present report analyses the business effects of the modern digital technologies, the profound shifts that they bring to the external environment of a company through changing consumer behaviour, competition and supply chains. It outlines the possible strategic domain of change for the companies depending on their products and markets.

Transformation is always a challenge and it requires strong leadership above all other things. However in the case of digital, when the future



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is changing rapidly and competition constantly seeks to disrupt the established business models and approaches, the leadership should go deep down into organization. Ultimately every employee should become a leader in a sense, involved into the change and empowered to effect it. In the Skolkovo School of Management we help our students to embrace the culture of constant learning and adaptation to the challenges of the rapidly changing business environment, which, we believe, will turn them into the world-class corporate leaders of the Digital Era.

The phenomenon of digitalization, or rapid diffusion and embedding of digital technologies and artifacts in the physical world, is starting to permeate all aspects of our lives and the functioning of the society as a whole. From hailing a cab to paying for coffee to tracking one's health to collaborating with a project team, our daily activities are increasingly intertwined with and aided by digital touchpoints and platforms. As a result, our expectations, behaviors, and habits undergo a profound change.

Digital transformation, a term that over the last few years has taken corporate boardrooms by the storm, by and large is driven by this change. While the conversation often centers on technological trends, it is not the technology per se that creates a need for transformation, but rather the profound shifts in the firm's external environment brought about by digitalization. For most companies, these shifts manifest themselves in changing customer demands as well as competitive pressures from new entrants, startups and global digital platforms alike.

The unfolding change is increasing felt in all industries, albeit its scope and timing varies significantly. Having started out among the usual B2C suspects, such as media, travel, financial services, and retail, digital transformation is quickly spilling into a broader range of industries, many of which in core B2B domains. Today, companies in automotive, industrial equipment, energy, and chemicals are starting to actively reassess their offerings and business models in the context of digitalization.

Incumbent organizations experience digital transformation at multiple levels. For firms close to the final consumer, the immediate focus often falls on rethinking and reconfiguring customer channels and interfaces. A more comprehensive approach involves redesigning the firm's core product or service offering by converting it into an integrated solution or perhaps a platform. Streamlining the operating model by leveraging new approaches to automation through robotics and AI offers yet another avenue.

Whatever the company's current approach, it is important to realize that digital transformation is not a project or an initiative but rather an



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ongoing journey. To make this journey worthwhile, it is imperative to consider the impact of digitalization on the entire business model of the company and to avoid taking a piecemeal approach. Furthermore, firms need to constantly reassess which of their current capabilities and competencies might lose relevance in the future and what new capabilities will become necessary. Building such a learning adaptive organization, in turn, will require a fundamental transformation of leadership, organizational culture, structure and governance.

This essay tackles many of the salient issues concerning digital transformation. From shifts in the external environment to key technological pillars of digitalization to main changes in business models to strategic approaches and leadership challenges to implementation, the essay offers a sound primer to aid the reader in making sense of the business impact of digitalization and charting a roadmap to move the organization forward. No matter the market, industry or business function, digitalization creates formidable threats and exciting opportunities that all of us need to take head-on to help our organizations succeed along the transformational journey.

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Digital transformation is rapidly changing the business environment. While creating numerous opportunities for growth, improving business performance, cutting costs, enhancing customer experience, and creating innovative business models, this phenomenon poses real threats to business as well. Companies aiming to achieve success simply cannot afford to overlook this trend and the only way to respond is to rethink their everyday operations. To succeed, a company needs an integrated strategy that is flexible to evolve with technology trends and, at the same time, takes into account a number of associated risks. All this requires in-depth understanding of the digital transformation phenomenon.

Here is where this report can help.

We believe that the efforts of SKOLKOVO IEMS to understand and explain digital transformation are very effective in considering how to address it and design a growth strategy for each specific business. The position a company holds in this respect today, be it among digital pioneers or digital outsiders, is a pure reflection of its management's understanding and response to the opportunities and threats that digital presents. The report *How to Read the Digital Transformation* provides valuable information to help management assess the position of a company, depending on the scope of its products and its presence on the relevant markets, and to choose the right strategic focus.



Alexander IVLEV
Managing Partner for Russia
EY

Digital economy growth depends on the speed of technology development. However, growth can only be implemented by humans. Indeed, we see that virtually all of our clients in Russia have embarked on the digital transformation journey. We expect the insights from the SKOLKOVO IEMS report to help many business leaders take informed decisions on how to effectively transform their business to meet the requirements of the digital era and mitigate associated risks.

See EY reports **The digitalisation of everything** and **Disrupt or be disrupted** for global insights on effective digital business strategies



Executive Summary

Digital Transformation is marked by the transition from the traditional enterprise “IT” to the new world of open digital systems, which are human-centric, informal, spontaneous, empathic, and affordable

The issue of Digital Transformation is omni-present in the business media today. It moves questions of technologies and their applications out of a specialized professional domain and into the focus of the “C-suite” corporate executives. Digital Transformation is marked by the transition from the traditional enterprise “IT” (task-centric, formalized, controlled, administered, expensive) to the new world of open digital systems, which are human-centric, informal, spontaneous, empathic, and affordable. As a result technologies are no longer just internal resources and assets, which are completely under management control, but are powerful independent forces shaping environments and markets. With the disruption that this brings to business, a new class of management risk emerges: that of being unable to grasp the power of digital forces to bring benefits to a company.

The four technological pillars of digital are commonly described as big data, social, mobile and cloud. Combined, they enable radically cheaper business operations, analytically tailored to the needs of each individual consumer and with goods and services delivered on demand. This rare combination of quality and affordability is what the digitally transformed customers are seeking. Those customers come empowered by almost limitless access to information, access that tends to bring market competition to the “perfect” state envisioned by classic economists like Adam Smith.

The net result is the boost in the consumer value provided by markets, albeit often accompanied by diminishing profits for sellers, especially those who are burdened with expensive legacy assets. Their business models are constantly challenged by the myriads of start-ups which seek to establish their market position through disruption of the status quo.

The strategy of survival in the era of digital transformation includes opening up to numerous partnerships with independent third-parties, with the aim of building an ownable **ecosystem** around a **digital**

platform (or marketplace). This is not an easy to do as it commonly calls for nothing short of reinvention of a classic corporation of the 20th century. In doing this it is essential to use the creativity and energy of the human resources of a company, who are themselves subject to the digital transformation. The employees of today – often pressed by the advances of automation of jobs – tend to seek ways to secure their long-term future through involvement in the business end-result. Unleashing their potential through empowerment to experiment, make strategic decisions and become de-facto entrepreneurs directly creating value to the company's customers can be a key milestone in the digital transformation of a corporation. ■

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01

The pressure to “go digital”

Whole industries have been disrupted in the past two decades by the new business models enabled by digital technologies

“**T**o stay competitive, companies must stop experimenting with digital and commit to transforming themselves into full digital businesses”¹ – statements like this are prominent in the present-day media environment of a business manager. The issues of Digital Transformation are increasingly viewed as the key to strategic success in any kind of business. All sorts of vendors and consultants seek to evangelize not only functional specialists, but the general management, especially at the highest level.

And not without a reason. Whole industries have been disrupted² in the past two decades by the new business models enabled by digital technologies. There were over 38,500 bookstores in the USA in 2004 – but more than 10,000 of them had gone out of business by 2012³. While in the mid-1980s there were over 46,000 agents selling air tickets in the USA, now there are just 13,000 of them⁴. The travel industry employed 124,000 people in 2000, but by 2012 the figure was down to 64,000⁵. The number of commercial bank branches per 100,000 adults in the US peaked at 35.5 in 2009 but was down to about 32 in 2014⁶. Similar dynamics to these can be found all across the advanced economies and in most emerging markets.

1 Tunde Olanrewaju, Kate Smaje, and Paul Willmott: The seven habits of highly effective digital enterprises – McKinsey & Company, май 2014 г.

2 See the comprehensive report The Upside of Disruption by EY: http://cdn.ey.com/echannel/gl/en/issues/business-environment/2016megatrends/001-056_EY_Megatrends_report.pdf

3 <https://www.statista.com/statistics/249027/number-of-bookstores-in-the-us/>

4 <http://www.travelweekly.com/Travel-News/Travel-Agent-Issues/How-many-travel-agents-are-there->

5 <http://www.travelweekly.com/Travel-News/Travel-Agent-Issues/How-many-travel-agents-are-there-> The article argues that the actual drop in the number of people in the profession is much smaller as over 40 000 work independently on-line. This demonstrates one of the effects of the digital disruption in an industry

6 <http://data.worldbank.org/indicator/FB.CBK.BRCH.P5?locations=US>

Who should be in charge?

One thing on which the experts on the digital issues tend to agree is that the question of the digital transformation of a company is a C-suite question. Of course all types of internal and external specialists do play a role and there must be a CIO or a Chief Digital Officer in the company who is responsible for handling the technical side of things but the whole process must start with the top-management vision and its implementation requires constant enthusiastic and informed involvement of the CEO and the Board. Just giving a speech at an annual meeting and writing an article for the corporate paper (“Digital is our future and we are fully prepared to meet it”) is not enough. Dates should be marked on calendars on a weekly basis for years to come.

The foundation for this understanding was laid in the research project by MIT/Sloan⁷ which gave important reasons why the digital transformation is a Board-level issue. Here are some of the crucial statements from the research:

- The **pace** of transformation defines the **quality of the result**. A fatalistic approach, like “it will happen anyway, so why bother”, will not work. Unless the transformation has the right tempo it will not produce the desired value, and tempo is largely a matter of committing enough of resources, which is possible only with top-level support
- Digital transformation is not about implementing technologies, but about **“transforming your organization** to take advantage of the possibilities that the new technologies provide”⁸. The organizational changes can be initiated around things like new customer experience, new operational processes or completely new business models, all of which can come only from the top-level business vision
- **“How” is more important than “what”**. There should be quality instruments for the transformation and the process should be well-managed. Among other things, any transformative action leads to the feeling of personal insecurity among the staff. This should be dealt with so that employees feel and see that the “bosses” really know what they are doing
- Successful Digital Transformation “comes not from creating a new organization, but from reshaping an existing one to take advantage of **valuable existing strategic assets** in new ways”, and companies can benefit considerably from investments they have already made. Once again, a holistic view of the organization, its assets and capabilities is required.

These are the words of the authors of the report, “Successful DT does not happen bottom up. It must be driven from the top”. In our opinion a qualifier is needed for the first part of the statement – a successful transformation does require a lot of bottom up activity, involvement and enthusiasm. However, it remains true that the initiation and the source of the constant drive of the process should come from top management.

⁷ Digital Transformation: a road map for billion-dollar organizations. Findings of Phase 1 of digital transformation study conducted by the MIT center for digital business and CapGemini Consulting

⁸ Ibid., p. 5

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The corporate world was not deaf to the signals. There is hardly a company in the world which had not launch a major “digital initiative”, sponsored at the top level of management, in the past few years. Yet management lore is full of cases of unsuccessful attempts to “go digital”. On the corporate side there are numerous stories of the failure rate of various implementations of the digital systems – somewhere in the range of 50/50, or even 80/20 – which positions the issue as a form of corporate gambling. One of the reasons may be that digital technologies and their impact on business are evolving so quickly that the digital transformation of a specific company within a specific industry becomes a fast-moving target. The successful cases and benchmarks become dangerously outdated almost as soon as they become public. In this context setting clear goals and drawing a roadmap to them become major challenges.

Having an answer to the question is of paramount importance. Investing in pursuit of a false benchmark can have a devastating effort on a business (Time Warner merging with AOL in 2000 was probably the first, but definitely not the last, company to discover this). How to approach the issue? How to read the Digital Transformation? It is the objective of the present paper to review the technological foundations of “digitality” and show its potentially transformative effect on consumers and competition on the market. ■

Leadership in a Digital Age

Since the dawn of human history, leadership has been a topic of a paramount importance. Breakthroughs and crises, prosperity and war – everything is up to leadership, and to the way it is exercised. Human beings are hierarchical creatures, so people tend to follow and to lead, and the phenomenon of leadership has long attracted attention of philosophers, scholars and, in recent years, managers. Although significant progress in leadership theory has been made over the past 50 years, the ‘Holy Grail’ of leadership is still beyond our understanding, and the most common word which is used in a link with the word ‘leadership’ is ‘crisis’.

The challenge for leaders today is that the context of business is evolving so fast that it is not always possible to embrace change in an organization. However, any challenge brings opportunity, and the digital era brings not only disruption to leadership but also an array of instruments that were unthinkable in the past. Speaking of this, we tend to look at the major components of leadership and how they are impacted by digital transformations.

When thinking about leadership, we split the phenomenon into six layers, each focusing on a specific question:

- Context: Where do leaders operate and what barriers and opportunities do they have?
- Behavior/ Action: What do leaders do to mobilize supporters and achieve their objectives?
- Skills: What kinds of abilities and traits do they need in order to get things done?
- Values: What kinds of values and core principles do they follow in their lives?
- Self-identity: How do leaders define themselves; who are they?
- Purpose: Why do leaders start projecting power and mobilizing followers? What is their vision of the future world?

Leadership work implies two-way communication: from the one side, context shapes leaders’ behavior and skills; from the other side, it is the purpose and vision which ultimately tries to change context. A leader acts in between, building bridges between ‘as is’ and ‘to be’ worlds.

Clearly, building successful organizations in the pre-digital era required very different technical and functional skills from those needed in the digital age. Leaders have no other option but to keep up with the ongoing revolution and to understand technology and its revolutionary force. However, a leader’s attitude to digital transformation and his or her response to challenges are different today due to a leader’s position in a rapidly changing environment:



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- **Digital leaders**, or leaders of the digital transformation avalanche, bring change to business and society with pioneering digital technologies and innovation that are embodied in their purpose and vision. **They drive change.**
- **Smart leaders**, who use digital transformation as a source of new instruments and channels, develop corresponding skills and shape behavior to become more efficient. **They use change.**
- **Reactive leaders**, who emerged in a pre-digital context, have to completely re-configure their organization and their leadership model. **They adapt to change.**

What kind of leader are you? The leadership paradox is that there is no ‘right’ or ‘wrong’ answer to this question. The position which a leader takes does not change the core pillars of leadership: it matters who you are, what your purpose is and how you interact with other people, rather than what particular skills or potential you possess. Therefore it is important to find the right match between the person and the pressure on the company: there are situations when the leader ought to drive change and situations when being reactive is more appropriate. In any case, digital transformation equips leaders with the tools to achieve more, engage wider audiences, communicate better and ultimately make our world a better place to live in.

Any business can be digitally transformed

The cases of successful digital transformation in the world multiply and increasingly come from the most unexpected fields. A recent example was provided by the German national team at the World Soccer Cup in Brazil. The team went all the way to win the World Championship and en route it had a stunning success against the host country, which had strong championship ambitions itself. Before July 8th, 2014 hardly any soccer fan in the world could imagine that it might be possible to beat Brazil (five time World Champions) in a game played in Brazil by a margin of 7-1⁹.

Of course this success was achieved through the tremendous work done by the coaches and players. Yet digital technologies played an important role. The coaches had worked out a concept (a “top management vision”) that was based on increasing the tempo and identified the most risky moment of the game – the period of possession of the ball by one player. So every training effort was put to decrease the possession time – and a very ambitious target was set, calling for a 300% reduction. A player was required to learn to hold the ball for the shortest possible time – not a millisecond longer than was necessary to pass it on. The speed and complexity of the actual game put it beyond the human possibilities to monitor and analyze such performance. Luckily, the present state of technology made it possible to develop a digital platform which can do this (done by the SAP company), transforming a stream of video into a real-time analysis of the key performance metrics, helping the coaches to identify the opportunities and barriers for improvement during the training exercises and guiding the strategy and tactics of the games¹⁰.

This brief case illustrates one of the key ideas of the Digital Transformation: no industry or field of activity can be considered “exempt” from the process. In many instances, the only real limit is the extent of the human imagination - and then the determination to put its results into reality. And now, two years later, we have another important lesson from the case. Unfortunately the performance of the German soccer team at the European Cup of 2016 was no match for the winning spree at Rio de Janeiro. The team struggled in the quarter-finals (and won only on penalties) and lost 0-2 to France in the semi-finals. Probably this tells us that a Digital Transformation is not a one-shot affair, but rather a continuous journey. No matter what success you have managed to achieve at one time, you should go on re-inventing yourself to stay ahead of the competition.

9 The score was so unbelievable that some TV companies – like BBC – put it in the news titles in words, not in numbers to show that there was no misprint

10 The case study is based on Jack Rosenberger: Germany’s Secret World Cup Weapon: Big Data – In: CIO Insight, 17 July 2014 (<http://www.cioinsight.com/it-news-trends/germanys-secret-world-cup-weapon-big-data.html>) and “SAP and the German Football Association Turn Big Data Into Smart Decisions to Improve Player Performance at the World Cup in Brazil” – Press release by SAP (<http://www.news-sap.com/sap-dfb-turn-big-data-smart-data-world-cup-brazil/#sthash.oPORT1NQ.dpuf>)

02

Digital technology vs. information technology

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What is so new about the “digital technologies” that they have generated so much interest? There have been “information technologies” (or systems) developing globally in various business applications since early 1950s, all of them working on the principals of digital coding and processing of the information. Many of them produced excellent results in practical operations, yet few people assigned to them a massive transformative role in corporate strategies. The historians of IT systems can remember a period of high enthusiasm with “cybernetics” in 1950s, but this had faded largely by mid-1960s after the use of computers failed to meet most of the promises and expectations. Can it be that we are dealing with a comparable situation?

All traditional “IT systems” work on the digital principle. Yet the distinction between the words and the worlds of “digital” and “IT” does make sense. The former was introduced precisely to describe the domain of computer applications different from the then-established usages of “IT”; those domains were first the personal computers and soon after the Internet. Digital started largely on the basis of personal enthusiasm and for a while was about entertainment and education rather than commerce. For about a decade “digital” was about people’s life, while “information technology” meant something made for the corporate world. However, “digital” business applications started to emerge and this stream grew at an incredible pace. Somewhere around the turn of the century (2000, the first “Internet boom” in business) the idea of “digital technology” came to be considered on par with “information technology” in business discourse. Since then, the latter issue has been progressively eclipsed.

At the same time, a shift took place in the technological relation of “DT” to “IT”. A decade ago, any professional would have quickly drawn a line

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between the two. “Digital” was all about access to the Internet, while “IT” existed on well-guarded company servers. Now in many cases drawing a technical line of separation is really impossible, and the process goes on. Probably by 2020 any meaningful distinction between the “digital technology” and “information technology” would be a matter of history with the former incorporating the latter as a certain class of application. Yet currently companies mostly look for organizational solutions to develop separately along both streams, having a CIO and a “Chief Digital Officer” as non-related posts, often in fierce internal competition for resources and attention.

The Information Technologies were composed of the “in-systems”: closed, task-centric, formal, controlled and administered centrally in the “take it or leave it” manner. Some of these characteristics come from the very nature of our view of what constitutes a corporate application – we expect everything to be task-centric in a company. Some other features were inherited from the technical limitations of the past – when computing power was relatively scarce, communication channels thin and unreliable and users were acquiring computer skills in the middle of their lives. This limitations tended to create the idea of a closed and tightly controlled system in which personal user experiences were dismissed as something irrelevant to the process. It was assumed that effectiveness and the possibility of the formalization of the usage practices lay within the very few “proper” routines. It is important to understand that this approach is grounded in nothing else but tradition. As we now know there is nothing inherent in the ideology and technology of the IT systems that justifies them being the common symbol of unnecessary and incomprehensible formalization.

The designers of “digital technologies” were using the same architectures and technical designs to arrive at completely different sets of systems, known as “out-systems”. These were open, human-centric, informal, spontaneous, and implemented through empathy in a “please, let us please you” way. One can hardly imagine a “strategy-driven KPI” behind the average Facebook session¹¹. For some time this set of features was considered wholly inappropriate to business applications, yet that notion is still widely held internationally.

Importantly for business, the “information technologies” and “digital technologies” had another major distinction. Digital was plainly cheap in its basic setting, and scalable up given certain skills and some creativity. The world of “real IT” always had a pricey entrance ticket. Classic enterprise systems could be very cost-effective when run at full load, yet getting to that stage required substantial investment. On contrary, the door to the world of “digital technologies” opened the very moment a basic PC was connected to the Internet. Nowadays this door is increasingly often opened by a smartphone. This affordability of setting up the basic digital infrastructure is the foundation of the disruptive nature of modern business start-ups (we will come back to this point later on).

¹¹ To be pedantic: there are people who use Facebook or Twitter as a traditional business instrument – for example for the sake of advertising or PR, yet they are in total minority and – what is very important – they cannot count on other users having the same approach. Most of the social media users are there definitely not for a business-like activity

Generation change dooms the “in-systems”

Maybe the key factor in the shift of attitude is generation change. People born before the mid-70s all had a period of formal computer training – in school or at work. They had teachers; they were given tasks and then rewarded or punished based on their performance. In many of the computer users of the senior generations, this approach left a deep fear of breaking the rules, which eliminates any possibility of experimenting¹².

On the other hand, people aged 30-something and less in many cases were acquiring the computer skills on their own – through uncontrolled experimentation and interaction with a PC. They do have some idea of “proper” things and rules, but those are a relatively small domain within the sea of possible practices. In their view a user without a screwdriver can hardly do something to a PC which will not be curable with the “reset” button (unless it is coffee on the keyboard, of course!). For the “digitally native” “Y-generation”, which is either entering business life right now or will do so soon, such a mode of acquiring computer skills is almost universal.

Many of them are home-grown computer experts with the knowledge comparable to an average person in an “IT-department”. These people strongly resist the idea of unnecessary discipline and formalization. The range of their reactions can extend from mere frustration to outright sabotage.

But history is on their side: in some years the majority of the workforce in any corporation will have enough computer skills to be at ease with any type of system, seeing it as a source and object of exciting developments. The “out-systems” will not just find their place beside the “in-systems” in the corporate landscapes, they will likely overtake the latter, becoming the ideological standard for business systems, blurring the line between the user experience in a business and personal setting¹³.

¹² Anyone with the experience of computer user support services knows that quite often people with the background of such computer training are reluctant to take even very obvious steps without the expert confirmation that “this can be done”.

¹³ An interesting view on the transition from “IT” to “Digital” and the related organizational changes is given in the blog post “The end of an Enterprise IT” <http://www.leanessays.com/2017/01/the-end-of-enterprise-it.html>

03

The Foundation of Digital Technologies

16

The four “forces” driving present-day digital technology are: “big data”, “social”, “mobile” and “cloud”

There is a widely shared understanding that the four “forces” driving present-day digital technology are: “big data”, “social”, “mobile” and “cloud”¹⁴. All of them have evolved relatively recently, sometimes out of quite unpromising beginnings¹⁵, to become some of the most used and abused buzzwords in the business media of the day. Now it is vitally important for any business manager to have a clear understanding of their basic functioning, applications and cross-influences and any reinforcement effects between the four.

Big Data

The term became popular around 2011¹⁶, and now it is arguably the one of the four forces that gets the most of attention in business media. The idea conceptualizes the burst-like growth in the capabilities to store and process data in computer systems of all sorts.

Data (storage and processing) has never been so cheap, which leads to it being really big. It has been estimated that humanity is now storing about 3000 Exabytes of information, which is 3 billion Gigabytes. To understand

¹⁴ An elaborate development of the concept is the idea of “Nexus of Forces” by Gartner IT-research and consultancy company: <https://www.gartner.com/doc/2049315/nexus-forces-social-mobile-cloud>

¹⁵ For example just some 15 years ago the mobile phone vendors struggled to market the user scenarios for mobile Internet access

¹⁶ McKinsey. Big data: The next frontier for innovation, competition, and productivity http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation

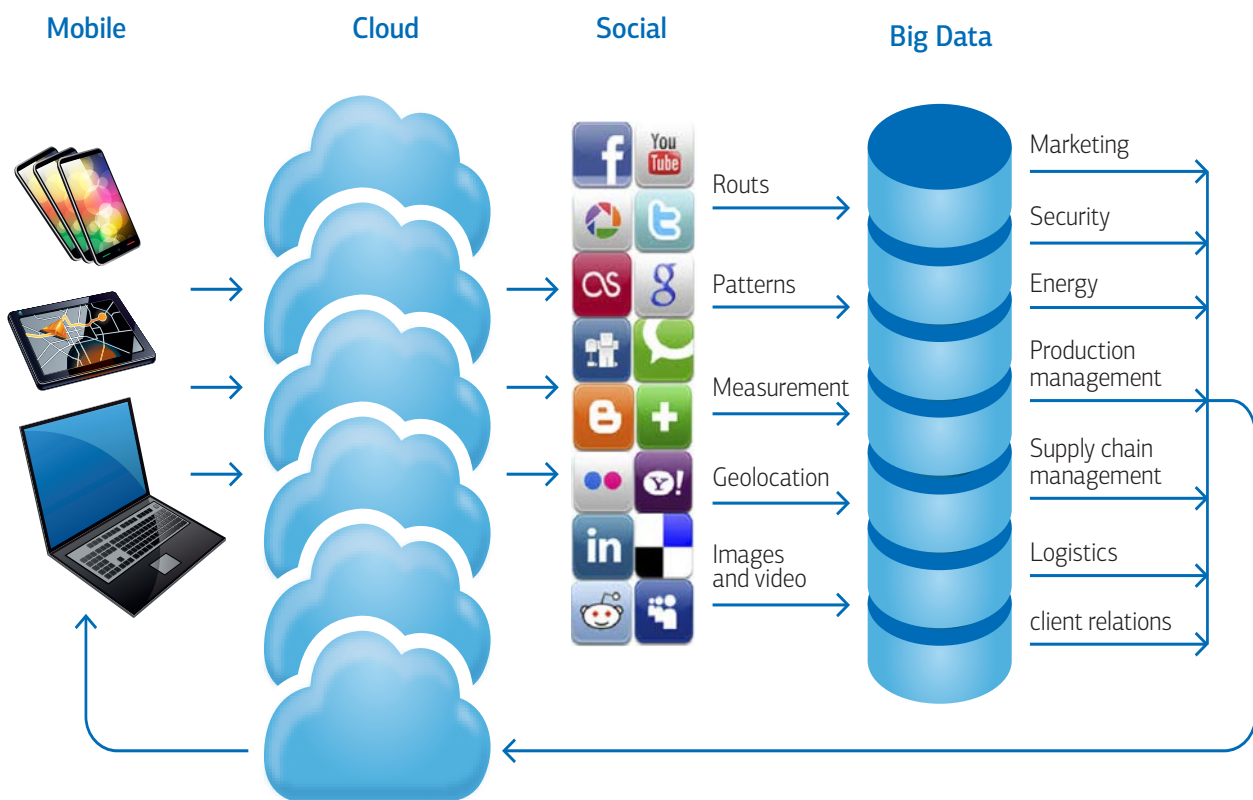
the novelty of the phenomenon: it even required inventing new names for numbers, up to recently the scientific world was pretty comfortable with having “Tera-” (a million million) as the biggest prefix in common use¹⁷. “Peta-” (a thousand Tera-) and then “Exa-” (thousand of Peta-) were invented solely for the purpose of describing the volume of info. It is quite likely that in a few years we will need to invent a new term, for a thousand Exas.

Even more staggering are the estimates stating that what is stored and analyzed is just no more than 1% of data that is actually “captured”; and what is captured is just a fraction of what could be captured. For example, in virtually all cases data from the growing number of CCTV cameras is just “recycled” – if nothing special happened during a particular timespan, the cameras start to record new data over the old, deleting it.

The same happens with the numerous signals from controllers and sensors used in industry. There is a growing number of applications which seek to use this data for the purpose of analysis, including attempts to find patterns over long periods. Proliferation of such analytical systems means that we can expect further expansion of the universe of data - by at least 10,000 times. This looks like truly “big” data. Yet, does it make real sense? Is there any qualitative advancement associated with this burst – or are we just stockpiling something for the sake of stockpiling?

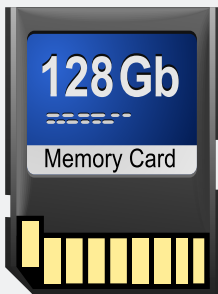
Data (storage and processing) has never been so cheap, which leads to it being really big

FIGURE 1. Figure 1. The four forces of digital transformation



17 Of course astronomy and physics work with almost infinite numbers, but nobody bothered giving name to them

The world's biggest library in your pocket



There are numerous impressive illustrations of the breathtaking abilities of modern data storage and processing, like the surge of capacity of the Micro-SD card (used widely in consumer electronic appliances) within the last 9 years or so.

In 2005 a card could store 128 Megabytes of information (already impressive for those who remember the era of floppy disks with a maximum of 1.4 Megabytes). By 2014 its "ultra" version would store precisely 1000 times as much – 128 Gigabytes. That means that about 100 of the new cards, with total cost of ca. USD 10,000, would be enough to store all the information in the Library of Congress of the USA¹⁸.

Actually, "big data" is a means, not an end. It is the essential foundation of the exponentially growing world of "machine learning" systems, which opens the door to what can qualify as Artificial Intelligence (AI). This growing class of systems is a key game changer in many industries, as it enables fact-based decisions in real time in massive volumes in areas which were previously the domain of mostly human judgment (e. g. selecting target audiences and selling messages for marketing campaigns).

Social

It is essential for modern digital systems that they bring together many users in different roles. If we go back to the example of a traditional computing task – like balancing accounts – it can be perfectly easily done by a single person. Yet for a service like Uber or GetTaxi it is crucial that hundreds of cabs and hundreds of thousands of customers use it – otherwise neither the sellers, nor the buyers will get any value.

Digital systems are largely built on the "snowball effect": the bigger the snowball, the more snow sticks to it, the bigger it grows further. The scientific term for the effect is "network externalities", which is often explained in the following way: "each new node in the network increases the value of the network for all the existing nodes". This effect is inherent to digital systems as opposed to traditional "IT", though sometimes its presence is not obvious to a user or observer. Let us map some examples:

Digital systems are largely built on the "snowball effect": the bigger the snowball, the more snow sticks to it, the bigger it grows further

¹⁸ To be precise: there is wide variance in the estimates of its information volume, coming largely from the difference in approach – speaking about storing just the semantics of information, i. e. words and figures, or including the graphic part (which may be essential for the rare medieval books or the hand-written artifacts by famous people). In the latter case the volume can increase by hundreds of times if used indiscriminately. If only semantics is taken into account, the global consensual estimate is in the range of 15-20 terabytes (some 20 million volumes at an average of 1 megabyte each)

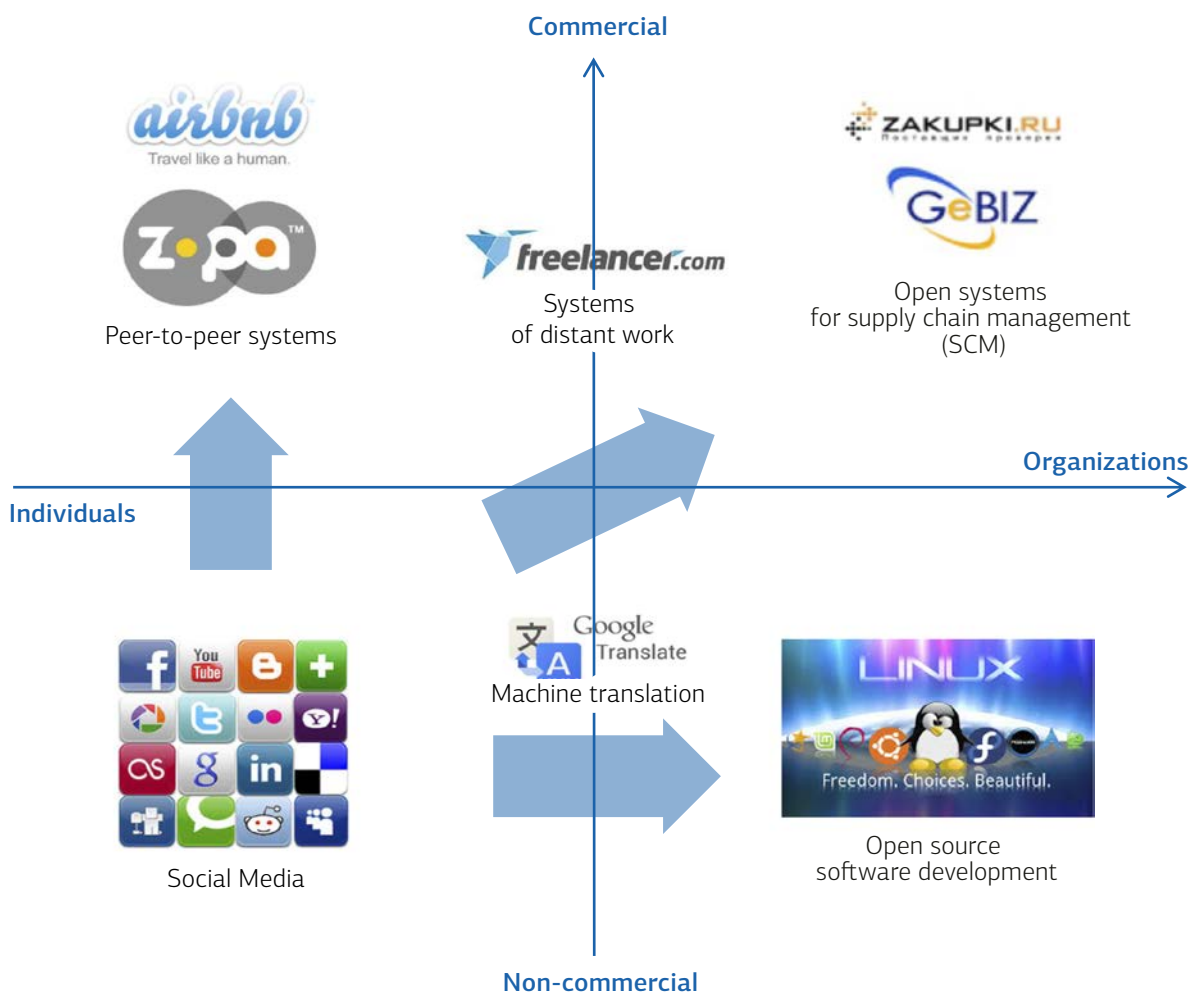
¹⁹ Launching such services can be really painful – they look pathetic before they cross a certain threshold. Actually the "social media" which are attracting huge number of users worldwide were out there since the break of 2000s (Friends Reunited in the UK launched as early as 1999 and Friendster in the US since 2001) – somewhat dormant for about 5-6 years. See: A Brief History of Social Media - <http://www2.uncp.edu/home/acurtis/NewMedia/SocialMedia/SocialMediaHistory.html>

Social can be applied for most varied tasks, both commercial and non-commercial, in both private and organizational contexts. Even applications like Google Translate, which we presume are just some smart piece of programming, actually do nothing more than match and analyze millions of human-produced translations taking those as the basis for “learning” languages.

The “social” aspect is an important contributor to big data with bits of information coming from socio-demographic profiles of users; time patterns (of products usage, payments, posting and commenting, etc.); content analysis; topology of links²⁰; graphics and video; geolocation, etc. These bits are used as they are, or they are put together (and thus “enriched”) for the sake of the growing number of applications in marketing, product development, supply chain management, credit risk management, human relations and so on. Yet, as was said above, what a digital system can now do, among other things, is make a mistake.

Social can be applied for most varied tasks, both commercial and non-commercial, in both private and organizational contexts

FIGURE. 2: Map of social systems in modern digital applications (some popular applications are given as examples, the lists are definitely not exhaustive)



²⁰ Who is linked to whom, in which manner (“strong” vs. “weak” relations), how frequently, with how many mutually shared links, etc.

It is probably too early to put a “mission/business critical” system to operate solely on a social basis

Hardly anyone has not been puzzled recently by a non-relevant product offer – from a retailer or even from a preferred bank. Or probably you were amused by a too-literal translation coming from a machine. Those are material evidence that the applications are often in the experimental stage and the rate of error can be sometimes even higher than a simple heads or tails guess. It is probably too early to put a “mission/business critical” system to operate solely on a social basis. On the other hand social digital systems often allow us to re-think the common notion of “errare humanum est”: it turns out that the sum of the efforts of masses of people is much more precise than we used to think. Probably not coincidentally, books with names like *The Wisdom of the Crowds*²¹ or *Predictably Irrational*²² have become business bestsellers recently. Philosophically speaking we may be on the verge of rethinking the very concepts of “solid fact” and “mistake” in many contexts²³.

The Commercial Power of Peer Recommendations

To never follow the crowd was an important lesson taught to us in childhood. Indeed many of the social and economic catastrophes of the past were caused by people copying other people’s actions without enough consideration. On the other hand, if we were to explore the world totally on our own, we would spend too much time discovering things which have already been tested by others. Is there a way to find a proper balance?

The modern “recommendation engines” which are used in e-commerce are designed to seek it. The ideal engine should recommend something which a customer is unaware of yet is potentially longing for. One of the most effective fields of application is the sale of content like films, music or books, and increasingly in the market for modern electronic equipment. These segments have virtually no natural “saturation point” for a customer – one can own thousands of records or films or dozens of fancy gadgets. For this reasons sales approaches like “customers who bought X (the item you’ve just ordered) were also buying Y (something you were not aware of) work miracles.

According to some sources Amazon.com had a boost in sales of 35% in 2006 when it introduced its modern up- and cross-sell recommendations engine²⁴. Forrester Research estimates that sales through recommendations account for 10-30% of turnover in e-commerce depending on the segment²⁵.

21 James Surowiecki : *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*, Doubleday, 2004

22 Dan Ariely: *Predictably Irrational: The Hidden Forces That Shape Our Decisions*, Harper Collins, 2008

23 The use of data from social networks in criminal investigations – like in the case of the independent investigation into the tragic crash of MH17 plane over the Eastern Ukraine in 2014 – poses a number of important challenges to the concept of “evidence” and “witness” as used in the modern law

24 <https://conversionxl.com/upselling-techniques/>

25 Ibid

Mobile

A sure way to amuse a modern child is to dive into the memories of the pre-mobile era. “I had a date with your mom in an hour and suddenly I ran into a chance for my first job interview. I could not miss the opportunity, nor could I warn her, we did not have handies in those times. I was an hour and a half late for the date – but at least I’d got the job. Still, she was absolutely mad.” “Couldn’t you have tweeted her?” For a child under 15 not being able to make a phone call – or going on-line instead – at any time at any place is almost beyond comprehension.

Yet the world of “mobile” is much broader than the mere connectivity of a smartphone or tablet PC. It is increasingly important in an industrial setting. Now the whole chain from capturing the raw data through storage and processing to the presentation of analytical results either on screen or on paper becomes location-agnostic. Theoretically, any processing or storage capacity can be accessed from any point – at least within the urban part of the world – for any use case. Now the new generation of devices is emerging, those capable of automatically moving around while fulfilling their tasks, like drones or self-driving vehicles. This opens up completely new horizons for targeted data collection and even physical action (like delivery of goods to remote areas).

This is empowered by the growing number of connectivity technologies, like 3G and 4G, Wi-Fi and Wi Max, GPS and Glonass, RFID, NFC, Bluetooth, etc. Those multiple connections are bringing alive what is called the Internet of Things, the machine-to-machine (M2M) networks that automate important processes, especially in the area of measuring, control and monitoring. Their applications include energy networks (the “smart grid”), production management, transportation and logistics, marketing, security, client relationship management, etc.

As for mobile phones themselves, their functionality was revolutionized in 2007 with the advent of the iPhone. That device was criticized by many at the time of its appearance, but what the critics had failed to grasp was that Apple Inc. effectively reversed the logic of designing. While the mighty market players of 2000s like Nokia or Motorola were trying to develop a phone with additional features, the new device was actually built as a very compact Internet terminal, which could be used for talking.

Apple did not invent the idea of the mobile content or software applications in a phone. What it did pioneer was the open marketplace for independent developers who could try to earn money by offering apps that capitalized on the unusual features of the iPhone, like the multi-touch screen or gyro-enabled control of motion. Within months of the introduction of the device, a whole new ecosystem of app developers and content providers emerged, with numbers growing every day and soon far surpassing the in-house capabilities of the established industry players. With the advent of a competitive marketplace under the Android operating system, the business model became open to other hardware manufacturers.

Asian companies like Samsung or Huawei were particularly effective in exploring the opportunity, wiping from the market two of its decade-long leaders, Nokia and Motorola. The new “terminal to the marketplace” concept of a mobile phone made it the device of choice to access the Internet for many of customers, radically diminishing the role of traditional PCs or notebooks.

Now the whole chain from capturing the raw data through storage and processing to the presentation of analytical results either on screen or on paper becomes location-agnostic

Mobile: allowing to capture the no-change.

Portable, compact and thus unobtrusive data collection systems made it possible to address some specific problems – like finding unusual stability in what should be naturally fluctuating. An early symptom of a dangerous infant disease (late onset neo-natal sepsis) is the stabilization of pulse and blood pressure on precisely one level - this is highly unnatural, as the pulse of a healthy person is constantly changing, albeit slightly.

The usual process of measurement was incapable of detecting the symptom – thus several precious hours were lost before the illness could be diagnosed. A modern system of constant real-time monitoring through a small and unobtrusive (features important for infants) meter gives an early warning to the medical staff²⁶. In cases like this mobile, often M2M, systems of all sorts are at the heart of further data analysis, in the venues we have discussed in the big data section.

Cloud

This development is more relevant to IT professionals. For an end user, an application either resides on his/her device or it does not – in the latter case it is somewhere in the “cloud” (think of your e-mails – do you know where they are physically stored?) Yet for the CIO of a corporation delegating the storage and analysis of the information – especially sensitive material – to a third party is a revolutionary decision with numerous effects and risks.

In the mid-2000s the growing speed of Internet connections started to allow software applications to be run on very remote servers. While the big corporations had to overcome certain psychological barriers to start using the new technology, it was a blessing for small businesses and individual users. Those were always facing the problem of a deficit of computing power and data storage capacity, which could be expanded only at considerable cost.

Cloud systems allowed smaller users not to worry about the issue, they could easily scale up and down the amount of power they used. The key business effect of the development of “clouds” was the advent of the Software-as-a-Service (SaaS) business model, which made it possible to transform the purchase of IT systems from “investment” to “operational expenses” with many positive consequences for financial management. Such deals first gained popularity with the small and medium-sized businesses, where they created an opportunity to use software applications previously affordable only by corporations.

Another crucial advantage of the model for smaller business was ease of installation and operation. “Cloud” companies were investing heavily in the development of consumer-friendly interfaces within the “plug and play” ideology, whilst the “heavy” enterprise-class software was notorious for deployment projects taking months, if not years. Nowadays the CFOs and CIOs of the biggest corporations also find the approach increasingly interesting for optimizing their purchase budgets and boosting the satisfaction level of internal clients.

Cloud systems allowed smaller users easily to scale up and down the amount of computing power they used

²⁶ Smarter Healthcare in Canada: Redefining Value and Success – www.ibm.com/smarterplane/global/file/ca_en_us_healthcare_smarter_healthcare_data_baby.pdf

The effects of digital technologies

The combination of the forces of big data, social, mobile and cloud had a profound effect on the technological capabilities available for business. First, due to the advancement of cloud, computing power has never been so cheap and available, even for small business users. This led to a dramatic decrease in the **cost of most business transactions**. Second, the advancement of data processing capabilities combined with the instruments of social profiling made these transactions **analytically customizable** – and on a mass scale.

Finally, the proliferation of all sorts of mobile terminals allowed the **on-demand delivery** of many services and products. Here we come to the “sweet spot” of the value of the digital transformation to the customers: cheaper products and services, tailored to specific needs and problems, and delivered to where they are needed at the very moment they are needed. ■

the “sweet spot” of the value of the digital transformation to the customers: cheaper products and services, tailored to specific needs and problems, and delivered to where they are needed at the very moment they are needed

Salesforce: using the SaaS model to become the market leader

The world's leading software for Customer Relations Management (CRM), Salesforce.com, operates on the SaaS model. This model was the key competitive advantage of the company when it was launched in 1999 against the more established brands like Siebel. Currently Salesforce.com holds almost twice the market share of its nearest competitor (19.7% vs. 10.2% for SAP CRM²⁷). This success largely came through a broader customer base enabled by the “cloud” model: Salesforce reports over 150,000 customers worldwide²⁸, while the SAP CRM has ca. 35,000 customers²⁹

27 <http://www.gartner.com/newsroom/id/3329317>

28 Salesforce.com Annual report 2015: http://s1.q4cdn.com/454432842/files/doc_financials/2015/Annual%20Report/Updated/Salesforce-FY-2015-Annual-Report-forweb_voo1_nojhq9.pdf

29 <http://www.online-crm.com/sap.htm>

At the Dawn of the Era of Artificial Intelligence

The first wave of enthusiasm for Artificial Intelligence came in the late 1950s as part of the tide of “cybernetics”. As soon as computers demonstrated the ability to process not only figures but also text and some graphics, engineers started to see if they could teach them to perform some “intellectual” tasks, like playing chess, translating from language to language or even writing poetry. Yet, after two decades of extensive experimentation came deep disappointment. The notion of the day was that no task can be computerized without being first put into the form of a precise sequence of commands: an algorithm. However, even relatively simple feats of the human intellect – like recognizing images – demanded the development of monstrous algorithms. Others defied algorithmization completely. By the mid-1980s there was a broad consensus that it was impossible to achieve things like machine translation of acceptable quality.

Now, “big data” has been a game changer. The new data processing capabilities permit the creation of computer systems which are radically different in how they work from “traditional” computers, which operated algorithmically, within a fixed set of instructions provided by humans. Those instructions could be very long, contain loops (making the calculation infinite), yet in the end they were employing the computers merely as effective “calculators”. That is, computers were solving problems which could in theory be solved by a human – though definitely they were more effective through being quick and precise. The “big data” revolution enables the extensive use of machine learning, the development of **methods** by which computers are trained to find themselves the best way to solve particular tasks. In such training, humans do not provide complete algorithms, but a set of positive and negative examples, and a way to generalize based on such a set. This is much like the way that we ourselves actually learn³⁰.

A simple illustration: there is no algorithm capable of distinguishing a cat from a dog. To a human being they are obviously different, yet this difference comes from a set of relatively subtle variations in the same features (eyes, ears, paws, tails, etc.). Casually we learned this in our early childhood. Yet this was very different from how we, say, were taught to solve mathematical problems. Instead of being instructed on some rules, we were simply shown numerous dogs and cats and told that the one is “hav-hav” and the other is “mew-mew”. The human brain – even of a child 1-2 years old – is capable of generalizing by itself, using several hundred examples in such a way as to reliably do the job in almost any new case for the rest of our lives.

TABLE 1. Summary of differences between the traditional algorithmic systems and big data statistical systems

Algorithmic data processing (“small data”)	Statistical data processing (“big data”)
<ul style="list-style-type: none"> • The human knows how to solve the problem down to every detail • The human gives specific instructions to the machine • The machine “computes” • The machine computing can be hand-checked at any point 	<ul style="list-style-type: none"> • The human knows the general approach to solving a task • The human creates principles for machine learning • The machine creates instructions for itself based on given examples and accounting for the ever-changing streams of data • Due to constant changes in the data a hand-check is impossible
Example: drawing the balance of accounts	Example: creating a real-time customized promotional offer based on a specific client’s profile and the behavior of all other clients

³⁰ There is a growing body of literature which explores the idea that human brain is radically different from a computer in the way it operates. See for example a blog post by a famous psychologist Robert Epstein, <https://aeon.co/essays/your-brain-does-not-process-information-and-it-is-not-a-computer>

An “algorithmic” computer would fail the task. But a big-data-enabled machine learning system can achieve it – and do much more. For example, Google has recently taught its machines to distinguish street number plates on houses and read them from ordinary street photos, an incredibly difficult task for a machine³¹.

The “big data” machines are now getting much closer to the way we, humans, process information. There are fierce debates going on to define the possible boundaries of artificial intelligence, yet it can be accepted now that computers are potentially capable of doing many jobs, which relatively recently were considered the unquestioned domain of human superiority. Another important issue has emerged: as much as the new artificial intelligence systems think like humans, they are prone to making mistakes like humans. As was said, their work is based on statistical analysis, and there is no theoretical way to make it 100% accurate. The idea of machines making irregular errors – even very rarely – is a new one; till recently, we counted on them as being error-proof. Indeed the rate of failure of machine decisions would be lower by a few orders compared to humans, but it is not easy to allow mentally for any margin, especially in mission-critical systems. Working out the approaches of handling the risks of errors in systems with artificial intelligence is a new problem for humanity to solve.

The advances of artificial intelligence provoke questions about the role of humans in many processes which were until recently considered beyond the capabilities of automation. Some implications of this may sound threatening. For example, in January 2017 Sberbank, the biggest Russian bank, announced that it is developing software that will automate legal writing for the collection of bad debts in consumer credit. There is a high rate of standardization in legal claims in this area, yet some important changes need to be made in each case. Currently, the work is done by 3000 qualified lawyers (as the customer base is tens of millions of people). The bank estimates that the software will be able to do the same amount with at least the same level of quality. Obviously, the idea is not very popular with the lawyers of Sberbank.

There will be more and more examples like this all around the world. Jobs which seemed immune to automation just a decade ago will succumb to the new AI systems. Probably the only comparable historic example is the advances in machines in late 18th century, which made some of the traditional professions, like weaving, obsolete. There is definitely a major social challenge looming both for the advanced and the emerging economies³². Reflecting on the issue, researchers have sought to compile a set of competences which will be firmly in the “human domain” in the reasonably foreseeable future³³. Among those are:

- Asking questions³⁴
- Attacking exceptions
- Tolerating ambiguity
- Employing “soft” skills³⁵

To those we would add the possession of will and energy. Any business is first of all an exercise in determination to pursue a goal in the face of a set of obstacles, often rejecting the notions of “obvious” and “possible”. No machine is known to be capable of doing this.

31 For more examples and an interesting discussion of implications for management see: Artificial intelligence meets the C-suite. In: McKinsey Quarterly, Sept. 2014. http://www.mckinsey.com/insights/strategy/artificial_intelligence_meets_the_c-suite

32 In an emergent economy like China, which was relying heavily on manual assembly of industrial products, the advancement of industrial robots powered by AI brings even more massive job cuts. Falcon, a leading global supplier of computer components has announced that it plans to replace not less than 500 000 of its workers in China with robots in the coming years.

33 Martin Dewhurst and Paul Willmott: Manager and machine: The new leadership equation – In: McKinsey Quarterly, September 2014

34 Pablo Picasso is credited with the words: “Computers are useless, they can only give answers”.

35 Though the quoted article addresses specifically the competences of management, we think that the application of the idea in the organization is much broader. Ultimately, any employee in the company will have a role based on the list of “human superiority domains”.

04

The Digital Transformation of business: broader, faster, shorter

26

When the whole world goes digital, a corporation which aims at success – or just a form of sustainable existence in the market – does not have a free choice of position on the issue

Technology is no longer a manageable resource, but an element in environment

This brings us to the very essence of the Digital Transformation: technologies are everywhere, they are affordable even to small businesses and start-ups and their effective usage can make a revolutionary change in the customer value of products or services. Thus the technologies are no longer just an “internal” issue for a company, “resources” that can be planned, managed, procured or ignored at will. When the whole world goes digital, a corporation which aims at success – or just a form of sustainable existence in the market – does not have a free choice of position on the issue. It has to assume the power of digitality in all aspects of its environment and find a way to use this power, or at least just to cope with it.

A metaphor might be in turning from a motor-boat in calm waters to a sailing vessel in the open ocean. The latter has to find its way to utilize the strength of the wind and currents. Doing this is never safe. There are many situations in which a boat crew has to put all its skills, efforts and will to struggle the elements of the nature just to survive.

Breaking a mast or crashing onto a reef is always possible. On the other hand, a storm can be a huge source of free power. You can circle the globe on this energy – as many skillful sailors have done. Probably the main competence here is to tell from the start the situation in which you can

expect a powerful and enjoyable free ride from those occasions when you should shout “All hands on deck!” and start to fight for survival. The same holds true for the implementation of modern digital initiatives. Sometimes they go surprisingly smoothly and bring quick fruits, yet quite often they require all the skills, will and energy of management to be implemented.

Broader: the focus of market efforts shifts

As was said above, one of the effects of modern digital technologies is a drastic decrease in transactional costs. This revolutionizes the markets through changing the nature of deals that can be effectively processed by a company. When transaction costs are high it is important that the volume of each transaction is big enough to justify them. Thus traditionally the key to the market success was in securing a way to operate in a relatively small number of large transactions – competing for what the statisticians called the “fat head” of a distribution of buyers. This approach required a focus on building a strong competitive advantage with relatively long-term allocation of supporting resources, typically achieved through the strategic planning – i. e. building large stakes for the future.

The force of Digital Transformation disrupts this picture and changes an average market deal: they become smaller in volume, but vastly more numerous. An example is a major development in financial technologies, the so called “blockchain”. This group of computer algorithms makes it possible to process guaranteed transactions without a central processing authority; the result is a drop in the cost per transaction literally by two orders of magnitude. The new technology enables financial companies to process profitably the payments worth a few dollars or even a few cents. This opens up a vast market of informal, small peer-to-peer payments – like giving tips to a waiter – for the financial institutions. In theory this can bring in hundreds of billions of dollars of new transactions which were never a part of the formal financial system, especially in emerging markets.

With the radically lower cost of processing a transaction the focus of successful business shifts to managing the “power of the moment”, being capable of effectively resourcing and processing a here-and-now transaction. The area of the competition moves to the “long tail” of the statistical distribution of customers.

The opposition of the “fat head” and “long tail” approaches can be graphically illustrated by comparing the composition of the advertising revenues of Google and the traditional advertising companies. The former has clients worth dozens of millions of dollars, but each of them represents less than 1% of the total revenue³⁶. The total number of business accounts with Google exceeds 1.5 mln in the US alone – the majority of income is provided by this mass of small and micro- businesses.

Compared to this WPP, the world’s biggest advertising holding company, which largely represents a traditional model of relationships in advertising, reports almost 18% of its revenues coming from just 10 of its biggest clients³⁷. The company does not report the total number of clients, but this

The force of Digital Transformation changes an average market deal: they become smaller in volume, but vastly more numerous

³⁶ E. g. Amazon.com was among the biggest Google advertising clients with the budget of U\$ 55 mio in 2011 - <http://www.wordstream.com/articles/google-earnings>

³⁷ <http://www.wpp.com/annualreports/2013/how-we-comply/managing-our-risks/>

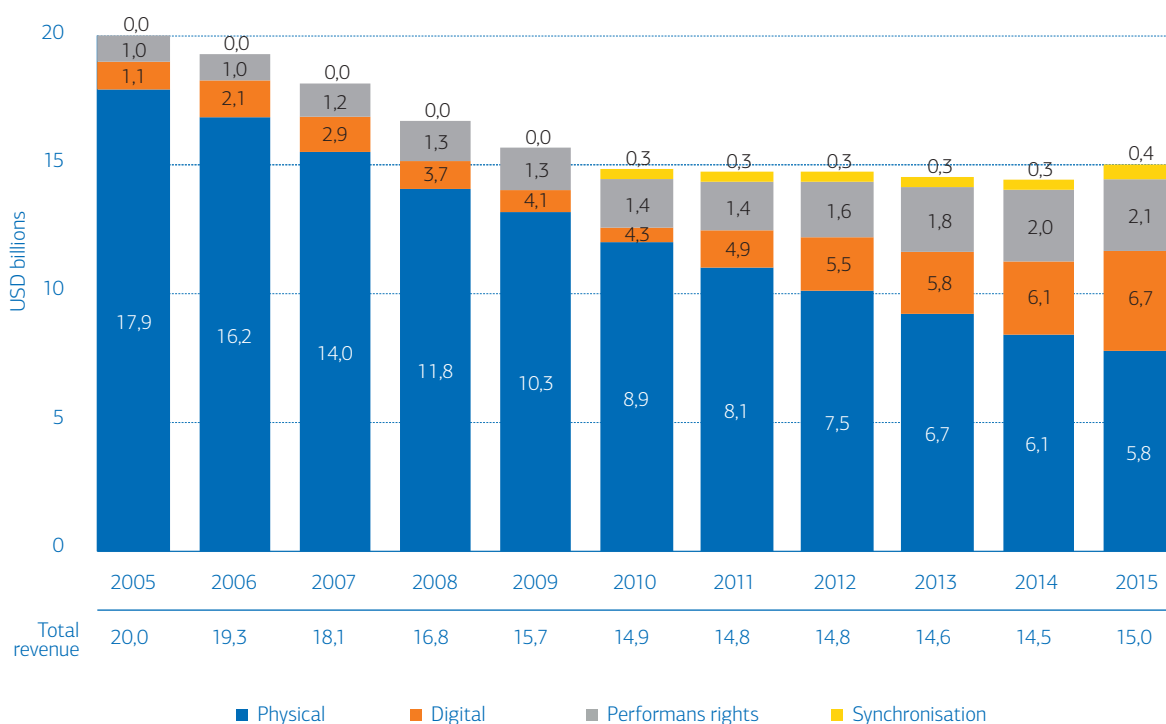
Since 2010 the overall market has remained stagnant, with the growth in digital sales being roughly equal to the drop in physical

can be estimated to be in dozens of thousands³⁸, which is some 100 times less than in the case of Google. The “long tail” business model of Google became feasible in advertising only through the Digital Transformation, which automated almost all of the clients’ operations (and delegated to the client much of the decisions and responsibilities – see below about interactional vs. transactional buying and selling), reducing the cost of an exchange to levels unheard of in pre-digital times.

What is the impact of such transformation on the overall market volume? There are ambiguous evidences from different markets. In some cases it seems net positive – as in the example of the payments for mobile phones (see the case). In other instances, as in the music industry, the picture is dramatically different. The latest report by IFPI shows³⁹ that overall market volume dropped quickly in 2005-10 despite the rise of innovative digital formats with smaller payments (subscriptions and per song purchases). Since 2010 the overall market has remained stagnant, with the growth in digital sales being roughly equal to the drop in physical (see Graph).

The music industry case demonstrates one of the biggest challenges of the digital transformation. It almost inevitably creates customer value, as the new market challengers try to tap into unsatisfied needs and wants. Yet it is not guaranteed to build value for the industry; quite often the contrary happens. In certain cases the “power of digital” which breaks up deals in the market may cross the line of feasibility.

GRAPH. Global recorded music industry revenues 2005-2015⁴⁰



38 Based on the number of offices, a typical number of clients handled per office and allowing for many offices in the network handling parts of the business of the same clients – large global companies – split either on the basis of geography or on the basis of the advertising specialization.

39 <http://www.ifpi.org/downloads/GMR2016.pdf>

40 Ibid

Too much is “given out” to the consumers as the growth of number of transactions lags behind a decrease in the value of each transaction. Usually market forces would consider this a misbalance and punish companies which drive the process too far, but attempts can be made – especially by newcomers – and have significant destructive impact. This is a very important point: while not all of the disruptive business models appear to be successful – in fact the attrition rate is huge⁴¹ – all of them do influence the market. Customers who were attracted by a disruptor which failed subsequently would not return to the industry incumbents, they would rather seek another new business star.

This may have a devastating effect on large incumbent corporations with lots of expensive legacy assets. An apt metaphor for this effect that has been suggested by the business media was that of a whale being eaten by piranhas. Even if the small predator fish gets choked after its bite, this does not really change the fate of the whale.

An apt metaphor for this effect that has been suggested by the business media was that of a whale being eaten by piranhas

Case: the effect of smaller but more numerous payments on total market volume

An interesting example comes from the Russian mobile communications industry. While the operators were making rapid progress in developing their networks, decreasing the price of the calls and seducing the customers with all sorts of marketing deals, the whole industry was suffering from the generally poor development of financial infrastructure in the country. Few people had checking bank accounts, thus paying mobile bills was causing all sorts of troubles. Customers always faced the possibility of running out of balance on the account at the most inconvenient moment – and this fear put a strong check on their usage patterns. Then a number of companies⁴² started to develop a technology of simple cash-in terminals connected to the centralized networks. Those were an immediate success and within a few years they mushroomed all across the country⁴³.

Now almost any mobile consumer has a choice of them within a walkable distance, many being available in 24/7 mode. Being switched off the mobile network due to a low balance is no longer a serious problem. Interestingly, the statistics shows that the average volume of payment in such networks is about U\$1 which covers 2-4 days of usual mobile consumption. Consumers seem to be very enthusiastic about paying in small sums for small periods. Yet the average number of minutes talked per user grew consistently between 2004 and 2009, the formative years of the “payment terminal” networks, with an overall increase of almost 50% during the period. Once again, the new model became feasible only through the use of the digital technologies. Collecting such small payments within the large networks employing human operators would have led to prohibitive costs.

41 Estimates of the chances of a funded digital startup to become a mainstream business vary from 1 in 700 to 1 in tens of thousands, depending on the time frame.

42 See the case of the market leader, Qiwi in SKOLKOVO IEMS report “Selected 15: Winning Strategies of the Russian Business Champions”: <https://iems.skolkovo.ru/en/iems/publications/research-reports/273-2015-06-16/>

43 The machine itself is rather cheap, and it is a small but constant source of profit for the independent retailers who rent them for the operations on the franchise basis. Now the number of machines is estimated at over 200 ths. – roughly equaling the number of retail outlets.

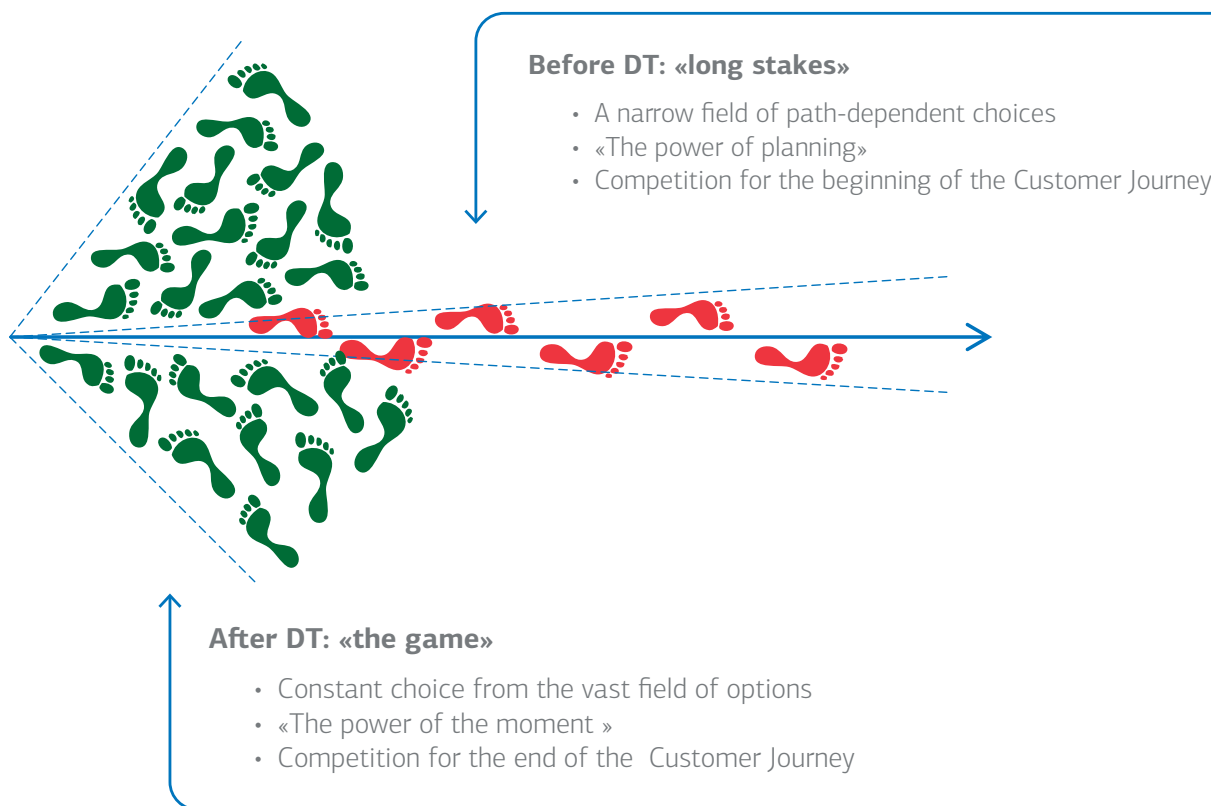
The Internet dealt a deadly blow to all business models based on information asymmetry

Faster and shorter: analytics and on-demand redefine planning

Operating in the “long tail” of the market – bringing quality services to many smaller clients – is not really new in the business history. Earlier examples include machine-woven clothes in 18th century or Henry Ford’s mass production of cars in 1910s. In both cases bringing down the cost of the product allowed for radical market expansion. Yet at those times such an expansion came with a compromise. Ford cars in particular became the symbol of standardized, “one size fits all” approach to the customers’ needs.

The effects of Digital Transformation are profoundly different. As was mentioned above, not only do customers get more of the cheaper products and services, they get them customized and on-demand, thanks to the power of social analytics and the network of the mobile “Internet of Everything”. Thus, bringing down the transactional cost is only part of the strategic challenge of the traditional corporations in the digital era. They also need to operationalize their agility in product development and customization, and do this to satisfy increasingly competent and **empowered customers**⁴⁴.

FIGURE. The change which the Digital Transformation brings to the strategic approaches



44 See more on empowered customers in EY’s “The Upside of Disruption”: http://cdn.ey.com/echannel/gl/en/issues/business-environment/2016megatrends/001-056_EY_Megatrends_report.pdf

Many of the business models of the past were in fact based on information asymmetry, whilst the producer could know things that were beyond the knowledge of an ordinary customer. Remember the travel industry of 1980s, at its zenith, when there were over 46,000 sales agencies in the USA? At those times the industry's intermediaries operated largely as knowledge management agents. They had volumes of information on hotels, airline tariffs, guided tours, etc., which were not available to the average customer. Selling packaged tours was a common business model, with the intermediary's profit usually achieved through creative re-shuffling of margins within the package (e. g. zero profit on the flight compensated through extra commissions from hotels).

The Internet dealt a deadly blow to all business models based on information asymmetry. Most of the customers in the world can in a few Google searches get about the same amount of knowledge as the industry experts. This led to the effect most commonly described as the "disbundling" of services: what used to come in package is now bought piece by piece with consumers pressing for the best price deal in each of the transactions. The travel industry was among the first to be profoundly affected by disbundling. The search and meta-search engines for hotels, tickets and travel amenities allowed customers to shop globally for the most attractive deals on a price/quality basis.

The power of social helped to understand the real quality of the offer through recommendations and ratings. In a sense, the market got very close to what economists have labeled "perfect competition" – with fully informed buyers making (almost completely) rational decisions⁴⁵. As the economic theory suggests, price becomes the key decision-making factor and competition tends to drive the profit margins of the sellers down close to zero.

The process of information search and decision making by a customer can be a really lengthy one. In fact it is very difficult to tell at what exact moment in time the "buy" button will be pushed. While in the traditional model the key marketing challenge was to bring a potential customer to the point of sale, in the digital world it is the facilitation of the actual deal that requires most of the effort. This can be done only through very quick reaction to the potential customers' requests, with instant re-formulation of the product offer. The key functions of product development and marketing which used to be the domains of thorough long-term planning, with lots of path dependencies in actions, now turn into a competition in speed, which sometimes shortens the strategic horizons from years to weeks if not days.

The strategic response: a platform breeding an ecosystem

The typical deals happening in the market now shift from transactions to interactions. With transactions, the traditional deals were the exchanges, in which one party – the seller – was supplying some value and the other party – the buyer – was simply paying for it. Supplying the value also usually meant carrying all the associated costs – but also keeping the associated information. Going back to the example of the travel agencies: it was the seller's responsibility to keep in line with the changes in tariffs and rates, train the sales personnel, give them information instruments, etc.

In a sense, the market got very close to what economists have labeled "perfect competition" – with fully informed buyers making (almost completely) rational decisions

⁴⁵ There is a growing debate in economics literature, whether an average buyer indeed cares to be "rational" in his/her purchases, yet the digital information systems allow anyone to be at least as informed as he/she chooses to be

digital systems technologies enable a complex real-time analysis of customer's behaviors. Yet there is a question of delivery: how to create myriads of versions of a product?

In the interactional exchange, a buyer gets a role in value creation, doing some part of the seller's job. In the case of the on-line air ticket sales or hotel reservation a customer is actually self-serving, looking on his/her own for the most attractive combination of price and value.

In return, he/she gets information, and associated market power. Thus the Digital Transformation is much about redistributing bargaining power within the value chain, mostly empowering the buyers to get more of the value in each deal. Many disruptive start-ups are happy to help newly empowered customers, yet for traditional corporations this paradigm is a major challenge.

Is there a reasonable way for the sellers to counter this? Here the power of customization and on-demand delivery becomes essential. Creating a product which is uniquely tailored to the needs of a specific customer, and delivering it precisely at the time and place it is needed is the only way to create a proposition that will take a customer out of the direct price comparison mode. As was noted above, digital systems technologies enable a complex real-time analysis of customer's behaviors. Yet there is a question of delivery: how to create myriads of versions of a product?

The increasingly popular answer is to engage the creativity and energy of independent suppliers by establishing a marketplace where they can offer their products and services to customers. Such marketplaces are called Digital Platforms. They are complex information technology systems which introduce a peculiar way of solving customers' problems and are open for use by partners, including developers of applications, merchants and agents. A platform can be used directly, or via applications built upon it either by the platform owner or by independent third parties. An example is provided by the M-Pesa mobile money platform in Kenya whose functionality serves as a basis for almost 100 independent business applications, like Musoni (microfinance) or Kopo Kopo (services to merchants)⁴⁶.

Platforms breed "digital ecosystems". In biology an ecosystem starts from a unique combination of natural forces – air, water, soil, solar radiation – that support the breeding of living creatures of special types. These creatures get increasingly adapted to living in the specific natural circumstances and with each other, finally benefiting more and more from this adaptation. Likewise, a digital ecosystem is a community which emerges from the combination of everyday use of a platform and its applications by its customers, developers of applications and merchants and agents with the skills and routines acquired through regular use.

For example, the M-Pesa ecosystem includes people who do the mobile money transfers, the developers of applications who are skilled in creating interfaces to the system to run independent businesses based on its functionality, the merchants who accept mobile payments, the agents who provide the cash-in and cash-out services, etc. The actions of these people are mutually beneficial and tend to support and reinforce each other, creating further opportunities, which are not feasible outside the specific ecosystem.

The owner of the platform provides the essential analytical and marketing tools which enable small suppliers to find the clients which suit them most, and benefits from the ever-growing volume of transactions. The

⁴⁶ The definition of platforms and ecosystems is based on SLOLKOVO IEMS report "Digital Financial Platforms and the Ecosystems of Financial Inclusion"

owner is also responsible for marketing the platform, its strategic development⁴⁷, technical support and many other essential functions. However operating a platform business is not an easy task. According to CB Insights, these marketplaces constitute the category with second highest attrition rate among start-ups (after the “social”)⁴⁸. Still there is an increasing number of cases of successful platform development by large traditional corporations.

Banks around the world are increasingly working on transforming themselves into financial platforms open to the independent third-party players. They seek to create large networks of partners that are integrated via APIs into the interfaces of the e-banks and m-banks enabling their customers to do the easy, and thus frequent, payments. Some of the banks go further and create full-scale marketplaces that promote the services of the banks’ clients. An example is the Russian financial group Otkrytiye with its innovative subsidiary Tochka, which targets small and medium-sized business. Tochka started to attract clients by offering very effective “cloud accounting” services. It went on and established a web-portal Otkrytaya Platforma (Open Platform, <https://openplatforma.ru/b2b>), a digital platform that promotes the products and services of the entrepreneurs that it serves. Currently the platform lists several thousand businesses in 28 product categories. ■

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47 One of the key issues in technical development is the creation of the so called APIs – the program interfaces that are used by independent partners of the platform. Effective APIs facilitate the intensity of third-part presence and are important revenue generators. Salesforce.com generates 50% of its revenues through APIs, eBay 60%, and Expedia 90% (Bala Iyer, Mohan Subramaniam: The Strategic Value of APIs – In: The Harvard Business Review, January 2015)

48 <https://www.cbinsights.com/blog/startup-death-data/>

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Summing up: what is actually transformed by Digital Transformation?

Digitally transformed customers come informed, enabled to switch suppliers at no cost, and thus empowered to bargain

As was demonstrated, the new generation of the digital technologies creates a new level of customer value via a previously unachievable combination of affordability and customization, delivering tailor-made products and services on demand and often at a much cheaper price than the traditional offer. Just compare the price tag and quality of services of, say, Uber to regular taxis, or of AirBnB to mainstream hotels. This definitely had a profound impact on customers, the way they select products and make purchase decisions. Digitally transformed customers come informed, enabled to switch suppliers at no cost, and thus empowered to bargain.

They transform competition in the market. In many of the segments, especially those with maximum penetration of digital technologies, the modern situation is quite close to what the classic economists labeled “perfect competition”, with many suppliers and rational buyers. As predicted by economic theory, profit margins are driven down to almost zero. Sometimes market disruptors emerge who are eager to operate even at considerable loss. Most of those fail, but they leave an irreparable mark on consumers’ expectations and demands.

With digitally transformed consumers and competitors, how can an incumbent large business survive in the market? This is definitely a challenge. Quite often, traditional corporations are faced with the need to fully

reinvent themselves – under the threat of perishing. Opening up to all sorts of business partnerships, nurturing an ecosystem of independent third-parties and liberally outsourcing to them most of the tasks of product development, production and delivery is one answer. This “platform” approach to business requires re-thinking and re-defining many of the management axioms of the past.

A helpful first step in the process can be to assess the domain of strategic action for your company. Though the transformation of the business environment goes across all industries, the specific forms and pace it takes vary deeply depending on the nature of the product, the regulatory environment and the place of the industry in the value creation chain. Understanding those differences is instrumental in developing the right strategy for the Digital Transformation of a specific company, focused on ambitious, though realistic, gains and feasible to implement. Analysis of the cases of successes and failures in digitization of major companies from across the globe brings three possible strategic domains of Digital Transformation:

- **“Fully digital”**: feasible when a company’s product is composed of information bits, not physical atoms, the company is close to the end-consumer and there are no regulatory barriers to major changes in the business model. The revolution in the industry of content creation (books, music, video) to which all of us have been witnesses in the past 15 years is an impressive case;
- **“Digitally wrapped”**: this route should be explored when either the product is too “physical” (e. g. airlines: it all ends up with human beings boarding the real planes, and this is beyond changing until the invention of the commercial teleportation of people) or there are strong regulatory barriers to radical revision of business model (banking is the perfect example: money is pure information and a lot of new approaches to it could in theory be developed, yet the industry is under strict control of international conventions and national governments, thus an individual player is not at all free to experiment with its market offer)
- **“Digitally spiced”**: most of the “heavy industries” which deal with physical products within the context of industrial purchases for further reprocessing fall here. It is very hard to imagine full-scale revolutions in business models in such industries, yet the digital technologies still play a transformative role within certain parts of the production or management processes.

Some details of these three strategy routes can be summarized in the following way:

Opening up to all sorts of business partnerships, nurturing an ecosystem of independent third-parties and liberally outsourcing to them most of the tasks of product development, production and delivery is one answer

Fully digital

Transformation goals

Creation of the completely new value chains through re-definition of:

- the product (e. g. introduction of e-readers, mp3 music and streamed video in the place of books, CDs and DVDs) or
- the suppliers (mobile and software app download platforms opened for free to any 3rd-party developer) or
- the consumers (stock exchange real-time quotes available to individual investors, not professional traders)

Business opportunity

Company creates and owns a “platform” for interactions and rents it out to sellers and buyers, who bear most of the costs of the exchanges

Business threat

Business model can be under the threat of piracy or consumer activism which leads to provision of competing services to the consumers free of charge

Operationalization of the strategy

Developing the systems of analysis of behavior of buyers and sellers which enable them to better target their offers and requests and thus increments business value for them

Focus of management

Building the analytical models which combine business effectiveness with high operation speed

Digitally wrapped

Transformation goals

Getting more profit within the existing value chain through going “out” of the company boundaries and “forward” towards the consumer

Business opportunity

Company creates consumer loyalty through creating the instruments which delegate to consumers important roles in product development and marketing (perceived as “customization”)

Business threat

A mistake in choosing the strategic model, an attempt to build a “fully digital business” which disrupts the existing cash flows without creating the new ones and create internal war between the “front end progressists” and “back end conservatives”

Operationalization of the strategy

- If the regulatory environment is the only barrier to the “fully digital” strategy a company can diversify the business to move into adjacent market segments that are less regulated (e. g. spin-off of operations in micro-finance and on-line payments from a regulated bank)
- Gaining competitive advantage through perfection of the technologies of the “digital wrapping”: interfaces, user experience, productivity/speed of operations, etc.

Focus of management

Determining the right strategic scenario and motivating and bounding the whole company (moderating the “battles” of progressists and conservators) for its effective implementation

Digitally spiced

Transformation goals	Strategic decrease of costs in the existing value chain through going “inside” the company and “backwards” to suppliers
Business opportunity	Creating seamless processes integrated with the supply chain
Business threat	<ul style="list-style-type: none">• An attempt at “waterfall digitalization” of a major corporation with complex and heterogeneous production processes• Thinking too small: implementation of micro-projects with no visible effect. A company gets the culture of viewing digital technologies as “toys”
Operationalization of the strategy	Finding the internal areas for digitalization capable of bringing a visible and reasonably quick ROI, and building a roadmap of such projects. In some cases – creation of new businesses units for the processes which can be transformed into “digitally wrapped” or “fully digital”
Focus of management	Developing and implementing the digital roadmap targeting the company’s strategic goals (strengthening the competitive position) with the view on technological feasibility

Another important tip. An executive challenged by the task of Digital Transformation can find numerous friends and allies among the employees of his/her corporation. Many of them have been also digitally transformed, have embraced the new technologies and are eager to break the established routines to pursue both better business results and a happier job experience. They are increasingly aware of the threats of automation through AI systems and start to seek for a secure strategic job future via opening up to re-definition of their traditional roles and functions. Empowering employees to experiment, make strategic decisions and become de facto entrepreneurs seeking the best ways to create value for your customers can be a key milestone in the roadmap of digital transformation of your corporation. ■

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YOU CAN LEARN MORE ABOUT THE DIGITAL TRANSFORMATION
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Consult the School web-site www.skolkovo.ru for the dates of forthcoming programs.
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which will help you to plan and initiate the Digital Transformation of your business.
Please mail all enquiries to: digital@skolkovo.ru

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