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Transformation of Traditional Retail Businesses in Response to the Digital Revolution

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ABSTRACT

Consumers have traditionally made purchase decisions at the store shelf, giving institutional brick-and-mortar retailers great power to learn about and influence behaviors and preferences. With the rise of e-commerce, mobile shopping, and most recently smart technologies, new competitors threaten this long-standing supremacy. Adopting a value-creation perspective, we analyze how digitization started the erosion of institutional retailing as the primary interface to the customer. We develop a framework that identifies five new sources of value creation and propose how these advance and transform competition for this interface. Depending on the importance of the new sources of value creation (in different purchase situations), stationary retailing may prevail as an important interaction point in a multichannel decision journey. However, increasing diffusion of branded-product platforms including connected devices and online retail platforms is shifting this authority to new players. For the parties involved in this multilayered competition, acknowledging the changes and actively managing their position in the evolving eco-systems is crucial.

KEYWORDS: traditional, retail, digital, revolution, transformation

I. INTRODUCTION

With the advancement of technology in the 21st century, The retail sector is experiencing a global revolution, and the whole credit goes to digitalization. Thanks to Digital Platforms, Businesses are experiencing many changes. The internet and mobile devices have enabled consumers to connect with companies.

As per Statista, By future, Total retail sales in the United States were projected to amount to $ 5.94 trillion. Digital devices are shaping the customer's shopping journey experience. It helps consumers make decisions wisely and in no-time and it also enables the retailers to help customers and get relevant information for making shopping decisions.[1,2,3]

The retail industry has gone through drastic changes in recent years to improve business operations and become more customer-oriented. Both online and offline retail markets are striving to eliminate the limitations in their services by using various advanced technologies and create personalized customer experiences.

According to Statista, The retail market size in India was expected to amount to $1.7 trillion. There are several factors such as changing customer dynamics, trends, and demands that made it a necessity for the retail industry to bring innovative approaches and adapt to the technologically advanced requirements at the fastest rate. The retail industry is shifting towards a digital advanced scenario and environment to carry out the operations in a personalized manner.

Digital transformation includes a more comprehensive and effective range of business opportunities. The retail industry is rapidly adopting digital transformation methodologies to revolutionize the entire process by integrating various assets, including divisions, business, staff, and advanced technologies. It creates new and innovative business models that help the industry focus on discrete strategy rather than just one technique or approach.

The recent advances in technology, including artificial intelligence, cloud, business intelligence, analytics, etc. have massively impacted the retail industry. The processes have become more streamlined and efficient, which will help the industry deliver better results to the customers.

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With the technological advancement and use of digital marketing methodologies, the retailers have the opportunity to engage with customers more precisely and effectively to know various queries, prospects, concerns and requirements that further help them to deliver products and services.

Digital transformation has eliminated traditional technologies' limitations and helped the retail industry be more responsive to the current market trends and demands. It has helped the industry to analyze existing workflows and review diverse operating models based on their agility, speed, functions, customer involvement, etc.

However, thanks to technological advancement, the customer experience has drastically changed but its importance is still the same. One of the most important aspects of the retail industry is always an attentive and engaging customer experience.[4,5,6]

The advanced tools and applications have enabled the collaboration of various operating models that help the industry make strategic business decisions through an open line of communications.

The operations have become more customer-centric, and the primary aim is to enhance the customer experience to a great extent. The new products and services can quickly be developed by thoroughly analyzing the recent trends and preferences and utilizing robust technologies.

Analytics is one of the essential aspects to enhance the operations of the retail industry, and digital transformation has enabled the industry to analyze the demographics and customer traffic that allows the business to make smarter decisions based on these details.

Thanks to Digital Transformation, the retail industry is completely revolutionized as the way of shopping has changed for both in-person and online platforms. The process of shopping has become more convenient, seamless and easy for the customers with the use of a multi-channel approach and advanced methodologies

Nowadays, Retail Industry is moving beyond mobile and connecting more devices. Technological advancement has completely changed the mode of shopping as the faster technology and smartphones have made internet shopping available at people's fingertips. The in-store shopping experience has also transformed with digital transformation as several stores provide screens or iPads to view product specifications and provide information for marketing lists and customer relationship management.[7,8,9]

Various technologies are leading digital transformation in the retail industry.

- Omnichannel retail
- Digital Marketing
- AI
- AR
- Analytics
- VR
- Facial Recognition
- Cloud services

The retail industry's changing nature makes it necessary to integrate advanced technologies into the operations to maintain a competitive edge in the market. The digital transformation of services is evolving continuously with the infusion of advanced technologies consistently. These technologies have majorly contributed to changing the retail industry dynamics and simplifying operations to a great extent.

II. DISCUSSION

Digital technology has become a foundational element for all industries, but retail is facing several challenges that have brought it to the fore. The industry has been reshaped by a number of factors—including the rise of e-commerce and omnichannel, changing customer behavior and hyperpersonalization, and growing supply chain complexity—all of which have been accelerated by the pandemic. These shifts have heightened the pressure on retailers' bottom line: over

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the past five years, margins have been shrinking by two to three percentage points per year, or even by as much as five to six percentage points, depending on the vertical.

A robust tech foundation can give retailers the capabilities to boost performance across the board, but to date, most organizations haven't made sufficient progress and are missing opportunities as a result. Only a few retailers have built true omnichannel offerings, harnessed data at scale, and implemented agile ways of working throughout their organizations. To reverse the negative trajectory of recent years, bold action is needed: retailers must undertake a radical transformation of their tech function—both its architecture and its operating model.[10,11,12]

A coordinated, ambitious tech transformation can have a wide-ranging impact. Our Digital Quotient Survey in the consumer and retail industries found that digital leaders generated 3.3 times the TSR of digital laggards between 2016 and 2020. This finding upholds the idea that technology will be a core driver of next-generation retail growth and will fuel omnichannel customer experience, smart offerings, and lean operations, as well as emerging business models such as data monetization. Retailers can follow a five-step action plan to assess the maturity of their IT landscape and their underlying organization and operating model. With these insights, retailers can then make the right strategic investments in technology to supercharge their performance.

Technology at the core of the retail industry's transformation

The retail industry has undergone tectonic shifts over the past decade. The COVID-19 pandemic sped up many of these trends, leaving retailers struggling to keep pace. Consumer activity has been shifting from offline to online, and most traditional retailers have struggled to expand their technological capabilities. In Germany, for example, online sales grew 23.0 percent per year from 2019 to 2020, while offline rose just 3.6 percent annually.[1]

In addition, retailers have seen changes—sometimes dramatic—in how consumers shop for products and engage with brands. Overall, consumers are becoming more connected, less loyal, more informed, and definitively channel agnostic. Consumer purchasing habits are also shifting toward healthy, fresh, local, and authentic products in grocery and casual and crossover categories in apparel.

A significant share of online sales has been captured by e-tailers, which have often been able to build direct relationships with brands; meanwhile, online marketplaces have become dominant platforms.[2] These developments increase the pressure on physical retailers to expand their omnichannel presence.

To become more responsive to these trends, retailers can harness technology as a core enabler across several areas of next-generation retail. Technology supports the seamless integration of online and offline channels with smart digital services that facilitate end-to-end customer decision journeys. Reliable, personalized offerings that have been optimized through advanced analytics can be updated in close to real time and supported by attractive digital content. Technology solutions for the supply chain include advanced, real-time management; cross-channel order management; and automated logistics, HR, and finance. Last, a robust tech foundation can extend retail business models beyond the traditional core business to generate additional revenues, diversify customer touchpoints, and increase customer data.

In our experience, the right investments can accelerate the time to market of digital offerings by a factor of three; double the internal skills needed to develop competitive solutions; and optimize run costs to save up to 20 percent, which can be reinvested in digital-innovation projects. Collectively, these improvements directly improve responsiveness to customer needs, enhance business performance and revenues, and increase TSR.

To fully exploit technology, retailers must undertake a radical transformation of their IT function.[13,14,15]

Foundational pillars for a holistic technology transformation

To fully exploit technology, retailers must undertake a radical transformation of their IT function. Six pillars spanning both tech architecture and the operating model represent a comprehensive approach (Exhibit 1). While some retailers have excelled in one or several of these pillars, few retailers have yet mastered all six. Because these pillars are interconnected, retailers need to work on all six in tandem to get the full value from investments in technology.

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Tech architecture

Next-generation retail architecture is fully omnichannel, powered by data, and highly modular.

Omnichannel integration. Traditionally, retailers' tech architecture was focused primarily on the store network and supply chain. E-commerce capabilities were developed through a separate effort that used commercial solutions that were integrated only in a limited way with legacy systems, hindering the ability of retailers to implement truly omnichannel journeys (and achieve real-time stock visibility). Best-in-class retailers have been able to deliver a distinctive, consistent customer experience across channels by migrating to a headless commerce architecture[3] that supports all touchpoints with shared functionalities, such as wish lists, appointment booking, and payments.

Home Depot, for example, for many years has focused on creating a personalized omnichannel experience for customers through offerings such as click and collect and personalized marketing.[4] And a retailer in China found that customers that are engaged across both its retail and online touchpoints are one-and-a-half to two times more valuable across loyalty tiers. Customers acquired in retail stores are converted to mobile-app users through a dedicated user journey in which they are engaged on personalized content and e-commerce and receive incentives to come back to stores.

Datafication. In traditional architecture, data are often fragmented across systems or partly consolidated in on-premises infrastructure with limited scalability. In addition, most companies have implemented only limited data and model standards, making it difficult to reuse and scale analytics use cases. To unleash the power of data and accelerate value capture, leading retailers implement cloud-based data platforms that enable automation and reuse over a set of defined protocols. Digital native Delivery Hero, for instance, harnesses customer data to calculate customer lifetime value and thereby inform strategic and tactical decisions depending on the value of specific customer segments. It uses these insights to shape decisions such as whether to run a marketing campaign for a specific segment or whether or not it should enter a new market.[16,17,18]

Tech modernization. Traditional retail architecture typically relies on monolithic and aging applications that dramatically hinder agility and upgrades while resulting in higher overall costs. Moving to a modular, microservice-based architecture can enable organizations to achieve greater flexibility and scalability. A Brazilian retail player transitioned from its monolithic architecture by prioritizing the transformation of all customer-facing business capabilities before upgrading its back ends. These efforts were key factors in the launch of a digital marketplace, which generated astonishing growth: over a four-year span, stock price increased more than 18,000 percent in value.

Operating model

The ways in which the tech function supports the organization—from embracing agility to building the right workforce—can significantly increase operational performance.

Product-led organization. Most retailers have set up an agile digital factory that combines business and tech resources to manage e-commerce (and sometimes analytics) capabilities. However, a transformation of the full IT function is required to meet a consistent baseline for efficiency, flexibility, and speed. A product-led organization focuses on developing and managing business capabilities (such as e-commerce checkout, demand forecasting, and warehouse management) supported by tech solutions. These products are then staffed with cross-functional teams of different tech competencies (for example, engineering, design, and architecture) led by business product owners to ensure a consistent focus on business outcomes.

Highly automated software delivery. Digital and software companies pioneered advanced engineering practices and automated the software development life cycle, but the retail industry is still in the early stages of adopting these practices. The definition and implementation of these practices will be a core element in achieving next-level performance in software delivery. In the transformation of the Brazilian retail player mentioned above, success factors included the establishment of product-led, agile ways of working as well as end-to-end automation. These capabilities enabled the organization to release new digital products within days.[19,20,21]

Talent-driven transformation. Most retailers have an IT department that relies on external partners to maintain business applications. As technology increasingly becomes a differentiating factor, the development of an internal pool of highly

skilled engineers is critical. An in-house team can not only protect the organization's intellectual property but also drastically improve delivery performance and time to market. Walmart, for instance, created Walmart Global Tech, comprising 15,000 engineers, data scientists, and other roles. By consolidating its relevant digital expertise across the globe into a center of excellence, it was able to develop innovative digital products to compete with online retailers.

Gauging progress

Most retailers have initiated a tech transformation but are still stuck firmly in the "emerging" phase on both architecture and operating model .As a result, they lack the tools, processes, and capabilities to fully resolve next-generation retail challenges. By contrast, best-in-class players have progressed to the "maturing" phase and are focused on continued

improvement.

Retailers that commit to a radical transformation of their tech function can both spark growth and increase performance. UK DIY player Screwfix, for instance, transitioned to an omnichannel business model across digital, stores, and catalog by establishing next-day-delivery and click-and-collect options. Learning from best-in-class players, Screwfix quickly became the fastest-growing company in the United Kingdom's construction and retail market.

Retailers that commit to a radical transformation of their tech function can both spark growth and increase performance.

Accelerating the tech transformation

To fully unlock the potential of technology and accelerate their tech transformation journeys, retailers can take several concrete actions.

1. Adapt a journey-driven approach by taking an end-to-end customer perspective[22,23,24]

Not all customer segments are created equal. Retailers should start by codifying the most relevant customer journeys and quantifying the value that could be generated through an end-to-end omnichannel experience. They can then implement frequent measurement along these selected journeys, comparing customer lifetime value with acquisition costs to effectively allocate resources to increase value. In the final phase, retailers can embed this journey lens across the business and tech organization.

2. Redirect tech investments, with a focus on business value

Many retailers still spend significant amounts of resources on legacy systems and software—also known as "keep systems running" expenses. This tech debt is crowding out investments in strategic priorities that would generate business value, as well as in pilots of new business models. They should instead introduce a 360-degree steering process in which joint business and tech teams share progress with the C-suite in quarterly business reviews. This group would collectively assess existing business targets and respective KPIs and reallocate resources toward future priorities.

3. Double down on data

Many organizations make the mistake of attempting to aggregate and manage all of their data to support strategy—a time-consuming endeavor. Retailers should instead pinpoint priority use cases by their potential to harness data to inform business decisions and create value. By integrating the data required to implement those use cases, IT leaders can closely collaborate with the business to establish the necessary tech and business foundation, such as a central organization with qualified data architects and scientists. Retailers can ensure functions use data on a regular basis by providing easy access, continuous updates, and relevant insights tailored to internal audiences.

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4. Build next-generation technology foundations

Retailers can take several steps to upgrade their tech foundation and speed the development of new solutions. They should pilot a cloud-based, highly automated development platform with built-in security and development tools. In addition, they should use standard software whenever possible to promote adoption of solutions, implement best practices for business processes, and facilitate upgrades for the newest features. Retailers can also benefit by getting granular: breaking up monolithic solutions to create a microservice-based architecture can increase flexibility and reusability while accelerating delivery.

5. Pilot extreme industrialization

Speed and scale should be priorities for retailers. They can accomplish these goals by industrializing their delivery models. Since organizational silos can be significant barriers, retailers should create cross-functional teams (for example, engineers, designers, and architects led by business product owners) to promote collaboration and visibility. The introduction of a massively automated software delivery pipeline can enable these cross-functional teams to manage the end-to-end delivery of their solutions and thus substantially expedite the delivery of new features to customers.

At a time when consumers are demanding greater flexibility, customization, and responsiveness, many retailers lack the tech foundation to meet these expectations. The answer is a comprehensive overhaul of the tech architecture and operating model. Time is of the essence, so retailers should take all the necessary steps to expedite the transformation. The benefits will be felt not only throughout the business and tech organization but also on the bottom line.

III. RESULTS

Since the emergence of the mobile-first mandate a few years ago, companies have been scrambling to keep up with a concept that has officially made its way into the mainstream: Digital Transformation.

Considering that technology and the market will continue to radically evolve, we've reached a point where no industry is safe from the need to digitally transform its products, processes, and services to ensure success for the future.[25,26,27]

While the methods and implications for digital transformation look slightly different in each type of business, no industry has a trickier time deciphering the applications of digital transformation than retail. Why?

Because while other industries like entertainment, financial services, manufacturing, etc. are able to more logically apply technology to their business, one thing that hasn't changed about retail is, at its core, it still requires the physical transfer of goods directly to the hands of a consumer. And, as a recent Forbes article put it, "You can't yet digitize a sweater," nor can you understand the touch-and-feel of fabric through a screen. For now, these facts will remain true for the foreseeable future.

The retail industry is also at an inflection point with young e-commerce brands going viral and seeking out space for pop-up shops while major retailers we've come to know over the years are going bankrupt or widely shutting down physical stores. In 2018 alone, over a dozen major retailers, like Sears, Mattress Firm, and David's Bridal to name a few, filed for bankruptcy. However, it's not all doom and gloom: There have also been retail stores, both new and old—like Target, IKEA, and Sephora to name a few—which have soared to heights by focusing on applying technology and agile practices to key areas of the business. So, let's dive into the key elements of digital transformation in the retail industry.

In this article, we'll explore some of the digital transformation trends in retail, highlight some successful examples of digital transformation in retail and the impact it's having on these businesses, and define a few areas where Ionic's technology can help.

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The Retail Landscape

To understand how digital transformation uniquely applies to retail, it's first important to grasp its definition. We've written about this term before, sharing some of its pitfalls more generally, so feel free to take a read, but for our purposes today, let's think of digital transformation in its simplest form before drilling down into how it impacts retailers.

At its highest level, digital transformation means using technology to create game-changing business innovations (whether through people or processes) that disrupt existing industries or create whole new ones.

Often, the most common examples that come to mind when thinking about this subject are Uber, Spotify, or Amazon. Each of these brands, among other big names, have played a major role in developing innovative products/services and shifting entire markets. But, when you try to apply these companies' digital methods direct to, say, an apparel retailer, the application is a little more nuanced.

That's because, as we mentioned, retail still has a traditional element to it: The final step of the shopper's journey, which is the physical delivery of goods to the consumer. This part of the customer journey has not yet been digitized, while all other parts it (acquisition, engagement, conversion, and retention) have been. This lack of change is because of factors like how a product fits a consumer, what something looks in-store, or how something feels when you touch or wear a certain fabric, which aren't yet elements of the shopping experience that translate well, digitally.

This, however, is just one part of the nuance of digital transformation in retail. The other part lies in the traditional methods of how retailers have garnered success in the past: A product-centric, buy-low/sell-high mindset. However, with the Amazons of the world quickly surpassing what used to be a lucrative strategy, the traditional mindset no longer works.

Most retail companies don't have the volume of Walmart or the vastness of products or price reductions as Amazon. More than that, customer service looks completely different than it did even five or ten years ago. Because of these behemoth companies and their built-in digital practices, how are more traditional retail companies expected to keep up? The answer is two-fold: The right technology paired with a new, customer-centric approach to business.

For companies that are able to digitally optimize the entire customer journey across their business, the more likely they are to stay in business for years to come. Consumer priorities have drastically changed and customers don't just want convenience in their shopping experience: They want their preferences to be deeply understood and catered to, automatically. And, the best way to do that today is with good data and the right technology.

Let's take a look at some ideas and examples of how technology can enable customer-centricity and kick-start digital transformation efforts for retailers.

Retail Digital Transformation Trends & Recommendations

First, it's important to understand that retailers need not fear that brick-and-mortar stores will become obsolete anytime soon. Instead, because of the radical shift in consumer technology and preferences, for retailers that want to succeed now and into the future, it's about finding the right balance between e-commerce and in-store efforts—all through the lens of digitization.

According to McKinsey & Company, by 2020 more than 80 percent of U.S. retail sales will still happen within the walls of a store. However, for in-store experiences to thrive they will have to be reimagined and redefined for the digital age.[28,29]

This is just one example of the importance for traditional retailers to rethink how they leverage and implement technology—not just on their website, but in-store as well. It's also worth noting from the same McKinsey study that

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more than 60 percent of Americans have a smartphone and about 80 percent of these consumers use their smartphone to shop, both when they're in a store or elsewhere.

Additionally, according to Statista, online e-commerce sales are projected to grow from about $360 billion in 2016 to over $638 billion by 2019. While Business Insider found that m-commerce (mobile) will reach $285 billion, or 45 percent of the total U.S. e-commerce market by 2020.

One more critical study, from Capegemini, showed how important customer preferences are for retail success, sharing: "Consumers wish to use technology to help them engage with the store at every step of the shopping journey." However concerns arise for some with the feedback that "...Many retailers are not implementing the digital initiatives that consumers want, achieving significant scale, or delivering a return." The study goes on to note that "a minority of digital leaders that have implemented relevant digital initiatives in the majority of their stores have realized significant benefits."

With 2020 just around the corner and the predictions mentioned above, digitally transforming products, processes, and the customer experience is no longer an option but a mandate for retail companies that want to succeed. And, luckily there are plenty of examples out there of companies large and small that are finding niches in the market through the right mix of technologies and dedication to transformational shifts in the business.

A few examples of digital transformation trends and technologies that retail companies should consider as part of their efforts include the following:

- Mobile apps: Whether a native app or a new-comer technology like progressive web apps, mobile apps and mobile accessibility still reign supreme. Shoppers use retail apps to look for localized deals, order products/services online, create wishlists, schedule in-store pickup, and so much more.

- Interactive kiosks or screens, in-store: This allows shoppers to quickly search inventory and find what they're looking for or discover new products and areas of a store. Additionally, kiosks are being used in all sorts of creative ways like scanning barcodes for product information or placing orders.

- Mobile POS (point-of-sale) devices: Think accessibility to Google or Apple pay at in-store checkout. Stores that prepare for the proliferation of digital payments will be setting themselves up for future success.

- Augmented and virtual reality options: Especially for clothing or beauty retailers, AR/VR tools for consumers can be a game changer. An example that comes to mind here is NYX Cosmetics, which has AR built into kiosks in-store which allow consumers to try on different shades of makeup products based on their hair, eye, and skin color—helping customers engage with a wider variety of products and make more informed purchases.

- Better workforce and inventory management systems: Applying technology to your business doesn't just impact consumers, but should also help your employees do their jobs better and more easily. Whether it's smart-shelf technology that digitally tracks inventory or other automated solutions that free up employee time to help customers, consider the implications of digitizing employee processes for a more seamless in-store experience.

The above include just a few of the many ways in which digital transformation can impact the retail industry for the better. With openness to testing and learning new ways to digitize processes and experiences, digital transformation in retail becomes a little easier to grasp and implement.

Let's take a look at some recent real-life examples of how some retailers are tackling the mandate for digital transformation.

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Retail Digital Transformation Examples: Tech & Retail Come Together

There are a number of retail companies out there that have been making big strides in their digital efforts, but instead of looking at brands that nailed digital transformation from the get-go because of inherent timing and technology (the usual culprits: Spotify, Amazon, etc.), let's look at traditional retailers that have been progressing with technology and have set themselves up to thrive in a rapidly-changing landscape. When thinking about this topic, three companies come to mind: Dick's Sporting Goods, Home Depot, and Walmart.

Dick's Sporting Goods

This year, Dick's was featured in the Wall Street Journal for its controversial decision to move all of its software building in-house instead of relying on third-party vendors. This transition to in-house software development allowed Dick's to build out better e-commerce platforms and a brand new system for inventory tracking. On top of that, with this new team and in-house control, Dick's also plans to overhaul its website, how products are showcased online, as well as update the website's search, checkout, and shipping estimate functionality.

According to the CTO, Paul Gaffney, it's not about just shipping features—He wants his team to get excited and be motivated by when the features they're shipping turn into revenue and profit. And, the company is already seeing results: Dick's president is quoted saying, "Transforming the technology group has improved productivity and the customer experience… it's become an enormous strategic weapon for us."

One great example of how digital transformation in retail is directly impacting customers and the business is Dick's latest ability to list sports products online within 30 minutes of a major event like a championship win or player trade. Previously, according to Mr. Gaffney, this effort would have taken three to five days and now it's happening almost instantaneously.

Additionally, the team also created a new merchandise search application for employees that tracks employee usage by store location in order to collect data and find patterns to guarantee the right stock in-store as well as improve the employee experience overall.

Since implementing the new team and investing in technology to improve processes, Dick's has seen a 17 percent increase in e-commerce sales this quarter with its stores generating 80 percent of its revenue.

These are just a few ways in which a traditional retailer can benefit from digital transformation.

Home Depot Digital Transformation

Home Depot is another retail company tackling digital transformation head-on and seeing remarkable results.

According to a Stores.org article, Matt Jones, Home Depot's senior director of digital strategy and mobile applications, said, "It was very apparent to us a number of years ago that customer shopping habits were changing. They were looking for convenience, and they were looking for frictionless shopping experiences."

And, clearly, Jones was right in that assumption. The need for technology to create frictionless shopping experiences is here, and Home Depot has already implemented technology to help its business thrive now and in a future landscape.

Here are a few examples of Home Depot's digital transformation:

- Targeting smartphone users: The Home Depot app has a lot of functionality which allows users to compare products and prices, search by barcode/image/text, order for in-store pickup, communicate directly with the retailer, and more.

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- Attracting the pros: For professionals that use Home Depot, the store has made order loading and checkout easier than ever—Allowing pros to reserve parking to pick up their order quickly and even offering special project pricing and volume discounts.

- Adding augmented reality to their app: With dedication to improving functionality across its digital experiences and app, Home Depot added an app feature that allows customers to use AR to view how certain products will look in a specific space (home, office, etc.).

- Leveraging location: Customers using their Home Depot app in-store are now able to search for a product and have the in-store location pointed out to them. The app doesn't just show which aisle a product is in, but will also uncover any coupons or deals related to the item and offer them to the customer instantaneously via the app.

According to Jones, the functionality and features of their in-store and digital experiences don't just help improve the customer experience, but also assists the business in gleaning key insights that impact how the company and stores are run. For example, because of Home Depot's rich well of data, the company learned that nearly half of online orders are picked up in-store, which lets executives know that their digital strategy is headed in the right direction and that there is value in betting on a healthy balance between both physical and digital experiences.

This type of dedication to the customer experience, augmented with the right technology, is just one of the many benefits of Home Depot's retail digital transformation.

Walmart Digital Transformation

Walmart has been quietly acquiring a number of different technologies and companies to tackle digital transformation and ensure its future success. From ModCloth to Art.com and Jet.com, Walmart is stacking its already massive inventory with a wider variety of products and prices to compete with Amazon and Target.

But it's not just the retail acquisitions that are important, Walmart's digital transformation is also improving in-store and e-commerce experience. According to another Forbes article, one part of that plan has been to add thousands of robots to 5000 of its 11,348 stores.

Perhaps robots sound like an extreme application of digital transformation in retail, but they're also a great example of the strides technology has made in recent years and how new types of tech are already in place to be applied directly to retail businesses today.

While some robots will be used to replace janitorial functions within stores, another area where they will be applied is for lower-level inventory tasks to manage rising costs in stores. According to feedback from 100 retail executives from companies with more than $500 million, as reported in the article, about 99 percent of them reported an inventory problem. The survey also found the following:

- 87 percent of respondents stated inaccurate inventories are to blame for more lost revenue than stealing

- 92 percent said their stores spend more time identifying inventory issues than they do implementing solutions

- 81 percent said they feel their stores are only keeping pace or actually falling behind technologically, despite the availability of new technologies

- 76% said the introduction of robots in stores would improve employee productivity

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The above highlights only one area of a traditional retail business that is struggling without the help of technology—Just think of other areas at the forefront and behind the scenes of the retail industry that can benefit from or be impacted by digital transformation and adding the right technology to your stack.

Whether retail companies or their employees like it or not, automation is one major key to whether a business will succeed or fail in the future.

Home Depot, Dick's, and Walmart are just a few great examples of using digital transformation in retail as a means to further business. Hopefully, some of these examples and the reasoning behind them can inspire your company to see how digital transformation can be a means to ensure future success.

While Ionic isn't (yet) building robots for you to add to your store, we do specialize in technology that can impact one major area of digital transformation: web and mobile app development.

So, let's talk about a few ways our technology can help tackle a major part of your digital transformation strategy.

How Ionic Can Help with Digital Transformation in Retail

Early on at Ionic, we bet on the web as a powerful platform for building stunning mobile applications. Since the advent of hybrid app development, along with the proliferation of the web, we've seen this approach become an even more viable, cost-effective, and performant option for companies looking to tackle digital transformation and their growing app backlog today.[30]

According to a recent Gartner report, mobile accounts for an increasing share of digital commerce transactions (~32 percent of online retail sales up from 28 percent in 2017), but mobile web doesn't always provide a great user experience. Additionally, developing native apps with lack of developer talent and funds can be time consuming and costly. Thankfully, with the right development skills and recent technology strides, there are a growing number of solutions that can help companies bridge the gap between their mobile and web experience. That's why, for companies today, it's important to consider the best way to reach customers and the strategy behind development efforts to decide whether or not to develop a native app, a progressive web app, or both.

Luckily, we've written in depth about the benefits and challenges of PWAs before, which you can read about here. And, we have also shared a more technical blog on how to decide what kind of app your business needs: Native or PWA? As Gartner shares in its report, investing in building out a PWA is great for a few reasons:

- PWAs align better with SEO and personalization practices. Because it's a web app, content on the app and the PWA itself is searchable by consumers, and indexed by browsers, to make it more easily discoverable and convenient for customers while also being beneficial for a brand's SEO.

- PWAs also are also easy to install, have a native look-and-feel, and are lightweight, which offers better support for offline and low-bandwidth environments.

- PWAs offer a faster time to market and less maintenance with simple app distribution and the ability to develop once and deploy across a number of platforms.

Lastly, while native apps are still an important part of the shopper's journey today, consumers are already experiencing app fatigue and don't always like being required to download an app to experience the benefits or discounts of a brand. With a PWA, a customer can access the same functionality and experience via the web without being required to download an app from the store—helping remove friction on the buyer's journey.

It's also important to recognize that mobile apps don't just benefit the customer through offering convenience and connectivity with a brand, but apps are can also be beneficial in streamlining processes for a business and its

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employees. For example, inventory tracking was listed as an issue for many large retail companies today. Using the web to build an app for better inventory tracking that employees can use when replenishing the stock room or to search while helping customers in-store, is just one way apps can be used to improve the employee experience and improve company processes.

As we've seen with a number of Ionic clients, when you arm your development team with the right technology to build applications at a higher speed and lower cost, you free up time for those employees to focus on new features, product ideas, and innovation in general. Check out a few of our case studies for examples of how we helped companies speed up their development, tackle their backlog, and innovate more frequently.

So, let's get to the two big ways Ionic can help with digital transformation in retail:

1. Mobile/Desktop Apps & PWAs: Enabling a wider talent pool (web developers) to create high-performing mobile/desktop applications or progressive web apps with speed and native functionality. Our technology also helps companies leverage existing employee skill sets to build and ship apps to market faster without the added cost and time spent for developing native apps.

2. Design Systems: According to Kinesis Inc., 94 percent of a user's first impressions of a company are design-related. Don't let bad design or inconsistent UI ruin the customer experience or impact your bottom line. Thanks to the latest version of our framework built with web components, Ionic 4, paired with Stencil, our reusable web component compiler, companies can now easily create a custom UI library that dynamically functions across teams and projects to ensure consistent UX and brand experiences (a.k.a. A design system).

You can read about this year's release of Ionic 4, our latest version of the open source UI framework, which pairs with any front-end technology of choice to help web developers build mobile and desktop apps using their existing skills and one, shared codebase. Plus, we also shared a recent article on Why Every Company Needs a Design System and how a system like this can help a business reduce costs and errors, improve time to market, and achieve better UX across projects and apps.

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It's clear that digital transformation is here to stay and requires all retail companies to refocus their efforts to ensure technology is transforming their business, processes, and customer experiences, or fear being left behind.

While Ionic might not be able to build a robot that performs a store's janitorial duties, we have been a key strategic partner for large, global companies tackling their app development projects—Helping these organizations leverage their in-house development skills and funds to efficiently create performant mobile and desktop apps that streamline their business processes and improve experiences for consumers.

Want more information on how to take on digital transformation through development? Book a strategy session with one of our Solutions Architects to discuss digital transformation and learn how Ionic can kickstart your dev projects.

About Ionic
Ionic is the leading cross-platform developer solution with 5 million developers worldwide. It powers 15% of apps in the app store, not including thousands of apps built internally at enterprises for every line-of-business need. Ionic is unique in that it takes a web-first approach, leveraging HTML, CSS, and Javascript to build high-quality iOS, Android, desktop, and Progressive Web Apps.

Ionic is a leader in enterprise app development. Thousands of enterprise customers use Ionic to build mission-critical apps for their customers, both external and internal.

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IV. CONCLUSION

The Cloud technology, mobile, big data analysis, internet of thing, and industrial internet of things are solutions for digital firms. Big Data analysis means the processing and use of large amounts of data that exceed the capacity of the software tools of traditional databases (relational databases) used to store, manage and analyze data. Big Data stems from the rapid increase in the amount, speed and variety of digital data generated in real time, as a result of the increasingly important role of information technology in business. Data management makes it possible to generate information that can be used in the time period before certain decisions are implemented.

The entry of smartphones and tablets into the business increases the levels of connectivity and interaction between users. This is partly due to social networks. With the development of smartphones, the ability to collect a variety of data generated by high levels of activity of users and employees is increasing. That's why more and more companies are implementing cloud technologies to handle the huge amount of data. According to Flexera report for 2020 worldwide, the percentage of companies using cloud services reaches more than 90%, 93% of enterprises have a multi-cloud strategy; 87% have a hybrid cloud strategy (Weins, 2020).

The pandemic does not allow to work in offices and to learn at schools and universities. All developed countries have reduced or closed the possibility to buy goods in stores, employees have to work mostly from home. In addition, some of nonessential businesses are closed or reduced. The only alternative to do these activities is online – internet and cloud services. Many industries are seriously hurt by these circumstances. The usage of the cloud will increase due to these situations. Additional resources are needed meet the growing usage of the cloud services. These are not only data center's resources but also network capacity and frontend devices like computers and smart phones. Some organizations will be not able to increase their hardware capacity, so they will be forced to migrate from their data centers to cloud because of personnel problems, narrow data centers, no appropriate hardware on the market and supply delays. The scaling of data centers is a complex project work and also needs investments. In many cases the enterprises and organization can also find that the public and public-hybrid cloud solutions are reliable and cheaper solution for their IT activities. This process is accelerated by the pandemic, but it is also a trend in the last years.

In 2016, about three quarters of companies based in the European Union (EU) and with a team of at least 10 employees have a website, and almost half use social media. However, only 10% of them state that they also analyze Big Data, according to Eurostat (European Statistical Office). The most popular sources for analysis are portable geolocation data used by 47% of businesses and data generated by social media (45%). One third (33%) of companies' report analyzing their own Big Data from smart devices and sensors, and 25% have used other Big Data sources (Schwertner, 2017). Of the EU Member States for which such information is available, Big Data analysis is used by at least 15% of companies in Malta and the Netherlands (19% each), Belgium (17%), Finland and the United Kingdom (15% each), in Bulgaria 7%. On the other hand, only 6% of companies analyze Big Data in Germany and Poland, and in Cyprus this percentage is 3% (Eurostat, 2016).

Big Data is a complex multidimensional notion. At first glance it looks like analyzing big amounts of data and producing information, but Big Data analysis is very difficult task. The components of the big data are mostly unstructured data – advertisements, films, images, and other graphics objects, geospatial descriptions, text documents in various formats, and possibly in different languages. The sources of these data lie mostly outside the organizational structures of the analyzing organization and are collected using networks, media tools, geolocation devices. This chaotic and unstructured amount of data is hard to analyze, to find the connections between the different documents and to derive relevant and useful information that can be used for making decisions.

The next problem is the short lifecycle of these data and the flood of new pieces of data and documents produced by the mass media, trade, industry and business. The data is changed very quickly and replaced by tons of new documents. All these facts lead to the necessity of new technology methods for data processing known as Big Data.

The Big Data technologies use the follow analysis methods:

- A/B testing – In this method, a control group of items is compared to other test groups in which one or more indicators have been changed. The aim is to clarify what changes improve the targets. With this method you can find the optimal combination of indicators to achieve a certain goal – for example, the best perception of a new marketing offers by consumers. The Big Data allow a huge number of iterations to be performed and a statistically reliable result to be obtained. For example, Amazon and Zynga use A/B testing.
- Association rule learning – This is a set of methods for identifying relationships, associative rules for relationships between variables in large volumes of data. These methods are used in data mining solutions.

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- Classification – A group of methods that allow to predict the behavior of consumers in a particular market segment – for example, to make a purchase decision, the volume of consumption, to refuse to use a product. Used in data mining solutions.
- Cluster analysis – A statistical method for classifying objects into groups based on similar common features that were not previously known. Used in data mining solutions.
- Crowdsourcing – A method of collecting data from a large number of sources.
- Data fusion and data integration – A group of methods that allow to analyze the comments of users of social networks and to compare with sales results in real time.
- Data mining – A group of methods that allow the detection of meaningful correlations, dependencies, repetitive patterns, trends and anomalies in data sets. Data mining tools are used to implement Big Data projects, which aim to predict a pattern of user behavior or, for example, to determine which group of users will best perceive a new product, what qualities are characteristic of the most successful employees and others.
- Ensemble learning – Developed for the purposes of machine learning, this method includes a number of predicative models, thanks to which it achieves high quality of the derived predictions.
- Genetic algorithms – In this method, possible solutions are presented in the form of "chromosomes" that can combine and mutate, and like the process of evolution in nature, the most adapted survive. This is a heuristic search algorithm used to solve optimization and modelling problems by random selection, combining and variations of target parameters and using mechanisms analogous to natural selection.
- Machine learning – A field of artificial intelligence aimed at creating algorithms for self-learning based on empirical data.
- Natural language processing (NLP) – Methods for recognition and processing of natural language, borrowed from computer science and linguistics.
- Network analysis – A group of methods for analyzing connections between nodes in networks. They are applied to data from social networks, allowing to analyze relationships between individual users, companies, communities and others.
- Optimization – A group of numerical methods for redesigning complex systems and processes in order to improve one or more of their indicators. They are used to support strategic decision-making – for example, the composition of the product line placed on the market, to conduct investment analysis and others.
- Pattern recognition – Methods with elements of self-learning applied to predict patterns of behavior.
- Predictive modelling – Methods that allow a mathematical model to be created for a predetermined probable scenario for the development of certain events. A typical example of the application of Predictive modelling is the analysis of data from a CRM system in order to predict the possible conditions under which some subscribers of a company will give up its services and start using those of competitors.
- Regression – A group of statistical methods for finding patterns between the change of a dependent variable and one or more independent ones. It is used for forecast analyses and in data mining. The "linear regression" method is widely used, which determines the influence of one numerical parameter on another. For example, what is the average value of sales volume when the marketing budget changes by 100 euros. Another option is "logical regression" – when the dependent variable can take only two values (0 and 1) – this is one of the most common methods for analyzing the probability of occurrence of an event depending on the values of some parameters.
- Sentiment analysis – These are methods for assessing consumer sentiment based on natural language recognition technologies. They allow messages related to a specific topic or subject (for example, for a given product) to be extracted from the general information flow, as well as to assess whether the opinions expressed on the topic are positive or negative, what is the degree of their emotionality.
- Signal processing – A group of methods borrowed from radio engineering, which aim to recognize a signal against the background of noise and analyze this signal.
- Spatial analysis – A group of methods borrowed from statistics for spatial data analysis – topology of the area, geographical coordinates, geometry of objects. The source of large volumes of such data is often the Geographic Information Systems (GIS) of large organizations.
- Supervised learning – Methods based on machine learning technologies that allow to find functional relationships in the analysed data sets.
- Simulation – Modelling the behavior of complex systems that are often used to predict and test different scenarios for planning purposes.
- Time series analysis – A group of methods borrowed from statistics and the theory of digital signal processing. Used to analyze repetitive series of data. Typical applications – tracking the securities market, tracking the number of patients with a disease and others.
- Unsupervised learning – Methods based on machine learning technologies that allow to identify hidden functional relationships in the analysed data sets. These methods have common features with Cluster Analysis.

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- Visualization – Methods for graphical presentation of the results of Big Data analyses in the form of diagrams or animated images in order to simplify the interpretation and easier understanding of the results (Stephenson, 2013).
- The situation is further complicated by the variability of the data. Their composition and structure are constantly changing when launching new services, installing advanced sensors, conducting new marketing companies and others.

Big Data is the focus of attention in many organizations, but its successful implementation is in the process of improvement. The data has a huge potential for improving the functioning of business organizations in all areas of their activities: from improving customer service, optimizing the ongoing internal processes in the organization, performance analysis and risk assessment. Unlocking this potential requires the use of specialized tools through which the data can be presented in an easy to perceive, analyze and predict graphical form, which serves as a basis for smarter management and business decisions. The key to faster integration of Big Data is the use of Business Intelligence (BI) tools. Analysts believe that BI technology is already a strategically important tool and a necessary tool for most businesses. By summarizing all the information accumulated through the various communication channels, business analysis systems provide a comprehensive view of the relationship between the business and its customers. Better service, optimization and acceleration of processes in the organization and finding the right channels for communication with different customer groups are just some of the benefits that can be achieved by introducing business analysis systems in the corporate infrastructure of organizations. Business analysis tools can reveal trends in customer behavior, thus making business organizations much more flexible and innovative in finding more successful approaches to retaining and attracting new customers.

Banks have long consolidated huge arrays of customer data, and modern technology allows flexible work with them. This creates the potential for optimization and additional monetization. The areas of application of such developments are many – from marketing to security, but one of the main advantages for banks in the application of Big Data is the sale of additional services to customers.

Mobile Platforms

The mobile broadband networks provide improved connectivity and the ability for digital technologies to be used everywhere. The deployment of mobile networks starts in 2007, but they surpassed fixed line broadband in just one year. Today, mobile broadband networks are the main carrier of broadband Internet access. This wider deployment of mobile technologies and access to networks, devices and applications eliminates time and space constraints in the use of digital technologies, thus dramatically changing everyday life and work environment. Mobile technologies allow people to use their personal devices for work, which increases the speed of work and changes work processes. Although only 50% of connections are currently made through third generation (3G) and fourth generation (4G) networks, the deployment of fifth generation (5G) technology by 2020-2019 is able to cover the growing demand for ubiquitous and instant access to applications. 5G networks use denser signals through smaller antennas and cloud solutions to deliver 50 to 100 times higher speeds than 4G networks. Thus, 5G promises to be of paramount importance for building the infrastructure of a number of industries. According to the GSMA (Global System for Mobile Communications – GSMA) by 2025, 1.2 billion people will have access to 5G networks. Switching to these solutions will change the mobile services provided to consumers and create new business models, as well as possible problems for countries and industries that fail to invest smartly during the transition period. Unlike previous evolutions of technology – 2G in the early 1990s, 3G in the early millennium and 4G less than a decade ago – the new 5G network standards will not only lead to faster data transfer speeds, but will also allow the connection of any sensors, devices, including cars, appliances and huge agricultural machinery. 5G will be a revolution not only for consumer services but for entire industries.

Autonomous DB Management Systems

It is a fact that the administration of the DBs is a very hard task. This is so, because nowadays the DBs are very complex: have many different types of data, many features and functionalities and also (as every software) more than enough bugs. The need to update and to upgrade the DBs can't be eliminated. There also big performance and security problems related to the DBs. This makes the Data Base Administration (DBA) a serious and hard task. There are not enough experienced DBAs and the salaries increase. From other hand the number of the installed DB instances increases drastically with the digitalization of the society and the industry. All this bring a bad reputation over the DBs:

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they are claimed as very complex products that need expensive personal and expensive hardware in order to be used. This is a big challenge not only for the consumer but also for the producer of the DBs. One way to reconcile this problem are the cloud services. With the cloud services the care for infrastructure, installation, supporting and running of the DBs and the applications are delegated to the provider of the cloud services. But the provider has its own problems – there are too many DB instances on the Cloud and too less experiencer personal and time to support the farms with the DBs. So, the industry slowly goes to the idea for "autonomous" DBs. These means that the maintenance, update, upgrade and security of the installed and running DBs will be done automatically. Even more – the complex performance tuning will be automated. The Oracle approach to these activities will be displayed.

The Cloud gives the unseen possibility for the enterprises (also middle and small) to host their software in the Cloud Services providers. This triggers a new problem – the huge amount of this software (particularly DBs) needs support efforts – patching, updating, upgrading, bug fixing, performance tuning, problems fixing, backup and recovery and many other activities which are the contents of the DBA job – very expensive because of the need for big amount of knowledge, experience, passion and talent. Definitely there are no enough people to meet these requirements. So, for good or bad these activities should be automated as much as possible.

The autonomous Oracle DB were available only in Oracle Cloud environment. The no Oracle Cloud installations were not able to be autonomous. Since the mid of 2020 Oracle purchase autonomous DBs for on premises installation. This solution is complex and expensive. The obstacle is not only the royalty fees. The autonomous DBs of Oracle are able to run only on specialized hardware known as Oracle Exadata. This is expensive Data Base Machine – a huge complex of computational, storage and internal and external network components.

The main feature of the Oracle Autonomous Database Cloud is that it offers high level of automation including machine learning and so eliminates human efforts, human errors and manual tuning.

This includes the following (Oracle Corporation, 2019):

- No Human Activities and Efforts: Database automatically upgrades, patches, and tunes itself while running; automates security updates with no downtime window required.
- No or reduced Human Errors due the checked procedures that are programmatically fulfilled: as result SLA guarantees 99.995% reliability and availability, which minimizes costly planned and unplanned downtime to less than 30 minutes a year.
- No Manual Performance Tuning: Indexes are automatically created, data are compressed. So, the Database consumes less compute and storage resources because of machine learning and automatic compression. Combined with lower manual admin costs, Oracle offers even bigger cost savings.

These unprecedented targets at this point of the development of the software sound as pure phantasy for every DBA (Hall, 2018), but now they are reality.

Artificial Intelligence in Business

Artificial intelligence (AI) can augment or automate decisions and tasks today performed by humans, making it indispensable for digital business transformation. With AI, organizations can reduce labor costs, generate new business models, and improve processes or customer service (Gartner, 2019).

Some design principles that will help the organizations evaluate artificial intelligence applications for business results, not just operational improvements, are the following:

- Anticipate the future – In digital business, AI generates insights that lead directly to business execution. A strategic AI application can produce granular insights into what customers, markets or other entities are likely to do in specific future situations and what the enterprise can do to influence them.
- Act autonomously – AI applications provide value by automating existing manual processes, but can also go a step further by enabling autonomous operation of the business.
- Connect to the customer – Digital businesses thrive on knowledge of markets and customers. To support digital business initiatives, AI applications must get as close to customers as possible. CIOs should think about strategic AI applications that enable their organization to capture critical information to help build more intimate customer relationships overtime.
- Elevate the physical – Strategic AI applications can improve the physical world by using robots.

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- Detect the invisible – Strategic AI applications can make decisions much faster than humans about increasingly complex situations.

Manage risk – Security, risk and privacy form the biggest barriers to the development of AI applications and are even more of an issue when AI applications serve a strategic business purpose. These limits reduce the risk of concept drift and prevents any damage the application could do (Gartner, 2019).

The global market for industrial robots is expected to nearly double in the next five years. Producers are forced to find ways to be more flexible due to broken supply chains. There has been a huge increase in the demand for material handling equipment and "collaborative robots" designed to interact with humans. These "cobots" are especially useful in e-commerce, which the coronavirus has given a huge boost. It is estimated that the pandemic has increased companies' buffer stocks by about 5%. To counteract this, they stock up on robots used in warehouses. Cobots are currently helping to maintain social distance, but will continue to be useful after the pandemic.

The greater and longer-term impact of a pandemic can be better understood through the data that companies generate from their activities and from the algorithms they apply to make current decisions.

Digital Transformation is more complex than plain automation of processes – it transforms the processes themselves, business models and customer expectations. Through comprehensive digital connections between systems, people, places and objects, the digital businesses create value and generate revenue. Every company today can develop a strategy and use digital technologies to create a profitable position for their business as well for their industry. The potential that is unlocked through digital transformation is the next step in the development of the global and national economy.

The new phenomena are also used to achieve exchange of communications between the companies and external parties – suppliers, distributors and customers. It is more complex than the simple exchange of messages or orders. It makes possible to study and to analyze the current market situation and customer demands and to reveal the trends of future changes in order to adapt and coordinate the efforts of the companies with the anticipating state of the market, customer needs and technologies.

Digital Transformation triggers the application of specific new digital technologies. New computer technologies with deep scientific origin get on the stage: Big Data, Analysis and Decision based on Artificial Intelligence methods, Self-Learning approaches and Algorithms and many others.

From the point of view of the IT technologies (hardware, software, networks) this leads to centralization of the hardware and applications in the Cloud Data Centers – that unleash totally new capability for corporations in terms of availability, effectiveness and/or efficiency. This increases the demand on specialized hardware like Data Base Machines that capsulate hardware components in a unit what makes the processing faster and the maintenance easier.

The integration of all these technologies transforms the society that will live in a totally changed world. The producing of goods, running the businesses, leading the organizations is moving toward intensive usage of new technologies and supporting applied IT methods (software, hardware, processes) and growing digital communication channels. This new world shaped through Digital Transformation is enormously multicomponent and complicated – we need constantly to analyze, assess and develop it to ensure the stability and the power of our societies.[29,30]

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