

Using a Digital Services Capability Model to Assess Readiness for the Digital Consumer

New digital services in consumer-facing organizations offer novel value propositions, closer consumer relationships and higher automation of consumer-facing processes. But transforming to fully digital services requires an organization to acquire specific capabilities. This article presents a digital services capability model that allows an organization to assess its current capabilities and identify gaps. Two in-depth case studies demonstrate the application of the model and show how it identifies the capabilities in urgent need of improvement. Our recommendations are built around four scenarios for using the model.¹

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The Importance of Digital Service Capabilities in Consumer-facing Industries

The increasing proliferation of digital technologies is transforming economies in many ways. This is particularly true in consumer-facing industries where the emergence of digital services is enabling novel value propositions, closer consumer relationships and greater automation of consumer-facing business processes.² These digital services are providing value-creating consumer interactions. For instance, an Italian auto insurer uses a telematics device installed in customers' vehicles to capture driving behavior and uses this data to create novel value propositions via personalized insurance services.³ The Finnish airline Finnair harnesses Facebook as a platform to create a customer community and a sense of collective identity with the company.⁴ The City of Boston introduced an iPhone app that senses potholes on city roads and allows citizens to contribute to road management in a highly automated fashion.⁵

¹ Varun Grover is the accepting senior editor for this article.

² Results of a survey of 2,000 C-level executives in 2015 show that more than 50% of the respondents from consumer-facing industries expect moderate to massive digital disruptions in the short-term future. See Grossman, R. "The Industries That Are Being Disrupted the Most by Digital," *Harvard Business Review*, March 21, 2016.

³ Vaia, G., Carmel, E., DeLone, W., Trautsch, H. and Menichetti, F. "Vehicle Telematics at an Italian Insurer: New Auto Insurance Products and a New Industry Ecosystem," *MIS Quarterly Executive* (11:3), September 2012, pp. 113-125.

⁴ Jarvenpaa, S. L. and Tuunainen, V. K. "How Finnair Socialized Customers for Service Co-Creation with Social Media," *MIS Quarterly Executive* (12:3), September 2013, pp. 125-136.

⁵ O'Leary, D. E. "Exploiting Big Data from Mobile Device Sensor-Based Apps: Challenges and Benefits," *MIS Quarterly Executive* (12:4), December 2013, pp. 179-187.



The extent to which a company modifies its operational model to take advantage of digital technologies strongly impacts its market performance.⁶ Required modifications to the operational model include restructuring digital assets, using digital technologies in transactions, customer interactions and business processes, and empowering the company's workforce. Progress in these areas determines a company's state of digitization and varies significantly across industry sectors.⁷ However, successfully embracing digital technologies not only requires modifying a company's operational model, but also developing and nurturing the organizational capabilities needed to manage digital transformations. Organizational and environmental structures will also have to be adapted to enable a company to swiftly leverage digital options.⁸ The transformational capabilities needed are multi-faceted and include a "digital first" mindset, digitized practices, empowered talent, data access and collaboration.⁹

The Need for a Digital Capabilities Reference Model

The high level of variation in the extent of digital capabilities suggests that companies face considerable challenges in developing the necessary transformational capabilities. These challenges include limited access to talent, a lack of business understanding and organizational agility, the absence

of an experimental mindset and inappropriate IT systems.¹⁰

Managers seeking assistance on how to evolve capabilities and wanting to learn from the accumulated experiences of others regularly turn to reference models that describe essential capabilities and provide patterns of how those capabilities evolve over time. Such models are very popular because they enable companies to assess their current state and identify the future states to which they aspire. However, the models are often criticized for ignoring an organization's situational context and for generating a bureaucratic mindset, which tends to impede, rather than enable, innovation.

A reference model that is potentially relevant for assessing the state of consumer-facing digital services is CMMI for services (CMMI-SVC).¹¹ It is a member of the capability maturity model integration (CMMI) family of process level improvement and appraisal programs and describes good practices in 24 process areas, such as requirements management, capacity and availability management and organizational process definition. CMMI-SVC provides general guidance on the development of mature service practices but lacks specific direction for the design of digital services. For example, it addresses managing capacity in general without discussing specific technology-related capabilities of digital services, such as customer data management. And although CMMI-SVC touches on the role of customer orientation, it does not consider the specifics of addressing private consumers. For example, it emphasizes understanding customer requirements but provides no guidance on consumer interaction or personalization.

Similarly, other recently developed reference models relating to companies' digital transformations often have a broader focus; they are not specifically relevant for consumer-facing services' roles.¹²

6 Bonnet, D., Puram, A. D., Buvat, J., Subrahmanyam, K. V. J. and Khadikar, A. *Organizing for Digital: Why Digital Dexterity Matters*, Capgemini Consulting. This study reports that executives in firms that redesigned their operational model and invested significantly in digital technologies say that their firms outperform competitors in KPIs such as customer satisfaction, innovativeness, profitability and growth.

7 Gandhi, P., Khanna, S. and Ramaswamy, S. "Which Industries Are the Most Digital (and Why)?" *Harvard Business Review*, April 1, 2016. This study classifies industries along 27 indicators in three categories (digital assets, usage and digital workers) and reports significant inter-industry variances.

8 Westerman, G., Tannou, M., Bonnet, D., Ferraris, P. and McAfee, A. *The Digital Advantage: How digital leaders outperform their peers in every industry*, Capgemini Consulting and MIT Sloan Management. The researchers found that companies not only require digital initiatives, but also high competencies in transformation management to enable them to outperform others in revenue generation, profitability and market valuation.

9 Soule, D. L., Puram, A., Westerman, G. F. and Bonnet, D. *Becoming a Digital Organization: The Journey to Digital Dexterity*, MIT Center for Digital Business, Working Paper 301, September 2015. This study refers to the transformational capabilities as digital dexterity and discusses its characteristics.

10 Bughin, J., Holley, A. and Mellbye, A. *Cracking the digital code – McKinsey Global Survey results*, McKinsey & Company, September 2015. This report identifies the significant challenges to meeting priorities for digital programs from a survey of 987 executive managers.

11 For a detailed description of the CMMI-SVC model, see *CMMI Product Team, CMMI for Service, Version 1.3, CMMI-SVC v1. 3. CMU/SEI-2010-TR-034*, Technical Report, Software Engineering Institute, November 2010.

12 See, for example, Gill, M. and VanBoskirk, S. *Digital Maturity Model 4.0*, Forrester Research, 2016. The broad scope of this model addresses overall digital transformation initiatives and defines four maturity levels and four dimensions of capabilities (culture, technology, organization and insights).

Given the importance of digital consumer services and companies' desire to learn from industry leaders and to understand how the necessary transformation capabilities can be acquired, we have developed a digital services capability model and studied its application in different organizational contexts. Our research shows that, in addition to the model providing an instrument for gap analyses (as all capability models do), managers of digital transformation initiatives apply the model with different underlying interests and for various purposes.

This article describes the model and how it is being applied in two case organizations. We recommend using the model for four purposes: inspiring, building trust, gaining consensus and communicating, and describe its value proposition and deployment in each of these areas.

Building Blocks of Our Digital Services Capability Model

Although digital services become visible to consumers through the technology used to provide the services, the value of digital services does not derive solely from IT provision. Digital services are systems in which human participants and machines carry out activities using information, technology and other resources. These systems are called service systems. The systemic view of services emphasizes the involvement of different conceptual entities, such as customers, products and services, processes and activities, participants and technologies in service provision. We call these conceptual entities service system components because they form a productive system. Interpreting service provision via a component framework helps in understanding the forms and functions of a service system that is operated in a single company or by multiple organizations, and in modelling current and targeted system designs.

In 2013, Steven Alter described a service system framework that consists of six service system components: *customers, products and services, processes and activities, participants, information and technologies*,¹³ together with three external components that have direct effects in the service

system: *environment, strategies and infrastructure*. Alter specifies five interrelationships between service system components, which describe where alignment between the components should primarily take place.

We used Alter's work as the foundation for our digital services capability model and the organizational capabilities required for the successful design and operation of digital consumer services.¹⁴ (Appendix A describes the research program that developed, tested and validated the model, and Appendix B provides an abridged description of the elements of the model.) For each digital service system component, we identified the needed capabilities, which consist of distinct organizational objectives and practices.¹⁵ We refer to the group of capabilities that relate to the same system component as a *capability class*.

The resulting digital service capability model consists of 17 capabilities in eight capability classes—(1) Consumers, (2) Services, (3) Processes and Activities, (4) Organization, (5) Information, (6) Technologies and Infrastructure, (7) Strategies and (8) Environment—with two or three practices per capability.¹⁶ The capability model is depicted in Figure 1.

The interrelationships between capability classes in the model reflect the complementarities of the capabilities. Because the components of a digital service system need to be aligned, selectively improving an individual capability will not have significant effects on service performance unless other capabilities are also improved. Furthermore, since internal components of the service system need to be aligned with external components, capabilities in the Strategies and Environment classes interrelate with internal system capabilities. For example, if an organization has not formulated and executed a digitization strategy, the effects of improving internal system capabilities on service performance will be limited. For this reason, the Strategies and

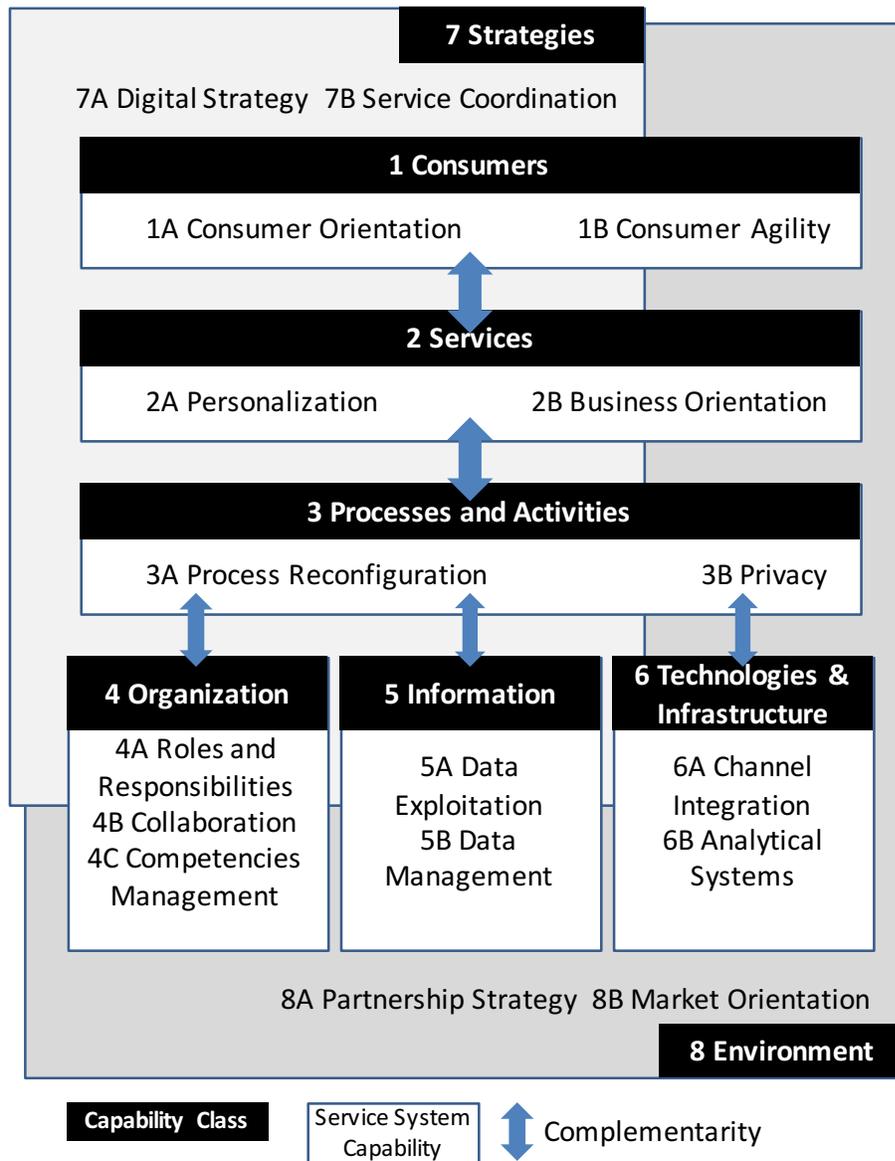
14 We renamed several of Alter's components (*customers to consumers, products and services to services, participants to organization*) to restrict the focus to organizational consumer services and merged the *technologies* and *infrastructure* components for simplification.

15 Our categorization of organizational capabilities builds on resourced-based theory of a firm. See Amit, R. and Schoemaker, P. "Strategic assets and organizational rent," *Strategic Management Journal* (14), 1993, pp. 33-46. This paper defines organizational capability as a firm's ability to "deploy resources, usually in combination, using organizational processes, to effect a desired end."

16 See Appendix B for a detailed list of capabilities, organizational objectives and practices.

13 See Alter, S. "Work system theory: Overview of core concepts, extensions, and challenges for the future," *Journal of the Association for Information Systems* (14.2), 2013, p. 72; and Alter, S. "Service system fundamentals: Work system, value chain, and life cycle," *IBM Systems Journal* (47:1), 2008, pp. 71-85.

Figure 1: Classes and Capabilities of Our Digital Services Capability Model



Environment capability classes are placed in the background of the other capability classes in Figure 1.

In what follows, we use the nomenclature shown in Figure 1 to refer to capability classes (e.g., Class 1: Consumers) and to an individual capability within a capability class (e.g., 1B: Consumer Agility). Practices within an individual capability are referred to by adding a number to the particular capability (e.g., Practice 1B1: Consumer-centric design methods).

The eight capability classes and the capabilities within them are summarized below:

- Class 1 (Consumers) addresses the ultimate recipient of a digital service and covers an organization’s capabilities to make sense of how services are consumed (1A: Consumer Orientation) and to sense and respond to consumer demands (1B: Consumer Agility).
- Class 2 (Services) characterizes the predominant design characteristics of a consumer-oriented value proposition

and includes the capabilities to align a value proposition to consumer demands (2A: Personalization) and to monitor the performance of services (2B: Business Orientation).

- Class 3 (Processes and Activities) addresses the formal and informal activities of service provision and includes the capabilities to enhance value-creating activities on the basis of digital technologies (3A: Process Reconfiguration) and to protect consumer information (3B: Privacy) in digital service interactions.
- Class 4 (Organization) covers the different aspects of organizational design, which determine how work is coordinated in digital service systems and includes the capabilities to design key roles (4A: Roles and Responsibilities), to foster intra-organizational collaboration (4B: Collaboration) and to manage competencies (4C: Competencies Management).
- Class 5 (Information) describes the approaches, methods and instruments for data management upon which a digital service is built. It includes the capabilities to continually assess the business potential of available data (5A: Data Exploitation) and to manage consumer data quality and accessibility (5B: Data Management).
- Class 6 (Technologies and Infrastructure) addresses the IT-related aspects of service design and includes competencies to integrate channels (6A: Channel Integration) and to manage analytical systems (6B: Analytical Systems).
- Class 7 (Strategies) addresses a service system's competitive positioning and includes an organization's capabilities to align digital service objectives with the organizational strategy (7A: Digital Strategy) and to coordinate service programs (7B: Service Coordination).
- Class 8 (Environment) looks at how a service system relates to institutional, competitive and regulatory framing conditions for service provision. It covers an organization's capabilities to manage partnerships and strategic alliances (8A: Partnership

Strategy) and to detect potential strategic market developments early on (8B: Market Orientation).

Case Examples of Applying the Digital Services Capability Model

Our capability model can be used to determine an organization's improvement potential for developing and maintaining digital consumer services. Below, we present two case studies that enabled us to clarify the model's application and value. Both companies are in consumer industries, and the case studies are based on interview data collected from top-level executives in each company.

There were five phases for the case study part of our research.¹⁷ First, in the *case selection* phase, we defined the criteria for selecting case companies. These criteria included a consumer-orientation and exposure to market disruption that is related to innovation in digital consumer services. We selected two companies (referred to anonymously), one from the automotive industry (CarCo) and one from the retail industry (RetailCo). Next, in the *preparation* phase, we identified company stakeholders who would participate in the assessment interviews. These stakeholders needed to occupy leading management positions and play active roles in digital initiatives (such as CIO, chief marketing officer and head of web applications) so they would have sufficient knowledge of the company's current and targeted capability levels. In addition, we collected internal case material provided by the participating companies, such as strategy statements and expert presentations, as well as publically available material about their digital services. In the third phase (*data collection*), we conducted interviews with managers of digital transformation initiatives. The interviews were designed to uncover the interviewees' assessments of their companies' capability levels relating to digital consumer services and to identify capability gaps. This self-assessment approach is consistent with other capability models such as CMMI. The interview protocols were approved by the interviewees, and the interviews included closed and open-ended questions. In the

17 Our case study design was informed by Eisenhardt's guidelines for case study research: Eisenhardt, K. M. "Building Theories From Case Study Research," *Academy of Management Review* (14:4), 1989, pp. 532-550.

data analysis phase, we calculated aggregate scores of the capability ratings, checked data consistency and cross-checked interview data with data from internal or external case material. We then prepared the case reports, which include descriptions of the companies' strengths in digital transformation capabilities (which we call foundational capabilities) and areas where the capabilities need to be improved. In the fifth and final *results validation* phase, the results of the capability assessment were presented to and discussed with the interviewees.

Case 1: Extending the Driving Experience at CarCo

CarCo is an automobile manufacturer that focuses on the sports and premium segments and operates on several continents with a network of self-owned and third-party distributors. It offers a range of passenger cars, including several hybrid vehicles, and a recently developed battery-operated car.

In spite of strong competition and unfavorable global economic conditions (e.g., the Eurozone crisis), CarCo has increased operating margins and sales volumes every year since 2011. CarCo's leading market position is due to its long-standing excellence in engineering and manufacturing, as well as to the strong emotional attachments of customers to its brand and products.

In response to the megatrends in the automotive industry, particularly electric power, digitization and connectivity, CarCo has taken deliberate steps in product innovation. These innovations include driver assistance systems (e.g., lane departure warning, adaptive cruise control), infotainment systems (e.g., iOS CarPlay, navigation) and remote apps (e.g., controlling the car's interior temperature, location information). Despite these strategic moves, CarCo remains convinced that its physical products are the single most important determinant of customer experience.

"Our customers don't want to play around with apps. They prefer to drive [rather than simply ride in a car]." CIO, CarCo, 2013

Drivers of Digital Transformation at CarCo

CarCo's profound conviction of the importance of the physical product is more and more called

into question by the ongoing expansion of digital technologies into all areas of customers' private and working lives. The company is facing a shift of customer requirements toward an increasing acceptance of the value of digital services. Technology innovations in areas such as the interworking of connected physical devices, including the car (cyber-physical systems), enables novel value propositions in the automotive sector. As a consequence, CarCo needs to transform its organizational capabilities so it can exploit emerging business opportunities such as mobility-as-a-service, autonomous driving or remote maintenance.

The CarCo executive managers we interviewed broadly acknowledged the need to embrace digitization and digital transformation:

"It is no longer just about a car that gets me from A to B as quickly as possible, but about one that also reflects my digital lifestyle. We must extend the driving experience with our digital service offerings." Head of Digital Innovation, CarCo, 2015

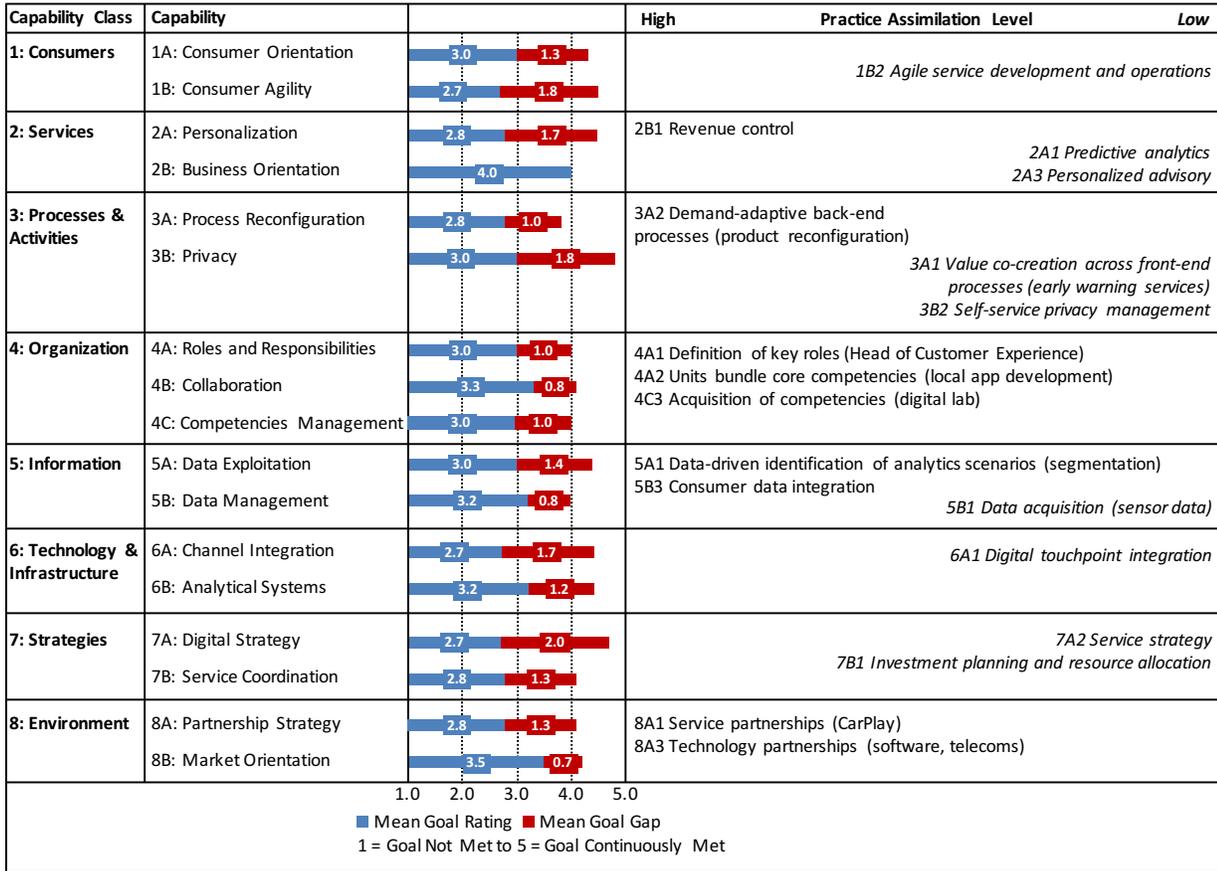
There are three broad optional directions for digital transformation at CarCo. The first is the design of novel in-car content and services, such as windscreen displays, traffic prediction, calendar integration and augmented reality functionalities. The second direction includes implementing vehicle management services such as remote usage restriction, remote steering, remote diagnostics and remote maintenance. The third includes providing the ability to switch between manual and (semi-) autonomous driving modes with functionalities such as adaptive cruise control and lane centering.¹⁸

Capability Assessment at CarCo

Based on interviews with six top-level executive managers at CarCo, Figure 2 provides an overview of the assessment results. The figure shows 1) the mean ratings of current capability levels, 2) the mean gaps to aspired capability levels and 3) the practices within each capability class that were assessed by CarCo as particularly high or low.

¹⁸ For a discussion of connected car features, see *Connected car, automotive value chain unbound*, McKinsey & Company, 2015, available at <http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/connected-car-automotive-value-chain-unbound>.

Figure 2: Capability Levels, Capability Gaps and Practices with High and Low Assimilation Levels at CarCo



The Foundational Capabilities of Digital Transformation at CarCo

As indicated by Figure 2, the cornerstones of digital transformation aimed at extending the driving experience are CarCo’s strong capabilities in Class 2 (Services), Class 4 (Organization), Class 8 (Environment) and Class 5 (Information). In the Services Class, the high personal and emotional appeal to excellence of the current product and service portfolio generates strong customer interest in novel services. The current organizational design fosters a strong focus on product and service innovation (demonstrated, for instance, by the recent establishment of a digital innovation lab) and is streamlined for efficient service delivery. In the Environment class, CarCo occupies a strong ecosystem position, where it has well-established cooperation with leading software and telecoms firms. Cooperation facilitates access to external providers’ complementary capabilities. CarCo also

has well-established information capabilities in Class 5 (Information). An integrated customer database enables coordinated customer interactions and targeted communications.

Class 2: Services. CarCo has strong capabilities in the Services class, particularly its Business Orientation capability (2B). It excels at delivering products and services with exceptional customer appeal and production efficiency, the combination of which allows CarCo to generate profit margins that are well above average (Practice 2B1: Revenue control). In Europe, CarCo’s customers are on average older than 50. In China, however, they are significantly younger and are more open to buying cars that include innovative digital services. As a result, CarCo already includes selected digital services in its current offerings, particularly in the areas of safety and security (e.g., car location), remote services (e.g., controlling the car’s interior temperature) and infotainment and navigation (e.g.,

iOS CarPlay). Figure 3 shows some illustrative examples.

However, the interviewees agreed that there is still much room for improvement of the Personalization capability (2A), particularly in the Predictive analytics practice (2A1, e.g., preventive maintenance) and Personalized consumer advisory (Practice 2A3, e.g., aquaplaning warnings).

“Currently, we are focusing on implementing car-specific services [such as lane departure warning system]. Future services will leverage networked data from multiple cars (swarm intelligence) and will reach assistance levels nobody will want to do without again.” Head of Car Electronics, CarCo, 2015

Class 4: Organization. CarCo has made deliberate adjustments to its functional and location-specific organization. It has strengthened its Competencies Management capability (4C) by establishing a subsidiary that operates digital innovation labs in different global regions and is responsible for identifying trends and prototyping digital services (Practice 4C3: Acquisition of competencies). This subsidiary attracts and brings in new employees with strong digital backgrounds and consumer-oriented, rather than product-oriented, mindsets.

“Having an independent subsidiary gives us more organizational freedom. We need

maximum agility but don’t want to interfere with the vehicle development processes already established at CarCo.” Head of Digital Innovation, CarCo, 2015

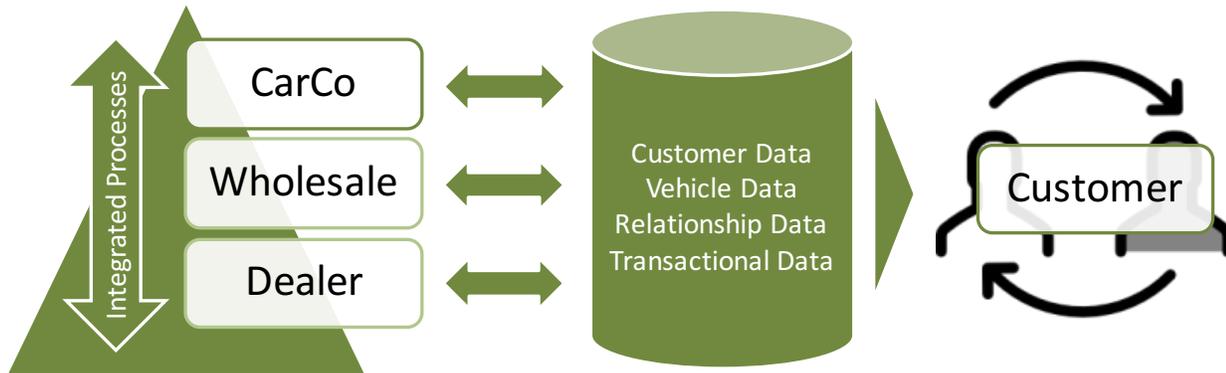
CarCo has also successfully developed the Roles and Responsibilities capability (4A). It has created local app development units (in China and elsewhere) that design and prototype digital services dedicated to location-specific customer behaviors (Practice 4A2: Units bundle core competencies). In addition, CarCo has grouped the functional divisions that conduct customer interactions in the marketing, sales and after-sales processes into a single customer relations department under a single head (Head of Customer Experience). This practice enables CarCo to provide consistent and personal communications across the complete customer lifecycle and is a cornerstone of its “*car for life—customer for life*” motto (Practice 4A1: Definition of key roles).

Class 8: Environment. In the Environment class, CarCo is characterized by a strong Partnership Strategy capability (8A). It has established several strategic Service partnerships (Practice 8A1) with, among others, Apple to realize iOS CarPlay, with a telecoms company to offer vehicle tracking services and with a traffic data provider to offer navigation services. CarCo also has Technology partnerships (Practice 8A3) with a data streaming provider and an enterprise systems provider. All these partnerships facilitate CarCo’s access to external

Figure 3: Examples of Personalized Digital Services at CarCo



Figure 4: CarCo's CRM System



service capabilities, positioning it for sustainable competitive positions in future service ecosystems.

Class 5: Information. CarCo has well-developed Data Exploitation (5A) and Data Management (5B) capabilities. It is one of the few car manufacturers worldwide with a customer database that integrates customer, vehicle, relationship and transactional data (Practice 5B3: Consumer data integration). This CRM system is depicted in Figure 4.

This database supports various organizational units (headquarters, wholesale, car dealers) and enables the coordinated management of customer interactions. For instance, CarCo has developed a system that segments customers in real time and predicts their likely responses to specific marketing messages. This system enables CarCo to send targeted communications to owners of its cars (Practice 5A1: Data-driven identification of analytics scenarios). However, CarCo still needs to do more to enable context-aware digital services, which require data generated by car sensors (e.g., speed, location, braking) be acquired from the car and integrated into the customer database (Practice 5B1: Data acquisition).

“Our CRM bundles all available data about customers, customer relationships and transactions. Concerning the car, it only contains product data, but lacks information on product usage, such as connected car data [from sensors].” Head of Product Strategy, CarCo, 2015

Digital Services Capability Areas Requiring Improvement at CarCo

The capability classes requiring improvement at CarCo are Class 7 (Strategies), Class 1 (Consumers), Class 3 (Processes and Activities) and Class 6 (Technologies and Infrastructure). CarCo's strategy formulation focuses on evolving the core product rather than on extending customers' driving experience. In the Consumers class, CarCo traditionally goes through long cycles of engineering top-quality products rather than through shorter cycles of agilely exploring customer needs, a prerequisite for developing digital services. In the Processes and Activities class, CarCo needs to reconfigure its front-end processes and implement privacy management. In the Technologies and Infrastructure class, it needs a higher level of integration of its customer-facing systems to enable and support innovative digital services.

Class 7: Strategies. The CarCo managers we interviewed identified the potential for improving both the Digital Strategy (7A) and the Service Coordination (7B) capabilities. A primary challenge with improving the Digital Strategy capability is clarifying the future of digital services at CarCo (Practice 7A2: Service strategy).

“There are very different and contrasting opinions about the extent to which digital services should complement or even substitute the current core product.” Head of Car Electronics, CarCo, 2015

The interviewees discussed three strategic dimensions that are relevant to CarCo's Service strategy practice: new customer services and products, improved customer relationships and sales,

and higher efficiencies in production and logistics. Table 1 lists possible examples of services identified by the interviewees for each of these dimensions. The definition of a digital service strategy is a prerequisite for initiating corporate-wide digital service programs. Current initiatives tend to be funded locally and to be largely under-resourced (Practice 7B1: Investment planning and resource allocation).

Class 1: Consumers. CarCo needs to improve its Consumer Agility capability (1B) because of the challenges relating to the development of connected car and web services (Practice 1B2: Agile service development and operations). It struggles to coordinate agile service innovation with robust vehicle engineering processes:

“You cannot imagine the exhaustiveness level to which we test our vehicles in all kinds of conditions. Such an engineering process takes at least three years. And now we have to find ways to launch integrated mobile apps in four-week development cycles. This is a real challenge.” Head of Car Electronics, CarCo, 2015

Similarly, the established approaches to developing enterprise information systems are

not suitable for web-based customer applications, because they are *“highly professional and fail-safe—however, they simply take too long and are too expensive.”* (Head of Marketing, CarCo, 2015)

Class 3: Processes and Activities. When discussing Capability 3A (Process Reconfiguration), the interviewees identified a high level of assimilation of Practice 3A2 (Demand-adaptive back-end processes), which already effectively uses enterprise systems to allow for product reconfigurations in the production process. However, they identified the need to improve Practice 3A1 (Value co-creation across front-end processes), particularly in the product-usage phase. For instance, a driver could share sensor data with other drivers to enable early warning services (e.g., about road damage).

A side-effect of this type of practice would be the increased importance of the Privacy capability (3B). The interviewees agreed that there will be an increasing need for transparency in customer data ownership and usage. For example, a self-service portal could allow customers to access and configure privacy policies (Practice 3B2: Self-service privacy management). The interviewees identified several challenges in implementing privacy management. First, CarCo itself has limited access to customer

Table 1: Service Strategy Strategic Dimensions and Example Services at CarCo

Dimension	Example	Citation
Services and Products	Personalized car configurations	“The car should profile and automatically make personal configurations, such as seat adjustment and mirror positioning.” CIO
	Transaction brokerage	“The car acts as an agent and handles micropayments (such as parking fees) autonomously.” Head of Digital Innovation
	Crowd intelligence	“Share and receive traffic warnings, such as aquaplaning, from other cars.” Head of Car Electronics
	Remote management	“Receive a warning on one’s mobile phone if daughter exceeds the pre-set speed limit.” Head of Car Electronics
Customer Relationships and Sales	Event notifications	“Invitation to driver training based on one’s driving profile.” Head of Sales Network
	Personalized upselling offers	“Use a driving profile to offer complementary car rentals.” Head of Sales Network
	Word of mouth marketing	“Use the in-car camera and social media to share driving experience.” CIO
Production and Logistics	Preventive maintenance	“Proactive diagnosis of potential failures.” Head of Car Electronics
	Live updates	“Updates of entertainment systems and car configurations via wireless communication.” Head of Car Electronics

data because at present the (often independent) car dealers own most of this data. Second, they were concerned that a shift toward extensive data transparency could lead to data leakage problems, which would decrease, rather than increase, customer’s trust in the brand.

Class 6: Technologies and Infrastructure.

CarCo’s Channel Integration capability (6A) is not well established. The insufficient integration of consumer-facing systems in terms of functionalities and interface design (Practice 6A1: Digital touchpoint integration) is a barrier to rolling out digital service offerings.

“Currently, our consumer-facing systems are too fragmented. Our web portal and the app must offer almost identical functionalities.”
CIO, CarCo, 2015

“We must be careful that the organizational allocation of responsibilities is not reflected in how our services are designed, because variations in the design of consumer-facing technologies with almost identical functionalities will confuse consumers.”
Head of Development, CarCo, 2015

Technology-specific shortcomings such as these hinder both channel-switching by customers and data flows between channels. For instance, in planning sales activities, the sales management team has no access to website usage data.

Results of Applying the Digital Services Capability Model at CarCo

Applying our digital services capability model at CarCo identified urgent, moderate and low needs for action in CarCo’s transformation toward extending the driving experience with digital services. Figure 5 summarizes the results of the assessment and depicts the average gap between the current and aspired capability levels for each capability class.

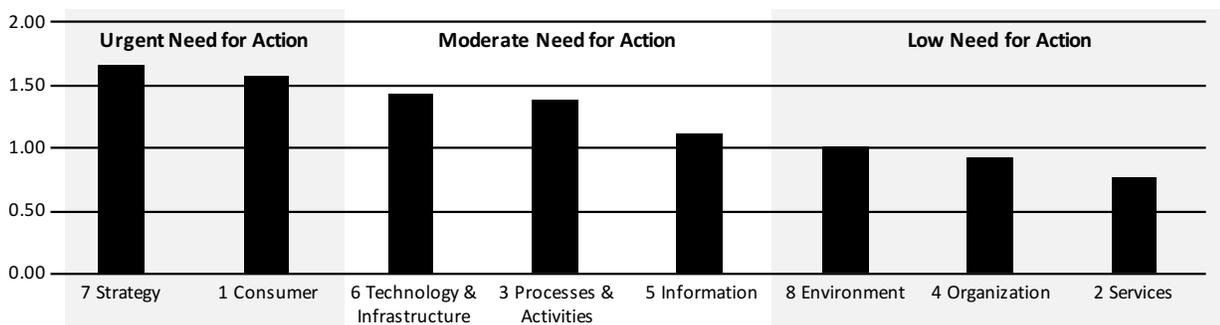
The digital transformation at CarCo clearly depends on developing capabilities in Class 7 (Strategies), particularly clarifying Service strategy (Practice 7A2), which goes beyond the evolution of the core physical product. Moreover, new capabilities in Class 1 (Consumers) are a prerequisite to producing innovative digital services, particularly for Practice 1B2 (Agile service development and operations).

Case 2: RetailCo’s Transformation Toward an Integrated Omnichannel Retailer

RetailCo is a European multi-business company with a focus on retailing and consumer goods. Its core business is food retail and wholesale, but it also operates in other markets as diverse as electronics, books, apparels, travel, petrol retailing, DIY stores and furniture.

In 2015, growth in RetailCo’s food retailing businesses (department stores, discounters, convenience stores and an online platform) was stagnating, although these businesses were (and remain) the market leaders in their various segments. The e-commerce electronics business was also

Figure 5: Results of Capability Assessment at CarCo: Average Gap per Capability Class (0 = None to 2 = High)



the market leader in 2015 and had been achieving double-digit annual growth rates in sales. Sales in other bricks-and-mortar businesses, particularly books, furniture, home accessories and apparel, were declining significantly in 2015, partially due to a consumer shift toward online retail.

RetailCo follows a dual strategy for transforming toward digital retail. First, it evolves traditional offline businesses toward omnichannel businesses (e.g., bookstores, consumer electronics stores, travel agencies). Second, it acquires pure online businesses to extend its online market shares (e.g., in electronics, online warehousing and online food retailing). While RetailCo's online revenues are still a small proportion (single digits) of revenue, online revenues grew by almost 50% in 2015.

Drivers of Digital Transformation at RetailCo

RetailCo faces strong competition and risks losing market share in many segments because of the growing trend to online retailing. But its diversified portfolio of retail businesses means that it controls a large share of consumers' wallets. However, because these businesses operate independently, RetailCo is currently unable to exploit digital technologies and turn its large footprint into a competitive advantage. The RetailCo executives we interviewed acknowledged the need to establish digitization capabilities, with a particular focus on developing two potentially strategic resources.

First, RetailCo operates a dense network of stores and sees strategic advantages from integrating stores with online channels and delivering omnichannel services (e.g., customers using a store as a showroom, then ordering online and picking the goods up in a store).

"Ninety percent of the population can reach our stores within 15 minutes. We must bring together online and offline channels, particularly because this will help us to understand and serve customer demands better than our competitors." Head of Digital Retail, RetailCo, 2015

Second, RetailCo businesses offer a comprehensive range of brands and products. However, the individual businesses are highly independent and don't share customer information. Integrating the synergistic yet distributed data about a customer's consumption of diverse brands

and products would strongly improve RetailCo's customer knowledge base.

"With our offerings, we cover a large share of a person's consumption. The integration of customer data from our different businesses would enable us to build superior customer knowledge." Head of Web Applications, RetailCo, 2015

Capability Assessment at RetailCo

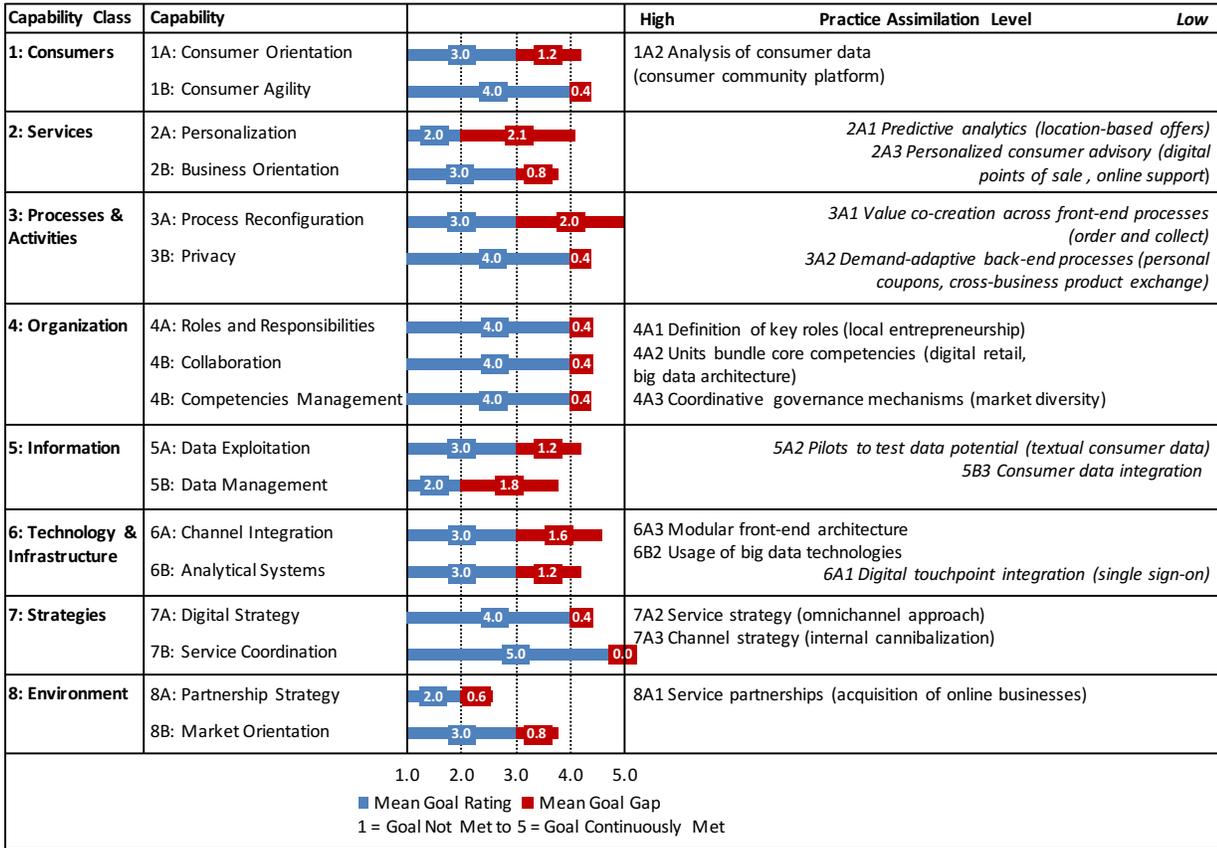
We interviewed three of RetailCo's subject matter experts (Head of Digital Retail, Head of Customer Experiences, Head of Web Applications) to determine the capability levels and practice assimilation states. This interview data, together with supplementary material obtained from RetailCo, formed the basis of the assessment based on our digital services capability model. Figure 6 provides an overview of the assessment results and shows the mean ratings of current capability levels and mean capability gaps, and lists the practices with high and low assimilation levels.

The Foundational Capabilities of Digital Transformation at RetailCo

The foundations of RetailCo's digital transformation are based on its strong capabilities in Class 8 (Environment), Class 7 (Strategy), Class 4 (Organization) and Class 1 (Consumers). In the Environment class, RetailCo's approach of evolving offline businesses and selectively acquiring online businesses has resulted in the company being the leader in the national e-commerce market. The strong capabilities in the Strategies class are manifested, for example, in the practice of proactively accepting internal cannibalization effects. RetailCo's decentralized organization provides strong incentives for local entrepreneurship and generates very diverse products and brands. The company's strong customer focus is enabled, for instance, by a vibrant social media platform for customers, which, according to a benchmark conducted in 2015, resulted in the highest customer reputation among national companies.

Class 8: Environment. RetailCo has a particularly strong Partnership Strategy (Capability 8A) and systematically develops its market positioning via acquisitions of online businesses (Practice 8A1: Service partnerships). It divides its product segments into those that are already strongly

Figure 6: Capability Levels, Capability Gaps and Practices with High and Low Assimilation Levels at RetailCo



effected by pure online players (e.g., books and music), those where the share of online customer purchases is increasing steeply (e.g., shoes and apparel) and those where pure online markets play a marginal role (e.g., food and DIY products). RetailCo systematically acquires companies to increase its online market shares in the first two segments. Examples include the acquisition of an e-commerce retailer in 2012 and an online apparel company in 2013.

Class 7: Strategies. RetailCo has a strong Digital Strategy capability (7A), where its Service strategy (Practice 7A2) emphasizes combining the advantages of physical and digital channels in an omnichannel approach. In an official statement, the CEO formulated RetailCo’s strategy as follows:

“Our focus is on a stronger interconnection of our bricks-and-mortar businesses with online shopping. The borders between online

and offline transactions must be dissolved.”
 CEO, RetailCo, 2015

Advantages of digital channels include a broad range of available products, price transparency and personalized and social recommendations. Among the advantages of physical channels (i.e., stores) are personal customer assistance, instant access to products, the ability to try out products, convenient returns and the social shopping experience.

RetailCo initially faced substantial resistance to omnichannel approaches because the individual companies feared losing business. But as the volume of online sales has grown, this mindset has changed completely and has given way to an active strategy of internal cannibalization (Practice 7A3: Channel strategy).

“By now, everybody has understood that digital transformation is real and that our online [channel] poses no threat to our

offline business.” Head of Digital Retail, RetailCo, 2015

An enabler of this mindset shift was early experiences with cross-channel cannibalization effects. A multichannel sales analysis reported that, while the introduction of the online channel led to a 13% decline in offline revenues, this decline was more than compensated by a 10% overall increase of own-product revenues and an additional 20% increase of third-party product revenues through the online channel (see Figure 7).

Class 4: Organization. In the Organization class, RetailCo’s has a particularly well-developed Roles and Responsibilities Capability (4A). As depicted in Figure 8, its organizational structure is characterized by decentralized entrepreneurship and central coordination (Practice 4A3: Coordinative governance mechanisms). RetailCo has around 20 decentralized retail businesses that are largely independent and operate in diverse markets. Together, they account for a large share of consumers’ consumption, including food, apparel, electronics, furniture, books, petrol and travel.

The businesses are affiliated to corporate executive departments (including a central retail department) and use shared support services (including those offered by an IT service provider). Both the executive departments and the IT service provider bundle digitization competencies in corporate sub-units. Example sub-units include

customer intelligence, digital retail and big data architecture. These units consult the individual businesses and create synergies amongst them (Practice 4A2: Units bundle core competencies).

The interplay between local independence and the coordination of inter-business synergies, which is supported by an e-commerce board (one of several such support structures), characterizes RetailCo’s corporate identity of local entrepreneurship (Practice 4A1: Definition of key roles) and enables the implementation of integrated omnichannel services.

“Decentralized entrepreneurship is at the root of our organizational culture. Formal and informal communication enables decentralized innovations to be proliferated in our organization with low friction.” Head of Digital Retail, RetailCo, 2015

Class 1: Consumers. In 2010, RetailCo launched a consumer community platform that includes functionalities for rating products, for discussing product ideas and for openly sharing consumption experiences such as recipes. The product ratings are integrated into product information services to support customer buying choices. This platform now has over 100,000 members. Using this platform as a basis, RetailCo has successfully developed and launched several novel health and beauty products. The platform also allows RetailCo to capture and react in a timely

Figure 7: Online Channels in RetailCo’s Food Business Resulted in a 30% Increase in Sales, Despite Cannibalization Effects

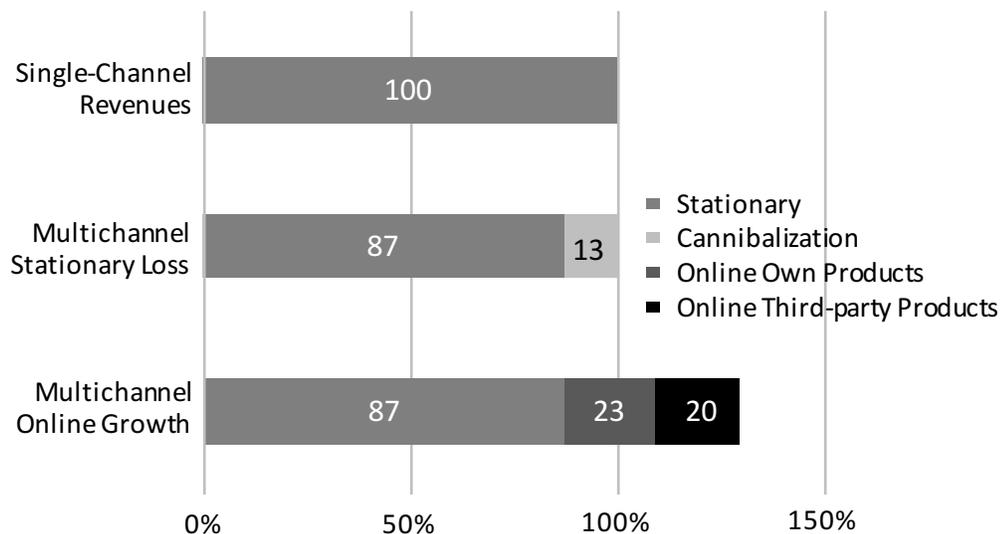
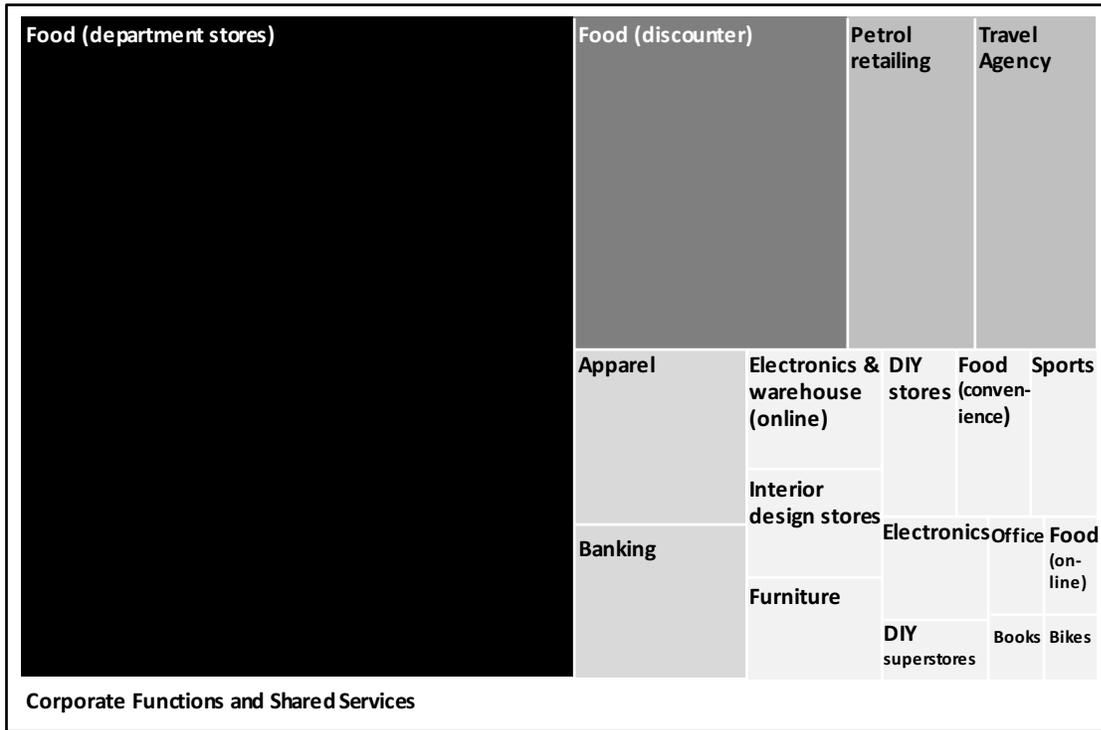


Figure 8: RetailCo’s Organization (Excluding Wholesale Businesses)



Rectangle sizes = share of revenue, as of 2015

manner to consumer responses to its novel service offerings (Practice 1A2: Analysis of consumer data).

Digital Services Capability Areas Requiring Improvement at RetailCo

As indicated in Figure 6, Classes 2 (Services), 3 (Processes and Activities), 5 (Information) and 6 (Technologies and Infrastructure) need to be improved. In the Services class, RetailCo has insufficiently satisfied demands for personalized service offerings because of its low levels of channel and business integration. Its consumer-focused business processes make inefficient use of digital technologies. Consumer interactions, for instance, could be better matched to personal contexts via personalized promotions. In the Information and Technologies and Infrastructure classes, establishing integrated consumer information across RetailCo’s individual businesses requires coordinating the various offline and online channels and integrating disparate consumer data that is held by individual businesses.

Class 2 (Services). Developing the Personalization Capability (2A) is of particular

importance for RetailCo. A main objective of its channel and business integration is the ability to offer personalized services throughout a customer’s buying journey. Figure 9 provides an overview of example personalized services that could result from the advanced integration of channels and businesses.

RetailCo wants the ability to proactively determine customer needs based on all available data on a customer’s context. For instance, information about a customer’s location together with her buying history would enable location-based product offers in the event of her approaching a store (Practice 2A1: Predictive analytics). Personalized services also require the implementation of advisory mechanisms. For instance, digital point of sale terminals could be installed in stores to extend the product portfolio and provide on-demand information about products and services. In addition, an online support service with video chat could provide advice on product installation (Practice 2A3: Personalized consumer advisory).

Class 3 (Processes and Activities). RetailCo’s Process Reconfiguration Capability (3A) is not sufficiently established. A major current process

Figure 9: Personalization Options for RetailCo to Support Customers Throughout their Buying Journeys

Demand/Attention	Decision Making	Transaction	Receipt of Goods	Customer Service
<ul style="list-style-type: none"> • Location-based services • Inspirational apps • Personalized promotions 	<ul style="list-style-type: none"> • Digital points of sale • Augmented reality apps • Peer-to-peer advisory 	<ul style="list-style-type: none"> • User experience • Social commerce • Innovative payment solutions 	<ul style="list-style-type: none"> • Precise delivery windows • Same-day delivery • Click and collect 	<ul style="list-style-type: none"> • Online support • Product assembly and installation • Peer-to-peer advisory

design focus is on integrating processes across businesses. RetailCo recently implemented various omnichannel features, such as paying via a mobile phone app in a physical store checking availability of a product in a store, and reserving a product in a store via the Internet. However, touchpoints across RetailCo’s businesses must be integrated to more fully exploit its local presence and diversified product range. For instance, the ability to order and collect becomes attractive to customers if and only if products from all businesses can be ordered online and collected at the retail store that is most convenient for a customer (Practice 3A1: Value co-creation across front-end processes). In addition, exchanging a product ordered online for an alternative product at the physical point of collection requires customer and transaction data to be integrated. What’s more, the integrated provision of personalized coupons would require the integration of the businesses’ offer-management processes (Practice 3A2: Demand-adaptive back-end processes).

Class 5 (Information). RetailCo is actively developing its Data Management (5B) and Data Exploitation (5A) capabilities. A few of its businesses, including the major food department store business, have jointly launched a loyalty card program. As a result of the high adoption rate, these businesses are able to match data from individual transactions to specific customers and cross-integrate customer data. However, this type of cross-business data integration needs to be extended across all the businesses before RetailCo can provide services such as cross-business product exchanges or personal couponing (Practice 5B3: Consumer data integration).

“Integrated customer knowledge would broadly contribute to improvements

in assortment planning, customer communication, pricing, promotion management and customer relationship management.” Head of Web Applications, RetailCo, 2015

At RetailCo, integrating customer data is difficult and challenging because of the multitude of customer data sources and stakeholders. RetailCo has a phased plan for integrating customer data sources (see Figure 10), starting with those with the highest potential overlaps and therefore the greatest synergy potentials.

“We have thousands of different consumer data sources. Integration cannot be done through measures at an organizational layer. We need to integrate step by step and to focus on optimizing the value-add to our customers with services.” Head of Customer Experiences, RetailCo, 2015

As well as working to improve its Data Management Capability (5B), RetailCo is also strengthening its Data Exploitation Capability (5A). Initial pilots combined transaction data with weather data to enable RetailCo to identify product segments where sales are impacted by the weather. According to the interviewees, however, fully developing the Data Exploitation Capability also requires the ability to handle and analyze unstructured data in analyses of customer behavior and product sales. In the future, RetailCo plans to incorporate textual data from consumers provided via the call center, via social media or in product comments (Practice 5A2: Pilots to test data potential).

Class 6 (Technologies and Infrastructure). A high priority for RetailCo is to develop Capabilities 6A (Channel Integration) and 6B (Analytical Systems). From a technology perspective, RetailCo’s

Figure 10: Phases of Cross-business Customer Data Integration at RetailCo



digital customer services are based on a modular architecture with decoupled front-end, application, service and data layers. This architecture enables consistent presentation across technology channels (e.g., web, mobile, ad displays and terminals) and universal access to functionalities such as product information management (Practice 6A3: Modular front-end architecture). RetailCo has also invested in a big data architecture (including Hadoop and a Teradata database), which enables flexible choices of technology to match the specific analysis requirements (Practice 6B2: Usage of big data technologies).

RetailCo will be further strengthening its Channel Integration capability by implementing single sign-on for customers (Practice 6A1: Digital touchpoint integration). This technology will provide central authentication functionality across multiple systems (offline and online) and will be integrated fully into the entire omnichannel architecture. A key challenge,

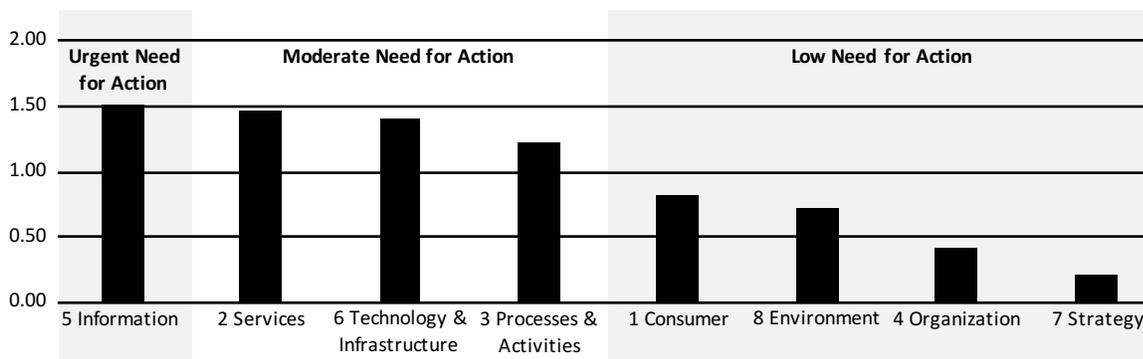
however, is to provide sufficient incentives for customers to use single sign-on.

“We are currently unable to connect web usage data with transaction data. Single sign-on is key for integration. However, customers will only use sign-on if we give them clear benefits.” Head of Web Design, RetailCo, 2015

Results of Applying the Capability Model at RetailCo

Applying our digital services capability model at RetailCo identified urgent, moderate and low needs for action in RetailCo’s transformation toward becoming an integrated omnichannel retailer. Figure 11 summarizes the results of the assessment and depicts the average gap between the current and aspired capability levels for each capability class.

Figure 11: Results of Capability Assessment at RetailCo: Average Gap per Capability Class (0 = none to 2 = high)



The most urgent transformation need at RetailCo is to develop digital services capabilities in Class 5 (Information). In particular, cross-business integration of customer data is a critical precondition for personalization throughout the customer buying journey and for offering integrated services such as order and collect, cross-business product exchanges or personal coupons.

Recommendations on How to Use the Capability Model

The two case studies presented above illustrate the business value that can be obtained from using our digital services capability model. From applying the model in these (and other) companies, we have identified four distinct, but not mutually exclusive, purposes (or scenarios) for using the model—Inspiring, Establishing Trust, Forming Consensus and Communicating. These scenarios represent different objectives with different dominant model features and apply the capability assessments from the model in different ways to create value (see

Table 2). We recommend that, before using the model, organizations should clarify the underlying motivation for using it (the scenario) and then tailor its application accordingly.

1. Use the Capability Model to Inspire

Some managers of digital transformation initiatives used the model by asking what they could learn from the experiences of others in different organizational contexts. A fundamental premise of this approach is that organizations can avoid mistakes already made by others and can benefit from accumulated advanced experiences identified by applying the capability model. Managers in this scenario want to identify their capabilities with low maturity and that therefore need to be improved, and to avoid the risk of ignoring external market experiences. They seek inspiration on how to selectively evolve their internal digital services capabilities.

In this scenario, the model allows managers to collect and accumulate examples of practices

Table 2: Scenarios of Model Usage, Objectives, Dominant Model Features and Value-Creation from Capability Assessments

Scenario	Objective	Dominant Model Features	Value-Creation from Capability Assessments
Inspiring	Gain inspiration from the practices of other organizations	<ul style="list-style-type: none"> Practice descriptions Holistic component descriptions 	<ul style="list-style-type: none"> Discussion of action alternatives Reporting of third-party experiences
Establishing Trust	Provide arguments for getting funding for digital initiatives	<ul style="list-style-type: none"> Transparent and replicable process for gathering good practices Cross-validation of practice effectiveness 	<ul style="list-style-type: none"> Emphasis on model validation Assessment of transferability of success stories from other organizations
Forming Consensus	Reach agreement on digitization priorities	<ul style="list-style-type: none"> Defined semantics Collective assessment process 	<ul style="list-style-type: none"> Involvement of stakeholders Joint calibration
Communicating	Use the capability assessments to communicate achievements	<ul style="list-style-type: none"> Operationalization of capability levels Assessment process that involves all relevant stakeholders 	<ul style="list-style-type: none"> Formal documentation of achievements Acting on capability assessments reported over time

adopted by other companies to strengthen specific capabilities. The model does this through short descriptions and corresponding examples of good practices. For example, in Class 1 (Consumers) the model contains evidence of how companies achieve higher consumer agility through diverse measures such as consumer-centric innovation methods, crowdsourcing activities and employee innovation programs.

Thus, the capability model provides managers with inspiration on how to incrementally improve internal digital services capabilities. The descriptions of successful practices used by others can be used as a checklist of measures and instruments for implementing capabilities. While this checklist will not provide detailed implementation guidance, it will provide an initial and broad overview of the scope of possible capability developments. Because, in this scenario, the model collects and accumulates experiences from different stakeholders and markets, its value lies in facilitating knowledge exchanges across organizational boundaries.

The participating managers at RetailCo showed particular interest in practices adopted by other companies for developing capabilities that needed much improvement at RetailCo. In particular, the documented practices for personalizing digital services and exploiting consumer data provided RetailCo's managers with inspiration for follow-up activities. They also compared their capability levels with those of other companies to gain a deeper understanding of RetailCo's comparative situation. For this reason, RetailCo managers took part in focus groups that facilitate inter-company exchange of experiences with developing capabilities in the Services Class (1).¹⁹

2. Use the Capability Model to Establish Trust

The development of digital services capabilities often requires significant investments (e.g., hiring staff, implementing education programs, re-engineering consumer-facing processes, acquiring novel IT assets), for which top management approval is mandatory. Because of the innovative nature of digital services, return on these investments is not guaranteed. To receive investment approval it is therefore important to convince decision-makers that these investments are urgent and will pay off.

One approach to establishing trust in the effectiveness of developing digital service capabilities before the investments have begun to pay off is to point to the experiences of other organizations with more mature capabilities. By validating that a practice has been effective in other organizational settings, our model provides *a priori* evidence that the introduction of a practice makes economic sense.

By helping to create trust that investments in digital services will pay off, the model can also help to gain top management support (a major cornerstone of a strategy for building digital services capabilities). Moreover, it can help to accelerate the execution of the strategy, particularly the targeted allocation of resources for developing capabilities.

Capability development at CarCo is subject to a rigorous strategic planning process at the program management level (with the goal of defining the overall roadmap) and to program execution processes at the business-unit level. When using the model, the participating managers at CarCo asked how and whether a particular practice became effective in different organizational contexts. As an example, when we presented the model to CarCo managers, they engaged in discussions on the effectiveness of privacy management practices (such as self-service profile management), on the evidence of successful application of practices in other organizations and on the transferability of success stories from other organizations.

3. Use the Capability Model to Build Consensus

In complex organizations, opinions on current levels of digital services capabilities and the improvements required are often as fragmented and heterogeneous as the management of digital initiatives. The success of a fundamental business transformation depends on there being a strong consensus and a clearly defined and well-executed digital services strategy. The basis for consensus and a shared assessment of the as-is situation is a shared language and consolidation and calibration of heterogeneous and potentially contradictory perspectives.

The capability model comprises a structure of capabilities and practices, along with definitions of the capabilities and practices. As such, it provides largely unambiguous conceptualizations of digital services capabilities. These conceptualizations

¹⁹ The table in Appendix A lists the focus groups we ran as part of the research project.

provide a shared language that facilitates the structured exchange of perspectives and assessments.

In the building consensus scenario, the model is, first, a “boundary object”²⁰—an artifact that enables knowledge-sharing across structural boundaries. It is a medium for exchanging perspectives from different organizations and units. Second, its semantics establish a shared language for formulating assessments and visions. Third, the model can also contribute to a wider process for aligning different interests in an organization.

CarCo used the model as part of a broad business transformation initiative. The model’s primary role was to initiate and provide a channel for joint assessments of current and required capabilities by the primary stakeholders involved in the provision of digital services (including marketing, consumer experiences, sales, product strategy and IT). Rather than looking at the assessment results at the individual level, the participating managers were much more interested in the commonalities and variations at the aggregate level. The results were used as input to a joint workshop in which the aggregate as-is assessments were calibrated, and steps for further developing capabilities were identified.

4. Use the Capability Model to Communicate

Tangible evidence of the current state of digital services capabilities is needed both at the corporate level and by those who are responsible for developing the capabilities. However, it can be challenging to ensure that local capability improvements are visible at the corporate level. Potential approaches to dealing with this challenge include comparing internal capabilities with those of other organizations (or other units within the business) and demonstrating how the capabilities improve over time. The capability model is a tool for capturing the state of capabilities at a specific point in time. Specifically, it identifies which capabilities to assess, suggests a methodology for evaluating capability levels and describes practices for implementing the capabilities. By capturing capability states at different points in time, the model

provides the means for continuously communicating capability improvements.

In this communicating scenario, the model’s primary role is to communicate the results of capability management. Thus, the model is a tool for creating internal awareness both of current capability strengths and of areas where there is an urgent need for improvement. The model shows what has already been achieved and, to an extent, allows success to be tracked back to the contributions of individuals.

RetailCo is characterized by decentralized governance and a culture of consensus in which managerial decisions are taken locally and as a result of collective decision-making processes. However, the distributed structure means that little is known at the corporate level about the state of local capabilities. RetailCo managers used our capability model to capture and communicate the state of local capabilities for which they are responsible (particularly in consumer-facing systems and analytics) and to create awareness at the corporate level of their planned activities.

Concluding Comments

This article has discussed the crucial role of organizational capabilities for digital services in consumer-facing industries. It has also highlighted the role of reference models in accumulating organizational experiences and supporting functional managers. However, there are doubts on whether reference models can support innovative tasks such as the development of digital services. Against this background, we studied the role and applicability of a capability model for the management of digital consumer services.

First, we developed a reference model for the capabilities needed to manage digital services in consumer-facing industries. Second, we used case studies to show how the model can be used to identify gaps in capability levels and to provide descriptions of different organizational conditions and priorities.

Based on these case studies, and from applying the capability model in other organizations, we have identified four ways (or scenarios) in which the model can be used. In the first scenario, managers of digital transformation initiatives, particularly executive managers and digital strategists, use the model to *inspire* their organization through the lessons learned from and experiences of other organizations. In the second scenario, managers use

20 Boundary objects are artifacts that “enable and constrain knowledge sharing across boundaries” that are meaningfully incorporated into the working practices of actors in diverse working fields and that have a common identity across these fields. For more information, see Spee, A. P. and Jarzabkowski, P. “Strategy tools as boundary objects,” *Strategic Organization* (7:2), 2009, pp. 223-232.

the model to construct the arguments for justifying investments in digital services capabilities and to *establish trust* that the investments will pay off. In the third scenario, managers use the model to *create consensus* and develop a shared assessment of capability levels. In the fourth scenario, managers use the model to *communicate* the state of digital services capabilities to the rest of the organization and raise internal awareness of them, and to highlight capability strengths and areas where the capabilities need to be improved.

Appendix A: Development of the Digital Services Capability Model

The research project to develop, test and validate the digital service capability model consisted of four iterative phases: 1) Identifying the problem and defining the objectives; 2) Designing and developing the model; 3) Demonstrating the model and 4) Evaluating the model. The table below provides an overview of the activities and methods (which included interviews with experts, focus groups and case studies) used during each phase and outlines the companies and subject matter experts involved in the research project.²¹

21 We followed guidelines for design science research and evaluation provided by 1) Peffers, K., Tuunanen, T., Rothenberger, M. A. and Chatterjee, S. "A Design Science Research Methodology for Information Systems Research," *Journal of Management Information Systems* (24:3), Winter 2007-08, pp. 45-77, 2) Venable, J., Pries-Heje, J. and Baskerville, R. "FEDS: A Framework for Evaluation in Design Science Research," *European Journal of Information Systems* (25:1), January 2016, pp. 77-89 and 3) Hevner, R., March, S. T., Park, J. and Ram, S. "Design science in information systems research," *MIS Quarterly* (28:1), March 2004, pp. 75-105.

Methods Used and Companies/Industry Sectors and Subject Matter Experts Involved in the Research

Phase	Method	Industry Sectors	Descriptive Job Titles of Subject Matter Experts
Objective Definition	Focus group to define requirements of the model	Companies from the energy, chemicals, consulting, consumer goods, sports club, education, retail, medical technology, software, travel and online services sectors	CIO, Head Customer Interaction, Consumer & Market Insights Director, Head of Social Media, Web Intelligence Manager, VP Data Science, Head of Marketing & Sales Applications, Head of Innovation Center, Head of Digital Marketing, Data Management Lead, Product Information Manager
Model Development	Cross-interview analysis to identify capabilities	Companies from the banking, education, property insurance, health insurance and retail sectors	Head of Marketing, Head of Business Architecture, Head of Direct Sales, Business Development Manager, Head of Business Engineering, CIO
	Focus group to identify practices	Companies from the banking, consulting, software, media, consumer goods, chemical products, education, retail, telecoms, tools and finance sectors	Analytics Practice Leader, CIO, Data Management Lead, Head of Customer Interaction Management, Head of Customer and Web Intelligence, Head of Business Intelligence Services, Senior Manager for New Business, Head of IT Strategy, Analytics Business Manager, Customer and Web Intelligence Manager
Model Demonstration	Cross-case analysis to test and refine the model	Companies from the retail, automotive, consumer goods, banking, education, finance, car inspection, health insurance and property insurance sectors	Head of Customer Intelligence, Head of Digital Services, Data Management Lead, Product Information Management Manager, Head of IT Strategy and Planning, IT Strategy and Planning Manager
Model Evaluation	Focus group where stakeholders assessed the model	Companies from the beauty products, education, travel, consulting, retail, interactive agency, mobility services, banking, consumer goods, apparel, IT services, book retailing and chemical products sectors	Head of Digital Analytics & CRM, Digital Business Manager, Senior Enterprise Architect, Head of IT Strategy, CEO, Data Design Director, Head of Data Quality Management, Information Governance Lead, CIO, Chief Data Officer
	Focus group where users assessed the model	A company from the automotive sector	Head of Sales, Head of Development, Head of Customer Relations, CIO, Chief Marketing Officer, Head of Product Strategy

Appendix B: The Digital Services Capability Model (Abridged)

Capability	Objective	Practices
1A: Consumer Orientation (Consumers)	Specify, operationalize and monitor the consumer value proposition of digital services	1A1: Qualitative or quantitative consumer surveys (e.g., measuring net promoter score) 1A2: Analysis of consumer data (e.g., social media monitoring, service ticket analyses)
1B: Consumer Agility (Consumers)	Manage digital services in an agile way across the entire service lifecycle	1B1: Consumer-centric design methods (e.g., design thinking projects, consumer focus groups) 1B2: Agile service development and operations (e.g., scrum, extreme programming) 1B3: Innovation management (e.g., crowdsourcing, employee innovation programs)
2A: Personalization (Services)	Tailor digital services to the context based on consumer information	2A1: Predictive analytics (e.g., next best offer) 2A2: Preference tests and experiments (e.g., A/B testing) 2A3: Personalized consumer advisory (e.g., peer-to-peer advisory)
2B: Business Orientation (Services)	Operationalize and monitor business impacts of digital services with suitable metrics	2B1: Revenue control (e.g., monitor revenues per service) 2B2: Usage monitoring (e.g., online consumer funnel analysis)
3A: Process Reconfiguration (Processes and Activities)	Reconfigure business processes to exploit the business potential of digital services	3A1: Value co-creation across front-end processes (e.g., self-service transactions) 3A2: Demand-adaptive back-end processes (e.g., dynamic pricing)
3B: Privacy (Processes and Activities)	Fully enable data transparency and privacy processes	3B1: Certification of data management practices (e.g., good privacy labels) 3B2: Self-service privacy management (e.g., interaction history, self-service profile management) 3B3: Proactive communication (e.g., opt-in requests)
4A: Roles and Responsibilities (Organization)	Clearly define, document and communicate roles, tasks and responsibilities for managing digital services	4A1: Definition of key roles (e.g., central channel coordination, chief digital officer) 4A2: Units that bundle core competencies (e.g., consumer tech unit) 4A3: Coordinative governance mechanisms (e.g., cross-functional incentives)
4B: Collaboration (Organization)	Fully enabled cross-functional and interdisciplinary collaboration	4B1: Cross-functional project teams (e.g., cross-functional innovation projects) 4B2: Interdisciplinary project managers (e.g., digital marketing manager) 4B3: Culture of collaboration (e.g., open office designs, informal digitization events)
4C: Competencies Management (Organization)	Fully acquire and develop knowledge and competencies for managing digital services and thus for exploiting consumer information in decision making	4C1: Capability planning (e.g., capability profiles) 4C2: Education programs (e.g., on-the-job training, employee education programs) 4C3: Acquisition of competencies (e.g., recruitment, start-up investments)
5A: Data Exploitation (Information)	Continuously evaluate and act on the business potential of consumer data	5A1: Data-driven identification of analytics scenarios (e.g., big data scenario analysis) 5A2: Pilots to test data potential (e.g., R&D projects for digital services)
5B: Data Management (Information)	Fully enable data exploitation methods and architectures for managing consumer data	5B1: Data acquisition (e.g., data flow analysis) 5B2: Data quality management (e.g., DQM program) 5B3: Consumer data integration (e.g., consumer analytics sandbox)

Capability	Objective	Practices
6A: Channel Integration (Technologies and Infrastructure)	Provide an integrated consumer experience through coordination and flexible design of consumer-centric systems and offline channels	6A1: Digital touchpoint integration (e.g., single sign-on) 6A2: Integration of offline and online channels (e.g., store availability check) 6A3: Modular front-end architecture (e.g., layered front-end)
6B: Analytical Systems (Technologies and Infrastructure)	Build a consumer analytics infrastructure to support the exploitation of consumer analytics scenarios	6B1: Integration of analytical information systems (e.g., integrated ERP analytics, web log analytics and text analytics) 6B2: Usage of big data technologies (e.g., in-memory analytics supporting online interactions) 6B3: Access management and data-usage policies (e.g., role-based access management)
7A: Digital Strategy (Strategies)	Align strategic objectives of digital service management with the business strategy and gain top management support for the objectives	7A1: Market vision (e.g., documented top management buy-ins) 7A2: Service strategy (e.g., digital service targets in company strategy) 7A3: Channel strategy (e.g., digital channel first strategy) 7A4: Consumer strategy (e.g., prediction of consumer segment evolution)
7B: Service Coordination (Strategies)	Plan and coordinate the management of digital services across the company	7B1: Investment planning and resource allocation (e.g., digital channel program) 7B2: Service portfolio management (e.g., cross-functional management of digital service portfolio)
8A: Partnership Strategy (Environment)	Form strategic partnerships to secure and continually improve the strategic position in digital service markets	8A1: Service partnerships (e.g., industry alliances) 8A2: Distribution partnerships (e.g., cross-market distribution partnerships) 8A3: Technology partnerships (e.g., partnerships with web companies)
8B: Market Orientation (Environment)	Ensure the management of digital services incorporates a thorough analysis of market and technology developments	8B1: Technology screening (e.g., technology radar) 8B2: Benchmarks (e.g., product benchmarking)

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