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Evaluation of Digital Business Model Opportunities

A Framework for Avoiding Digitalization Traps

Using a three-phase framework, companies can avoid three digitalization traps and effectively evaluate digital business model opportunities.

Lina Linde, David Sjödin, Vinit Parida, and Heiko Gebauer

OVERVIEW: In the era of digitalization, manufacturing firms find it difficult to assess what is "the right" digital business model. To avoid common digitalization traps, company leaders and managers need to carefully assess each business model opportunity before committing to implementation and commercialization. We present insights from our case study about the diverse and complex issues related to digital business models. We highlight three digitalization traps and provide a three-phase framework companies can use to evaluate digital business model opportunities and make an informed decision on the commercial prospects for each model vetted.

KEY WORDS: Digital servitization, Risk management, Business model innovation, Industry 4.0, Digitalization paradox

To avoid missing out on the opportunities presented by digital technologies—like the Internet of Things, cloud computing, artificial intelligence (AI)—industrial companies may sign new business deals in haste. In many cases, the goal is to replicate the success of global high-tech companies such as FAANG—Facebook, Amazon, Apple, Netflix, and Google—by adopting digital business model innovation. For example, by investing in smart and connected products (Porter and Heppelmann 2014) combined with AI capabilities (Gerbert et al. 2019), providers like Volvo and ABB can offer enhanced digital business models based on fleet management and site optimization by monitoring and analyzing the performance of numerous products.

Profiting from digital business models is much more complex than companies frequently assume. Industrial companies often invest in digital technology without fully understanding the implications of digitalization. They try to steer their businesses towards new digital business models, but the returns in terms of revenue enhancement are generally modest and sometimes negative. This phenomenon is often called the "digitalization

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paradox," where manufacturing companies are unable to profit from their substantial investment in digital offerings (Gebauer et al. 2020; Parida, Sjödin, and Reim 2019; Sjödin et al. 2020). A key managerial challenge is to rein in the push to digital business model commercialization that arises from exorbitant customer requests and aggressive internal sales targets. Instead, companies must take the time to evaluate carefully the business impact and profit potential of new business model opportunities. Current literature and practice offer businesses few insights into how to do this accurately and significant gaps remain.

Academics and practitioners have only limited understanding of the traps that manufacturing companies risk falling into and how those traps help to explain the digitalization paradox. Scholars have highlighted the challenge of pinpointing customer needs (Kohtamäki et al. 2020; Lerch and Gotsch 2015), integrating multiple digital technologies (Gebauer et al. 2020), and developing new partnerships and distribution channels (Ganguly and Euchner 2018; Kamalaldin et al. 2020). While teams in charge operationalize new digital business models at the time of contract signing, often complex interdependencies exist with elements and processes extending throughout the organization, most of which are outside the operational sales team's control. This complexity and interdependency compounds risk during the business model commercialization process because small errors can cascade into more serious business risks and ultimately lead to failure. Companies need to understand the causes of and traps within the digitalization paradox.

Companies lack clear frameworks to evaluate new digital business model opportunities. Existing frameworks focus mainly on developing and designing new business models and less on how to evaluate them (Johnson, Christensen, and Kagermann 2008; Osterwalder and Pigneur 2010). This deficiency is particularly pronounced for digital business models, which means companies are ill prepared to deal with the many new and unknown decisions associated with digital offerings (Luz Martín-Peña, Díaz-Garrido, and Sánchez-López 2018). Over time, companies' digital offerings for customers often prove to be bad deals for both sides of the relationship. Profitability gets squeezed by significant increases in costs and too few revenue enhancements (Kohtamäki et al. 2020; Sjödin et al. 2020), and concrete customer value may fail to materialize due to deficient processes or understanding of pain points. Ultimately, companies' credibility and reputation get jeopardized as they try to become digital pioneers. To cope with this tendency, companies realize that they need to evaluate the business model opportunity more judiciously before signing a business deal involving new digital offerings (Ganguly and Euchner 2018). Companies need a more carefully considered, systematic process for evaluating the potential of digital business models prior to commercialization.

This study identifies traps inherent in digital business model innovation and offers insights into how industrial companies can improve the way they evaluate new digital business model opportunities. Based on in-depth studies of eight industrial manufacturers, we develop a three-phase digital business model evaluation framework with distinct steps and key questions for companies to consider.

Why Evaluate Digital Business Models?

Many industrial firms use digital technology to innovate their business models and explore new innovative offerings (Sjödin et al. 2020). These digital business models typically add service elements to physical products so that companies can provide customized solutions (Kohtamäki et al. 2020).

The proliferation of digital technologies points to radical changes at the core of business activity and a significant transformation across all dimensions of the business model—namely, value creation, value delivery, and value capture (Sjödin et al. 2020). First, the provider creates value closer to the customer's operations since providers can use data from a fleet of equipment to identify areas for improvement in the customer's ongoing operational processes—for example, optimization of equipment and condition-based maintenance (Kohtamäki et al. 2020). Second, the shift to digital business models often requires new kinds of capabilities, such as data analysis and software development, that surpass manufacturing firms' core competencies and yet are critical to enable them to deliver the value created (Parida et al. 2014). Many industrial companies have unclear processes and face organizational resistance and inertia when they move beyond developing mechanical equipment to digital solutions (Kamalaldin et al. 2020). The ecosystem relationships required to deliver value also changes. For example, a new market might require new local partners to partake in delivery, and new governance challenges might arise when new stakeholders, such as cloud computing providers, get introduced into the business (Sjödin, Parida, and Kohtamäki 2019). Third, digital business models often mean moving from a capital expenditures (CAPEX) model, such as the traditional purchase of equipment with add-on repair and maintenance services, to an operating expenses (OPEX) model where the customer pays for an outcome—for instance, the amount of material processed by the equipment (Sjödin et al. 2020). While this shift has strong strategic benefits and recurring revenue flows, it also exposes the provider to significant uncertainty and risk it needs to manage. These business model challenges are well-known within industries, but firms still struggle with how to mitigate them.

The business model literature has advanced significantly in the design and development of business models (Amit and Zott 2012; Johnson, Christensen, and Kagermann 2008; DaSilva and Trkman 2014; Osterwalder and Pigneur 2010). For example, the business-model canvas by Osterwalder and Pigneur (2010) provides a thorough guide, frequently applied by both academia and industry, on how to design the business model and its components. Similarly, Johnson, Christensen, and Kagermann (2008) provide a conceptualization of what a business model is and how to go about constructing one. These high-level frameworks provide important analytical insights for industrial firms as they develop new business models. However, what is lacking is a structured methodology to evaluate a business model opportunity before commercializing it. An exception is the article by Euchner and Ganguly (2014), which discusses a systematic approach to developing new business models and identifies concrete steps to reduce the

risks associated with them, based on experience from Goodyear. Euchner and Ganguly did not focus predominantly on digital business models. Risks are higher for digital business models because they differ in nature than the traditional model of manufacturing firms (Kohtamäki et al. 2020). Existing studies effectively explain what a business model is (DaSilva and Trkman 2014), describe what components constitute a business model (Gassmann, Frankenberger, and Csik 2013; Osterwalder and Pigneur 2010), and demonstrate how to develop a business model (Amit and Zott 2015; Johnson, Christensen, and Kagermann 2008; Sjödin et al. 2020). However, existing studies do not provide a structured means of evaluating a digital business model in terms of discrete customer opportunities. We address this gap in the literature by providing insights into the traps inherent in digital business model innovation and how industrial companies can better evaluate new digital business model opportunities.

Method

The current research initiative has run for more than three years, involving 14 leading industrial companies that operate in mining, manufacturing, transportation, construction, energy, forestry, telecommunications, and pulp and paper. We selected these companies because they all explored digital technologies to offer new innovative services for business-to-business markets (Table 1). Our research focused on what are the key challenges and traps of digitalization and the provision of digital services to customers, how companies evaluate digital business model opportunities, what specific activities and processes do companies apply during the early stages of business-model evaluation, and what are the best practices and lessons to be learned from dealing with digital business model commercialization.

We conducted numerous interviews with senior managers and executives in each company who were responsible for digital business development and the digitalization strategy specifically. Based on these inputs, we gathered insights into the challenges and other pertinent issues relating to digital business models. As the study advanced, we focused on eight progressive companies that had recently commercialized digital services for their customers. We gathered detailed accounts of how the management team responsible for commercialization engaged in digital business model evaluation before signing customer contracts. For example, we studied the business model commercialization processes for site management solutions in mining operations, managed capacity contracts in telecommunications, smart grid solutions for utility providers, and outcome-based service contracts in forestry.

We analyzed our data using thematic analysis, a systematic method for discovering themes in complex data sets by coding and categorizing common phrases and themes expressed by interviewees (Braun and Clarke 2006; Cenamor, Sjödin,

TABLE 1. Study companies, their digital business models, and key challenges

Company (# employees, net sales)	Digital Business Model	Key Digital Business Model Challenges
Telecom network equipment provider (99,417 employees, 2,272 billion *SEK in 2019)	Outcome-based contract based on used network capacity	• Calculating impact on revised revenue stream • Identifying critical contractual boundary conditions
Forest equipment provider (1,400 employees, EUR 537 million in 2018)	Proactive maintenance contract for fleet management	• Developing sales force capabilities to sell solutions • Identifying which digital features create higher value for customers
Mining equipment provider (14,400 employees, 88,606 million SEK in 2019)	Site optimization service	• Predicting unexpected customer behavior • Setting up delivery organization for advanced service performance
Mining processing equipment provider (15,000 employees, EUR 3.6 billion in 2019)	Cost-per-ton contract for milling	• Assessing life-cycle costs • Designing service contract with appropriate performance guarantees
System and technology provider (144,000 employees, USD $27.978 billion in 2019)	Life-cycle services for smart motors	• Identifying and incorporating all life-cycle costs in contract • Identifying ecosystem partnership for service delivery
Energy equipment provider (728 employees, 3,326 million SEK in 2018)	Control system	• Identifying ecosystem partnership for service delivery
Mining equipment provider (14,268 employees, 40,849 million SEK in 2019)	Autonomous solution for underground mining	• Revising value proposition for customers • Assessing financial reputation risk
Transportation machinery provider (52,378 employees, 152,419 million SEK in 2019)	Fleet management system	• Involving specialized technology partners in the co-development of the offering • Setting up contract conditions without delivery experience

*: SEK = Swedish krona

The strategic push to digitalize can also lead to digitalization overreach—that is, exploiting opportunities without conducting the appropriate research.

and Parida 2017). Using this process, we identified digitalization traps and the activities companies undertake to avoid them, as well as to evaluate digital business model opportunities. We then identified patterns among the codes to define the themes and subthemes. Finally, we mapped links between the themes to create a framework to evaluate digital business model opportunities. For example, we grouped the codes "Assess business model opportunity risks" and "Revise business model to handle risks" into the subtheme "Phase B: Managing Digital Opportunity Risks."

Based on the data gathered, we developed the first draft of a digital business model evaluation framework. To validate our insights, we conducted a series of five workshops involving key respondents from the eight progressive industrial companies. During the workshop, we focused on asking for feedback, identifying the traps, and verifying the digital business model evaluation framework. We further validated the framework through two companies that implemented and tested it; these companies work with automation control systems and telecommunications network equipment.

Digital Business Model Traps

Due to increasing competition and fear of new entrants, the companies we studied often adopted a high-risk, all or nothing strategic approach. By adopting this approach, companies get market traction for digitalization efforts in the form of increased resource allocation and ability to explore new customer opportunities. Yet the strategic push can also lead to digitalization overreach—that is, exploiting opportunities without conducting the appropriate research. As our study shows, the lack of research leads to failure to exploit the new digital business model. This failure occurs due to three common traps:

1. Pushing out a digital business model without understanding customer value;
2. Promising additional gains without understanding the value delivery process; and
3. Getting sold on the digital opportunity without understanding the profit formula (Table 2).

Trap 1: Pushing Out a Digital Business Model Without Understanding Customer Value

In their rush to explore digital business model opportunities, companies may not appreciate specific customer needs that they ought to fulfill. Their approach does not systematically untangle the true value a digital offering creates. Engineering-intensive companies are often overly enthusiastic about the potential value of digital technology but fail to consider fully what the customer requires. A forestry company's technical director described how representatives from their forest equipment provider eagerly promoted their digital preventive maintenance solutions and its numerous functionalities without clearly understanding how that digital offering would deliver his top priorities of increased productivity and lower costs. Feeling under pressure to pursue digital opportunities, he invested in the equipment provider's ambitious digital service contract. This service contract did not last long because it failed miserably to address the customers' needs—namely, productivity gains and lower operational costs. As a

TABLE 2. Three common traps

Traps	Key Themes	Frequency Across Study Cases
Trap 1: Pushing out a digital business model without understanding customer value	Engineers often too enthusiastic about solving technological problems	8/14
	Challenge for R&D to understand the specific customer or end-user digital needs	10/14
	Lacking ability to critically evaluate what customer is willing to pay	11/14
Trap 2: Promising additional gains without understanding the value delivery process	Lacking appropriate delivery routines for digital solutions in sales and service units	11/14
	Overlooking influence of global market variations for digital solutions delivery	8/14
	Managing the cultural clash between reactive product sales and proactive digital services	10/14
Trap 3: Getting sold on the digital opportunity without understanding the profit formula	Deficient understanding of profit formula	9/14
	Lack of benchmark for analyzing financial parameters for digital services	10/14
	Miscalculating hidden costs inherent in transforming organization to digital offerings	13/14

result, the technical director recommended that his company's branches stop procuring the digital service.

A related concern is that customers put companies on the wrong track because they cannot articulate their specific needs. In such cases, providers may agree to solve a customer problem without having critically evaluated the specific need and its business potential. One provider of mechanical equipment expressed frustration after co-developing a new operation-monitoring and optimization service with the customer over a nine-month period. Once the solution was ready for full-scale launch, the customer hesitated and was unwilling to pay for the "highly valuable service" for their operation. In essence, the customer valued only one part of the service highly enough to be willing to pay for it; they didn't want to pay for the whole solution. As the service manager explained, "We obviously hadn't, under that nine-month period(!), been able to understand what this service was worth for the customer—clearly, it wasn't as much as we had expected and calculated for."

Trap 2: Promising Additional Gains Without Understanding the Value Delivery Process

Digital initiatives get launched with promises of value creation but without clear understanding and details regarding the basic infrastructure and competencies needed (for example, roles, processes, service points) to ensure delivery of the value proposition. For example, a construction equipment company launched a site optimization solution without having its sales and after-market organization, and skills to manage such ambitious offerings, ready.

When introducing new digital solutions, companies need to rethink and reconfigure the delivery process. We observed increasing conflicts because of misaligned back ends (headquarters) and front ends (distributors) in seeking to fulfil a common goal of digital business model commercialization. Issues range from dealing with many business models simultaneously, needing to change the mindset of delivery staff, making significant investment in the delivery process, to managing market heterogeneity. A valuable digital offering may fail because a company has yet to implement the appropriate processes for delivering that value. In such cases, the outcome is a severely diminished value proposition that causes customer dissatisfaction, loss of brand value, and financial loss. A sales manager at the forest equipment manufacturer said, "My sales force is not used to selling on optimization or efficiency parameters, they are product experts and used to selling arguments based on technical features—not how much time a customer can save if we optimize their fleet."

Trap 3: Getting Sold on the Digital Opportunity Without Understanding the Profit Formula

Companies often fail to fully consider the implications of the digital business model in terms of the profit formula—that is, the revenue model versus the cost structure. Lack of experience in analyzing financial parameters—that, understanding how the business model reacts to different market conditions, such as fluctuating demand, and identifying the critical boundary conditions—leads to mistaken choices of price and performance parameters, as well as flawed contracts. Companies act on the premise that they can derive benefit from investing heavily to develop solutions for a specific customer by scaling the offering through additional sales to other customers. Because digital solutions tend to be highly customized, they may offer only limited scalability unless explicitly and strategically determined from the outset. To ensure revenue generation, companies need to understand a digital opportunity's value, not only for their current customers but also for the broader market.

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Similarly, when companies try to estimate the actual costs of exploiting new digital opportunities, they may be unable to determine the full range of possible costs. Some costs may be obscured in the overall cost structure. Others may be indeterminate currently but would nonetheless be important for the future profit formula—for example, costs of hiring new service staff, investment in ongoing IT development, and customization and maintenance of digital platforms/systems. According to a fleet management system manager at a transportation machinery provider, "We didn't have enough experience with this kind of deal to set up a bullet-proof contract. How to calculate it financially over time, and what parameters to actually charge for, took us a few iterations to figure out."

We provide an example of how a telecom network equipment provider encountered these traps in a recent deal (see "A Practical Example of Digital Business Model Traps" on page 48).

A Framework for Evaluating Digital Business Model Opportunities

Opportunities for digital business model innovation are abundant; they can arise from customer requests, strategic initiatives, and active sales units. Although the ambition to commercialize these opportunities is often strong, managers should carefully evaluate each business model devised to promote a new digital offering before signing a deal with the customer. For example, knowledge gleaned from prior failed digital business model initiatives motivated the telecom network equipment provider in our example to institute a process of systematically assessing each new customer opportunity to match it to the right kind of business model. As one manager involved in the business model development said, "We have learnt over time that we need to be able to make

A Practical Example of Digital Business Model Traps

A case from the telecommunication industry illustrates the traps inherent in digitalization. A request for a digital business model came from the customer organization seeking a solution to deal with the rapidly growing market demand for bandwidth. The strong pull from the customer, together with a newly established working relationship between the CEOs of both organizations, enabled the fast realization/commercialization of an outcome-based contract where revenue was tied to "used network capacity." Having the customer drive the development of the digital opportunity ensured the telecom network equipment provider avoided *Trap 1: Pushing out a digital business model without understanding customer value*.

However, in its rush to get the digital business model up and running, the provider fell into *Trap 2: Promising additional value without understanding the value delivery process*. Because it lacked experience with digital offerings and possessed only limited knowledge of the requirements such businesses place on the delivery organization, the provider struggled to develop new invoicing routines, distribute responsibility internally, redesign the local support organization, and calculate in the costs associated with increased risks. The consequence was early losses.

The strong customer pull persuaded the provider of the efficacy of the digital opportunity without fully understanding the profit formula—as a result, the provider fell into *Trap 3: Getting sold on the digital opportunity without understanding the profit formula*. Most challenges originate from difficulties in how best to distribute costs internally amongst departments and how to calculate revenue from fluctuating demand for the outcome ("used capacity"). A related issue lies in understanding how the introduction of a new business model impacts a company's existing business models with customers. Knowledge gleaned from developing this digital business model motivated the telecom network equipment provider to institute a process to systematically assess any new customer opportunity to match it to the right kind of business model.

more professional assessments of what a new business model is, and provide better decision material where we highlight the risks and financial implications of making a decision to go or not to go, because the normal process is designed for traditional rollouts."

In our study, we found that companies have developed structured approaches to evaluate new digital business models before taking final commercialization decisions (signing a contract). Aggregating best practices from these approaches using our thematic analysis, we have defined a three-phase evaluation framework that can help companies improve their business model innovation practices. The three phases include the following: Phase A: assessing digital opportunity value, Phase B: managing digital opportunity risks, and Phase C: modelling digital opportunity financials (Figure 1). Each phase has a specific focus containing two steps that unfold sequentially, and an ultimate purpose of reaching an informed decision on the prospects for commercializing the digital business model under evaluation. While the steps follow a sequential logic, a firm may need to go through the framework several times if the evaluated business model opportunity gets a "no-go". We describe each phase, the steps for each, and questions to consider (Table 3).

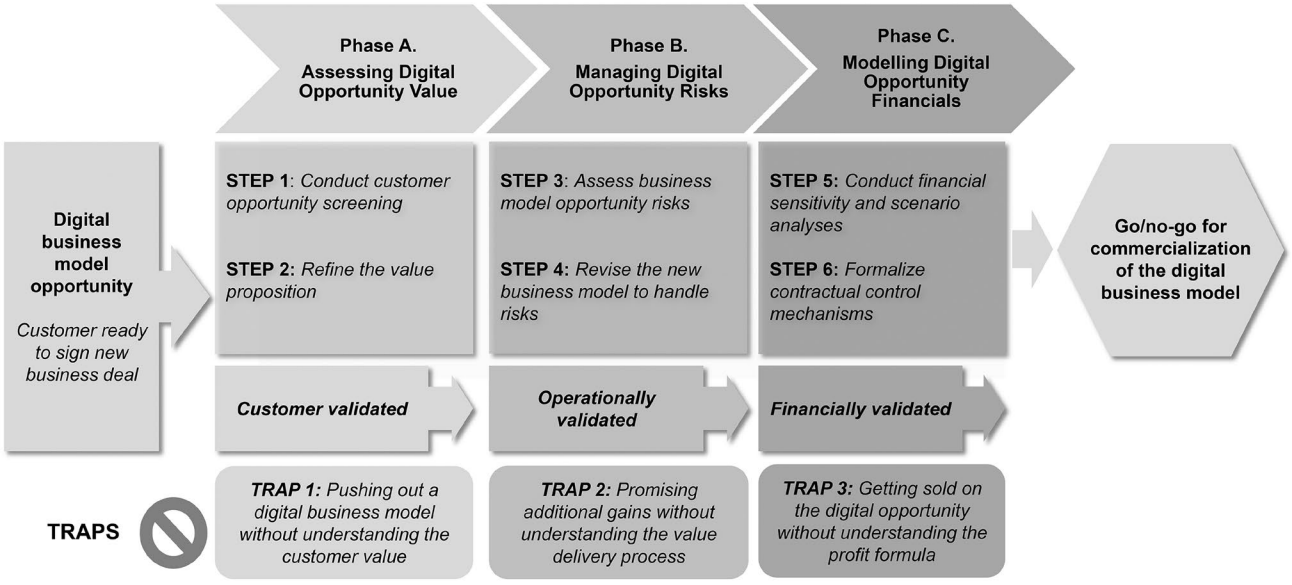

FIGURE 1. A framework to evaluate digital business model opportunities

TABLE 3. Implementing the digital business model opportunity framework

Phases	Steps	Questions to Consider
Phase A: Assessing Digital Opportunity Value	1. Conduct customer opportunity screening	• What perceived customer need(s) can we solve through digitalization? • What are the hidden customer needs and motivations in wanting to digitalize? • Do we have a clear and data-driven understanding of customer operations?
	2. Refine the value proposition	• How is value created through the new digital business model? • What is unique and compelling about the value proposition under consideration? • Does the customer acknowledge and fully understand the value of the digital offering?
Phase B: Managing Digital Opportunity Risks	3. Assess business model opportunity risks	• What new risks can be identified with regard to the new digital business model? • Which risks are the most critical in ensuring successful commercialization? • Can we implement the new digital business model without any negative influence on our existing/traditional business?
	4. Revise the new business model to handle risks	• What are the most critical risks to address and are both parties ready for digital offerings? • Which risks should be retained, and which should be mitigated (that is, which risk management approach should be used to handle each risk)? • How can we adapt and reconfigure the digital business model to manage the risks? • Is there a balance between each risk and its reward(s)?
Phase C: Modelling Digital Opportunity Financials	5. Conduct financial sensitivity and scenario analyses	• What are the critical financial parameters, and how do they affect the business model's profitability? • Under which conditions does the digital business model "make sense" financially?
	6. Formalize contractual control mechanisms	• What financial or performance control parameters are suitable to reflect the value created by the digital technology? • Is the risk ownership (that is, who is responsible) clear? • Does the incentive model create the desired behavior?

Phase A: Assessing Digital Opportunity Value

In this phase, companies conduct a systematic assessment of the customer opportunity against the new digital business model. The logic of this assessment entails adding and capturing additional value for both the customer and the provider. As one digital solution manager put it, "To understand the potential of a digital offering, you need to understand how it solves a customer problem—what specific function, payment model or technical feature is it that created value for them?"

Step 1: Conduct customer opportunity screening—This step entails obtaining deep insights into customer activities to understand a digital offering's potential. By understanding the nature of the customer business through structured analysis of operational data from disparate systems, a company can more easily screen for attractive value propositions. Companies must understand the underlying assumptions concerning what customers think about their own efficiency and what they recognize as opportunities for greater efficiency (bottlenecks), and which digital services (for example, fleet tracking, site optimization) can help with a solution. Thus, focusing on a well understood and evaluated customer opportunity is a vital first step.

A systematic approach to customer opportunity screening entails looking outwards to the customer and inwards to the company's internal strategy. For example, the new business model needs to understand and dissect customer needs and objectives. A mining equipment provider we studied initially screened and listed problems and challenges that customers faced—for example, traceability of materials and lower CO_2 emissions. The provider produced a list of possible customer opportunities that needed to be addressed. The provider can rank the opportunities according to their importance for the customer and its ability to solve them through combinations of analytics software and connectivity, and then make an informed decision about which opportunity to target.

Step 2: Refine the value proposition—This step involves assessing what is unique and compelling about the customer solution under consideration and then refining those aspects. Companies should be wary of pursuing opportunities that do not differentiate themselves from the competition; it will be hard to scale such business models for other customers and secure acceptable profit margins. Conducting a

As part of the value proposition, companies should also compare the value created to the cost of the solution.

competition screen—that is, discovering competing offerings—is thus an important component in this step.

As part of the value proposition, companies should also compare the value created to the cost of the solution. For example, a global automation and control system provider described how the company would consider a gain/pain ratio, which involved measuring the gain delivered to the customer versus the pain and cost for the customer in adopting the proposition. If a misfit exists between the business model idea and the customer opportunity, companies should put the process on hold to revise the digital business model commercialization process or stop it altogether.

The final output of Phase A should include a customer needs analysis and a customer validated digital business model opportunity, so the provider can be certain that the value proposition creates value for the customer and avoids *Trap 1: Pursuing the digital business model without understanding customer value*.

Phase B: Managing Digital Opportunity Risks

Commercializing a new digital business model opportunity is often connected with increased risks when something unknown surfaces, and when the business landscape is subject to change. In this phase, companies aim to make informed business decisions related to the additional business risks associated with introducing a new business model. A business development manager from a manufacturer of construction equipment stressed the importance of this phase: "You cannot skip this step; a digital business model entails new kinds of risks which we as a product-oriented company have difficulties in estimating—what are the consequences of charging per usage hour? Do we need to calculate for changed maintenance routines? Will such an offer change the customer's behavior?"

Step 3: Assess business model opportunity risks—This step entails a structured assessment of new risks that can arise in the shift towards uncertain digital offerings. For the purpose of identifying risks and their causes and consequences, many managers we interviewed recommend using staff experienced in implementing new business models to brainstorm and capture diverse competencies and alternative perspectives. This qualitative analysis is a key source of learning that can further shape the digital offering and the contractual setup. To make this step more efficient, our interviewees highlighted the importance of focusing on risks related to the specifics of digital business models (similar to the list of traps) and

TABLE 4. A practical example of a global telecommunications company using our framework

Phases	Steps	Actions Taken
Phase A: Assessing Digital Opportunity Value	1. Conduct customer opportunity screening	• Arranged meetings with progressive customers and visited their sites on several occasions to obtain a better understanding of each customer's operations • Structured mapping of end-customer (the customer's customer) needs to reflect potential evolution of the digital business over time • Conducted need-finding workshops to identify concrete customer needs and pain points for the digital business model. This action produced a list of both known and unknown needs for opportunity screening with customer.
	2. Refine the value proposition	• Refined contractual details and target outcomes based on the opportunity screening • Jointly agreed on the key performance indicators (KPIs) for customers • Validated the value proposition, target outcomes, and price parameters with senior management and knowledgeable operational managers at customer site • Built attractive value proposition based on interaction with key customer staff members
Phase B: Managing Digital Opportunity Risks	3. Assess business model opportunity risks	• Conducted internal business model assessment and risk mapping through involvement of experts from diverse business units • Focused on identifying new risks and their causes and consequences based on prior experiences • Assessed overall impact of business risks (for example, cannibalization of existing business model and spread impact) on existing business models with strategy team • Prioritized most important risks to address in the contract and internal processes
	4. Revise the new business model to handle risks	• Discussed with customer the most critical risks to address and potential revisions to the contracts • Retained risks with customers when gains are feasible • Specified business model intents and risk-sharing approach in revision of contract
Phase C: Modelling Digital Opportunity Financials	5. Conduct financial sensitivity and scenario analyses	• Created potential financial model that includes price parameters and contractual limitations. • Stress tested financial model by creating several "what if" scenarios to obtain a better understanding of the digital business model and how to ensure a financially viable model • Analyzed how different assumptions impact financial outcomes
	6. Formalize contractual control mechanisms	• Intensified efforts to formalize contractual control mechanisms to secure clarity of scope, control of the revenue model, and management of change together with customer • Captured the vision underpinning the business model in the contract to ensure an aligned view and expectations • Sustained efforts to develop clear definitions, processes, and tools for verifying performance, measuring development, following up on actual outcomes, and how adaptations to current processes should be decided to secure operational control from both sides

avoiding the general risks associated with every contract. Four of the eight companies we studied clustered risks relating to maturity of digital solutions, digital service delivery competencies, and changed customer behavior caused by revised contractual responsibilities. For example, companies can manage and maintain connected products remotely for the customer, but this shift in responsibility may change customer incentives and increase costs: customers may act opportunistically to overuse the products when they are no longer responsible for maintenance costs. In addition, the battle to tap into the value underpinning digitalization and digital platforms may provoke volatility in the roles and ambitions of sub-suppliers and/or partners, whose contributions may well be essential for the success of a new business model.

Step 4: Revise the new business model to handle risks—This critical next step allows the new business model to be optimized for the specific conditions of the customer opportunity. The focus on handling risks, however, must not compromise the scope for innovation and creative thinking—that is, cycling back to the established business model—since traditional, product-based business models may erode the value of digital solutions for both sides. Companies should use identified risks and conclusions drawn from the evaluation constructively and feed back to the "owners" of the opportunity (the local sales team) so that the business model can be shaped to manage these risks optimally.

The key activities center on suggesting actions to manage the risks and related consequences. The specific focus is to select the right approach to risk management, which includes the following options: 1) avoiding the risk (making sure it is outside the scope of the offering); 2) mitigating the risk (acting to reduce the negative impact); 3) transferring the risk (letting the other stakeholder take risk as well as reward); and/or 4) leveraging the risk (charging customers/other stakeholders for the costs). Where there are significant costs related to implementing these options, they need to be specified and, if possible, quantified to avoid value leakage. As many digital initiatives are new and innovative, companies need to decide how the estimated mitigation costs of the business model shall be covered by the first offering and how much shall be covered by future offerings. Due to this uncertainty, companies need to assess the risks identified with the corresponding expected rewards—risks should be taken if the potential reward is high enough. The risk-analysis activity should not be seen as a pure "financial control filter" for innovative ideas but rather as an activity enabling the "smart design" of new digital business models and informed decisions.

The final output of the opportunity-risk management phase should include a detailed risk assessment and an operationally validated digital business model opportunity to help the company avoid *Trap 2: Promising additional value through digital offerings without understanding the delivery processes*.

Phase C: Modelling Digital Opportunity Financials

Before commercialization, companies should analyze the financial parameters carefully to ensure that the new business model includes a robust profit formula. Our interviewees highlighted the astounding number of failed business model initiatives stemming from miscalculations, or no calculations at all, about the parameters influencing economic viability. This phase entails gaining understanding of the commercial dynamics and consequences of implementing the new business model as well as the impact on the existing business. This understanding is even more important in digital business models because revenue streams are neither fully linked nor proportional to the cost structures to the same degree. A service development manager from a provider of forestry equipment said, "We have realized that we need a better way to understand the financial parameters if we are going to try out these [proactive maintenance] contracts, so that we can calculate the risks that need to be built into the contracts."

In a digital business model, revenue may be linked to used capacity or improved efficiency of a system or equipment, while the provider incurs the costs for delivering this value.

Step 5: Conduct financial sensitivity and scenario analyses—This step meets the objective of improving understanding of how the model reacts to changed market and solution assumptions, thus assuring the robustness and financial viability of the digital business model. A key part of this analysis is identifying the critical financial parameters and how they affect the business model's profitability. In traditional business models, costs and revenues are closely linked in the sense that, when a product is delivered, the cost occurs, and the payment is then controlled through the contract. In a digital business model, revenue may be linked to used capacity or improved efficiency of a system or equipment, while the provider incurs the costs for delivering this value.

Sensitivity analysis involves testing how different assumptions exert an impact on digital business models. The global telecommunication company we studied provides a good example of how to carry out this analysis. The global telco had learned from earlier failure to calculate revenue from fluctuating demand and had developed a structure for performing sensitivity analysis. The company did the sensitivity analysis by varying the market and solution assumptions sequentially—for example, the number of subscribers or the capacity needs—to analyze how different assumptions impact financial outcomes. The company used this knowledge to determine pricing parameters and incentive models, which ensured a financially viable business model.

A more sophisticated scenario analysis entails combining market assumptions into sets that represent different financial

scenarios (pessimistic, expected, and optimistic) and modeling the financial projections in each case, which can then be used to stress test the new digital business model. Ideally, the new business model should be robust enough to survive these scenarios. If not, the case is made for considering a revised revenue model or introducing contractual limitations.

Sensitivity and scenario analyses are useful tools that together provide a good picture of the overall financial uncertainty associated with the new digital business model. Management can use these to support its decision-making.

Step 6: Formalize contractual control mechanisms—This step is the final task, and its purpose is to develop contractual control mechanisms that secure clarity of scope, control of the revenue model, and management of change (avoiding scope creep). The contractual aspects are crucial in managing both risks and rewards. Specifically, the contract describes the intention (a formal representation of the business model), including the vision underpinning the business model, the arguments for it, its fundamental structure (scope, responsibilities, liabilities, prices, and payments), and the value proposition. Due to the contract's formal value, it becomes the "reality" and, therefore, defines the base from which the business risks derive in practice. The consequences in terms of risk exposure and especially the financial results are, to a large degree, the result of the scope and content of the contract, irrespective of the intentions behind the model that make contracting critical for digital business models.

In formalizing the contract, key activities include developing clear definitions, processes, and tools for verifying status, measuring development, following up on actual outcomes, and putting in place rules governing adaptations to current processes to secure operational control. Companies need to secure ownership of the risks, such as specifying who is responsible for both internal and external risks. For example, a forest equipment provider exploring an advanced service contract with a key customer had failed to specify which organizational role was supposed to monitor the usage data of the equipment to enable preventive maintenance. This spelled failure to realize value for the customer.

Phase C helps companies to avoid *Trap 3: Getting sold on the customer opportunity without understanding the profit formula*. The final output of the opportunity financials modeling phase should include a detailed assessment and a financially validated digital business model opportunity, leading to a go/no-go recommendation. We provide a practical example of a global telecommunications company using our framework (Table 4).

Conclusion

In their efforts to capitalize on digitalization, companies may rush to commercialize new digital business models without carefully considering the consequences. Our study underscores the importance of evaluating the business model to avoid traps that can severely impact the financial viability of industrial companies. Companies must ensure digital business models address true customer needs, align with internal strategies, and maintain a judicious balance between risk and reward. Our comprehensive framework can help companies avoid unnecessary risks in their digital business model innovation activities. It supports both individual executives and companies in taking control of their business model innovation processes and in appreciating the critical decisions, traps, and trade-offs involved, thereby allowing organizations to derive the full benefit from digital business models. While we developed our framework in the context of industrial companies, companies in other industries can benefit from these evaluation principles.

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