

# Cutter Business Technology JOURNAL

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Management, Innovation, Transformation

"Business transformation is not just about technology or the innovative use of technology. Businesses need to think strategically and innovatively, visualizing a big picture of business and the supporting ecosystem in the new digital age."

— San Murugesan,  
Guest Editor

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Client Services: [service@cutter.com](mailto:service@cutter.com)

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by San Murugesan, Guest Editor

# Opening Statement

The commerce that we recognize today has come a long way since prehistoric times. From a simple swapping of goods or services for other goods or services approximately 150,000 years ago,<sup>1</sup> it has undergone fundamental transformation — particularly in the last four centuries — to the complex buying, selling, and trading that occurs now.<sup>2</sup> Its model, organization, and methods of transaction and fulfillment have changed significantly, particularly following the introduction of money, industrialization, advances in transport (steamships, railroads, highways, aviation, and now drones), adoption of IT (including the Internet and Web and, more recently, mobile devices), and globalization. According to a recent study by Accenture and Oxford Economics, the increased use of digital technologies could add US \$1.36 trillion to the total global economic output in 2020.<sup>3</sup> If you consider the transformation of business to be phenomenal thus far, what do you expect the future of business will be?

Well, it's definitely not going to be "business as usual." The business landscape is poised for an unprecedented wave of further innovations and changes. How these will emerge, who will be the leading players in different sectors, and how the changes will affect us — average people in both advanced and developing countries, young and old — are still unknown. Nevertheless, we can make educated guesses, which may eventually become reality.

A welcome combination of complementary factors drives and supports the inevitable formation of a new business landscape. Technological advances such as augmented reality, virtual reality, cognitive assistants, 3D/4D printing, personalization, conversational interfaces, drones, deep learning, predictive analytics, the Internet of Things (IoT), blockchain, digital currencies, new payment systems, and affective computing play major roles in promoting and enabling the next wave of business innovation. These technologies — combined with new business models facilitated by social/collaborative commerce, shared services, and crowdsourcing — will have a profound influence across the business world. Furthermore, businesses will need

to cater to the new expectations and demands of the digitally embedded "selfie" generation of customers, while also serving older generations.

This scenario raises a few pertinent questions among business executives and IT professionals: Where is the business world headed? How will businesses get transformed, and what new applications and innovations will emerge? What will evolve as the "new normal"? What new opportunities will arise for the IT industry and technology professionals?

In this issue, we examine these questions and provide perspectives on them from experts in different areas.

**If you consider the transformation of business to be phenomenal thus far, what do you expect the future of business will be?**

## Business Transformation: A Multidimensional Problem and a Source of Ample Opportunities

It requires no great imagination to say that the IT advances noted above will be leveraged for a variety of business functions and activities. Among other things, businesses could:

- Embrace data analytics, sentiment analysis, and advances in machine learning to gain new insights, make better business decisions, and improve customer experience and engagement
- Use online and offline customer data and other relevant information to create better customer profiles for effective micro-targeted marketing
- Harness artificial intelligence, deep learning, and smart systems, along with new kinds of display devices, for advertising and marketing
- Make use of augmented reality, virtual reality, and mixed reality for new applications and services

- Leverage the IoT, positioning systems, and wireless communications to enhance customer experience and engagement
- Employ smart cognitive assistants in retail and customer services
- Use technology to assist customers in merchandise selection or to facilitate the design, creation, and delivery of personalized, tailor-made products
- Leverage 3D/4D printing, drones, autonomous vehicles, and new delivery models for retail commerce

Yet business transformation is not just about technology<sup>4</sup> or the innovative use of technology. It's a multi-dimensional endeavor. You need to bring together and integrate technology, business models, business processes/operations, organizational structure and culture, customer experience and engagement, and people's needs and wants. You also have to address issues such as security and privacy, reliance and trust, and customers' and partners' concerns and comply with regulatory and legal requirements. In short, businesses need to think strategically and innovatively, visualizing a big picture of business and the supporting ecosystem in the new digital age.<sup>5</sup>

Businesses have to come up with their business strategy for this new age and revisit and revise it as often as necessary. Writing in the *MIT Sloan Management Review*, Boston College Professor Gerald C. Kane and his co-authors argue that "The ability to digitally reimagine the business is determined in large part by a clear digital

[business] strategy supported by leaders who foster a culture able to change and invent the new."<sup>6</sup>

Business opportunities abound in the new digital age. But you need to be creative, and you can't expect customers to tell you what they need or want. As Steve Jobs famously observed, "People don't know what they want until you show it to them."

## In This Issue

In our first article, David Wortley illustrates very well how technology has irrevocably changed the photographic industry since its inception. He paints an excellent picture of how, over a short span of 30 years, technology has totally transformed the photography business, destroyed some established leaders in the industry (e.g., Kodak), and let in new players who quickly seized the promise of technological advances. He then outlines the lessons businesses can learn from the industry's journey and identifies the potential business opportunities that arise in this domain.

Next up, Vipin Jain discusses the key factors that encourage a business to transform itself into a digital business. He then examines three approaches to digital business transformation: business model transformation, business operations transformation, and IT transformation. To develop and successfully implement a practical, strategic transformation plan that helps realize the business vision, he advocates that businesses address a few critical questions about their organization, their objectives, and their capabilities. He then outlines emerging business opportunities in the healthcare, airline, and government sectors.

In our third article, Raj Ramesh offers an optimistic view of the disruptive technologies that are impacting every industry, noting that "disruptive technology can offer a business tremendous value if it is integrated well into the organization." To enable this integration, Ramesh offers a framework to help organizations "understand and model [their] current state, model the desired future state, and identify the work that will help [the] organization move toward that future." To demonstrate the framework in action, Ramesh walks us through an assortment of possible paths a hypothetical grocery store chain, Big Grocers, might take in its digital transformation journey. He also discusses the role of architecture in enabling organizations to "take a systematic approach to digital transformation."

Innovation is a key element for digital business transformation. In their article, Cutter Senior Consultant

### UPCOMING TOPICS

#### APRIL

Philip O'Reilly

#### **Fintech Innovation and Disruptive Digital Technologies**

#### MAY

Steve Andriole

#### **The Innovator's Imperative**

#### JUNE

Roger Evernden

#### **Leveraging Enterprise Architecture for Digital Innovation and Disruption**



Bhuvan Unhelkar and Alok Sharma briefly examine the landscape of contemporary innovation and discuss three types of innovation — incremental, transformational, and breakthrough — that a business can choose to pursue either individually or in combination with other firms. They also discuss how big data, IoT, and the cloud can facilitate innovation and the challenges that organizations must address when embracing these technologies, illustrating them with two use cases: remote health monitoring and self-driving cars. They also briefly describe a process for managing innovation.

Financial services is a key sector that first embraced — and was also impacted by — digitization, and it is poised for further transformation. In our concluding article, Dorota Zimnoch examines the changing landscape of both the finance and insurance industries, touching on customers' growing expectations, business model disruption, and regulatory changes. She then outlines several models and strategies for collaborating with the fintech and insurtech startups that are disrupting these industries. Zimnoch describes how established businesses can choose to work with startups, invest in them, or build them, and she gives examples of firms that have adopted each of these models. She also provides helpful guidelines for businesses in any industry on how to choose suitable models and partnerships based on what their business objectives are and what role they want to play in the intended collaboration to achieve the desired transformation.

According to Klaus Schwab, founder and executive chairman of the World Economic Forum:

We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society.<sup>7</sup>

We hope you will find that the articles in this issue present perspectives and ideas on business transformation in the digital age that are interesting, insightful, and practical. We also hope they will inspire and encourage you to visualize the likely future of business in your domain and to explore the opportunities it presents. Finally, we hope their insights will help you identify suitable transformation strategies and plans and, if needed, choose viable collaboration models for partnering with startups and other firms in your digital business efforts.

## Endnotes

<sup>1</sup>"Commerce to eCommerce: The History of Commerce" ([www.ebizwebpages.com/the-history-of-commerce-and-ecommerce](http://www.ebizwebpages.com/the-history-of-commerce-and-ecommerce)).

<sup>2</sup>"History of Retail and Wholesale." EuroCommerce, 2017 ([www.eurocommerce.eu/commerce-in-europe/history-of-commerce.aspx](http://www.eurocommerce.eu/commerce-in-europe/history-of-commerce.aspx)).

<sup>3</sup>"Digital Density Index: Guiding Digital Transformation." Accenture, 2015 ([www.accenture.com/us-en/insight-digital-density-index-guiding-digital-transformation.aspx?c=strat\\_digidens\\_10000001&n=otc\\_0315](http://www.accenture.com/us-en/insight-digital-density-index-guiding-digital-transformation.aspx?c=strat_digidens_10000001&n=otc_0315)).

<sup>4</sup>Kane, Gerald C., et al. "Strategy, Not Technology, Drives Digital Transformation: Becoming a Digitally Mature Enterprise." *MIT Sloan Management Review*, Summer 2015 (<http://sloanreview.mit.edu/projects/strategy-drives-digital-transformation/>).

<sup>5</sup>Demirkan, Haluk, James C. Spohrer, and Jeffrey J. Welser. "Digital Innovation and Strategic Transformation." *IT Professional*, Vol.18, No. 6, November-December 2016 ([www.computer.org/csdl/mags/it/2016/06/mit2016060014.pdf](http://www.computer.org/csdl/mags/it/2016/06/mit2016060014.pdf)).

<sup>6</sup>Kane et al. (see 4)

<sup>7</sup>Schwab, Klaus. "The Fourth Industrial Revolution: What It Means, How to Respond." *World Economic Forum*, 14 January 2016 ([www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond](http://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond)).

*San Murugesan (BE [Hons], MTech, PhD; FACS) is a Senior Consultant with Cutter Consortium's Data Analytics & Digital Technologies practice, Director of BRITE Professional Services, and an Adjunct Professor in the School of Computing and Mathematics at the Western Sydney University, Australia. He is Editor-in-Chief of the IEEE's IT Professional and Editor of IEEE's Computer. Dr. Murugesan has considerable experience in both industry and academia, and his expertise and interests include the Internet of Everything (IoE), cloud computing, green computing, healthcare IT, advances in the Web, and IT in emerging markets. He offers training programs on cognitive computing, IoT, cloud computing, and green IT.*

*Dr. Murugesan is coeditor of the books Encyclopedia of Cloud Computing and Harnessing Green IT: Principles and Practices. He edits the "Cloud Cover" column in Computer. Dr. Murugesan is Standing Chair of COMPSAC Symposium on IT in Practice, a fellow of the Australian Computer Society, and served as a distinguished visitor of the IEEE Computer Society. Dr. Murugesan held various senior positions at Southern Cross University, Australia; Western Sydney University; and the Indian Space Research Organization, Bangalore, India. He also served as Senior Research Fellow of the US National Research Council at the NASA Ames Research Center. He can be reached at [smurugesan@cutter.com](mailto:smurugesan@cutter.com).*



# Business Opportunities in the Selfie Era: Where Disruptive Technologies and Life Events Meet

by David Wortley

Developments in the technologies we use to share and recall life events are likely to create an explosion of business opportunities within the next one to three years. The popularity of “selfies” posted on social media services such as Instagram are witness to the growing demand for technologies and platforms that empower users with the ability to instantly share their experiences with friends and strangers anywhere in the world and to archive these memories for later recall in the months and years that follow. As the digital technologies used to record visual images and audio have matured, so have the richness, quality, and immersiveness of our captured life events improved and become ever more accessible to the consumer market.

This article examines the impact of digital technologies, including virtual reality (VR), on the sharing and archiving of life events and explores the potential business opportunities that are apt to arise from these technologies. It also seeks to illustrate, through exploring the impact of disruptive technologies on the photographic industry, the lessons to be drawn when either tackling the technological challenges in a long-established traditional business or seeking to create a new market opportunity enabled by disruptive technologies.



Figure 1 — Old sepia photograph circa 1953.

## Evolution of Technologies for Recording, Sharing, and Archiving Life Events

The human desire to document memorable moments has consistently created business opportunities for companies that offer products and services to record, share, and archive life events (see Figure 1). Over the last 30 years, technology has totally transformed the nature of those opportunities, destroyed some established household names, and opened up a massive market for the innovative use of the latest disruptive technologies.

During the last century, the skills, technologies, and resources needed to capture memorable moments were not widely available to the average consumer. Cameras required manual settings for focus and exposure, film had to be developed, there were inevitable delays between taking a picture and having a print available, and the finished product could not be widely shared. Consequently, there was a thriving ecosystem of photographers, camera and film manufacturers, and processing services whose competitive advantage was built around a combination of quality, cost, and — especially — speed of service between the recording of the memorable moment and its availability for sharing. This demand for instant gratification drove the development of Polaroid cameras with self-developing prints, which, although of limited quality, satisfied the desire to document a moment in time and share it instantly.

## The Impact of Digital Technologies on Photography

The ability to directly capture and store images electronically began to develop in the 1990s. Devices like the Canon Ion — which captured low-resolution images in analog format onto a mini disk inside the camera and allowed them to be either transferred to a computer for printing or displayed on a television set via composite video — signposted the digital revolution in photography (see Figure 2).



Figure 2 – Canon Ion Camera and Example Laser Print circa 1991.

Prior to the launch of the Canon Ion, Kodak had introduced the PhotoCD service through an international network of retail outlets. This process involved processing traditional 35mm film and scanning it onto a CD, which could then be used to transfer digital images onto a computer for electronic editing, printing, and distribution.

### *Enabling Technologies That Have Shaped Digital Photography*

Over the years, the technological barriers to the consumer's ultimate goal of being able to capture, amend, share, and archive memorable life events have been broken down by a combination of enabling technologies that include:

- Embedded “smart imaging” technologies in domestic cameras that make it possible for novice photographers to achieve professional results
- Powerful optical and digital zoom technologies that can capture distant events with high quality
- Compact digital storage technologies capable of storing millions of images
- Very high-resolution image capture
- Social media sites offering easy upload of photos and videos
- Fast broadband and wireless technologies
- Consumer photo and video editing software across computers, tablets, and phones
- Increasingly powerful cameras integrated into smartphones

As individual users were empowered with consumer tools previously accessible only to photographic professionals and organizations whose revenue was generated directly from photographic services and consumables, the photographic industry was severely challenged by competitors with no established track record in that industry.

The vast majority of life events recorded in still image or video format and shared almost instantly with a potentially global audience likely do not incur any costs to the creator or viewer of these captured events. Whilst there still is (and probably always will be) a market for professionals with specialist skills and/or equipment capable of ensuring that the most special events are well documented, the bulk of revenue generated by an industry based on satisfying the basic human need to capture, share, and archive life events will come from sales of compact cameras with constantly improving functionality.

### *The Emergence of the Smartphone Camera*

Today, cameras embedded into smartphones are seen as an essential feature. The first mobile phone to include a camera, the J-Phone, was launched in Japan in 2000. The camera in this phone was rear-facing so that it could be used like a traditional camera. The business opportunity that this innovation created was essentially born out of the demand to be able to capture and share life moments instantly, something digital cameras could not do because the images had to be transferred via memory card to a computer for electronic processing and distribution. Over the years that followed, the quality and resolution of the camera lenses consistently improved. Today, top-of-the-range phones challenge



compact cameras in performance, and phone manufacturers form strategic alliances with manufacturers of high-quality lenses to address this opportunity.

For rear-facing cameras to not only capture images (and, later on, video), but also instantly share those images, the wireless telecommunications networks needed to be fast enough to be able to transfer images to recipients, initially via SMS picture messaging. It was not until late in 2003 that some mobile phones introduced front-facing cameras, including the Sony Ericsson Z1010 and Motorola A835. The iPhone 4, released in 2010, was the first iPhone to include a front-facing camera module. The early front-facing cameras had very low 0.3 megapixel lenses because their introduction for face-to-face video calls was limited in functionality by the speed of the wireless telecom networks of the day and because, it was thought, the quality of the video in a face-to-face call was of less importance than simply being able to see the person at the other end. The makers of these early front-facing cameras weren't envisioning that they might be used to take "selfies."

**The latest generation of drones, equipped with action cameras that can be controlled by a mobile phone, brings aerial photography and videography to the masses.**

### Enter the Selfie

The first selfie taken with a camera is credited to Robert Cornelius, who in 1839 used a box camera and ran round the front, stood still for a minute, and then replaced the lens. Buzz Aldrin was the first astronaut to take a selfie from space in 1966, but it wasn't until around 2012 that the word "selfie" and the action of taking one's own photograph gained mass popularity. By 2013, it had become commonplace enough to be included in the online version of the *Oxford English Dictionary*.

In October 2013, Imagist Labs released an iOS app called Selfie, which allows users to upload photos only from their front-facing smartphone camera. The app shows a feed of public photos of everyone's selfies and those of the people they follow. The app, which soon gained popularity among teenagers, does not allow users to comment; they can only respond with selfies.

An early selfie stick, possibly the first, was used in the 1980s by Hiroshi Ueda to overcome the difficulty of taking self-photos whilst on holiday. This early invention used an extensible rod attached to a traditional small camera tripod to mount a compact camera with a mirror to enable the user to preview the image. This invention, rather than being a roaring success, actually made it into a book of 101 "un-useless" inventions (i.e., inventions that are *almost* useless but not quite). Of course, selfie sticks are now ubiquitous, although they are not always popular. Sometimes, as at large events where they can interfere with the pleasure of others, they are actually banned.

### The Role of Social Media and Mobile Apps

Since the era of Web 2.0, characterized by technologies that empowered users to publish their own content via the Internet, social media sites such as Facebook and YouTube have offered hosting services that encourage the capture of digital images and videos and have provided an archive for instant sharing and retrieval of them by both users and their social/global network.

The business model for these digitally enabled services is largely based on revenue from advertisers and sponsors who gain exposure every time videos and images are viewed. The value of these companies is also related to this phenomenon and the number of members/users.

The acquisition of new hardware products such as the Oculus Rift by companies like Facebook is an indication that they see a strong market opportunity for technologies that provide an even richer viewing experience, primarily through virtual reality.

### Action Cameras

The almost insatiable demand for technologies that enable users to document, share, and archive life events has also spawned the emergence of "action cameras," such as the GoPro Hero range. These rugged, compact devices are increasingly able to capture high-resolution images and broadcast quality (4k) video of action events for which using a handheld camera or mobile phone would be impractical. These devices can record and share such life events as skiing, snowboarding, surfing, and diving, which previously could not be captured without professional equipment. This has created business opportunities related to both camera technologies and a range of mounting accessories designed to cover any scenario.



## Drones

Another technology that has been driven and enabled by the desire to document and share life events in ever richer and more innovative ways is the drone. Previously, aerial photography and videography were really only possible through the use of helicopters and planes manned by experienced professionals. The cost of hiring such a team is beyond the reach of most individuals, but the latest generation of drones, equipped with action cameras that can be controlled by a mobile phone, brings aerial photography and videography to the masses (see Figure 3). Aerial photos and videos can now be captured by a single user equipped with a drone and a smartphone, which can not only control the drone, but can also preview images and video on the phone and even capture those images and videos as they are streamed wirelessly from the action camera mounted on the drone.

## Physical Artifacts from Life Events

The ability to capture, share, and retrieve life events digitally does not satisfy the associated human need to have a tangible artifact such as a photographic print that can be stored in a wallet or kept in a photo album. Consequently, there will always be a business opportunity to provide products and/or services that fulfill this need. Ubiquitous examples of this can be found in large retail chains and superstores, which will print images from customer media (e.g., memory cards/sticks) onto not only photographic paper, but also mugs, mouse pads, T-shirts, and all kinds of other merchandise.

## Business Opportunities from Emerging, Disruptive “Life Events” Technologies

Looking ahead, the digital technologies that have already transformed the recording and sharing of life events will likely be joined by 360-degree cameras and virtual reality, as well as enhanced video- and teleconferencing technologies. The principal drivers for the development of these market opportunities have been:

- The basic human need to capture, share, and archive life events
- The desire for instant gratification of this need
- The demand for independent control over the capturing, sharing, and archiving
- The added value of “richness of experience”



Figure 3 — Image taken using a 3DR drone and GoPro Hero 4 camera.

The barriers to the development of these business opportunities have been and will continue to be the capability and affordability of key technologies, primarily:

- High-speed wireless networks
- Graphics and “viewing” technologies such as VR headsets and 3D displays

In the case of 3D technology, it is significant that the prime manufacturers of 3D-capable television sets have now left the marketplace, principally because of the limitation of having to wear special glasses to view 3D movies. Thus, the 3D experience market is largely confined to public viewing spaces, such as cinemas, where the wearing of glasses is just part of a special event outside the home.

## 360-Degree Cameras and Virtual Reality

The latest imaging technology to emerge is potentially the most disruptive force in the life events technology space yet. 360-degree cameras such as the Ricoh Theta S and Samsung Gear 360 are able to provide the new and previously impractical experience of creating images and videos of a complete 360-degree space. This disruptive technology adds a whole new dimension to the capturing, sharing, and archiving of life events, including sharing these events in real time, which empowers the viewer to effectively become totally immersed.<sup>1</sup>

Facebook and YouTube currently offer video streaming of downloaded 360-degree video clips, and both companies are moving into the live streaming of events in 360 degrees through the use of these consumer cameras.

The viewer has the ability to control the viewing experience through a range of devices such as VR headsets, mobile phones, and computer screens. In my opinion, the rapid development of these devices and services will sound the death knell for 3D camera and screen technologies and will create new business opportunities enabled by 360-degree video.

As with all new disruptive technologies, the business opportunities enabled by 360-degree cameras will initially be limited by the key technologies that impact the quality of the experience, the accessibility of viewing technologies, and the speed of wireless technologies. But based on the experience of previous innovations targeting life events, the demand for the richness of 360-degree viewing will create a virtuous circle that drives the development of all the critical sectors.

The impact of these 360-degree cameras in enabling virtual reality experiences that can be easily accessed via VR headsets and smartphones is already being felt as major social media platforms such as Facebook, YouTube, and Vimeo are actively promoting 360-degree videos and images. This is apt to fuel the demand for 360-degree cameras and applications that simplify and enhance the editing and publishing of 360-degree videos. The next logical development in this area is the inclusion of tools that add interactivity and gamification elements such as Pokémon-type challenges and the use of artificial intelligence to generate movie-style special effects.

### ***Video- and Teleconferencing Technologies***

It is also likely that 360-degree video will create business opportunities in the videoconferencing, Web broadcasting, and teleconferencing space. This market has matured greatly since the introduction of the early boardroom videoconferencing solutions, which failed to live up to expectations for a range of reasons, including:

- High cost and inflexibility of systems
- Poor quality of the experience
- Failure to reproduce the effectiveness of face-to-face meetings

360-degree video, once it has been enabled by better camera lenses and sufficiently high-speed telecom networks, has the potential to bring high-quality videoconferencing and broadcasting to a mass population, driving a demand for cameras, VR viewing technologies, and 360-degree hosting services.

## **Lessons to be Drawn from the Impact of Digital on the Photographic Industry**

These reflections on the disruptive impact of digital technologies on the photographic industry are intended to provide a general insight into the way in which enabling and disruptive digital technologies can destroy or force fundamental change in well-established traditional industries whilst creating totally new business opportunities for companies *and* startups with no previous track record or presence in those sectors.

There are many examples of how digital technologies have disrupted markets and companies. Consider the Virgin Group, which began as a vinyl record direct sales organization in the 1970s and now has a presence in travel, insurance, health and fitness, and banking. Virgin has been able to recognize and leverage the power of digital technologies to satisfy basic human needs in richer and more competitive ways than established providers.

For companies established well before the digital age or startup companies seeking to make an impact, the most important takeaways from this article are:

- Identify and understand the basic human need behind your products and services.
- Seek to develop digital offerings and channels that address both “instant gratification” and consumer control/personalization of your products and services.
- Understand and leverage the power of disruptive digital technologies to provide the richest possible consumer experience both in the purchase of your products/services and their usage.

## **Endnote**

<sup>1</sup>For an early example of a 360-degree video used to capture and share a life event through social media, see [www.youtube.com/watch?v=LnvVQg6mI3I&t=6s](http://www.youtube.com/watch?v=LnvVQg6mI3I&t=6s).

*David Wortley is the founder and CEO of GAETSS (Gamification and Enabling Technologies Strategic Solutions), a UK-based consultancy that specializes in understanding and predicting the impact of disruptive technologies on business and society. He is a Fellow of the Royal Society of Arts, a respected speaker at international conferences, and a contributing author to the recent book The Future of Business. He can be reached at [david@davidwortley.com](mailto:david@davidwortley.com).*



# Disrupt or Be Disrupted: The Digital Business Imperative

by Vipin Jain

## Welcome to the Digital Age

We are living in the digital age, where emerging digital technologies, business models, and the reduced cost and time for trying out innovative business solutions are transforming both personal behaviors and businesses, irrespective of a company's industry, geography, or size. Attend any conference or open any magazine, and chances are you will be reminded about the need to exploit the new business opportunities created by the ongoing digital disruption or run the risk of being left behind. Business leaders need to be aware of the risks posed by agile, innovative firms that can respond faster to dynamic business demands, provide timely competitive offerings, and deliver enhanced customer experience while reinventing — or at times newly inventing — sectors of the economy.

No industry is immune to digital disruption, and most of them are in varying stages of responding to the phenomenon in the hope of retaining — and hopefully growing — their market share. Successful digital startups like Uber (taxi, shared economy), Netflix (movie and TV show rental/streaming), Amazon (retail and cloud services), Facebook (social), and Airbnb (hospitality) are perfect examples of disruptors that, in a very short period of time, have established themselves as leaders of their respective business domains while offering tough competition to market leaders and at times driving them out of business. As of last year, five of the top seven S&P 500 companies (Apple, Alphabet, Microsoft, Amazon, and Facebook) were businesses that were started within the past three decades with small seed money but big, innovative ideas that led either to reinventing a market or creating a new one.

Today's pure digital businesses (e.g., Amazon, Facebook, Google) serve as role models for savvy traditional companies (e.g., GM, Citi) that are ready to retool and advance into the digital age. A quick review of companies listed in the *Fortune* 100 over a period of a few decades shows that remaining on this list is tough; it requires ongoing innovation, agility, and capability to adapt to a dynamic business environment. Established companies like GE, Disney, JPMorgan Chase, and

American Airlines have proved that being innovative and agile is not limited to startups. These companies are successfully executing on their own digital transformation journey while taking full advantage of opportunities provided by digital disruption.

In this article, I discuss key drivers for adoption of digital business, propose a framework organizations can use to guide their digital transformation efforts, and consider the value digital transformation is delivering in areas of healthcare, travel, and government.

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## Drivers of Digital Business

Digital experiences have become a standard part of daily life. Leading companies recognize that digital disruption presents multiple growth opportunities, including delighting their customers with convenience and personalization, leveraging the wealth of data trails from digital activity to get even closer to the customer, and using technology to operate faster and better.

The digital business trend is driven by many factors, including technological advances, emerging business models, increasing customer expectations, and the will to retain market leadership. Disruptive innovations are interrupting businesses continuously in almost every sector, and everyone seems to be in a race to become the leader of their own industry.

Figure 1 provides a quick overview of the leading drivers influencing the next wave of innovation and digital businesses. To be successful with digital transformation, organizations need to understand these drivers properly and develop and execute on a holistic, integrated strategic plan addressing the needs of the business.



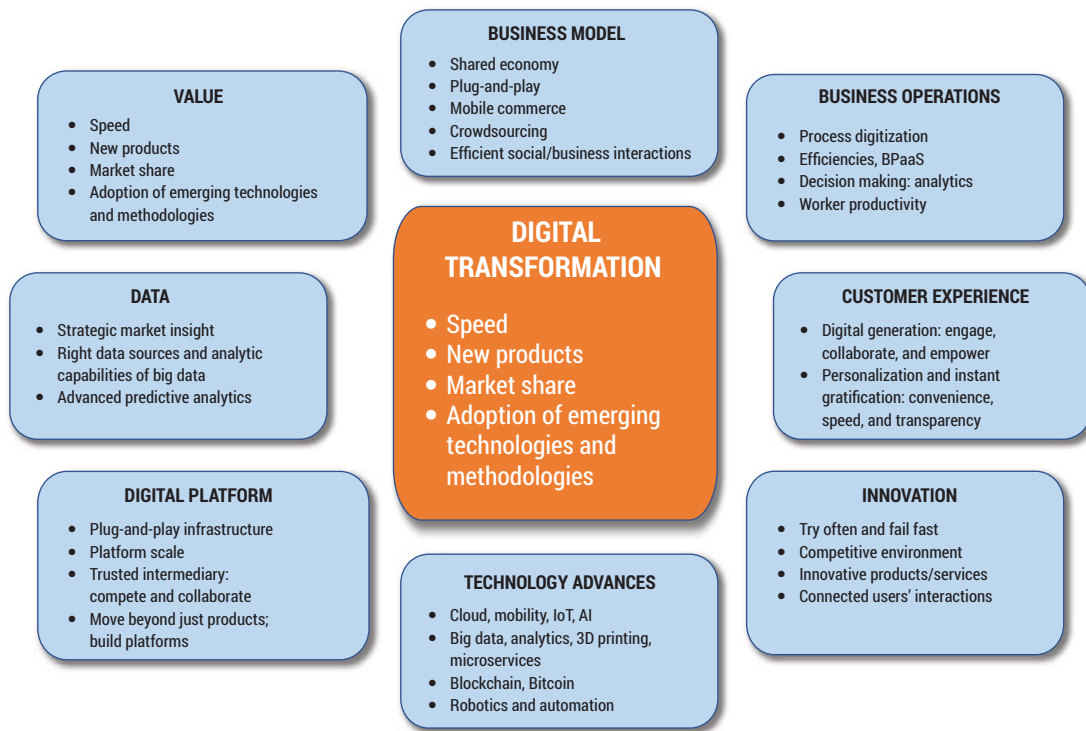


Figure 1 – Key drivers impacting businesses and encouraging digital transformation.

## Technology Advances

Over the past couple of decades, technologies have advanced and become ready for industrial use at an unprecedented rate, impacting all aspects of business. Organizations are actively considering technologies like artificial intelligence (AI), the Internet of Things (IoT), cloud, 3D printing, predictive analytics, computer vision, and others for the solutions they are envisioning. For example, smart cities solutions rely on IoT, analytics, and AI; self-driving cars leverage sensors, computer vision, robotics, and AI; and digital healthcare and artificial limbs depend heavily on AI, analytics, and 3D and 4D printers. Leveraging these technology advances requires an integrated, holistic plan to achieve optimal benefits.

We're now in the midst of an ongoing emergence of revolutionary technologies such as blockchain, Bitcoin, microservices, APIs, and so on, each one quite capable of transforming an existing industry or creating a new one. Consider blockchain, which is an open distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way. The ledger itself can also be programmed to trigger transactions automatically. According to an industry survey, 90% of major banks in North America are exploring the use of blockchain technology for payments.<sup>1</sup> One accounting firm, EY Switzerland, has provided digital wallets to all of its employees, has installed a Bitcoin

ATM in its office in Zurich, and accepts Bitcoin as payment for all its consulting services.<sup>2</sup> Companies such as Netflix believe that speed is key to winning in the marketplace and are adopting technologies like microservices, APIs, and DevOps to achieve the required speed and replace silos with microservices teams.<sup>3</sup>

## Business Model

With these technology advances, new business models such as shared services (e.g., Uber, Airbnb), mobile banking (e.g., payments, funds transfers, remote deposits), and crowdsourcing (e.g., Be My Eyes, IdeaConnection) have matured and become viable. Other disruptive business models include:

- App-only banks with no branch offices but higher returns
- Healthcare plans that use high-tech screening and wellness tools to deliver health services for US \$149/month with no limits or deductibles
- Robots that can “walk” a farmer’s crops looking for pests
- Digital government initiatives that use emerging technologies to improve citizen services

The advent of new business models and supporting technologies has opened new business opportunities that individuals and companies — from startups to



large established firms — can pursue. Companies are not only reengineering and optimizing their business processes to leverage new technologies, they are also transforming how these processes interact with each other within the company and between involved partners.

### ***Business Operations***

Customer experience is arguably the first change observers will notice as a result of digital transformation, but it is just one part of digital transformation, albeit a highly visible one. Other parts of the transformation are generally hidden behind the scenes, but they are as critical as customer experience. Businesses are getting big paybacks from digitization of internal processes, which enhances employee productivity and overall performance. Leveraging automation and process digitization enables the delivery of business processes as a service (BPaaS), as well as self-service for standard functions like HR-related tasks. Collaborative tools allow for virtual teams, thereby removing the limitation of physical offices and facilitating more active participation by all. These capabilities are critical for the bottom line in terms of overall speed, throughput, profit, company reputation, and growing revenue from digital business.

### ***Digital Platform***

With digital business, the distinction between partners and rivals is being blurred, and businesses need to develop a keen understanding of all the different relationships that might exist between firms in their orbit and how they might cooperate and/or compete with them. It is quite possible to compete with a company for one business opportunity while cooperating with them on another, resulting in what has been called “coopetition.” For example, within the entertainment (television) industry, HBO competes with Netflix (as it does with Showtime) for programming market share, but it collaborates with Netflix to have leverage against distribution channels such as Comcast and Amazon.

Firms should focus on developing effective digital platforms and becoming trusted intermediaries that can bring competing businesses together. Some fast-growing companies like Facebook, Apple, Uber, and Airbnb are leveraging digital platforms for business growth. These businesses have created an open, participative, plug-and-play infrastructure that allows both consumers and producers to collaborate and work together effectively, enhancing overall business value.

### ***Data Analytics***

In today’s digital world, it is critical to assemble the right data and turn it into strategic assets to make timely decisions for business and customer interactions. Most probably, this will require collaboration not just within an organization but with partners as well. As part of a data strategy, we need to consider data sources, analytical capabilities of big data, the role of data-driven decision making, and risks around data privacy and security.

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### ***Customer Experience***

We are living in an experience-based economy without traditional loyalty to brand or company. Irrespective of industry, one common competitive advantage is the customer experience you offer. A high level of differentiated experience enables market leadership (think Amazon in retail, or Netflix in entertainment) and a premium price position. Providing a great customer experience requires a good understanding of your customers and the digitization of customer touchpoints.

Businesses are building their analytics capability to understand customers in more detail. For example, insurance companies are improving their portfolios and cost structures through analytics-based underwriting and pricing and using technology to enhance in-person sales conversations.

### ***Innovation***

Today’s emerging companies are born digital. They can change — and change fast — to answer consumer demand or a competitive offering. So how can an enterprise win at digital? I believe the answer lies in digital transformation and the innovative solutions you develop as part of it.

## **A Digital Transformation Framework**

An effective transformation framework and plan can support enterprises in achieving their full potential in

the age of disruption. In my view, there are three approaches to digital transformation:

1. Business model transformation
2. Business operations transformation
3. IT transformation

These approaches are well integrated with each other, and organizations need to look at them in a holistic manner instead of treating them in isolation. Figure 2 provides a high-level overview of a digital transformation framework that has been used successfully by many businesses across different industries.

**While consumers are not aware of the transformation at the IT level, they will ultimately benefit from it.**

### Business Model Transformation

The rarest and least predictable of the digital transformation approaches, business model transformation causes the most disruption not only to the business itself, but at times to the whole ecosystem in which a business exists. It typically involves changing part of the supply chain and thus impacts both operations and

the underlying IT. This approach is generally led by the CEO, CFO, or CMO and is supported by the COO, CIO, CTO, and other business leaders. Businesses that rely heavily on data intelligence need to develop connected services and produce insights to see what can be monetized to unlock new business models.

### Business Operations Transformation

Digital technologies allow businesses to move at incredible speed, accelerating their responsiveness to uncover issues and inefficiencies, predict what will happen, and then adjust as needed. Business operations transformation may be required to support a change in the business model, add a new business capability, or improve operations through the transformation of customer experience, products and services, and/or core operations. One example is using automation to eliminate manual work.

### IT Transformation

An organization's underlying technology will need to transform internally to support new business capabilities, enable operational improvements, and take advantage of emerging technologies like cloud, SaaS, and virtualization. IT transformation requires taking a portfolio approach to IT and managing it effectively to maximize the return on investment while meeting business needs. Successful transformation demands an

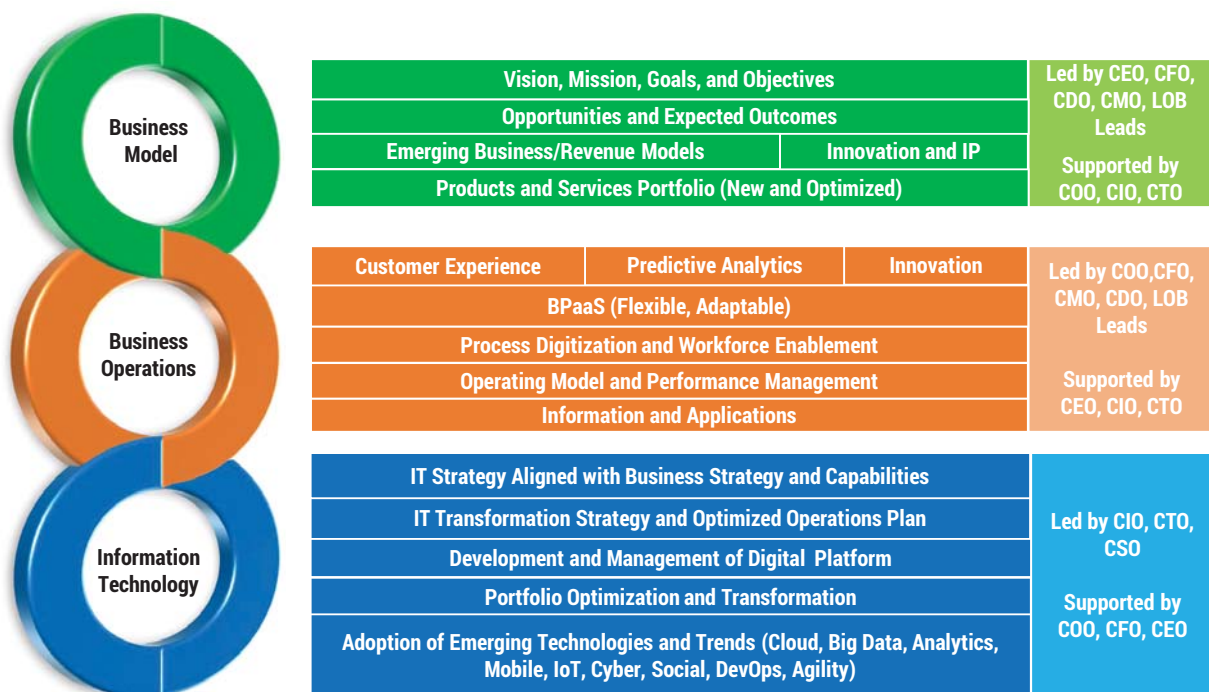


Figure 2 – A digital transformation framework.

effective alignment of business strategy with IT strategy and the transformation roadmap. While consumers are not aware of the transformation at this level, they will ultimately benefit from it.

### Which Approach Should You Choose?

Most enterprises should focus their energies and budget on the sweet spot where they can get quick *and* long-term benefits — and this may vary depending on their strengths, weaknesses, and competitive pressures. As you start your journey of digital transformation, irrespective of your current situation, keep the following in mind:

- Don't be hyperactive; think rationally about your fear and anxiety.
- The best response to fight back against disruption is not to try to replicate the disruptor's strategy and look to disrupt a business model, but instead to focus on your products, services, operations, and customer experience.
- Reassess what you do and how you do it. Learn from others who have been disrupted, such as the newspaper and travel industries.
- Customers are focused on features like customer experience and personalization and will move somewhere else if you don't remove friction from your processes.

Businesses going through digital disruption must ask critical questions about their organization and honestly assess their capabilities to develop a practical strategic plan and move forward to achieve their vision:

- Are we the innovator and disruptor?
- Are we being disrupted by someone else? If so, how: business model, business operations, or IT?

- What are the opportunities and risks posed by digital disruption?
- How do we leverage these opportunities to achieve our full potential and win in the digital age?
- Do we have the right resources and transformation strategy to achieve our vision?
- How do we address the gaps we might have in our strategic plan?

### Emerging Digital Business Opportunities and Value

According to industry analysts, 67% of Global 2000 enterprises “will have digital transformation at the center of their corporate strategy” by 2018.<sup>4</sup> Companies like Uber, Netflix, Amazon, Spotify, Coursera, and PayPal started as digital businesses and have digital in their DNA. Many established businesses like Mercedes-Benz, American Airlines, GE, JPMorgan Chase, Boeing, and Walt Disney have made digital transformation a central focus of their business strategy and are reaping the benefits from it. Many other businesses are either in the early stages of this digital transformation or face the risk of becoming obsolete.

Sooner or later, all industries will be impacted by digital disruption. In fact, digital business has invented new industries that did not exist before. Figure 3 provides a quick overview of various industries and their current status in terms of digital disruption.

Even though being disrupted will be difficult on laggards, it does not mean that an industry is dead. It only means that the industry is reinventing itself, and surviving in this environment will require businesses to adapt to the changes quickly. For example, even though many long-standing daily newspapers have withered or died,

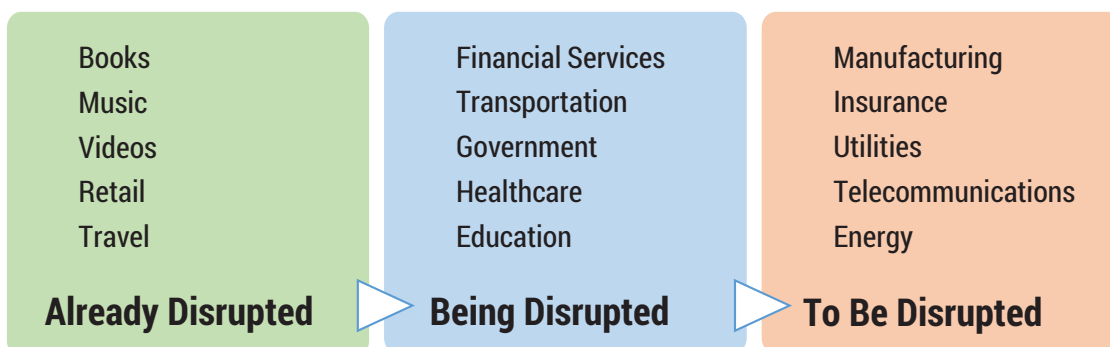


Figure 3 — Industries being impacted by digital disruption.

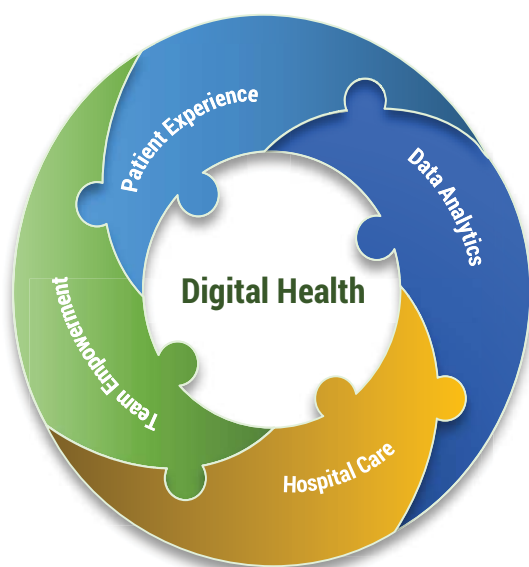
newspapers like the *Washington Post* have reinvested in themselves and are beginning to thrive.<sup>5</sup> Depending on the industry, changes may involve new business offerings, new partnership or compensation models, more efficient operations to attract new clients, or improved underlying technologies and infrastructure. For example, within manufacturing, 3D printing may be used to create custom-made parts faster and at a reduced cost. In the following sections, I review three business areas — digital health, digital airline, and digital government — and discuss the current state of each industry, key challenges, and the digital disruption taking place. I also show how innovators are converting these challenges into business opportunities and delivering innovative solutions for the benefit of society.

## Digital Health

The healthcare industry is under tremendous pressure to deliver higher-quality care at lower cost. Lack of sufficient health insurance, ineffective government policies, and hard-to-access health record data lead to delayed treatment of diseases, increased complexity, and higher cost of treatment. A shortage of skilled healthcare professionals, the emergence of new diseases, and changing expectations from patients make it still more difficult. Going digital is one key to reducing cost by streamlining organizational processes, analyzing the clinical data needed to make better healthcare decisions, and offering better health management tools to caregivers and consumers.

Scores of health providers, both startups and established players, are trying new approaches that use emerging technologies to deliver healthcare services more effectively, often with a focus on prevention, wellness, and managing chronic conditions. Innovators and early adopters of digital health are relying on emerging technologies (cloud, AI, analytics, social, cyber), reengineering patient experience and operations (comprehensive patient engagement, personalized medicine, coordinated care and record keeping), and focusing on delivering innovative solutions to earn a share of the trillions of dollars in annual healthcare spending. Figure 4 provides details on some of the key capabilities required to achieve the full benefit of digital healthcare.

Forward, a medical startup just launched by serial entrepreneur Adrian Aoun, provides access to futuristic primary care for US \$149 a month.<sup>6</sup> There are no copays, and membership — as with Netflix — covers an all-you-can-consume set of services from the practice: doctor visits, a baseline screening, access to Forward's team of doctors and nurses via email, ongoing monitoring through wearable devices, and even some medications and supplements. You'll still need to buy insurance to cover things like hospitalizations, surgeries, and specialist care, but Forward takes care of basic healthcare at a much more reasonable cost.



## Digital Health

Innovative and transformative healthcare leverages emerging technologies such as cloud, AI, analytics, sensors, digitization, and genomics to drive better diagnosis and treatment.

### Patient Experience

- Patient engaged using multiple channels including pre/during/post treatment to get and stay healthy
- Access to coordinated healthcare and integrated, secured healthcare records

### Data Analytics

- Quick decision making and insight enriched by data
- Clinical and operational analytics
- Research powered by infinite data storage and computing power

### Team Empowerment

- Innovation-empowered healthcare team (natural human-computing interfaces and interactions)
- Paperless intelligent sensors and devices

### Hospital Care

- Ubiquitous, personalized, connected experience
- Virtual health and remote monitoring
- Citizen-centric, trustworthy social connections

Figure 4 — Essentials for digital health.



## Digital Airline

Over the past couple of decades, the airline industry has gone through a lot — terrorism, which resulted in increased security requirements and cost; global financial instability, which led to fluctuating travel demand; and higher fuel prices, which impacted the bottom line. Ever-increasing competition from global and regional airlines and travelers' demands for better customer experience have forced airlines to develop new business models, optimize business operations, and fully leverage emerging technologies effectively.

Digital disruption is impacting all core capabilities of the airline industry, including sales, route scheduling, customer service, seat occupancy, loyalty programs, and more. Airlines that have not been able to change with the times have either been acquired by other airlines or gone out of business. Most airlines that are undergoing digital transformation are focusing on three areas (see Figure 5):

- Customer experience
- Operations and employee productivity
- Aircraft connectivity

### Customer Experience

Customer experience includes collecting and understanding customer behaviors and providing offers and experiences that are personal, relevant, and connected

across all journey touchpoints, thus promoting customer loyalty and workforce productivity. Let us review a couple of these touchpoints:

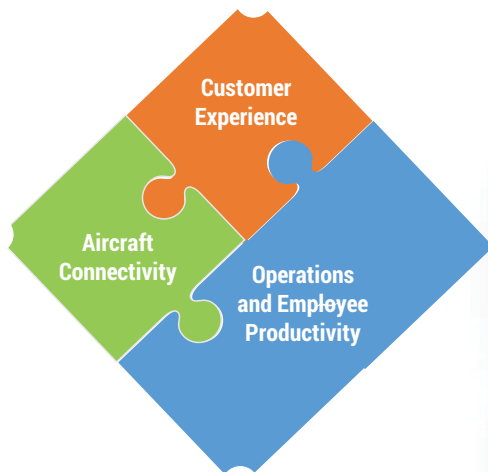
- **Digital airport** — provides a seamless transition from arrival at the airport to ticketing to boarding, and then from landing to baggage claim to departure from the airport with personalized and location-aware mobile devices
- **Multichannel commerce** — focuses on delivering the right product to the right customer in the right place at the right time

Most successful airlines have been focusing on customer experience, and based on an industry poll, JetBlue and Southwest have emerged as the top scoring airlines in this category.<sup>7</sup>

### Operations and Employee Productivity

This area includes providing passengers with exceptional integrated services while improving operational efficiencies and capturing critical data in time to provide rich insight. Operational efficiencies include things like efficient flight, ground, and airport operations:

- **Flight operations** — requires effective communication among crew and maintenance crew to deliver excellent passenger services and resolve issues in time; enables easy access to crew schedule, flight manuals



## Digital Airline

Airline provides innovative and transformative air travel experience to passengers, while fully leveraging emerging technologies such as cloud, AI, analytics, sensors, digitization, and genomics to drive exceptional customer experience, efficient operations, and employee productivity.

### Customer Experience

- Customer servicing
- Sales and marketing
- Loyalty management

### Aircraft Connectivity

- Product experience
- Safe and reliable experience
- Optimized performance

### Operations and Employee Productivity

- Flight operations
- Revenue management
- Maintenance and engineering
- Airport operations
- Crew planning

Figure 5 — Essentials for a digital airline.

- **Ground operations** — enables improved aircraft maintenance and safety through collaboration; quick identification and resolution of any maintenance issues
- **Airport operations** — leverages in-air and on-ground data and analytics to drive efficiency and resolve any airport operational issues by communicating with experts

### Aircraft Connectivity

Seamless connectivity between aircraft, staff, passengers, and processes enables a friction-free passenger journey. It ensures optimal product experience and performance, including onboard comforts and conveniences provided through optimized crew and flight operations.

### Digital Government

As private businesses across different industries are transforming themselves with digital technologies, citizens across the globe are calling on their respective governments to follow suit. Even though effecting any change, including digital transformation, tends to be more challenging within the public sector than the private sector, government leaders at all levels are listening to citizens and realizing that they need to transform how government is working today.<sup>8</sup> They are looking for ways to improve the public's experience with government at the federal, state, local, agency, and department levels and supporting initiatives to build, buy, and share technology that allows for efficient services for citizens and businesses. Constrained budgets and

increased expectations from citizens are encouraging the use of emerging digital technologies to reengineer and streamline business processes and operations to deliver services focused on customer experience.

Irrespective of size, the digitizing of any agency is complex and requires special attention to core capabilities for engaging citizens, other agencies, and private businesses. Leading business strategy consulting firms suggest that when done successfully, worldwide government digitization can save \$1 trillion annually in economic value.<sup>9</sup> Figure 6 provides a high-level overview of various capabilities a successful digital government must have, as well as some of the critical elements (e.g., strategy, governance) that enable them.

Most governments across the globe realize the complexity and criticality of transforming themselves, but they also see the potential benefits of doing so. Examples of digital transformation at the federal and municipal levels include:

- The US General Services Administration (GSA) created 18F (now part of the GSA's Technology Transformation Service [TTS]) and the White House launched the US Digital Service (USDS) to focus on fostering digital transformation by helping agency leaders understand and implement new approaches, business models, and technologies.<sup>10</sup>
- Striving to become "The Smartest City" in the world, "Singapore is using data to redefine what it means to be a 21st-century metropolis."<sup>11</sup>
- In India's Smart Cities Mission, the Ministry of Urban Development has identified 60 cities to be developed

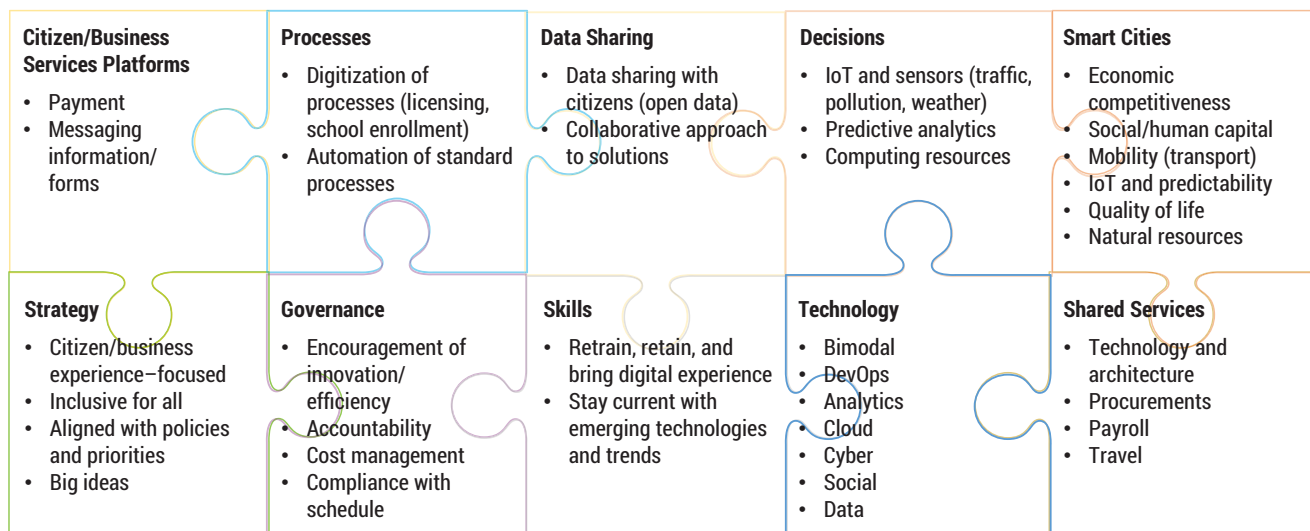


Figure 6 — Essentials for digital government.

as smart cities and “use technology, information, and data to improve infrastructure and services.... [to] improve quality of life, create employment, and enhance incomes for all.”<sup>12</sup>

Digitization helps governments make their services more accessible, efficient, and effective.

## Conclusion

The digital age is here to stay, and so are the disruptions it is causing across different industries. In fact, digital transformation is just getting started, with organizations leveraging current and emerging technologies to create new business models and optimize business operations. Successful digital transformation requires organizations to have a holistic view of business strategy that drives overall IT strategy and enables the changes required by business. Even though it is difficult to forecast how much digital disruption will impact any particular industry or business, sooner or later every industry will be affected. Savvy business leaders are not taking any chances and are facing the challenge head on. They are anticipating upcoming digital disruptions and working to convert them into strategic opportunities to retain or gain market leadership. A final word to the wise: *be the disruptor or be ready to be disrupted by one.*

## Endnotes

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<sup>8</sup>“The Government We Need.” Technology CEO Council, January 2017 ([www.techceocouncil.org/tcc\\_reports/the\\_government\\_we\\_need/?back=Reports](http://www.techceocouncil.org/tcc_reports/the_government_we_need/?back=Reports)); Digital India (<http://digitalindia.gov.in>); “Shaping the Future of Digital Economy and Society.” World Economic Forum ([www.weforum.org/system-initiatives/the-digital-economy-and-society](http://www.weforum.org/system-initiatives/the-digital-economy-and-society)).

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Vipin Jain is CTO for Optimal Technology Solutions Inc. (OTSI) based in Chantilly, Virginia, USA. He leads OTSI's Digital Transformation Strategy and Architecture practice. Mr. Jain has over 30 years of experience in all aspects of technology management and solution delivery, including digital and IT strategy, enterprise and solution architecture, IT portfolio optimization and transformation, and deployment of global business solutions. Prior to joining OTSI, he held various executive-level positions with HPE, Microsoft, and Accenture, where he advised industry executives from Fortune 500 companies and US federal agencies delivering innovative business solutions. Mr. Jain also held executive-level positions within AIG, Merrill Lynch, Citibank, First Chicago, Empire Blue Cross Blue Shield, and other firms, managing technology across several enterprise-wide initiatives and performing due diligence of potential acquisitions. His breadth of experience includes work with large and small commercial companies, US federal and state government agencies, and management consulting firms. Mr. Jain has worked in multiple business domains, including banking, brokerage, insurance, healthcare, pharmaceuticals, energy, consulting, banking, and government. He is a member of industry groups focused on the public sector, digital and IT transformation, big data, and cloud. He can be reached at [vipin@optimaltsi.com](mailto:vipin@optimaltsi.com).



# How Can Companies Harness Disruptive Technologies?

by Raj Ramesh

## Current Challenges

Earlier this year, Fukuoka Mutual Life Insurance announced that it planned to replace 34 white-collar workers with IBM's Watson Explorer, a machine with cognitive capabilities.<sup>1</sup> It is the dawn of the cognitive era, and we will see more and more disruptive technologies being introduced in the business environment. How do we prepare for this?

The business environment is changing at a faster rate than ever before. One of the drivers of change is clearly technology, which is disrupting business at multiple levels. Within the organization, technology is disrupting business processes and the roles people play. Outside the organization, technology is enabling new business models, leading to new forms of competition. Today's customers have much more access to technology and devices, and they expect to use those to interact with businesses. They also expect businesses to offer more sophisticated, smarter products and services tailored to their needs and preferences.

## Multiple Dimensions of Change

To complicate matters, we face a plethora of disrupting technologies such as virtual reality (VR), cloud computing, mobile computing, blockchain, artificial intelligence (AI — including machine learning, deep learning, and cognitive systems), and more. However, disruptive technology can offer a business tremendous value if it is integrated well into the organization. Disruptive technologies may enhance old processes or enable new ways to do things.

In the earlier days of the Internet, integrating one technology was hard enough. How can we integrate multiple technologies into today's businesses? What parts of the business a company chooses to build in-house and what parts it chooses to outsource is a strategic decision. Apple, for example, has created an ecosystem in which all its products are intended to connect seamlessly with one another for a richer user experience. United Airlines, on the other hand, focuses only on the flight segment of a person's travel. Understanding the

desired customer experiences will help companies decide how to strategically leverage vendors that specialize in specific solutions, while at the same time integrate with their internal business processes. Examples of such providers include LinkedIn's social platform, Uber's ride sharing, and Visa's payment processing.<sup>2</sup>

We need a structured approach to effectively deal with multiple dimensions of these challenges. In this article, we will explore a framework for integrating new technologies into business processes. To make the framework more concrete, we will look at the impact of two specific technologies — artificial intelligence and virtual reality — on a hypothetical grocery store chain. Of course, you can adapt the framework for your own industry and include the technologies that are relevant to your context.

We will examine the impacts of technologies on multiple dimensions, including people, processes, customer experience, the organization's existing technology infrastructure, and business models. These are practical issues managers face. Some of their questions have centered around how to evaluate different technologies, what impact they will have on the organization, how much they will cost, when they should start working on them, and so on.

## The Ecosystem

A business operates within an ecosystem that includes the entities to which it connects in order to serve its customers. This ecosystem may include its suppliers, service providers, competitors, governing bodies, other stakeholders, and even intangibles such as the interest rate, customer preferences and desires, and so forth.

To adapt to changes in the business ecosystem, many organizations are embarking upon an exercise called "digital transformation," in which technology plays a significant role. The intent is for businesses to be more relevant to their customers, who are demanding much more than they have in the past.

Digital transformation is a complex and difficult exercise. This is because businesses are doing many things



simultaneously: they are modernizing existing systems, reconnecting those systems to the existing network, modernizing some parts of the network, introducing new and often disruptive technologies into the organization, and connecting these new technologies to existing or upgraded business processes. Essentially, there are too many parts and more avenues for failure.

Organizations often experiment with ideas in isolation without giving due consideration to how an idea fits within the larger context of the business, much less the business ecosystem. Thomas Edison invented the electric light bulb, but without a mechanism to produce electricity, distribute it, and charge for its usage — without the supporting ecosystem, in other words — the light bulb would not have been very useful.

The same principle applies to individual experiments in AI and other technologies. We need to understand how technologies integrate into the ecosystem of the organization. For example, if our experiments with machine learning show that we can predict customer purchase behaviors, how could that concept be integrated into the purchasing process? What effect would that have on social media feeds or the psyche of the customer? How could that affect inventory?

## The Framework

Disruptive technologies need to be integrated to achieve well-defined business goals, such as improving operational efficiencies, automation, customer experiences,

and enterprise asset management or launching new products or services. To transform your organization, you need to understand and model the current state, model the desired future state, and identify the work that will help your organization move toward that future.

As an example, we will use a lightweight exercise for the retail food industry, since many of us are familiar with how a grocery store operates. A grocery store and two disruptive technologies will illustrate some basic concepts.

### Visualize the Current State

Consider a hypothetical US grocery store chain called Big Grocers, which has 2,739 retail locations in 32 states. Most stores are profitable and currently operate as any typical grocery store does. If you are a customer, you drive to the store, park your car, walk in, take a shopping cart, walk through the aisles to load your items in your cart, head to the checkout counter to have the items scanned by a cashier, bag them, and take the cart back to the parking lot to load the groceries into your car.

The easiest way for most business people to understand the customer's shopping experience is to depict it visually. While a process map<sup>3</sup> is a common depiction, a simple illustration such as the one shown in Figure 1 is more useful for our purposes.

Viewing this current-state picture of the shopping experience, we might immediately see many possible areas Big Grocers could change in the future. What should the customer experience be in the future (say, five years

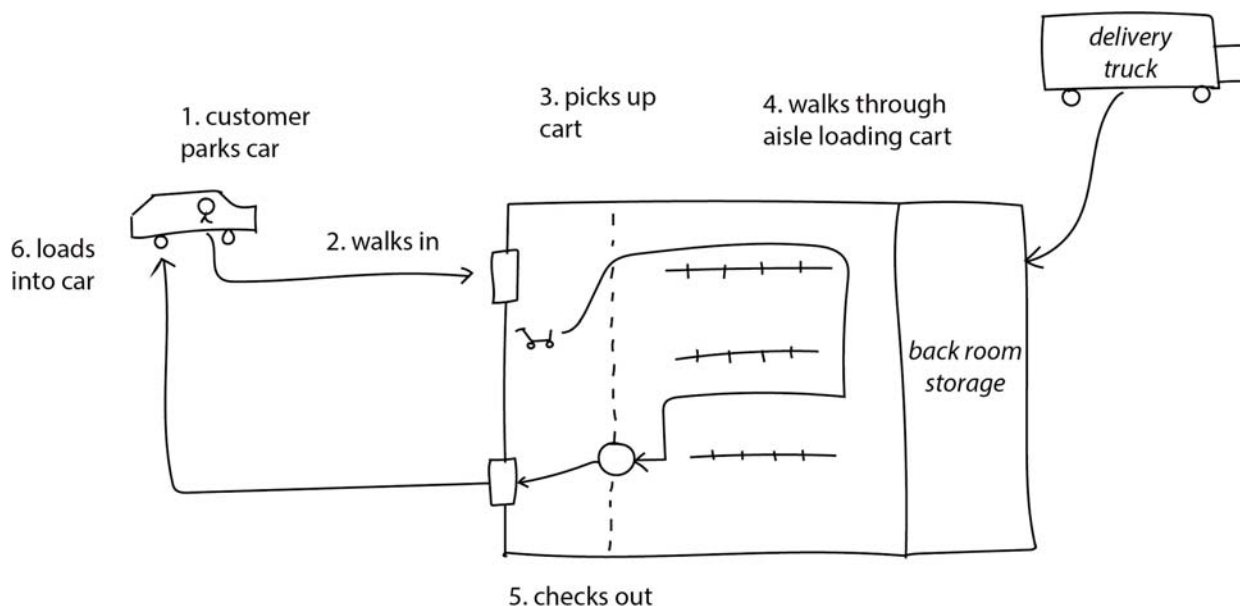


Figure 1 — The current state of Big Grocers.

out)? Before we explore that question, it is instructive to understand two things:

1. What technological advances have been made in recent years, and how can they help the business?
2. What do customers want to accomplish, and what matters to them (convenience, relationship, loyalty, etc.)?

There might be some business constraints, of course, but focusing on them might take some solutions out of consideration before they have even had a chance to be analyzed and debated. We can apply the constraints in a later phase, or seek ways to mitigate them.

**While not all disruptive technologies will be applicable in your domain, you won't know which ones are relevant and which ones aren't until you think them through in the context of your industry.**

### *Understand Available Technology*

Technology is integral to any large business today, and judiciously leveraging it gives some firms a competitive advantage. Airbnb, for example, created a different business model by leveraging technology to compete directly with the hotel industry.

Business managers do not need to understand how technologies work, but they do need to understand what each can do. With this knowledge, they can better understand where a technology can fit into the ecosystem.

While not all disruptive technologies will be applicable in your domain, you won't know which ones are relevant and which ones aren't until you think them through in the context of your industry. Hence, you will always need to keep abreast of technology. Lean on your IT department and people who are passionate about technology to help you.

### *Incorporate Company Goals and Strategy*

The future state of the business cannot be designed in isolation; we must consider the internal and external environment.

Say Big Grocers has identified that its current largest customer base is above the age of 35, but there is a big opportunity to cater to younger adults. Customers in the young adult segment have different characteristics

and needs. They are digitally savvy; they have relatively little money, since they may be just starting out on their careers; they may be single or recently married; if they have children, those children will be relatively young; and they tend to be busy people.

The store wants to grow its market share in the young adult segment. If we impose the characteristics and needs of this segment on the future state, we can virtually walk through a shopping experience as a young adult. Before creating a future state, however, we should understand the company goals and strategies.

To prove the point, say that the company's goals call for increasing the market share among the older generation instead. This segment typically has more money and is not technically savvy. They will not use virtual reality or any of the disruptive technologies for shopping. In that case, the company may still need to find ways to integrate technology into the organization, but it will not be integrated with the customer experience. Rather, it will be integrated at the back end to mature the distribution and supply chain management processes.

### *Visualize the Future State*

In our grocery store example, let's consider some ways the business might integrate disruptive technology. It is useful to "walk in the customers' shoes" as an exercise, but since we cannot do that physically, we will do it virtually.

Let's start with the first step, where the customer drives to the store and parks their car. In the future, this may be a fully electric, self-driving car. Would Big Grocers want to have electric charging stations so the car can be charging while the customer shops? Would there be a special section for such cars? Would customers even come to the store in the first place, or would they prefer to order online and have the groceries delivered by drones or self-driving trucks? Would the company then want to reduce the size of the parking lot? Would the store itself be smaller because fewer customers would be visiting the physical location?

We can see how a single question has multiple implications. The possible options branch out in many ways. Figure 2 shows some possible future enhancements in red.

We can ask similar questions of other stages in the journey. For example, say the customer shops through a VR-enabled device. They can walk through a virtual store, pick out items from the virtual shelves, and drop them in a virtual cart. Since fewer customers are coming to the store, we could reduce the shelf space and keep

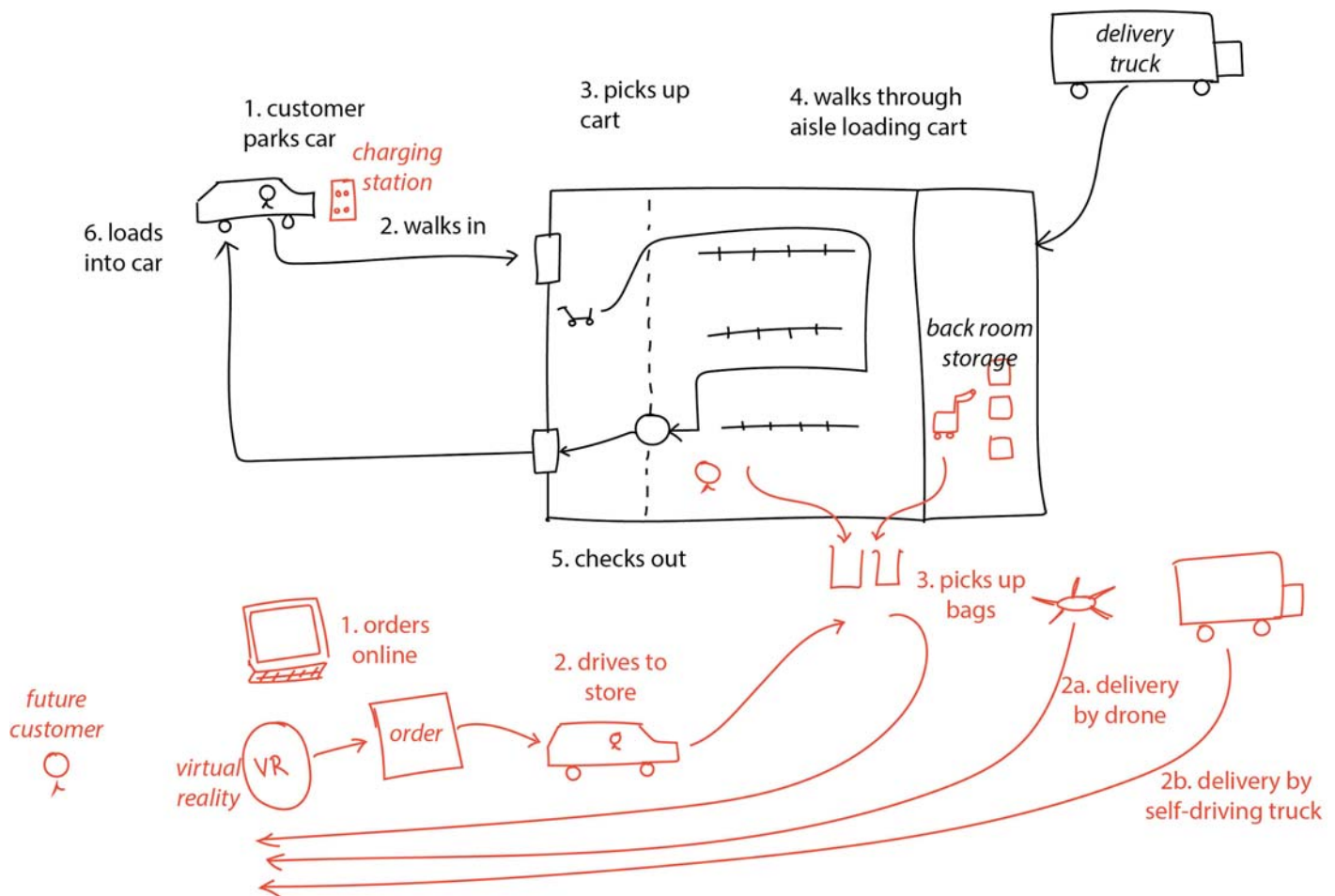


Figure 2 – The future state of Big Grocers in relation to the current state.

most items in the back storage area. This would also make it easier for robots to pick out products and box them.

We could track what's on the shelves, what's in the back storage area, what products have expired and need to be removed, what products have to be reordered, and so on. Operations would be streamlined because we will have more data, and customers' experiences will be attuned to their specific needs. This data can be used to make inferences about the trends and customer expectations, using the discipline of machine learning.

With VR, the store configuration and even decor could change for each customer based on their preferences. If a customer was identified as vegetarian, perhaps the virtual store would hide the meat section.

Amazon is experimenting with a store concept through its Amazon Go project,<sup>4</sup> wherein the customer can pick out the items they want and walk out. The items will automatically be charged to the customer's credit card.

### Start with the Customer Experience

What is customer experience-based transformation? Think of all the reasons your customer interacts with your company. Maybe it is for sales, maybe for service, or maybe just to find out some information. The term "customer" is used in a broad sense and includes internal customers as well.

The different paths that each customer goes through for a specific need, such as to purchase products from your company, may be slightly different. However, a set of capabilities is required to support each path. If a specific path is relatively more important, you could use that as a basis to prioritize work. You could measure criticality based on a number of factors. Perhaps the volume of customers interacting through a particular path is high, and by focusing on that path you can positively impact a large number of customers.

In the Big Grocers example, we may want to focus on individual customers who purchase groceries at the

store. We have already depicted possible enhancements we can make to that journey. This is captured in the future-state blueprint (or architecture).

## The Role of Architecture

Architecture provides a mechanism for companies to take a systematic approach to digital transformation. Exploiting architectural principles such as modularity and reconfigurability will ensure that the transformation is built on a strong foundation. That in turn ensures business agility.

**Architecture provides a mechanism for companies to take a systematic approach to digital transformation.**

### *Architectural Framework*

In a recent *Cutter Business Technology Journal* article,<sup>5</sup> Joe Peppard and John Thorp introduce a framework for digital transformation with four facets:

1. **Strategy** — choosing the right things to do
2. **Architecture** — doing them the right way
3. **Delivery** — getting them done well
4. **Value** — getting the benefits

In this article, we will focus on the architectural facet.

To accomplish the transformation, many functional areas within the organization have to collaborate. The future-state grocery store customer experience will not be possible without collaboration across the functional areas of the organization, as well as collaboration between business and IT.

### *Architectural Blueprint*

The scope of the architecture should include both business and IT. Architecture provides the blueprints for transformation; the current state is captured in one blueprint and the desired future state in another. Then we can look across both blueprints to identify areas that have to change, and by how much. Figures 1 and 2 are essentially examples of those blueprints, although we can make them more formal if desired.

Companies typically use many approaches to enhance their capabilities to ultimately transform. If a company is siloed by functional area, we may find capabilities being developed within one functional area with little consideration for what's happening outside that area. If the company is project-based, we may find capabilities being developed within projects, while integration across those projects is usually an afterthought.

Another way to enhance capabilities is to take a customer-centric view and develop capabilities along a customer journey or value stream. We will focus on this last one, since that naturally resolves the integration challenges if executed well.

In this approach, we identify the customer experiences that matter the most and focus on those. This gives us a starting point to identify all the impacted business areas and technologies that have to transform. Updates in some areas may also trigger updates in others, because the organization is a network of connected elements. Adhering to architectural principles will ensure the overall system flexibility as the organization continues its transformation journey.

### *Architectural Elements*

For an effective framework, we'll need to model our business and the elements that make it run, model the constraints, model the capabilities, and model the ecosystem outside the business.

As we visualize the grocery store, we can identify many elements that enable the operations. Some of them are tangible and some intangible. Tangible elements include the parking lot, carts, shelves, items on the shelves, refrigerators, computing hardware, cash registers, people, and so on. Intangible things include processes, data, strategy, goals, needs, leadership, and the like.

The interaction of these elements with one another is what forms the architecture of the business. One innovative way to think about possible future states is to imagine that an element is missing or is replaced. Airbnb came up with a new business model for lodging by removing the need to own the accommodation spaces.

In the Big Grocers example, what would happen if the store did not have physical carts? Perhaps people could be given a scanner or even use an app on their phone to scan items as they walk through the aisles. Their selections would be tracked, bags containing their items would be waiting for them at the door, and they could just walk out with them, as their credit card would be



charged automatically. Sam's Club uses a mechanism that closely mirrors this scenario with its Scan & Go app.<sup>6</sup>

### The Ecosystem Context

We've briefly discussed the business operations, the architectural elements that enable the customer experiences, and the business models. All this was done with the knowledge of what technology can enable, and considering each element of the architecture, to see if one or more of those can be replaced by the disruptive technology.

Once the architectural elements are identified, we can capture them in an easily managed format. Typically, this is a database.

Using the grocery store example as a basis, let's model the major parts of a business (see Figure 3). Any business typically offers products or services to its customers; has many functional areas such as sales, marketing, accounting, and so on; and is enabled by business processes, which are supported by people and technology. There is a supply chain and distribution channels. The company's ecosystem may also include partners, regulatory bodies, and competitors that have an influence on the operations.

There are many ways to model this business. In the Big Grocers example, we may model the physical aspects of each store as if we were looking at it from the air. We

will see the store layout and be able to discern the parking lot, the entrance, the different designated shopping areas, the offices, the storage area, the delivery docks, and so on.

Alternatively, we could model the same store conceptually as a set of capabilities it needs to leverage, including distribution management, sourcing management, people management, inventory management, vendor management, and business strategy and planning.

Yet another way to model the store would be to model the customer journeys. Some customers are people who walk into the store, some may be restaurants that have the groceries ordered through an account manager and delivered, and some may be event halls that source the groceries directly from the distribution centers. Each type of customer goes through different journeys, which can be modeled as well.

As you can see, the same physical store may be modeled in different ways depending upon what you want to understand about it. You may create multiple models that reflect different perspectives.

### To Recap

Through the Big Grocers example, we essentially identified the framework for integrating disruptive technology into the enterprise. The major steps in the framework include the following:

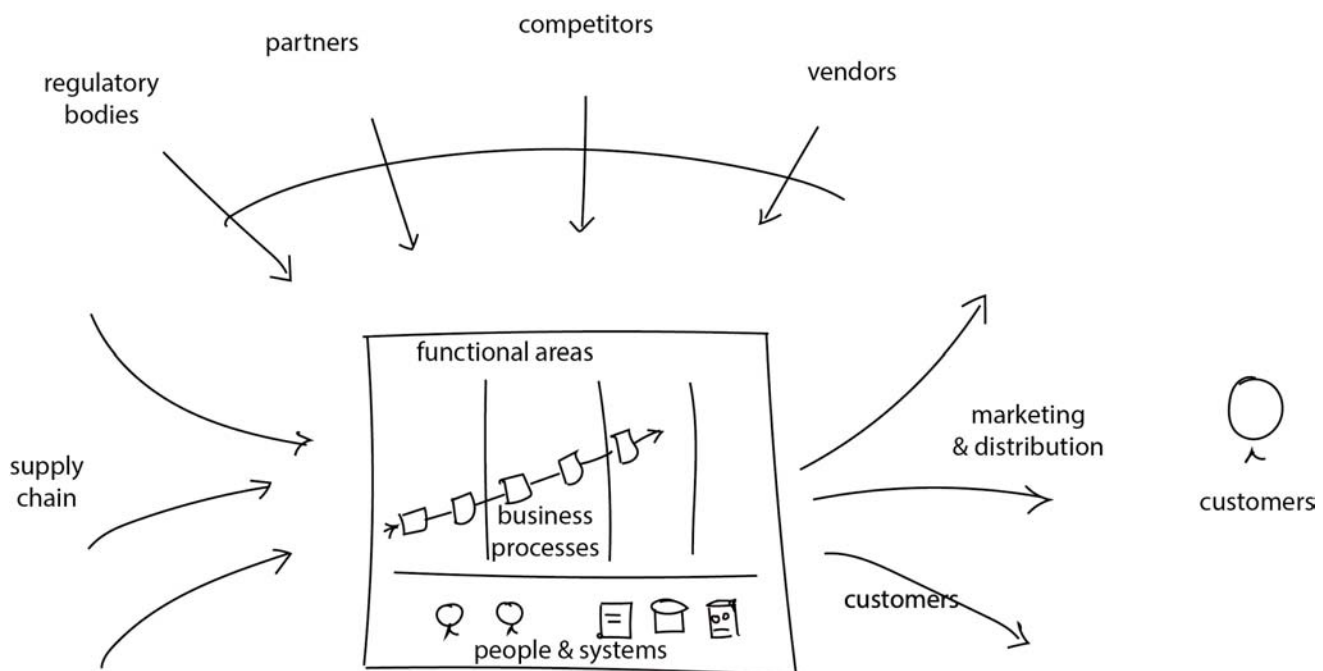


Figure 3 – Ecosystem of the organization.

- Capture current state to ensure that all stakeholders have a common understanding of the challenges.
- Understand where technology can be applied to enhance the end-to-end processes in a future state.
- Understand company goals so that the work to be done in harnessing disruptive technologies is aligned with such goals.
- Design the desired future state, showing where technology is used, what value it will provide, and how the customer experience will change.
- Prioritize work by customer journeys. The term “customer” is used in a broad sense and could refer to internal or external customers.

### *The Framework Systematizes Transformation*

These steps will then set the stage to create a roadmap for implementation, which is outside the scope of this article. The framework is depicted in Figure 4.

## Putting It All Together

Integrating disruptive technology into your organization is a challenging exercise. Most companies have an already entrenched business model that can be difficult

to change, even if the desire exists. For example, Barnes & Noble cannot simply change to the Amazon model.

Disruptive technology presents many options, and trying to implement them all will result in spectacular failures. So the key is to prioritize. Prioritization should be driven by the company’s goals and strategies and facilitated by architecture. The various functional areas have to collaborate in this task because integration cannot happen in isolation.

The framework outlined above can help you ensure successful integration of disruptive technology. It lets you depict a long-term vision, while enabling you to progress incrementally toward that vision. Each functional area can contribute its portion of the work, while understanding the enterprise goals. Architecture is a great vehicle for that. Often, a team is tasked with keeping the architecture up to date as well as facilitating integration across functional areas. This team also develops standards so that the architectures of the individual functional areas can be “connected” together into a holistic view.

The framework is modular and scalable. It allows for multiple pieces of the vision to be worked on simultaneously. In the Big Grocers example, while one effort may focus on integrating disruptive technologies into the store’s customer-facing processes, another may focus on upgrading the processes and technologies of the supply chain. While collaboration is critical, each area has leeway in how it designs and develops its internal work. Some companies establish overall enterprise standards, while others let different areas develop independently as long as the integration “interfaces” are well defined and adhered to. This allows for siloed organizations to collaborate without overhauling the whole organizational structure.

The framework reflects reality and should include the real-world possibilities and constraints. The possibilities help identify what can be changed (such as a new way of sourcing raw material), and the constraints help identify what cannot be changed (such as keeping the same business model). You can still choose to remove the constraints and change your business model, for example, but such a change needs to be shown in a different architecture that represents a different desired future.

Companies need to take a structured approach to harnessing disruptive technologies. While prototyping and experimentation are required, for most companies such experimentation should be done with a holistic plan in mind. That way, the prototypes can be developed further and integrated into the customer journeys of

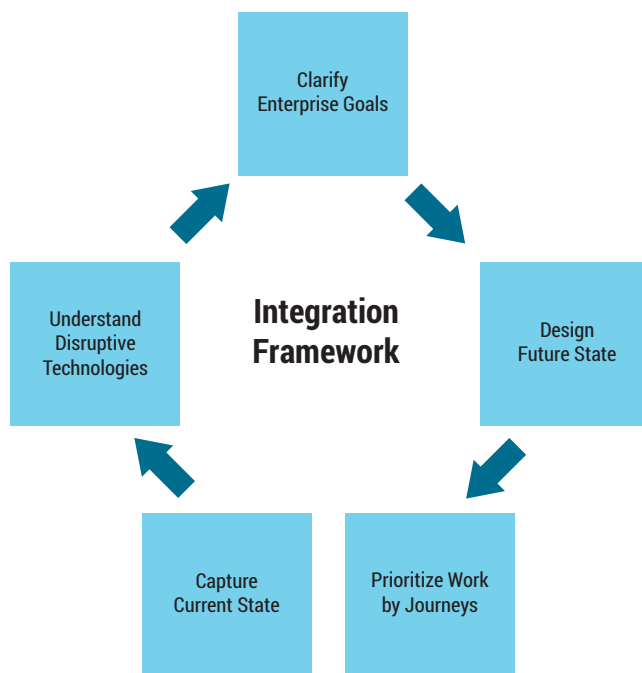


Figure 4 – The Disruptive Technology Integration Framework.

interest. This incremental yet deliberate execution will help reduce risk and increase the likelihood of success.

## Endnotes

<sup>1</sup>McCurry, Justin. "Japanese Company Replaces Office Workers with Artificial Intelligence." *The Guardian*, 5 January 2017 ([www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance](http://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance)).

<sup>2</sup>Desmet, Driek, Niels Maerkedahl, and Parker Shi. "Adopting an Ecosystem View of Business Technology." McKinsey & Company, February 2017 ([www.mckinsey.com/business-functions/digital-mckinsey/our-insights/adopting-an-ecosystem-view-of-business-technology](http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/adopting-an-ecosystem-view-of-business-technology)).

<sup>3</sup>"Documents Associated with Business Process Model and Notation (BPMN), Version 2.0." Object Management Group, January 2011 ([www.omg.org/spec/BPMN/2.0/](http://www.omg.org/spec/BPMN/2.0/)).

<sup>4</sup>Leswing, Kif. "This Is Amazon's Grocery Store of the Future: No Cashiers, No Registers, and No Lines." *Business Insider*, 5 December 2016 ([www.businessinsider.com/amazon-go-grocery-store-future-photos-video-2016-12](http://www.businessinsider.com/amazon-go-grocery-store-future-photos-video-2016-12)).

<sup>5</sup>Peppard, Joe, and John Thorp. "What Every Business Leader Should Know and Do About Digital." *Cutter Business Technology Journal*, Vol. 30, No. 1, 2017 ([www.cutter.com/article/what-every-business-leader-should-know-and-do-about-digital-494486](http://www.cutter.com/article/what-every-business-leader-should-know-and-do-about-digital-494486)).

<sup>6</sup>Scan & Go app, Sam's Club ([www.samsclub.com/sams/pagedetails/content.jsp?pageName=scan-and-go](http://www.samsclub.com/sams/pagedetails/content.jsp?pageName=scan-and-go)).

*Raj Ramesh helps organizations answer the question, "How do we harness the power of artificial intelligence (AI) and machine learning (ML) in our business?" In addition to his AI and ML experience, Dr. Ramesh has more than two decades of experience in business and IT across many domains. He has worked with senior-level business and IT leaders in Fortune 500 companies as an adviser and architect to foster deeper business-IT collaboration through consulting, advising, and teaching. Dr. Ramesh has written extensively and spoken at many national and international conferences. He can be reached at [dr.raj.ramesh@topsigma.com](mailto:dr.raj.ramesh@topsigma.com).*



# Innovating with Big Data, IoT, and the Cloud

by Bhuvan Unhelkar and Alok Sharma

Big data, the Internet of Things (IoT), and the cloud are technological innovations that need to demonstrate corresponding business value. While the aforementioned technologies have distinct identities of their own, they are also interdependent. Innovating with these technologies at a business level demands a multi-disciplinary, holistic approach that also incorporates an understanding of how to manage risks. The Big Data Framework for Agile Business (BDFAB) provides a basis for fostering innovation and managing the risks associated with it in the big data, IoT, and cloud space. This article discusses the nature of innovation in the context of big data, IoT, and the cloud and its application in practice.

## Understanding Contemporary Innovation

As Guest Editor San Murugesan and I noted in a previous Cutter article, “Innovation is the key to survival and prosperity in this new ‘disruptive’ age, which is dominated by technological advancement and obsolescence, as well as a changing business environment.”<sup>1</sup> However, unlike a one-off, dramatic innovation that changes the world, most innovations in the business space are iterative, incremental, planned, and collaborative. Such innovations use technologies to achieve business goals.<sup>2</sup> And since the business context is continuously changing, an organization’s efforts to innovate cannot be based on rigidly defined goals; instead, they must be driven by a set of guidelines for activities that can produce business value.

Innovators in such a dynamic business space need to be cognizant of the possibility of value coming from unanticipated directions. Correlating this value to business goals can be challenging because the innovation may not always demonstrate direct returns on investment. Big data, IoT, and the cloud add to the challenge as the direction of the innovating efforts may be dramatically different from the value that results. For example, an innovator could be trying to solve a security glitch in an IoT device, and the end result might be

enhanced user experience. This situation is exacerbated by the complexities and vastness of data, the variety of IoT devices, and the uncertainty around the sourcing, storage, and sharing of data on the cloud by multiple parties.

Big data technologies (typically the distributed database architecture of Hadoop) and corresponding in-depth statistical analytics (e.g., descriptive, predictive, and prescriptive) create opportunities for innovative business applications. For example, big data analytics holds the promise of reengineering business processes that enable decentralized decision making. This requires new and creative ways of organizing the reporting hierarchies of a decentralized, data-driven business. Another example is the ubiquitous nature of cloud computing (despite certain privacy and security concerns), which has not only resulted in novel approaches within existing businesses, but has also spawned entirely new and innovative business models. Innovating with big data, IoT, and the cloud is challenging because by their very nature these technologies require:

- Due consideration of the security and privacy of data and its usage over the cloud
- Drafting and execution of service-level agreements (SLAs) regarding utilization of the cloud
- Understanding of the myriad sources of public and private data and a mechanism to use and pay for them
- Usability and overall user experience of IoT devices
- Upgradability of IoT devices, especially as many IoT devices may not have any contact with their manufacturers after they are released in the market
- Changing government rules and regulations around the use of these technologies
- Long latency in seeing the results from implementing the aforementioned technologies, as they require coordination amongst multiple organizational and user disciplines (e.g., technologies, business processes, usability, legality, security, privacy)



- Higher-than-usual risks due to uncertainty in the markets and dependency on factors beyond the control of the firm

Adopting an innovation in a business introduces risks emanating from changes in business practices, business operations, and business culture. Recognizing these risks and planning for the corresponding changes is as important as the innovation itself and vital for risk management. Successful implementations require a full understanding of the business, the domain in which it exists, and continuous improvements during the implementation process. Thus, the process of innovation also needs to keep pace with the way the industry — in particular, the big data-related industry — is going.

## Creative Destruction and Disruptive Innovation

There are three types of innovation that an organization can choose to pursue: transformational, incremental, and breakthrough.<sup>3</sup> Each type of innovation has its place in the world of big data, IoT, and the cloud:

- **Transformational innovation** dramatically changes the organization and entire industries. Transformational innovation requires organizations to deep-think their core values and offerings. For example, if railroads had understood that their core value was “people movement” (as against the efficient running of trains), then they would own the airlines now. Big data on the cloud spurs transformational innovation as it opens up opportunities for entire industries to collaborate across vast sets of data and generate actionable insights. Organizations like Google and Amazon are part of this new industry that is transformational.
- **Incremental innovation** is meant to enable an organization to exist efficiently and effectively by creating new, small, yet significant improvements to its way of conducting its existing business (line or brand extensions, new bells and whistles, new packaging, new improved ingredients, etc.). For example, it might be said that the tobacco and alcohol industries have innovated more in packaging than the products themselves. Big data technologies are continuously being improved in terms of performance and security. For example, the distributed database technologies of Hadoop are evolving to in-memory Spark. Technical innovations help optimize business processes in an incremental manner rather than a dramatic one. Such innovations are multidisciplinary and collaborative and require excellence in managing risks.
- **Breakthrough innovation** lies in between incremental and transformational innovation. According to the Northwestern Ontario Innovation Centre, “It requires significant change on the part of the innovating organization, both in terms of cultural and systems support.... Breakthrough ideas create new markets and business opportunities that did not exist before.”<sup>4</sup> Big data analytics on the cloud helps foster breakthrough innovations that decentralize traditional, hierarchical organizational structures, as decision making moves to the point of contact with the customer.

In technology-based innovation, changes occur at the business and industry levels that can be destructive in a creative sense. In his book *Capitalism, Socialism, and Democracy*, Joseph Schumpeter coined the term “creative destruction” to denote a “process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.”<sup>5</sup> Once again, the aforementioned examples of Google and Amazon demonstrate the creativity in spinning off an entire industry based on big data analytics and the cloud. In “Technology, Jobs, and Creative Destruction,”<sup>6</sup> Chrissie Deist talks about the power of innovative technologies to eliminate existing jobs and create new ones. For example, the position of “data scientist” did not exist a decade ago, whereas it’s one of the most coveted roles as we write this.

**If railroads had understood that their core value was “people movement” (as against the efficient running of trains), then they would own the airlines now.**

Creative destruction is accompanied by another idea — that of disruptive innovation. This term, conceived by Clayton Christensen, “describes a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors.”<sup>7</sup> This approach to innovation reduces the risks inherent in aiming for an innovative solution that might be too sophisticated, too expensive, and too complicated for many customers in the market. Through its Agile iterations and increments, BDFAB (which we discuss below) is most amenable to disruptive innovations utilizing the technologies of big data, IoT, and the cloud.

## The Innovation Imperative in the Context of Big Data, IoT, and the Cloud

The Internet of Things effectively comprises two concepts: the Internet, signifying connectivity and communication, and Things, representing a variety of objects. Advances in wireless communications and networking are complemented by the shrinking size and cost of microcomputers, sensors, and actuators driving several IoT applications. Affordable miniaturized portable or wearable devices (pens, watches, buttons, and even underclothes) are only adding to the popularity and permeation of IoT in our daily lives. This has enabled hitherto unimaginable innovative potential in road navigation, health monitoring, contactless purchasing, crime monitoring, and even grocery shopping.

**Without compatibility between devices from different manufacturers, IoT will be more hype than reality.**

This potential, however, is brought to fruition only when it is complemented by back-end cloud technologies. The value of an IoT device to its user is manifold when such a device is “alive.” For example, GPS navigation is of greater value if its back end collaborates with weather, traffic, and sporting events databases. The value of a pacemaker lies not only in its support to the heart, but also, potentially, its ability to alert relevant services in case of an emergency. It is thus imperative that IoT devices be innovatively integrated with the back-end cloud where data is stored, shared, and analyzed.

Big data analytics and technologies provide further innovative opportunities as the insights generated by these analytics can be used in business processes to shift the decision making to the contact points between the customer and the staff of an organization. For example, analytics in the banking domain can provide sufficient insights to enable a teller talking with a customer across the counter to make an offer for a car loan. In the emergency response domain, paramedics can be provided with sufficient analytical data to enable them to administer improved immediate care to an accident victim whose personalized IoT devices are connected to a back-end analytical system hosted on a cloud.

The innovation imperative from the solution provider’s viewpoint has led not only to unique ways of utilizing

the devices, but also to the provisioning of analytics as a service (AaaS). AaaS on the cloud is highly disruptive, as it dramatically changes a business model. A typical cloud-based service provider works on the business model of users paying for the services as they are consumed. These services include storage of data and hosting of analytical applications. AaaS, however, offers analytics in the shape of reusable components that can be plugged into end-user applications as needed. For example, an analytical service providing weather data can be plugged into many different applications, ranging from traffic monitoring apps through to scheduling applications for sporting events. Thus, AaaS shifts the business model from that of a service provider to that of a truly customer-centric business.<sup>8</sup>

## Challenges in Using IoT and the Cloud

Innovative applications that embrace new technologies are fraught with risks, which require innovative approaches for their handling. Following are some of the risks and challenges in applying IoT and cloud in the business space:

- **Security.** The more devices connected to the network, the more vulnerable they are to being hacked. This is a major issue confounding the industry and academia.<sup>9</sup>
- **Standardization and interoperability.** There are too many competing standards, making IoT devices incompatible with each other. Google, Microsoft, Intel, Apple, and Samsung are all pushing their own versions, and there is no consensus in the industry on how to centralize around common standard(s). Without compatibility between devices from different manufacturers, IoT will be more hype than reality.
- **Manageability.** One analyst firm predicts that “the IoT market will grow from an installed base of 15.4 billion devices in 2015 to 30.7 billion devices in 2020 and 75.4 billion in 2025.”<sup>10</sup> How are these devices going to be managed? The 2.3 billion smartphones in use today<sup>11</sup> — a number that will only grow — have spawned the global service provider industry (Verizon, AT&T, Vodafone, Bharti, China Mobile, etc.). The scaling of the smartphone coupled with smart devices will create an industry that will be extremely challenging to monitor, regulate, and standardize.
- **Network optimization.** The IoT is characterized by a large amount of control traffic (the device connecting to the network, authenticating itself, going to sleep when not active, paging periodically to announce its

presence, etc.) and very little data traffic (a few bytes to a few Kbytes per data cycle). In contrast, current networks are meant to handle a small amount of control traffic and a large amount of data traffic. How do we align current networks with the diametrically opposed requirements of emerging IoT devices?

- **Social aspects.** How will society evolve when we are being watched or monitored by IoT devices (e.g., Amazon Alexa) all the time? How will governments use this information to serve, spy on, or prosecute their citizens? Will there be a few mega-corporations controlling the IoT ecosystem, or will there be a more democratic setup of constructively competing smaller players?
- **Analytics.** What kind of big data analytics will be needed to harvest useful information from the massive flood of data IoT devices will be generating? For example, “a Boeing jet generates 10 terabytes of information per engine every 30 minutes of flight, according to Stephen Brobst, the CTO of Teradata. So for a single six-hour, cross-country flight from New York to Los Angeles on a twin-engine Boeing 737 — the plane used by many carriers on this route — the total amount of data generated would be a massive 240 terabytes of data.”<sup>12</sup> How and where to store this data and how to enable its sensible analytics are challenges that demand creative approaches to data sourcing, storage, analytics, and display.

## IoT and Interoperability on the Cloud: Practical, Challenging Scenarios

In this section, we discuss challenges that arise due to lack of interoperability and some practical standards in the IoT and cloud space.

### Remote Health Monitoring

- A hospital issues a medical wearable to a patient to monitor the patient’s health remotely and on a 24/7 basis. The medical wearable could be manufactured by a company, say, Phillips.
- The medical wearable uses Wi-Fi in the patient’s home to connect to the broadband network provided by the patient’s telecommunications service provider, say, AT&T.
- The broadband network connects to the CRM server used by the hospital and provided by another supplier, say, Epic.

- The hospital CRM sends an alert to the doctor’s smartphone provided by another manufacturer, say, Apple.

It is easy to see that even this simple example of remote patient monitoring involves devices and services offered by four suppliers; namely, Phillips, AT&T, Epic, and Apple. If any of these devices or services is incompatible with the rest of the system, then even the simple use case of remote patient monitoring will be impossible. Hence, it is critical that the industry harmonize around a common set of standards so that the entire system can function smoothly on an end-to-end basis.

### Self-Driving Cars

Now let’s look at the example of a self-driving car, an application that is essentially “IoT on wheels.” Like IoT, a self-driving car is composed of sensors (to sense speed, distance from other vehicles, the surrounding environment, etc.), a decision engine (to make decisions based on the input from the sensors — to change lanes, to slow down, etc.), and an action engine (to apply the right stimulus to the vehicle to modify its behavior based on the instructions received from the decision engine — turn its steering wheel to change direction, ease up on the accelerator to slow down, etc.). In this scenario:

- The sensors could be coming from different vendors (NXP, Siemens, etc.).
- The decision engine could be running software developed by different vendors (Google, Uber, etc.).
- The action engine could be coming from different car manufacturers (Ford, Toyota, etc.).

**How will society evolve when we are being watched or monitored by IoT devices all the time?**

Further, suppose there is an accident involving the self-driving car. In the absence of a human driver (which today allows the blame for an accident to be conveniently placed on the car’s operator), who will bear the legal liability for the accident, considering that any action taken by a self-driving car is an extremely complex interplay of sensors, decision engine, and action engine? The answer will involve technical, analytics, legal, social, and automotive aspects. Innovative answers will thus require multidisciplinary

approaches supported by frameworks such as the Big Data Framework for Agile Business,<sup>13</sup> which we discuss in the next section.

## Fostering and Managing Innovation: Taking a Strategic Approach

The role of a framework and strategy in fostering innovation and reducing associated risks cannot be emphasized enough. BDFAB supports innovative approaches to optimizing business processes, ascertaining business context, flattening organizational structures, and enabling Agile decision making. The social and collaborative aspects of innovation are also embedded in BDFAB.

Figure 1 shows a process for managing innovation in business using big data, the IoT, and the cloud. This BDFAB-based process provides a mechanism for reducing the risks of innovating in this space. The process starts with envisioning the business model and corresponding business value. Incorporating big data in business requires an understanding of the many non-technical facets of the business, including economics (e.g., calculating ROI), sociology (e.g., project teams and their behavior), psychology (e.g., individual motivators and biases), and so on. IoT devices provide the primary basis for data capture. This speaks to the interdisciplinary nature of BDFAB. Analytics utilizes that data to provide probability and causation models that help generate

insights, while the cloud provides the basis for collaboration at the data, process, and visualization levels.

Now let's consider how this innovation process could be applied in the education domain, for example. Currently, many students in a particular community in the US state of Florida are not able to access their science or math lessons from home due to lack of sufficiently powerful personal devices. MobileNerd, a cloud-based platform, is built with a back-end architecture that is highly elastic and can generate as many virtual machines (VMs) as the student users need. Since the analytical computations and all the hosting of the data for the student lessons is done on the cloud-based platform, students are able to access their science and math tools from anywhere, using basic laptops that only need to run a browser. Increasingly, this manner of hosting education-related AaaS for multiple educational institutions within Florida is having a major "destructive creation" effect on the local society. It is changing the way the education industry works and bridging what is known as the "digital divide" amongst students.<sup>14</sup>

## Conclusion

Businesses judge innovation in terms of the value it provides in either handling existing problems or tapping into new opportunities. In this article, we have highlighted the innovative potential of big data, IoT, and the cloud. A framework such as BDFAB is most

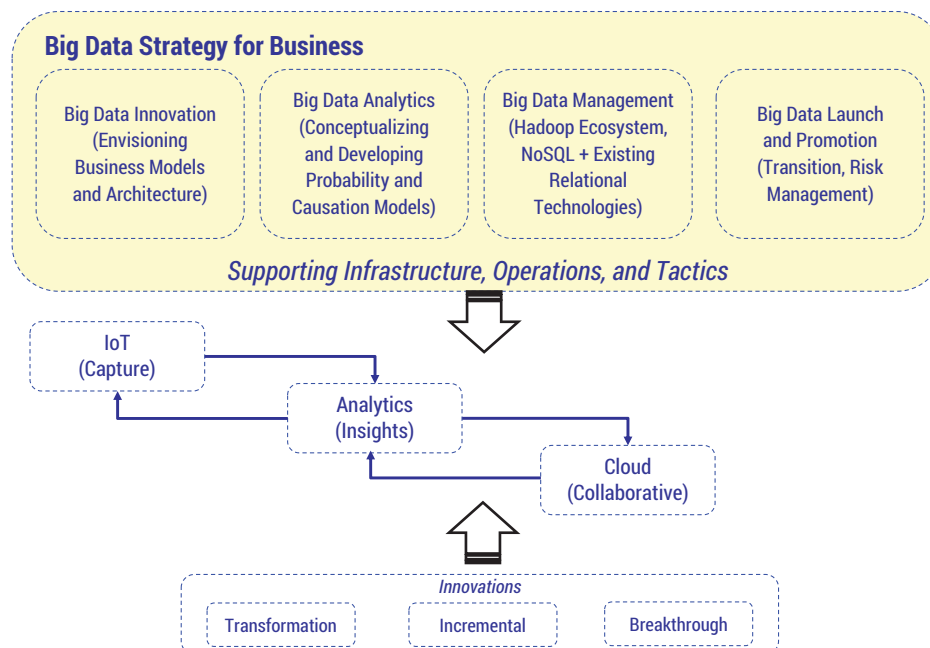


Figure 1 – Positioning innovation within a big data strategic approach.



helpful in channeling an organization's innovation efforts. This is so because the framework facilitates the iterative and incremental application of ideas utilizing the aforementioned technologies — and continuously focuses on Agile business values. Therefore, even though the results of such innovation efforts are not necessarily dramatic, they can provide significant value to the business.

## Endnotes

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*Bhuvan Unhelkar (BE, MDBA, MSc, PhD; FACS) is a Senior Consultant with Cutter Consortium's Business Technology & Digital Transformation Strategies practice. Dr. Unhelkar has more than two decades of strategic, as well as hands-on, professional experience in the information and communication technologies (ICT) industry. He currently leads the IT department at the University of South Florida (Sarasota). As a founder of MethodScience.com, he has demonstrated consulting and training expertise in big data (strategies), business analysis (use cases, BPMN), software engineering (object modeling, Agile processes, and quality), collaborative Web services, green IT, and mobile business. His domain experience includes banking, financial, insurance, government, and telecommunications organizations. Dr. Unhelkar earned his doctorate in the area of object orientation from the University of Technology, Sydney, in 1997. Since then, he has authored/edited 17 books in the areas of collaborative business, globalization, mobile business, software quality, business analysis/processes, the UML, and green ICT, and he has extensively presented and published papers and case studies. Dr. Unhelkar is a sought-after orator, a Fellow of the Australian Computer Society (elected to this prestigious membership grade in 2002 for his distinguished contribution to the ICT field), Life Member of the Computer Society of India, Rotarian (Paul Harris Fellow), Discovery Volunteer at NSW Parks and Wildlife, and a previous TiE Mentor. He can be reached at [bunhelkar@cutter.com](mailto:bunhelkar@cutter.com).*

*Alok Sharma is CEO of MobileNerd, a cloud-based SaaS company that delivers virtual computing environments for education, training, and distance learning applications with the objective of optimizing IT infrastructure and eliminating the digital divide. Earlier, Dr. Sharma was Senior VP, Corporate Development and Alliances, at Harris-Stratex, the Microwave Division of Harris Corporation, where he was responsible for leading corporate strategy, mergers and acquisitions, and the development of key strategic relationships for the company. Dr. Sharma was the Founder and CEO of Telsima Corporation, a global provider of 4G broadband wireless solutions, from June 2004 until it was acquired by Harris-Stratex in February 2009. Prior to founding Telsima, he was VP and General Manager of the Worldwide Cable Business at Juniper Networks. Before Juniper Networks, Dr. Sharma was the Founder and CEO of Pacific Broadband Communications, which was acquired by Juniper Networks in December 2001. He has held senior management and technical positions at Hewlett-Packard, Fujitsu/Amdahl, Integrated Device Technology, and Siara Systems, a metro routing company acquired by Redback/Ericsson. Dr. Sharma received his PhD in electrical engineering from the University of Wisconsin-Madison, holds seven patents, and has authored several articles in leading academic and trade publications. He can be reached at [aloksharma@mobilenerd.net](mailto:aloksharma@mobilenerd.net).*



# What Models Are Banks and Insurers Adopting to Drive Digital Transformation?

by Dorota Zimnoch

Digital disruption impacts every part of our lives and every single industry. Klaus Schwab, founder and executive chairman of the World Economic Forum, calls this “The Fourth Industrial Revolution,” which is “characterized by a range of new technologies that are fusing the physical, digital, and biological worlds, impacting all disciplines, economies, and industries, and even challenging ideas about what it means to be human.”<sup>1</sup>

The financial services sector was one of the first to be impacted by digitization, and for many years, banks (and also insurers) have been innovating their offerings to respond to the increasing demands of customers, changing regulations, and heightened competition. But the real disruption — which has changed banks’ business models and the way they interact with consumers — began with the emergence of fintech. Increasingly, small, nimble, technology-savvy companies are unbundling the offerings of traditional banks; consider online lenders (e.g., Lending Club, Zopa) that provide loans to customers who, due to strengthened credit criteria, have lost access to conventional bank loans, or remittance companies (e.g., TransferWise, Azimo) that allow customers to send money abroad at the fraction of the cost charged by banks. In recent months, the trend has been observed even more strongly in the insurance space with the rise of insurtech, which impacts the whole insurance value chain, from customer onboarding, through risk assessment, to selling the products, and finally to claims processing.

Digital transformation has become inevitable, and banks and insurers are looking for the most efficient strategies for the digital age.

## A Changing Landscape

### *Solution-Based Customer Experience*

Digital disruption results in consumers looking for an experience that is efficient, provided in real time, integrated, flexible, accessible, relevant, and intuitive.

Fintech and insurtech companies shift the focus from products to solutions, directing their efforts toward solving real problems. For example, M-Pesa provides consumers in Kenya (and other markets) access to financing and microfinancing products through their mobile devices. By leveraging the new technologies, M-Pesa developed a holistic understanding of customer needs and proposed simplified products and relevant solutions. Other examples include Trov, an on-demand insurance firm that allows customers to insure specific products, and Cuvva, which launched pay-as-you-go insurance to address the needs of infrequent drivers.

Despite the inroads being made by fintech startups, a recent survey<sup>2</sup> found that the top priority of most banks remains the transactional banking relationship, with customer experience being a secondary focus. Yet a 2014 report by PwC<sup>3</sup> highlights the need for banks to move away from a distribution strategy focused on products and channels toward a customer-centric strategy that focuses on meeting the customer’s needs with a seamless, omnichannel experience. Banks should leverage consumer data and insights to prepare tailored offerings and services. One bank that takes this approach is Metro Bank. Calling itself a “retail concept that happens to be a bank,” Metro models its branches on the Apple store concept (much loved by consumers) and provides an omnichannel experience to its “fans” (Metro’s term for its customers).

### *Disruption of Business Models*

In a report on APIs and bank as a service (BaaS) in the fintech realm,<sup>4</sup> venture capitalists David Brear and Pascal Bouvier present banking as a platform (BaP) as an effective strategy for delivering value to customers in the digital age (see Figure 1). The bank provides a licensed and regulated core back-end infrastructure and layer of APIs through which different players in the ecosystem can offer their products and services to the bank’s customers. For example, BBVA (Banco Bilbao Vizcaya Argentaria) partnered with Dwolla to enable customers to make real-time payments.<sup>5</sup>

Breare and Bouvier observe that banks (and insurers) have long benefited from economies of scale but suggest that they recently lost a network effect, as fintech firms keep unbundling bank offerings, thereby peeling off some of their customers. Banks and insurers that face stiffening competition can no longer enjoy the “We were first, why change?” status quo. Banks and insurance companies do not “own” the customer anymore.

## Regulatory Changes

In addition to the above changes, the EU’s Payment Services Directive (PSD2)<sup>6</sup> will further accelerate digital disruption as banking data will (with customer consent) be shared with third parties through secure open APIs, allowing third-party developers to create helpful services and tools that customers can utilize.

McKinsey analysts Henk Broeders and Somesh Khanna point out that for years banks and insurance companies have focused on driving digital transformation by upgrading Web and mobile technologies and creating innovation and testing centers. They list “four fundamental ways in which digital capabilities can be used by banks to create value”:<sup>7</sup>

1. Increasing connectivity with customers, employees, and suppliers
2. Using big data and advanced analytics to extend and refine decision making
3. Enabling straight-through account opening
4. Fostering innovation across products and business models

That said, the speed of change, their old legacy systems, a limited talent pool, and the lack of an innovation culture have encouraged banks and insurance companies to take another tack: exploring collaboration with startups as the way to drive digital innovation.

## Strategies for Incumbent and Startup Collaboration

Depending on their objectives, banks and insurers can choose different models of working with startups. For example, if they wish to add additional value for their customers but have no resources to develop products and services in-house, they may choose to buy a fintech solution and integrate (e.g., BBVA buying Finnish online banking startup Holvi). Alternatively, they may wish to distribute the risk and simply partner with another company that provides a complementary product (e.g., Berlin-based mobile bank N26 joining up with P2P money transfer service TransferWise).

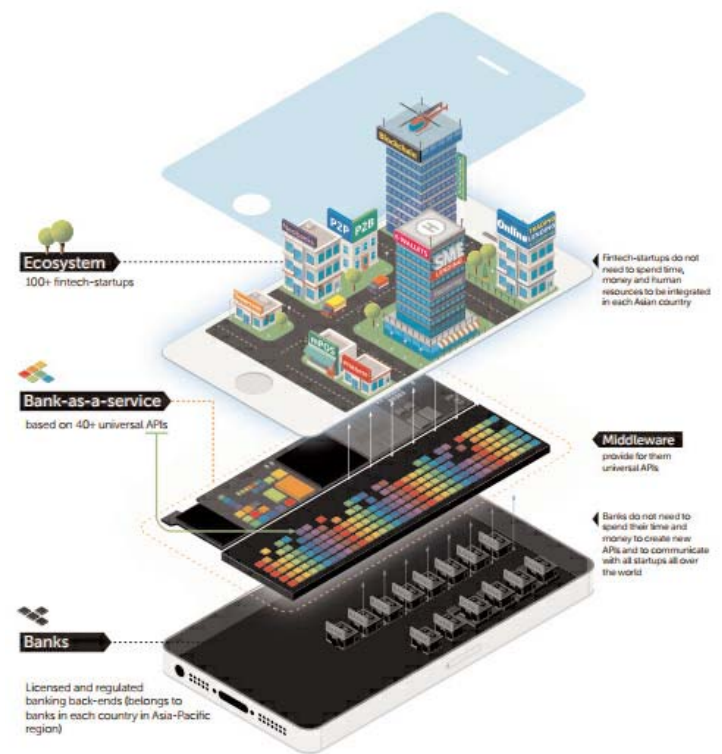


Figure 1 – Banking as a platform. (Source: Life.SREDA VC.)

At The Heart,<sup>8</sup> a European center for corporate-startup collaboration, we have identified the following ways of engagement (see Figure 2). The details of each strategy are described below.

## Working with Startups

Companies can work with startups by setting up an incubator, developing collaboration platforms, conducting scouting projects, or participating in dedicated programs.

### Corporate Incubator

The role of a corporate incubator is to offer startups resources such as product knowledge, mentoring, accounting assistance, office space, legal guidance, and the like, so that they can focus on the core of their business and grow it. Incubators differ from accelerators (described below), as they neither invest in nor take equity from startups. Examples include:

- UK-based insurer Aviva has created the “Digital Garage” in Singapore. This dedicated coworking space allows IT specialists, creative designers, and business leaders to identify, collaborate, build, and test new ways to deliver innovative products and services for customers.<sup>9</sup>



Work with startups	Invest in startups	Build startups
Corporate incubator Own or share co-working space with startups	Sponsored accelerator Outsourced or shared acceleration program, offering support for equity	Intrapreneurship Bottom-up initiatives working like startups to validate new biz
Startup Relations Portal Online channel as a single point of contact for potential partnerships	Corporate accelerator Batches of selected startups undergoing 3- to 6-month program	Company building labs Internal startup factory
Executive startup search PULL: Identification of startups based on individual briefs	Corporate Venturing Own fund, investing in VCs or investments off the balance sheet	Spin-Out/Spin-In Bring ideas outside for launch and integrate when successful
Vertical Pitch Programs PUSH: Review of potential partnership opportunities in a syndicate	M&A Buy and integrate new businesses	Outsourced Company Building

Figure 2 – Incumbent and startup collaboration strategies. (Source: @TheHeartWarsaw.)

- Deutsche Telecom’s incubator, hub:raum, links the company with startups, entrepreneurs, and subject matter experts in the digital ecosystem.<sup>10</sup>
- Insurance and financial services giant AXA has launched Kamet, an insurtech incubator where disruptive products are designed, created, and offered to insurance clients.<sup>11</sup> Projects are led by employees as a way to inspire an innovation culture in the organization and merge the nimble approach of the startups with AXA’s product expertise worldwide.

### Startup Relations Portal

Some established companies set up platforms to collaborate and develop relationships with startups. Like career sections on corporate websites, such portals are the entry point for external startups to learn about incumbents’ current calls to partner with startups or to pitch their own solutions in areas of corporate interest.

An example of such a platform is the Innovator’s Edge, which gives traditional insurers the chance to interact and collaborate with insurtech startups.<sup>12</sup> An example outside the financial services sector is the Unilever Foundry,<sup>13</sup> which enables startups to find calls for ideas from different Unilever brands and respond with ideas and solutions. The young companies also receive access to Unilever advisors and mentors and can attend Foundry events around the world.

### Executive Startup Search

Companies that are looking to solve a particular business challenge via partnership with startups often use scouting services, which scan the ecosystem based on the individual corporate brief. Nordea Bank has teamed

up with Nestholma Venture Accelerator and scouted around 50 startups,<sup>14</sup> while companies like ING and BNP Paribas leveraged external scouting partners to source and select startups in their areas of interest.<sup>15</sup>

### Vertical Pitch Programs

In the case of industry-wide or cross-industry topics, companies can work in syndicates to search for the best solutions. A fintech program run at The Heart helped eight banks to identify the most important cybersecurity challenges and matched them with potential scaleups to provide the relevant solutions.

### Investing in Startups

Banks and insurance companies may decide to invest in startups via accelerators, corporate venture capital funds, or M&As.

### Sponsored Accelerator

Accelerators, like incubators, offer a wide range of support by linking experts to startups and providing operational support. The difference is that accelerators invest in their startups and support them in so-called cohorts. Examples include:

- WERK1, a Munich-based digital incubator, has worked with leading insurance companies to launch the W1 Forward InsurTech Accelerator.<sup>16</sup>
- Aviva is partnering with Silicon Valley digital startup accelerator Plug and Play.<sup>17</sup>
- Direct Bank of Singapore (DBS) launched an accelerator powered by “venture catalysts” Nest.<sup>18</sup>



- Many leading insurance incumbents have invested in the Global Insurance Accelerator, which aims to develop an ecosystem in which they support startups and nurture innovation in the insurance industry.<sup>19</sup>

### Corporate Accelerator

Instead of developing an ecosystem, banks and insurers may choose to run an in-house accelerator, which is typically a three- to six-month program for the selected startups. Examples include:

- Allianz X is a digital accelerator, powered by Munich-based insurer Allianz, where startups and insurance experts collaborate during 100-day sprints on incubating business ideas.<sup>20</sup>
- Mumbai-based Yes Bank has partnered with T-Hub (a startup incubator) and Anthill (“a speed scaling platform for early growth stage startups”) to launch a business accelerator program for fintech startups called Yes Fintech.<sup>21</sup>
- The innovation arm of MetLife Singapore, LumenLab, introduced the Collab accelerator, which focuses on supporting scaleups in fostering innovation in response to industry needs.<sup>22</sup>

### Corporate Venturing

A corporate venture capital (CVC) fund is set up by companies aiming to invest corporate funds directly in external startups, hoping to make a return on investment when a startup is sold or moves onto a stock exchange. Examples include:

- Citi Ventures oversees a global network of labs and manages an internal Acceleration Fund, focused on disruptive technologies and business models, such as blockchain technology, cryptocurrencies, wearables, the Internet of Things, future commerce, cybersecurity, and authentication.<sup>23</sup>
- Global insurance company XL Catlin launched a CVC fund to attract startups aiming to solve the challenges related to business risk.<sup>24</sup>

### M&A

An M&A focuses on buying and integrating solutions, allowing corporations to win competitive advantage and take a leading role in driving innovation. Examples include:

- BBVA bought Finnish banking startup Holvi, Mexico’s Openpay, and US-based tech company Simple. It also invested 30% in the UK-based Atom Bank.<sup>25</sup>
- Allianz bought a stake in insurtech firm simplesurance.<sup>26</sup>

### Building Startups

To acquire expertise in developing nimble and customer-centric offerings and to foster an innovative entrepreneurship culture, companies may decide to build startups in-house.

### Intrapreneurship

Intrapreneurship can be defined as a bottom-up initiative that works like a startup to validate a business idea. Such a strategy introduces to the company the concept of thinking like an entrepreneur and, as such, discovering new opportunities, adopting a customer-driven mindset, extracting the most value from limited resources, and delivering solutions quickly to the market. One example is goodie, “an intuitive, smartly designed shopping platform ... created as an internal startup” by Warsaw-based Millennium Bank.<sup>27</sup>

### Company Building Labs

Companies may also decide to identify, build, and globally scale new business models, as Allianz has done with Allianz X.

### Spin-Out/Spin-In

This is a strategy in which a company takes an idea outside business-as-usual operations, sends off a team of employees to develop the idea into a solution, invests in it, and when the solution is proved, buys it back. The spin-in model has been very successful for Cisco in bringing new products quickly into new markets.

### Outsourced Company Building

A good example of this strategy is Berlin-based FinLeap, “a company builder specializing in fintech.”<sup>28</sup> As reported by TechCrunch, FinLeap successfully launched solarisBank, as well as “Savedo, a marketplace for investment products; FinReach, a software-company that has created an automated account switching kit; Valendo, an asset-based lender; Pair Finance, an online debt collector; and zinsbaustein.de, a digital platform for real estate investments.”<sup>29</sup>

# Which Strategy Is the Right One?

Deloitte identifies three approaches banks can use to counter disruption, scenarios that also apply to insurance:

- 1. **Maintain a dominant position, staying on top of the trends and protecting their business model by leading innovation** (e.g., ING). This option may help companies to retain their competitive advantage, but it is resource-intensive, including money and talent. Firms must be able to react to market trends and implement solutions quickly, which is often a challenge, especially when a bank/insurer is constrained by legacy systems.
- 2. **Reinvent (meaning relaunch) the business after convergence of new technologies.** Analyzing business objectives may lead a bank/insurer to decide to drive digital transformation and relaunch its business. One example is Citi in the UK, which decided to close its physical branches and move all customers to online and mobile channels.
- 3. **Join an ecosystem — offering investment, know-how/expertise, and a consumer base — and collaborate with startups to deliver innovative solutions quickly and cost-effectively.** This option allows a bank/insurer to merge the best of two worlds. One example is DBS, which partnered with digital banking and customer analytics provider Moneythor to provide customers with personalized financial recommendations and insights.<sup>30</sup>

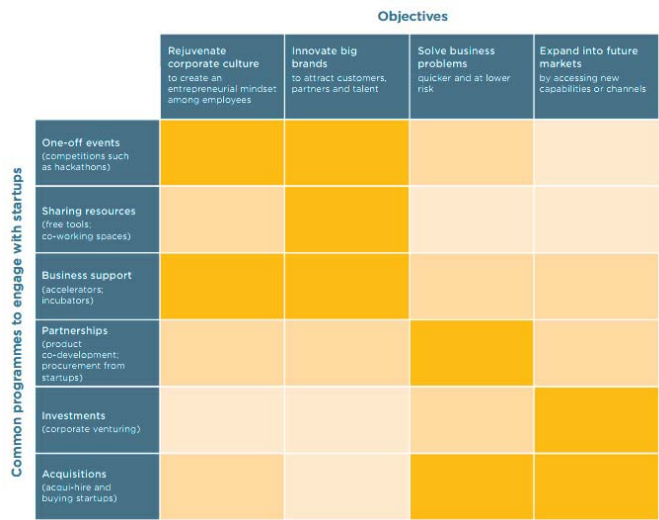


Figure 3 — Nesta's collaboration framework, which indicates how common types of startup programs tend to deliver against key objectives in working with startups. The darker the field, the more suitable a program is for satisfying key objectives. (Source: Mocker et al.)

To decide which partnerships and models to pursue, banks and insurers should determine what their business objectives are and what role they want to play in fulfilling them. In other words, what would they like to achieve by working with a startup? The "innovation foundation" Nesta provides a useful matrix to map possible objectives (see Figure 3).<sup>31</sup>

Even if your organization has nothing to do with banking or insurance, you can follow a similar procedure when considering your response to digital disruption. Once you have decided on your objectives, conduct an analysis of the key competencies of your business and those that could be complemented by partnering with startups. Leveraging the strengths of a startup can help your company to become lean and agile, focus on customer-centric solutions and not on products, strengthen your talent pool, acquire new technologies, and so on. Keep in mind that you will also need to identify KPIs by which you can measure the success of your partnership(s).

As a manager, you should also ensure that you have board support in fostering innovation. Appoint innovation champions who can help your company achieve organizational and cultural readiness for innovation. Key to success are employees who are inspired, engaged, and allowed to take risks, test, and learn (and sometimes fail) on the way to creating a collaborative culture that can lead to win-win partnerships for the benefit of customers, employees, shareholders, and the business.

Once you choose a strategy, leverage networks to scout and attract appropriate partners. It is usually more effective to tap into existing networks than to run in-house scouting, which requires a specific skill set, a strong network, and investment of resources (time, budget). The World Economic Forum recommends:

... finding and becoming part of networks that can help identify potential partners for collaboration as well as developing the company's reputation as an attractive innovation partner. Networks in this sense include both structured and self-organized groups, including industry clusters and associations, online communities, informal business connections, research communities and links that can be provided by specialized advisers, intermediaries, and capital providers. Such networks are invaluable for identifying and connecting with firms to collaborate with.<sup>32</sup>

Finally, whichever model and strategy you decide to follow, it is important to stay focused, keep things simple, and clearly communicate your objectives. Organizational theorist Henry Chesbrough suggests using an open innovation model to make the best use of internal and external ideas and resources. He also offers the sage advice that "building a better business model is more important than getting to market first."<sup>33</sup>

## Endnotes

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Dorota Zimnoch is an international fintech and insurtech expert, ranked in the Top 20 in the InsTech Power 100, PwC Global Power 100, and Woman in Finance Power 100. As a founder of Zing Business Consulting, Ms. Zimnoch advises corporate boards and focuses on business transformations and turning digital disruption into market-winning solutions allied to effective and high-quality implementation. She gained her experience working with leading financial brands such as Citi, AIG, Alico, MetLife, and 4finance, as well as startups. Ms. Zimnoch is also a Strategic Adviser and the Fintech and Insurtech Program Leader at The Heart. She is an active member of the fintech community in London via Tech London Advocates, FemTech Leaders, and InsurTech London. Ms. Zimnoch is a guest speaker at globally focused conferences. She can be reached at [dorota@zingbc.co.uk](mailto:dorota@zingbc.co.uk).

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