



# Connected Business: Creating Value in the Networked Economy

Oliver Gassmann and Fabrizio Ferrandina

The networked economy has become the main paradigm in today's business world; it is the emerging economic order within the information-based society. Products and services are created, produced, and distributed on networks, platforms, and ecosystems along the customer journey. The base of the networked economy on a company level consists of connected businesses where most products, processes, and services become smart and connected. It began with cars, machines, consumer electronics, and now embraces everything from connected oxygen cylinders in hospitals (e.g., *Linde*) and connected cows in agriculture (e.g., *Medria*) to connected, smart dust with sensor networks on the micrometer level to detect light, vibration, and chemicals (e.g., *IBM*). Technologically, the Internet of things (IoT) has built a bridge between these physical worlds and the world of bits and bytes. At its root, IoT analyzes products in real time while customers are using them. As a result, B2B can become B2B2C where the value chains come closer together. At the same time, however, they become more fragile and vulnerable as the COVID-19 crisis in 2020 has shown.

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O. Gassmann (✉)

Institute of Technology Management, University of St. Gallen,  
St. Gallen, Switzerland

e-mail: [oliver.gassmann@unisg.ch](mailto:oliver.gassmann@unisg.ch)

F. Ferrandina

Zühlke Group, Zürich, Switzerland

e-mail: [Fabrizio.Ferrandina@zuehlke.com](mailto:Fabrizio.Ferrandina@zuehlke.com)

Connectivity is ubiquitous, from the connection of companies like *Amazon* with *Apple* to the connectivity of simple functions. *BMW*'s seat heating will allow owners to make a booking on a monthly basis with the touch of a button. The car manufacturer can now update not only the vehicle's infotainment system over the air but also every single line of code in the car's computer systems. Hardware features such as a seat heater, already installed, can be activated by customers at any time after purchase. Additional features will be offered on a monthly subscription basis. For example, customers could deactivate the seat heating system in summer and save money. The advantage for *BMW* is obvious: the production process is simplified because "everything" is built into every car. The activation of additional features will be only a matter of the business model applied.

Today's business leaders differ greatly in their response to the opportunities that the networked economy offers. And so it is extremely important that certain misunderstandings on connected business are set straight:

1. *Be afraid and freeze.* "Connected business is the digital storm of destruction which threatens the existence of our company. Companies are afraid and decide not to compete with the same weapons *Amazon* and *Google*, as an example, are using." Instead of exploring the opportunities of the networked economy and launching their own initiatives, these companies are frozen like rabbits in the headlights. Digitalization is seen as a competence belonging to others, as the CEO of a medium-sized manufacturing company intimated: "These digital players are threatening us, but software is not our core competence. We concentrate on our core business, which is non-digital." The result is that the opportunities to explore connected business are missed.
2. *Delegate to R&D.* Some managers believe, "Connected business is just 'innovation on the chip'." In other words, connectivity is viewed as falling naturally within the remit of R&D or the IT department. It's their job to create products that have sensors, are able to communicate, and provide connectivity for all processes. This purely technological view leads companies to develop over-engineered products that are generally too expensive. When customer perspectives are ignored and the full potential of connected business is downplayed, the business books tend to fill up with innovation flops. In particular, technologically oriented machinery companies are tempted to delegate digitalization to R&D, and the reason is obvious. That inside-out approach often worked in the past.
3. *Hire a chief digital officer.* There is also this belief that "we only need a chief digital officer where all digitalization is concentrated. He or she will digi-

talize our company and build up the connected business.” This underestimates the efforts that business leaders need to make—as *Volkswagen* painfully experienced a few years ago. Establishing a chief digital officer’s position is a perfectly sound starting point. However, a successful transformation requires business leaders to give their full commitment and buy into the company’s journey of digital transformation. It has to be written in bold letters into the job description of every business leader. As happened with the creation of chief quality officers in the 1980s and 1990s, these chief digital officers will experience a first flush of enthusiasm and heightened awareness but will soon falter when confronted with the fundamental nature of the changes required. Often these positions degenerate into what can only be described as staff functionaries, who fail to exercise a sustainable impact on the business.

Those business leaders seeking to implement a successful connected business need to possess a fundamental understanding of the change drivers in the relevant industry and a deep insight into the way companies create and capture value.

*IoT* is the technological base for the bridge between the physical and virtual world (technological view). It is based on five layers: (a) physical products and services, (b) integrated sensor technology, (c) connectivity between products and companies, (d) data analytics based on advanced algorithms and deep neural networks, and (e) digitally triggered product upgrades and services. The *networked economy* is the emerging economic order where products, processes, services, and value chains are connected via IoT within the information-based society (economic view). *Connected business* is concerned with the way companies exploit the potential of IoT in order to develop new business models aiming to create and capture more value (company view).

## 1 Game Changers in the Networked Economy

In the recent past, IoT has been used as a differentiating factor in creating competitive advantage, but, today, most technologies are mature, widely available, and relatively cheap. Connected products, per se, no longer provide a competitive advantage. In the future, the decisive factor will be the intelligent use of such technologies to create superior customer value and to build a sustainable business model. This will differentiate success from failure. What follows is a summary of twelve pivotal trends that have to be addressed when developing connected business for the networked economy:

1. *Ubiquitous connectivity has been increased.* The driving factor behind ubiquitous connectivity is the diminishing cost of computing due to Moore's law, miniaturization, and network effects. It is not only people who are "always on" but also things that are permanently connected, smart, and in communication with each other. People now find themselves firmly ensconced in the age of machines, as technology becomes ubiquitous and cheap. Connected products have been launched in the consumer market for professionals—for example, iPads that are used to service or even control heavy machinery or production facilities.

IoT has become a big value driver as it bridges the physical and the digital world. The global IoT market amounted to over US\$ 250 billion in 2019. It is projected to rise to nearly US\$ 1500 billion by 2027 (Fortune Business Insights 2020). Today, most industries have been greatly affected by IoT: manufacturing 50%, energy 34%, mobility 32%, smart cities 31%, home 18%, and agriculture 13% (Statista 2019). Future applications can be observed in many industries such as health care—for example, remote diagnostics, wearables, and remote health interventions.

Because IoT is being more widely used, information—specifically, vast amounts of environmental data, often unstructured—is collected and exchanged between machines and devices. These smart IoT products/services and cyber-physical systems substantially reduce the amount of human interaction. Associated with the world of IoT is a huge bundle of enabling technologies such as RFID, near field communication (NFC), wireless sensor networks, cloud networking services, artificial intelligence (AI), and distributed ledger technologies (e.g., blockchain), as well as additive manufacturing technologies (3D printing). Indeed, the proliferation of APIs has further supported the connectivity of businesses and taken it across the borders of today's industry into new ecosystems that straddle the customer journey. As these systems become more vulnerable to hardware and operating systems that are widely trusted, the role of cybersecurity technologies becomes increasingly important.

2. *Digital technologies become commodities.* Despite all the talk about digitalization, these technologies are no longer differentiators. Standardization and application programming interfaces (APIs) drive modularity in technology development. As the speed of technology diffusion increases, any competitive advantage accruing from digital technologies is of very limited duration. For example, 10 years ago, there was only one major digital terrestrial commercial wide-range communication system to hand—the GSM cellular standard. Today's world offers several standards from which to select a smart connected solution (GSM LTE/5G, NB IoT, Sigfox,

LoRaWAN). The innovation cycles become shorter, while the available portfolio of applicable technologies increases significantly.

3. *Achieving mastery in orchestrating all necessary technologies in a single system becomes crucial.* Simply managing the technology is no longer enough. Selecting, mastering, and maintaining appropriate cutting-edge technologies is a necessary prerequisite for creating and delivering technically successful solutions for connected business, but it is no longer sufficient, judging by today's standards. Given the very interdisciplinary, widely distributed architecture and the broad diversity of technologies that must work seamlessly together to provide a reliable, scalable, end-to-end, connected business system, the interplay of technologies has to be clearly understood and fulsomely orchestrated if real customer value is to accrue. Only companies that have the required human and technical resources will excel in this market, or at the very least survive. In other words, a smattering of expertise in one or two technologies will no longer suffice.
4. *Transaction costs go down dramatically* with digitalization and standardized interfaces. A bank transaction costs US\$ 4.00 through a branch, US\$ 3.75 via a call center, US\$ 0.85 using an ATM, and only US\$ 0.08 by mobile online. The underlying trend is micropayment, realized by many initiatives such as *Apple Pay*, *Google Pay*, or national initiatives like *TWINT*. With transaction costs between companies decreasing due to standardized interfaces such as APIs (application programming interfaces), the cost of collaboration is decreasing in nearly all industries. This facilitates the creation of many new collaborative business models along the value chains. The rise of platform companies and ecosystem orchestrators could be merely enabled without low transaction costs.

In future, secure, independent transactions between products and things are aimed at decentralized platforms via distributed ledger technology, such as blockchain and its most prominent application of digital currency, bitcoin. A necessary condition for these secure transactions is digital trust as well as digital identities. Both are promoted by the European *GaiaX* project to develop efficient and competitive, secure, and trustworthy data infrastructure in Europe, driven by *Bosch*, *BMW*, *Deutsche Telecom*, *SAP*, and *Siemens*.

5. *It is not about big data; it is about smart and relevant data.* Exponential data growth will continue, mainly driven by connected devices. In 2020, data was continuing to grow by 40% per year. By 2025, it is expected to reach 175 zettabyte—1 zetabyte equals  $10^{21}$  bytes or 1 trillion gigabytes (Hagiu and Wright 2020). The fuel for a connected business is, in essence, data but data that has business relevance. The biggest challenge for a com-

pany is often how to identify the relevant data and transform it into useful information and business-relevant knowledge so that business models can create and capture value. Too often companies erect huge data cemeteries that are neither relevant nor usable.

In many regions of the world, the flow and use of data for connected business is largely unrestricted. However, in Europe, more strict regulations have been put in place to guide data usage and commercialization. Since 2018, Europe's General Data Protection Regulation (GDPR) introduced quite restrictive legislation on data protection and privacy, giving individuals greater control over their personal data. Nevertheless, it is fair to say that a mere click on "accept general terms and conditions" is enough to keep the data flowing (for an overview on compliance checks, see Chatzipoulidis et al. 2019, for instance).

6. *Data analytics increase the value of data.* Huge improvements in the development of algorithms have generated exponential advances in data analytics. Artificial intelligence (AI) and, in particular, machine learning have increased the value of data. While many companies spoke about their "data cemeteries" in the 1990s, the value of that data in today's world has been recognized in most industries. Data has become the new oil. But if data is the new oil, the trained model is the new refinery. A data strategy has, therefore, to include how to manage and protect the AI-based data model. Developing trust has become of vital concern to most companies, where explicit privacy principles are not only developed in consumer-oriented companies like *Apple* but also in B2B firms like *Bosch* and *Siemens*. In the age of ubiquitous connectivity, maintaining trust has been recognized as a source of competitive advantage.
7. *Shifting customer expectations drive user experience and convenience.* This trend has been triggered by technological feasibilities and represents a significant challenge for mature corporates. Technology combines greater convenience and user experience within one function, application, or industry with the result that it also raises expectations when undertaking other customer journeys. Customers expect a superior user experience in terms of convenience, one-stop shopping, provision of solutions, and ease of transactions in various areas (Leavy 2019). The experience of shopping at *Amazon* or booking a journey on *booking.com* leads to higher expectations in industries such as insurance and banking. As soon as pioneering FinTech companies like *Aladdin*, *PayPal*, and *Swissquote* entered the marketplace with superior convenience and simplicity—and additional lower transaction fees—they were quick to conquer the market.

8. *Points of sale are shifting in several product categories.* Insurance for consumer electronic products is sold by the retail company. Meta-portals like *Comparis* and *Check24* offer the cheapest prices for almost everything, whether it be property, cars and motorcycles, telecom services, credit cards, mortgages, health insurances, and many other products too numerous to mention. These price comparison platforms are financed by advertising or click redirection. Regardless of whether smartphone insurance is sold at the counter of a retailer or via a price-comparison platform, the margins for the insurance company are very much shrinking. Smartphone apps and the corresponding marketplaces have become the new points of sale. Not only has the point of sale relocated to your pocket via the smartphone app but the vendor has also changed. You pay *Uber* for the ride, not the local taxi driver; you pay *Netflix* or the ticket sales platform for the movie, not the local cinema owner.
9. *Platform companies with two-sided markets are winning in many industries.* Eight out of the ten most valuable companies worldwide such as *Amazon*, *Alibaba*, *Apple*, and *Google* are built on platforms based on the logic of the two-sided market. Due to direct and indirect network effects, a platform is able to scale very quickly once a critical mass has been reached. The winner-takes-all principle is a consequence of the network effects and is evidence that the platform is working effectively. After the success of the digital pioneers, asset-heavy companies also began to initiate platform activities. *Siemens* launched the IoT platform, *Mindsphere*, and *Daimler* unveiled its mobility platform, *Moovel*. *Trumpf* founded *Axoom*, a digital hub of the shop floor in manufacturing, which was later sold to *GFT*.  
Yet, most platforms of incumbents fail. In 2016, *GE* forecast that its IoT platform, *Predix*, would achieve a sales volume of nearly US\$ 10 billion by 2020. But *Predix* did not take off as expected because it was trying to support too many verticals without the necessary domain expertise. Clearly addressing customer needs and creating perceived customer value remains no less important. In many cases, industry outsiders, because they are neutral players, have the best chance of securing wide market acceptance from all actors. Most companies do not want to jump on competitors' platforms.
10. *Value creation has shifted in the connected world.* Some players in the value chain gain more; others lose more. The music industry is a good illustration of this shift. In the unconnected age, the publishing label and the musician earned US\$ 1 each per CD sold. In the connected *Spotify* world, music has become very cheap, and turnover has shifted to the music streaming service platform, *Spotify*. The label gets US\$ 0.0016 per

song played; the musician only US\$ 0.00029. The remainder of the subscription stays with Spotify as the intermediary. In 2020, *Spotify* had a turnover of nearly US\$ 7 billion, the major proportion coming from premium subscribers. *Spotify*'s huge increase in market share is undoubtedly very promising, but it has yet to turn a profit.

There are similar examples in the B2B sector. The market for elevator maintenance used to be a fairly closed market, but it has undergone a major transformation due to connectivity. The typical business scenario was that an elevator got maintained, regularly inspected, and approved by the manufacturer's service team. But now, more and more companies have entered the market offering manufacturer-independent elevator services based on IoT using remote monitoring. These highly efficient remote diagnostics will only send out a service team when the condition of the elevator requires intervention—the service team can be in-house or third party. These new players have imposed themselves on the elevator maintenance market, rupturing the direct business relationship that had previously existed between the elevator manufacturer and the building owner or facility manager.

11. *The development of ecosystems along the customer journey requires multilateral partnerships.* Ecosystems are enabled by lower transaction costs combined with ubiquitous connectivity. The goal of such collaborative efforts is to develop a superior or new value proposition for the customer. This is enabled through data sharing in order to increase convenience and user experience and create positive spill-over effects from one service to the other. As a result, large ecosystems such as mobility, hospitability, education, housing, healthcare, and B2B marketplaces are being developed across today's industry boundaries. These ecosystems are expected to grow immeasurably in the decade to come. By 2025, *McKinsey* estimates that 30% of the world's expected turnover of US\$ 190 trillion in revenue will be redistributed across today's industry boundaries. Hundreds of today's industries will reconstitute into 12–20 cross-industry ecosystems. Therefore, it will become imperative for companies to create dynamic partnering capabilities and a well-honed skillset for sensing, storing, and analyzing data. An important part of this dynamic will be to create strong emotional ties with customers and develop a powerful emotional connection for their brand and company as a whole.
12. *Cooperation becomes more the norm than the exception.* A judicious mix of cooperation and competition finds expression in this new paradigm for ecosystems. *Amazon* and *Apple* cooperate when you buy your new iPhone via *Amazon*. But, at the same time, both companies are serious rivals



when offering competing digital media ecosystems: *Apple's* iTunes versus *Amazon* music. *Audi*, *BMW*, and *Daimler* are fierce competitors in the premium automotive sector but, at the same time, cooperate as joint owners of *HERE*, the location-based service company. *HERE* technologies capture location content such as road networks, buildings, parks, and traffic patterns and develop services to compete with the dominant competitor, *Google* Maps.

While traditional strategic management—taught, for example, by the famous academic, Michael Porter, in the 1980s and 1990s—aimed to create a comparative competitive advantage for a product or company, securing sustainable survival in today's global competition has become much more complex and challenging. Today's competition is no longer between individual companies or products but between entire value chains and business models. Given this hyper-competition, companies need to define with some degree of precision where they want to compete and where they aim to cooperate within the value chain. Cooperating with competitors is increasingly becoming the rule rather than the exception. The ultimate goal of all business activity is to achieve superior customer value.

Cooperation is by no means easy. How do you position your company and your products and services in the market against your competitors while cooperating at the same time? Even greater is the challenge of changing to a mindset that requires you to cooperate with a competitor in the non-competitive space. Small- and medium-sized companies (SMEs), in particular, seem to be highly reluctant to share relevant information with a competitor or even supplier. Nevertheless, cooperation is gaining in importance with the merger of industries, the rise of platform economies, and the trend toward one-stop offers.

To survive in the networked economy, companies need to consider such trends in relation not only to their overall competitive strategy but also for each individual product and service offering. Some industries such as retail and media have responded very quickly to these trends. Business leaders must constantly rethink how to create and capture value in a rapid and dynamically changing environment. Other industries such as mobility, energy, and health are in the process of change; an indicator of this trend is fast-growing pioneers entering the industry. Yet, some industries seem more resistant to these trends as shown by the higher degree of inertia among their players and customers. Overall, it is just a matter of timing and the pace of individual industries. Since business innovation is initiated primarily through industry outsiders, it

is important to recognize the attractiveness that a particular industry may hold for new entrants.

Business leaders need to reflect on these change drivers in terms of their relevance to their own industry. They ought to ask themselves the following questions: *What are the implications of these new competition rules? What should companies strive for in these times of uncertainty? How can companies create comparative competitive advantages when superior technologies are no longer enough to win? How do companies keep their customers and win new ones when they shift their demands and the points of sale? How does a company position itself when industries merge into large ecosystems with new profit allocations?*

## 2 Getting More Out of It: Business Value

Answering these questions may appear straightforward, but they do present serious challenges for businesses. The first principle to recognize is that the purpose of a company is to create value. To survive in the long run, a company must create real value for its customers while capturing a share of the created value for itself. The “new economy” of the 1990s failed largely for two reasons: value creation for potential customers was never large enough, and value capture did not actually occur. Too much attention has been given to the clicks on a website and too little consideration to the conversion rates. At the end of the day, the crucial question is how many website visitors actually bought a product.

An important lesson to draw from the decade of enthusiasm for Internet-based business is: do not forget the real value of the company’s activities. This is especially relevant to innovation in the early phase when the value is merely a number on a piece of paper, a concept study, or a business case but has yet to take a tangible form for real customers. When we speak of the value of products, services, and processes, we need to be more precise: It is not only about the objective value of products, services, and processes in terms of technical specifications, but it is also about the perceived value from the customer’s point of view.

Business value is about creating and capturing value. This is relevant for all kinds of innovation, not just the networked economy. Developing the 72 generation of rear axles for *Volkswagen* is known terrain where customer insights and functions are clear. But starting a connected business initiative is much tougher. At the beginning of the innovation curve, several technologies are available, and multi-options on platforms, technologies, and functionalities produce uncertainty. Too often, implicit and untested assumptions on

customer expectations lead to the neglect of business value considerations. Therefore, thinking in terms of business value is of particular importance in connected business initiatives.

Consider a simple definition of business value.

$$\text{Business Value} = \text{Customer Value} + \text{Company Value} \quad (1)$$

Every product innovation, process innovation, and business innovation should follow this basic formula to create a core business value. Without business value, innovation makes no sense commercially.

This formula is valid and relevant for all kinds of business. Every innovation has to be checked for its potential to create value for the customer and for the individual company. A crucial lesson can be drawn from the IoT business domain: IoT per se has no value. There is no market for IoT as a technology on its own. There is only a market for the products, services, and processes of the company, developed through the deployment of its IoT capabilities. IoT requires sensors and connectivity, which make the product more expensive at first glance. Business value is based on value for its customers—for example, better user experience, greater convenience, lower costs, and/or value for the company itself through, for instance, lower maintenance costs, and higher employee satisfaction or safety.

## 2.1 Examples of Successful Business Value Are Much in Evidence

- The German high-tech company *Trumpf* enables their laser cutting machines through IoT to allow remote diagnostics, remote monitoring, and remote system parametrization. As a result, customers acquire value through higher performing machines, better process quality, and less unplanned downtimes. They gain an increase in efficiency and can focus on their core processes. *Trumpf* ultimately benefits as it can sell these intelligent and connected machines for higher prices. In addition, *Trumpf* captures valuable real-time insights for its R&D on how its machines are used on customer sites. Moreover, there is the benefit of increased customer loyalty.

- With its On!Track system, *Hilti* offers a robust system solution for managing all the assets of a construction company, anytime and anywhere. Customer value resides in lower tool stocks, lower costs, better preventive maintenance of the tools, fewer disruptive breakdowns, secure documentation, real-time location tracking of tools, and an increase in employee safety. The value proposition for customers can be summarized in the phrase: *greater efficiency through transparency*. The value for *Hilti* is also clear: it gets to know its customers much better, and it sees what tools the customer use and how often. On!Track customers are more profitable when compared to other customers, and they have the highest percentage of so-called truly loyal customers. These customers buy *Hilti* tools on all available channels as appropriate: from the *Hilti* salesmen on the construction side, to the physical *Hilti* store and the virtual *Hilti* store online.

The business value effect can be—for both customers and company—direct or indirect. Often direct effects such as realized cost reduction or higher margins per service are seen as more convincing, more tangible measures of a connected business project's success than indirect effects such as customer intimacy, customer loyalty, and smarter operations. However, it is also true that indirect effects are often overrated in project proposals and elevator pitches to investors while concurrently underestimated in terms of a company's long-term competitive advantage.

### 3 Creating Full Business Value for Multi-lateral Partnerships in Ecosystems

These basic business value considerations are a condition sine qua non for commercially successful innovation. However, in many areas of open ecosystems, it is not enough. *Amazon* on its own would never be as successful without dealers using its platform. In other words, if *Amazon's* platform wasn't attractive enough for dealers to sell their products, there would be no value at all. It is crucial to create additional value for partners, especially when the platform is first launched. *Airbnb* and *booking.com* are only successful because they create value for their customers *and* their house landlords when they use the platform.

It is only when several partners come together to co-create new products and services that a whole value chain becomes competitive. This “full business value,” as we call it, is essential in ecosystems where multi-lateral partnerships strive to create superior or new value for their customers. Every activity has to

be focused on enhancing the customer journey. Shifting customer expectations toward convenience, superior user experience, and shifting points of sale demands collaboration among several partners. The orchestrator of an ecosystem has to consider the full business value. That is value creation for customers, company, and partners in the ecosystem.

Extended definition of business value in open ecosystems:

$$\text{Full Business Value} = \text{Customer Value} + \text{Company Value} + \text{Partner Value} \quad (2)$$

The most impactful business value can be developed through win-win situations for the customer, the company, and its partners in the ecosystem.

Allocation of business value is not static; it changes dynamically. *Uber* became one of the most successful mobility providers without owning its own cars and without employing its own drivers. For the business to be successful, *Uber* needs its drivers as partners as much as it needs its customers. The appeal of the *Uber* platform should extend not only to customers but also to drivers. Numerous drivers in Boston use the *Uber* platform and also the *Lyft* platform, *Uber's* toughest competitor. During peak hours after work, on Friday and Saturday nights, and during large events and festivals, the demand for mobility services exceeds the supply of drivers. In such circumstances, *Uber* responds by raising its fares to attract more drivers onto the road. In other words, *Uber* increases partner value. The same dynamic increase in partner value in the form of higher fares occurs at times when drivers' opportunity costs increase—for instance, at New Year's Eve or Christmas.

The dynamic pricing algorithm adjusts rates based on a number of variables, such as route time and distance, traffic, and prevailing rider-to-driver demand. Interestingly, *Uber* is aware of the customer's willingness to pay higher prices. When smartphone batteries are running low, people are more willing to pay for an *Uber* ride. When the *Uber* app switches to power-saving mode, it is showing its awareness of this fact. For the most part, dynamic pricing is based on machine learning; *Uber* creates a future-proof prediction of various independent conditions of the two-sided market: historical data, weather forecasts, holidays, global events, and traffic conditions are all factors that adjust pricing and, thus, the real-time sharing of business value between customers, partners, and *Uber* itself.

Thinking in terms of complex multilateral partnerships and stakeholders is becoming increasingly important for most ecosystems. Conceiving mechanisms to create value across the board for all stakeholders involved is more challenging than devising means to generate traditional business value, and it will become increasingly important in the future. This broad creation of value has been a demand of the stakeholder perspective for many years. A company should not only create value for its shareholders but also for its employees, customers, suppliers, and all partners including society as a whole (Harrison et al. 2010). In the modern ecosystem, this ethical stakeholder perspective has been reformulated into commercial thinking. Without at least long-term fair value creation and distribution to all relevant partners in an ecosystem, the innovation will not be sustainable.

## 4 Barriers to Creating Business Value

The trend toward connected business and ecosystems is a given. But how is it best to develop an ecosystem with multilateral partnerships that will generate new or superior customer value? Why do so many connected business projects fail? Why do only a small fraction of all platform projects succeed? Why is very little heard about the thousands of floundering initiatives? Why do most CEOs have too high expectations that are never met within the given time frame? Over the last decade, the digitalization of the world has created the basis for ecosystems, but, at the same time, some major barriers remain:

***Technology for Technology's Sake.*** Companies often participate in the drive to digitalization because everyone else is doing it. This “bandwagon effect” is also known as the “hype cycle” of new technologies. Business value does not require the use of the most sophisticated, cutting-edge technology. Too often companies utilize innovation technologies because the attractiveness of solving customer pain points is seen as high. This so-called *hype cycle* or *fever curve* of new technologies can be observed in most industries at any time. Figure 1 illustrates a hype cycle of emerging technologies (Gartner 2020).

By the time a technology finds itself at the top of the hype curve, expectations have become inflated. Given the explosion of interest, individual projects can transform an entire industry. However, on average, failure rates have been very high when the new technology has been introduced. Bandwagon effects and the principle of hope lead to an overrated evaluation of the technology and, consequently, an overheated investment in it.

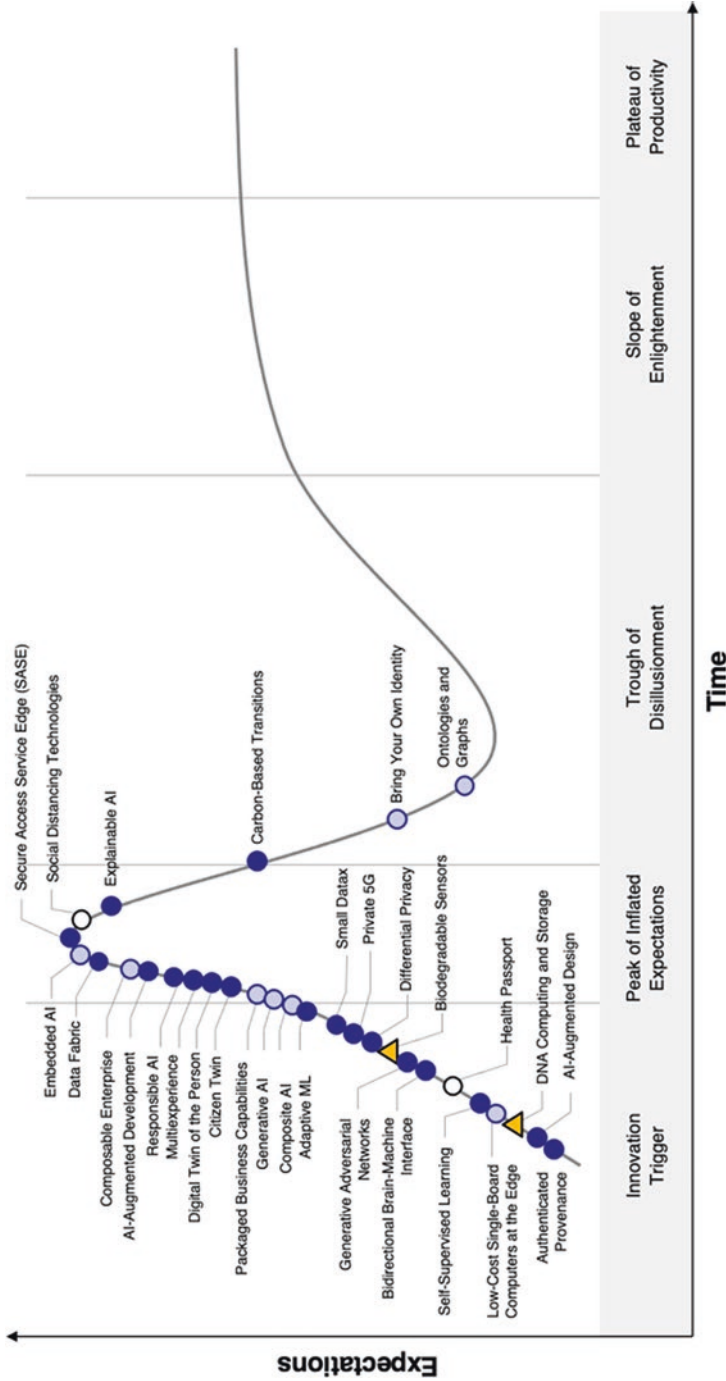


Fig. 1 Following the hype cycle for emerging technologies is often misleading, Gartner (2020)

In order to better judge the real value of a new technology, the potential for creating value and capturing value has to be analyzed. End-to-end thinking from customer gains and pains to technological solutions helps. *Tesla* did not use IoT as a fashionable gadget; instead, it was the first automotive company to fix cars over the air as they stood in the owners' garages, similar to smart phone software upgrades. In 2014, *Tesla* had already fixed broken charger plugs, increased the performance of its cars, and changed suspension settings to give the car greater clearance at high speeds. *Tesla* does not have the largest R&D center, nor does it have the longest experience in the automotive industry, but it is mostly able to place itself in its users' shoes.

***Generalization from Failure.*** When the new economy bubble burst in 2000, everyone thought that the Internet was dead; but, today, the most valuable companies are Internet based. When the bitcoin market bubble burst and prices fell, this was widely perceived as a failure of the entire blockchain technology. But the underlying distributed ledger technology is independent of the commercial application of cryptocurrencies. When *Amazon's* artificial intelligence (AI) based recruiting algorithm failed due to racial and gender biases, many HR managers responded with an across-the-board rejection of AI as a suitable technology for HR processes. But these managers failed to appreciate that AI is based solely on correlation and not causality. A more thorough training in AI would massively improve appreciation of its strengths. Otherwise, it should come as no surprise that "garbage-in" will inexorably deliver "garbage-out." To avoid the type of generalization that comes from failure, a deep root cause analysis should be conducted into failures. To go a step further, rather than speaking of failure, a real opportunity for learning should be welcomed. The best known example is *3M* with its Post-it sticker invention. The experiment to make a strong adhesive failed; the glue did not fully stick. Instead of giving up, one of the scientists, Art Fry, used the glue's "low-tack" properties to mark the hymns in his church choir's hymn book—he was a gospel singer in his freetime. After years of development in business discovery workshops, the success story of *3M* Post-it notes was finally born. This is not new. In the pharmaceutical industry, every active substance that has an effect also has a side effect. The business case defines what is effect and what is side effect. *Pfizer* developed *Viagra* as a drug for treating heart disease, which, in its clinical trials in the late 1990s, was shown not to work fully. But volunteers in the clinical trials had been reporting interesting side effects—*Pfizer* soon started with pilot studies on patients with erectile dysfunction and went on to develop one of its most commercial drugs.



***Privacy Restricts Data Usage.*** The digital world captures data on what we think: three million emails per second are sent; 660,000 new *Facebook* accounts are created per minute. It captures what we feel: 35,000 individual likes are given on *Facebook* per minute. It records our movements via GPS on our smart phones. It captures what we buy via retail companies; *PayPal* and credit card companies service our purchase transactions; 47,000 apps are downloaded per minute on *Apple's* App Store alone. It tracks what we search; over two million search requests are placed per minute on *Google*. More and more, it tracks and captures how we use our products, machines, and processes as we use them. But, in Western countries and especially in Europe, people are becoming more and more sensitive to the way their data is used. The case of *Cambridge Analytica* with *Facebook* (see chapter “Cambridge Analytica: Magical Rise, Disastrous Fall”) has raised alarm bells in our society. The smart city initiative in Toronto, *Alphabet's* sidewalk labs, failed because of resistance on the part of data-sensitive citizens. Besides fulfilling the legal requirements, like the General Data Protection Regulation (GDPR) in Europe, many companies actively address the data privacy issue on several levels. Companies such as *Microsoft* and *Bosch* do have self-imposed data privacy principles that address transparency, control, and security issues. In addition, it is essential to obtain user consent and to do so without compromising the integrity of the process. Organizationally, several large companies have set up trust centers to further develop and enforce these privacy issues. This is especially important in ecosystems where data is shared across company borders.

***Most Data Are Not Relevant to Business.*** “Always on” is not just a trend for teenagers with smart phones but for every human and physical thing. There are dozens of studies forecasting the number of IoT-enabled devices and the exponential growth of data. As early as 2014, an *Audi A8* generated over 2000 data points. What data are relevant to *Audi's* business? Who owns the driving data? Today a smart wind turbine of *Siemens* contains 300 sensors, which continuously transmit 200 gigabytes per day to *Siemens*, with an installed base of over 10,000 turbines worldwide. The challenge remains how to extract smart, business-relevant data out of the data universe and translate that data into business-relevant knowledge where real value for the customer can be developed. The biggest challenge is not the algorithm but the question: how to access business-relevant data. There are a few robust steps to take to prepare a dataset for machine learning: articulate the problem early, it all starts with the problem. Then, establish data collection mechanisms and format these data to make everything consistent. Finally, data reduction and rescaling

are important. *Siemens* often collects data from its products, translates these data into business-relevant information, and tries to apply this information to relevant business models. Companies like *LinkedIn* or *Facebook* use their available data offered by users and the movements of eyeballs.

***Customers Are Not Willing to Pay.*** The machinery industry creates plenty of value through smart connectivity of value chains, remote monitoring, remote diagnostics, remote system parametrization, and system optimization. The goal is clear: create recurrent revenues that will make the company resilient against economic downturns and build customer loyalty. But how do you convince customers to engage in new revenue models, such as subscription models, performance-based contracting, and pay-per-use models? If only sensors and SIM cards are added to the machines and tools without providing additional services, it just makes the product more expensive. If new services are created but the customer is not willing to pay for them, it only increases the overhead costs of the company. In such cases, often seen in product or machinery companies, neither customer value nor company value can be created. For those B2B firms that try to charge for services they have been giving free, three alternatives need to be evaluated: *Bill it, kill it, or keep it free.* Often, free lunches are not sustainable. It requires considerable effort and a mindset imbued with a service-dominant logic to convince customers that they receive a valuable service that they should now pay for. Companies should be recommended to evaluate pricing models that offer professional services of high quality, instead of delivering free, low-quality services.

***Platforms Don't Scale.*** At this point *Bosch's* Chief Technology and Chief Digital Officer Michael Bolle told us: "Nobody wants to be captured on another one's platform. Everybody wants to create his own platform. This is the reason why platforms do not scale and fail in most cases." Many successful business models are based on platform strategies with two-sided markets. Leading examples such as *Amazon*, *Facebook*, *Foursquare*, *Instagram*, *YouTube*, *eBay*, and *Uber* are known for their incredible success and market capitalization. The ubernization of the economy is a widely known phenomenon as platform companies capture more and more of the value while product companies are threatened with becoming commoditized. Due to increasing marginal returns, the winner often takes all. Most platform initiatives of imitators simply fail. *Siemens's* Mindsphere is doing just fine; *GE's* Predix platform has been imploding in recent years. Most platform initiatives fail; it is a battle against the odds. The reason is not lack of attention on the customer side but

mainly lack of traffic and—above all—lack of business. Manufacturing companies are often not successful in imitating platform players like *Alibaba* or *Amazon*. Instead, it is preferable to evaluate complementary roles in the ecosystem and use the power of these platforms to generate company growth. Since rising marginal returns and the winner-takes-all principle reduce the chance of blockbuster winnings, these companies would do well to evaluate their niche platforms and create the emotional and data-based stickiness that will bind existing customers to their platform.

***Partnering Has to Be Learned.*** Lower transaction costs make cooperation between companies much easier: in particular, the costs of collaboration can be reduced by many factors. But companies are still not sufficiently well prepared to collaborate and conduct partnerships. Coopetition is particularly challenging when the mindset of cooperating with the competitor has to be developed from scratch. The efforts required to achieve a partnering mindset with competitors are often underestimated. If a competitor is growing faster and more profitably than the company in question, it can seem like an uphill struggle for business leaders to convince their teams to partner with this competitor and agree a proposition that will deliver superior value. Instead of concentrating on the customer journey and the joint superior value proposition, most companies want to become the orchestrator of the ecosystem rather than exercising a role committed to creating customer intimacy and stickiness.

**Roles Are Not Clearly Defined** In connected business projects, the biggest challenge is often to get access to the right data in the right place. But unclear roles make this difficult. Data scientists love to solve complicated technical problems, delve single-mindedly into the algorithms, and leave IT and politics to the managers. IT managers want to run systems that are stable, maintainable, and secure; they often block new AI initiatives because of their perceived uncertainty. Business and sales think more in today's than in tomorrow's solutions; they want to sell the working system in the here and now. Top management is often too far away from a proper understanding of the cultural issues affecting teams. Overall, CIOs are often too focused on the pure technical side of the IoT solution. This is much too narrow a perspective, as Nick Jones, research vice president at *Gartner*, reiterates: "Successful deployment of an IoT solution demands that it's not just technically effective but also socially acceptable. CIOs must, therefore, educate themselves and their staff in this area, and consider forming groups, such as ethics councils, to review corporate strategy. CIOs should also consider having key algorithms and AI systems reviewed by external consultancies to identify potential bias."

***The Wrong Key Performance Indicators (KPIs) Lead to the Wrong Activities.*** When IoT became popular, many companies set the goal of making all their products IoT enabled. According to an empirical study by Gebauer et al. (2020) from the *Bosch IoT lab*, this leads to high IoT investment and high operational costs. Due to a lack of service-oriented KPIs, companies are not able to recover these costs through corresponding returns from service offerings. There are a number of traps to be avoided:

- Companies often measure the customer acquisition costs necessary to convince customers to use and pay for services. But due to missing indicators on service quality, companies experience a high customer churn rate. As a result, customer acquisition costs become too high, leading the business case to fail.
- By aiming at recurrent revenues from services, companies often overlook the real value. *Microsoft* starts to measure (and incentivize) not only sales but real usage of all functionalities of the product. This creates higher customer satisfaction and emotional ties to the customers.

Management's attention should refocus on business value mainly for its customers, including setting KPIs that are more value based and less technology oriented. This is not an easy task to fulfill. It is easier to measure the share of IoT-enabled products in the overall portfolio than the real value created on the customer's balance sheet. But this is where the easy path can lead to—a commercial dead end.

## 5 End-to-End Thinking to Understand the Value Driver

Instead of simply jumping on a new technology trend, the emerging technology should be evaluated in a holistic *end-to-end view* to understand the complete solution. For early pioneers, it makes sense to completely rethink the entire business process, product and service, or business model. It is important to understand the pains and gains of customers and users or as Jobs said it “You've got to start with the customer experience and work backwards to the technology.” Without deep customer insights and understanding of their likely pains and benefits, the risk of an electronic mouse trap is high. Over-engineering and technology for technology's sake are often R&D-driven responses.

For the innovation project, it's all about the perceived customer value. But in several cases, it is not even clear who the customer is, as a simple example shows: who is the customer in the elevator industry? There is no simple answer to this question. Is it the user who utilizes the vertical transportation in the building? Is it the investor who pays the bill for the elevator? Is it the owner who is interested in life-cycle costs? Is it the facility manager who maintains the building and is responsible for the service contracts? The service business is typically responsible for more than 60% of the total turnover of an elevator company and, therefore, highly business relevant. Is it the architects who design the building with its functionalities and thus strongly influence the choice of elevator, especially in complex high-rise buildings? Is it the elevator consultant who specifies the elevator and, therefore, strongly influences the buying decision? In the end, the pains and gains of all of the product's stakeholders must be considered from an end-to-end perspective. Every stakeholder gain created and every stakeholder pain alleviated contributes to the business value of the elevator company. The overall business value is maximized if the new offering represents real pain relief and gain for all stakeholders. In most cases, the stakeholders have conflicting interests: in our elevator case, the investor wants to minimize his investment; the facility manager wants ease of service handling; the owner of the building wants low life-cycle costs; the architect often wants the building to have a wow factor. And finally, the actual user of the elevator is interested in getting from A to B.

Moreover, often customers do not really know what they want. If you ask the users of an elevator, they will answer they would like to minimize waiting and travelling time. As a result, elevator companies have started a very costly race to increase elevator speed. The Taiwanese "Taipeh 101" building achieves speeds of 60 km/h, which requires a very costly internal air pressure control system to equalize pressure for users. While these races may be interesting to make it into the Guinness Book of World Records, the cost of such systems is exorbitantly high and, in the case of most buildings, offers limited benefits to users. Instead, research has shown that users actually do not like to stand around doing nothing, while waiting for the next elevator. They usually want to reduce *perceived* waiting time. But this is not the same as absolute time measured in minutes and seconds. Perceived waiting time reduction can be achieved more effectively and smarter by offering entertainment and convenience during the process of waiting, boarding, and travelling. Hence, the user experience can be enhanced through other means. Steve Jobs has been quoted as saying: "Why ask customers for their requests, it's our job to know what they want." From an end-to-end perspective, it is crucial to find the sweet spot where the user experience is optimized, and the user is delighted.

## 6 Thinking in Business Models: Overcoming Silos

Business value requires holistic thinking in business models. A business model is the story of how a company creates and captures value. Compared to product and process innovators, research has shown that business model innovators are more profitable, harder to imitate, and therefore create sustainable competitive advantages. However, it is very difficult to disrupt an industry as radical new ways beyond the dominant industry logic have to be considered. It is difficult for mature and experienced players in an industry to overcome this dominant logic and forget everything they have learned thus far. This is why disruptive innovations often come from outsiders. The disruption from landline phones to mobile phones took the input of the outsider, *Nokia*. But when mobile phones became smart, neither *Nokia* nor *Erickson*, *Motorola*, nor *Siemens* managed to make the breakthrough. Only when *Apple* entered the mobile phone market with the iPhone in 2007 did the disruption succeed. The reaction of the established companies at the time was typical: “The iPhone is just a niche market,” commented *Nokia’s* CEO in *Forbes* magazine. Ironically, this was the start of *Nokia’s* rapid descent from dominant market leader to bankruptcy.

Industry outsiders can more easily ignore the dominant logic of an industry. They do not have to unlearn what others have learned over decades. They do not have to work against their corporate DNA. The reality should not be glorified, however. Start-ups and outsiders are much more likely to fail with their disruptive innovation. The higher the innovative step, the higher the probability of failing. But, if these business model innovators survive and succeed, the impact of change on the whole industry can be radical and sweeping, as the well-known examples of *Amazon*, *Apple*, *Ebay*, *PayPal*, *Uber*, *Alibaba*, and *TenCent* have shown.

It becomes more important to think of business models from the perspective of the customer journey. To fulfill the customer’s desire for greater convenience and better user experience, many industries need to transcend company borders and think in terms of holistic solutions. *Daimler* does not just want to sell cars: it offers mobility. The insurance company, *Helvetia*, does not only want to sell household insurance; it intends to offer its customers comprehensive solutions in the home sector. *Roche* regards collaboration between health-care and technology companies as the key driving forces for the future of healthcare (Huber 2021). In ecosystems, multilateral actors collaboratively develop joint value propositions, based on complementary modules. Often

ecosystems are developed by an orchestrator who adopts the role of the hub firm.

The question is how to innovate the business model and disrupt an industry. How can a company get out of the low margin red ocean and create an uncontested market space? How can a company create a blue ocean and out-compete its competitors by ignoring them? How is it possible to create and capture value in a radical, new way? This requires strict thinking in business-model terms. A business model provides answers to four questions (see Fig. 3):

- WHO? Who is the target customer?
- WHAT? What is the value proposition?
- HOW? How is the value proposition being implemented?
- VALUE? How is it profitable?

In other words, a business model must address the target market, the value proposition, the supply chain architecture, and the revenue model. Business model innovation is finally reached when two or more of these dimensions are simultaneously changed. Every new product, process, and service should be assessed on its potential for business model innovation. Clearly, the creation of a new business cannot remain within R&D or product management. It is a task for the entire company deploying all its functions. Thinking in terms of business model structures has an important side effect for companies: it overcomes silos in a company, as several functions have to work closely together.

But how best to innovate business models? Following the business model navigator helps to overcome the dominant industry logic. It unfolds in four steps: initiation, ideation, integration, and implementation (Fig. 2).

**Step 1: Initiation** As a first step, a company has to analyze its ecosystem as it applies to today's world to understand today's business model in terms of the four questions: *Who is the target customer? What is the value proposition? How is the value proposition being implemented? How is it profitable?* It helps to get a much better understanding of today's business model when the actors in the industry are analyzed—that includes customers, suppliers, partners, competitors, and new entrants. Moreover, the change drivers for this industry have to be analyzed. This can be consumer shifts (e.g., hybrid customers in banking), market integration (e.g., *Apple* entered the mobile phone business), technological trends (e.g., digitalization), sustainability awareness (e.g., plastic-free packaging), or regulations (e.g., the last mile in telecommunications).

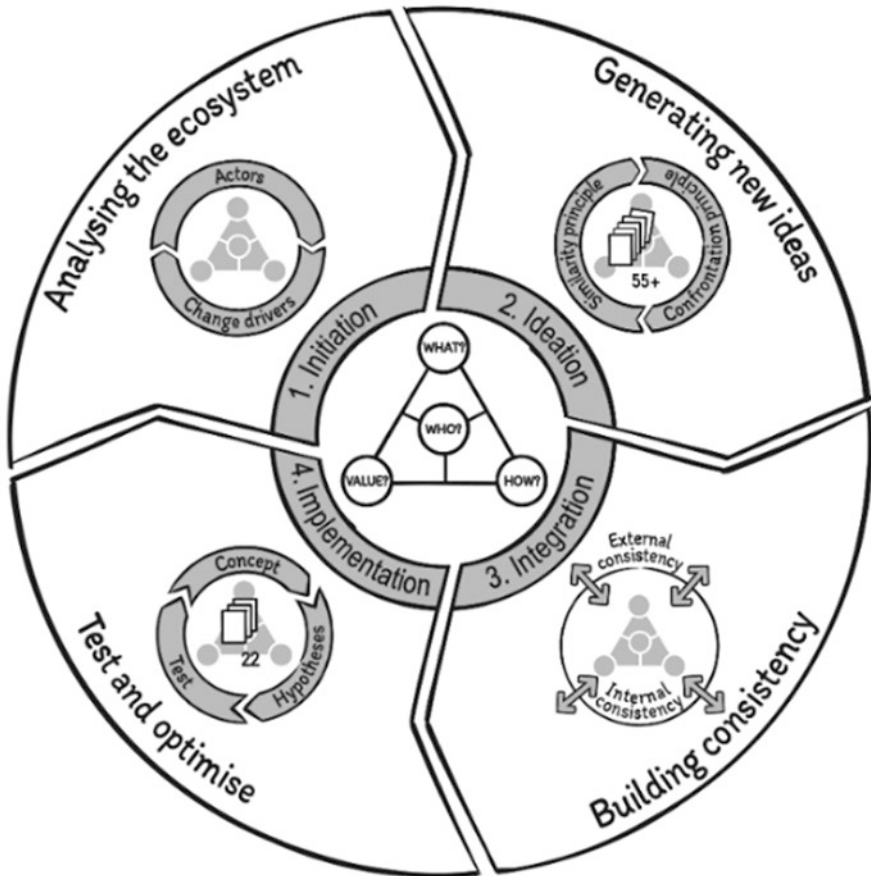


Fig. 2 Four steps toward a new business model, Gassmann et al. (2020)

**Step 2: Ideation** During the ideation phase, new business models are ideated. Here, our research has shown that 90% of all business model revolutions are based on 55+ business model patterns, which can be recombined like Lego bricks. This principle, which has its origins in computer science and is also used in mechanical engineering (the TRIZ methodology of Altshuller), has proven very effective.<sup>1</sup> Popular business model patterns in connected business are add-on, orchestrator, layer player, performance-based contracting, equipment as a service, integrator, guaranteed availability, hidden revenue, lock-in, razor and blade, solution provider, subscription, and two-sided markets. These patterns have to be recombined creatively for criteria and process (see Gassmann et al. 2020).

<sup>1</sup> For more details on business model patterns and examples, see [www.businessmodelnavigator.com](http://www.businessmodelnavigator.com).



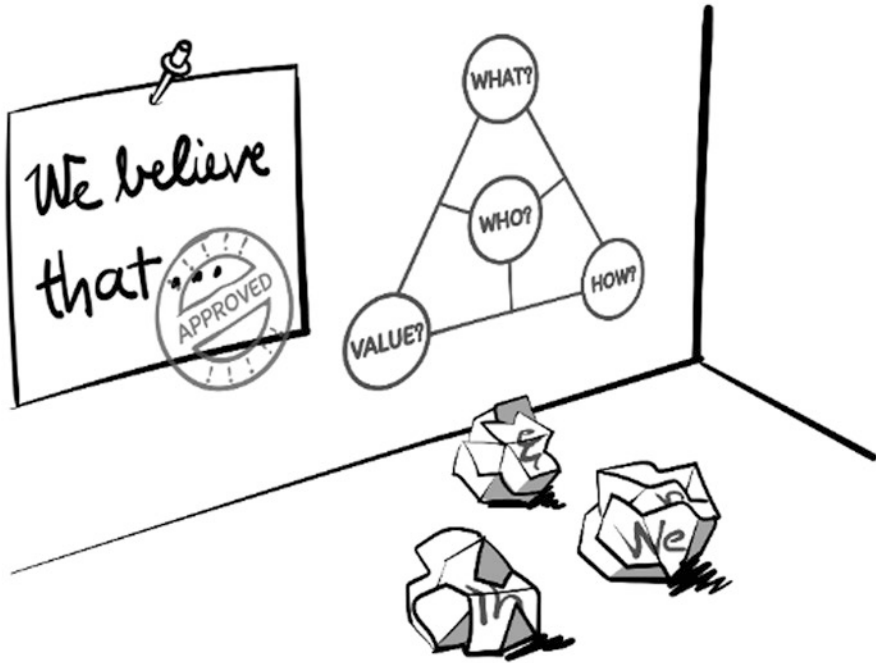


Fig. 3 Make your underlying assumptions explicit and testable, Gassmann et al. (2020)

**Step 3: Integration** This is a critical phase where the consistency of the new business model is evaluated. There are two major directions. First of all, the business model has to be internally consistent in terms of how the four questions are answered and how the business model fits into the internal competencies of the company. Secondly, the business model has to be checked for external consistency—for example, its fit with the other stakeholder’s interests and the competitors’ landscape as well as its fit with the change drivers of the industry. Often the devil is in the detail. *Hilti’s* fleet management, which today is a big success story responsible for 50% of the company’s turnover, was close to failure due to complex contracts, adverse selection of customers, and salesman lacking the ability to sell the complex fleet concept—to name only a few. Every single factor can be a killer for the new business model.

**Step 4: Implementation** In the implementation phase, it is important to make the underlying assumptions of the business model explicit, develop hypotheses, and test them lean and fast. Connected business is much more about speed, scalability, and disruption than other innovation areas. This

makes business model initiatives more attractive but also more fragile and riskier. It helps if the initiatives are launched with big visions but small steps to manage the risk. It is essential to speed up the learning process in terms of build, measure, and learn cycles. Building a minimum viable product (MVP) is important to learn about the latent requirements of the users, to understand the value drivers, and to validate the underlying assumptions of the product, the strategy, and the growth engine of the connected business. R&D engineers with a scientific background, PhDs in chemistry or engineering, perform their technological work very solidly. But, surprisingly, when it comes to business, pure trial and error replaces their scientific thinking. Not to be misunderstood, action is called for. But it helps when the team develops specific hypotheses on the product, the customer preferences, and the business model, and then validates those hypotheses. Thinking in lean start-up terms accelerates validated learning as a rigorous method for demonstrating progress. This is different to old school business cases on Excel sheets.

This is often misunderstood as proof of concept (PoC). But while technological feasibility needs PoC, understanding customer requirements is in greater need of proof of value (PoV). The most unknown factor consists more often in customer preferences and behavior or partner acceptance than in technological feasibility.

Speed remains crucial; flexibility and pivots are important. A dead end in terms of a false hypothesis should not be considered as a failure but as part of a learning process. As with experiments in natural science, lessons need to be learned from business experiments, to pivot the company's value propositions, partnering model, or revenue model. Experiments are opportunities to learn (see also chapter "Experimenting: What Makes a Good Business Experiment?") (Fig. 3).

## **7 Data Analytics Are Great, but Data Access Is Key**

AI has revolutionized data analytics and reduced the cost of prediction. With the development of Alex Net in 2012, the first scientific breakthrough in deep neural networks was achieved, followed by a wave of deep learning applications in many product fields and industries. Importance is attached to the value created and captured, ranging from superior customer service, chatbots, preventive maintenance, health diagnostics to robots, and autonomous

driving. The impact of neural networks on connected business value creation is enormous. And this is just the beginning, as innovation research has demonstrated in the past.

Most important are applications to better gain customer insights:

- The German construction product company, *Einhell*, uses AI, especially natural language processing, in order to evaluate product features from social media comments. While *Amazon* uses evaluations of a product in the round, *Einhell* uses product feature evaluations of products—for instance, “I like the battery of the *Einhell* PXC.” *Einhell* uses these social media comments to identify and evaluate product features from a customer perspective. They identify the features and their perceived customer value.
- Many insure-techs have started to use chatbots in customer interaction. Experiments have shown that these chatbots can not only interact but also sell products. The performance of bots in sales can match the top 20% of human salesmen, if the situation is conducive (e.g., same gender of bot and customer; customer does not know that the “salesperson” is a bot). Research on marketing tech sees huge potential here, limited only by ethical considerations.

It is important to reiterate that AI is only based on statistical correlation and not causality. In order to train the algorithm, the quality of the data must be high. The biggest challenge facing most AI projects is how to obtain access to the right data in the right place. Hurdles are manifold, from legal barriers like GDPR, non-standardized interfaces, and media breaks, to conflicting interests between participating companies and stakeholders.

Once a new technology fails to fulfill its expectations, the disappointment is huge, sparking immediate discussion in the press and media:

- *Starbucks*'s AI designed a super-efficient duty roster that allowed baristas only five hours of a break between shifts.
- *Amazon* developed an HR algorithm that automatically weeds out women from job applications.
- *Google*'s image recognition algorithm categorized black people as gorillas until 2015.

The algorithms were trained with non-representative data. Sample bias during the training phase is often the cause of weak models and thus weak prediction. AI is just based on statistical programs that have no values, no emotions, no reflection, and no morality.

Two things are crucial for AI and neural networks but often are forgotten: (a) AI has to drive business value; it must be supported by business models in order to create and capture value; (b) access to the right, business-relevant data has to be ensured.

## 8 Success Factors in Leading Connected Business Initiatives

Connected business has to create business value for its customers, partners, and company. In order to start a connected business project, the following cockpit or checklist has proven to be very helpful (see Fig. 4).

Develop the business model and answer the questions: Who is the customer? What do you offer to the customer? How is this offering implemented? Why is the business model profitable? In other words, address the target market, the value proposition, the supply chain architecture, and the revenue model. This is the core of the business model cockpit.

The cockpit chart is a structured checklist for developing a business model. It is organized into several key sections:

- Gains:** A section with a smiley face icon and five horizontal lines for notes.
- Pains:** A section with a frowny face icon and five horizontal lines for notes.
- Cash:** A section with a Euro symbol icon and five horizontal lines for notes.
- Revenues:** A section with five horizontal lines for notes.
- Costs:** A section with five horizontal lines for notes.
- Products & Services:** A section with a gift icon and five horizontal lines for notes.
- Pain Reliever:** A section with a hand icon and five horizontal lines for notes.
- Gain Creator:** A section with an upward arrow icon and five horizontal lines for notes.
- Positioning:** A section with a target icon and five horizontal lines for notes.
- Our Mission:** A section with five horizontal lines for notes.
- Competencies:** A section with a key icon and five horizontal lines for notes.
- Our Assumptions:** A section with a plus sign icon and five horizontal lines for notes.
- How to test them:** A section with a wrench icon and five horizontal lines for notes.

In the center of the chart is a diagram titled "New Business Model". It features a central circle labeled "Value Proposition". This circle is connected to three other circles: "Revenue Model" (top), "Cost Structure" (bottom left), and "Customer Segments" (bottom right). Each of these three outer circles is further connected to a "Who?" label, indicating the target audience for each component. The diagram is surrounded by a grid of horizontal lines for notes, with "Who?" labels on the left and "What?" labels on the right.

Fig. 4 Cockpit chart for disruptive business innovations as a checklist, author’s own illustration

What are the gains and pains of customers? What are the gain creators and pain relievers, and how are they translated into the intended products and services? Then, what is the positioning of the product? In other words, how is it possible to create a comparative competitive advantage? It helps to write down the mission of the intended business—for example, “we want to facilitate our customers’ success by providing... services.” Then, stand in your customers’ shoes and check: “I buy [this product] instead of [a competitor’s product] because [the comparative advantage of our product] which is proven by [facts no arguments].”

The revenue model has to be explicit in terms of revenue streams and costs along the life cycle of the product. Often forgotten is the clear definition of the company’s core competencies [“we can...”] and the definition of the required partnering competencies [“we need...”]. In most cases, the need for external knowledge and competencies is underestimated. This is particularly relevant in ecosystem and business model projects where own industry knowledge is no longer enough. Moreover, partnering is underestimated in the area of software development when the company itself has no software DNA.

It is essential for the cockpit chart to make the business’s implicit, underlying assumptions explicit as a testable hypothesis and show how to test it. Learning from *Google* moonshot projects, try to kill your own project or, in other words, validate the most critical assumption first. It is important to fail earlier in order to learn faster and at less cost.

From the research and hundreds of connected business projects, it is important to summarize the lessons learned on how to lead such initiatives successfully.

1. Key to all connected business initiatives is the ability to create and capture business value. Be careful not to overemphasize technology. Instead, develop end-to-end solutions with customer value. For this, a deep understanding of the value driver of the applications is necessary.
2. Thinking in business models is not only about value creation and capture. It helps also to overcome company internal silos. The answer required of a business model is the integrated answer to four questions: Who is our customer? What do we offer to the customer? How do we implement our offering? Why is it profitable?
3. Carefully evaluate platform initiatives regarding direct and indirect network effects. If not feasible, than take complementary roles in the ecosystem.
4. AI is important but access to the right data is key. Since AI is only about statistical correlation and not about causality, it is important to train the

model with relevant data. If data is the new oil, the model is the new refinery.

5. Concentrate on your core competencies and collaborate with partners in ecosystems in order to create a superior value proposition for your customer along the customer journey. Be open to cooperation, even if this requires a major shift in mindset.
6. You only can manage what you can measure. KPIs need to focus on business value drivers where connectivity addresses the sweet spot between the effort expended and the impact on business value.
7. Get top management support; connected business is a strategic transformation journey that is often underestimated.
8. Set up a diverse team from different backgrounds and functions. Include outsiders to challenge your company logic and embrace ideas from outside. Think in terms of customer journeys and business models, and less in terms of company hierarchies and processes.
9. Make the underlying assumptions of the business model explicit. For each assumption, there should be a clear testing strategy: a picture is more than 1000 words but a prototype is more than 1000 pictures. Engage prototypes with customers and partners.
10. Develop the skills within the organization to walk the transformation journey. Develop a culture of openness and experimentation; there should be no sacred cow in the room. Be persistent and keep on trying. Aim to strike a balance between long-term benefits and short-term results. It is a long journey but it starts with small steps.

And finally, to summarize the lessons learned from being over 25 years in the innovation sector: “Think big, start small, fail cheap, and learn fast.”

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**Oliver Gassmann**, Prof. Dr., is Professor for Technology Management at the University of St. Gallen and Director of the Institute of Technology Management since 2002. His research focus lies on patterns and success factors of innovation. He has been visiting faculty at Berkeley (2007), Stanford (2012), and Harvard (2016). Prior to his academic career, Gassmann was the head of corporate research at Schindler. His more than 400 publications are highly cited; his book *The Business Model Navigator* became a global bestseller. He received the Scholarly Impact Award of the *Journal of Management* in 2014. He founded several spin-offs, is member of several boards of directors, like Zühlke, and is an internationally recognized keynote speaker.

**Fabrizio Ferrandina** is Partner and CEO of the Zühlke Group, a global innovation service provider. Until 2018 he was CEO of the German subsidiary and member of the Zühlke Group Executive Board. His career has been dedicated to driving software and system projects for clients all over the world. Prior to his industry career, he worked as a researcher at the University of Frankfurt with focus on software and data engineering where he published several scientific papers. Fabrizio Ferrandina holds a degree in electronics engineering from the Università Politecnico di Milano, Italy, and a postmaster MBA from CEFRIEL, Milan.