REALIZING STRATEGIC VALUE THROUGH CENTER-EDGE DIGITAL TRANSFORMATION IN CONSUMER-CENTRIC INDUSTRIES[1]

When customers of consumer-centric service industries are digitally activated, they become the vibrant Edge of a new ecosystem that creates new strategic value. Using a case study from the healthcare industry, we show how IT is used to create new value for the enterprise at the Center, as well as for the entire ecosystem, when assessed through three Center-Edge models identified by strategy researchers: value chains, value shops and value networks.[2]

Paul Gray[3]
Omar A. El Sawy
Guillermo Asper
Magnus Thordarson

Center-Edge Digital Dynamics in Consumer-Centric Industries

Many consumer-centric industries provide products and services to millions of consumers. These industries include healthcare and wellness, retail, hospitality and travel, sports and entertainment, legal services, financial services, residential real estate and many more. IT professionals and business executives are used to thinking about enterprise-centric ERP systems as the IT center of gravity, but increasingly the focus of IT activity is shifting from the enterprise *Center* to the *Edge* of the enterprise as consumers are digitally connected and activated. Enabling this shift requires managing both IT deployment and organizational transformation at the Center of the enterprise, as well as accommodating consumers' digital interactions at the Edge and understanding how to realize new strategic value through the shift. This article examines the phenomenon of *Center-Edge digital transformation* in consumer- centric industries through a case study in the healthcare industry. It provides guidelines for IT and business executives in any consumer-centric industry who would like to understand how to better

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manage and realize strategic value through a Center-Edge digital transformation that strives to energize the Edge.

Definitions of Edge and Center as used in the Article

An "edge" is typically defined in spatial terms as the part that is farthest away from the "center" of something. But an edge is also used to describe an energy advantage that is potentially vibrant. In a business context, the energy connotation of edge applies where emerging initiatives from the Edge of an enterprise can energize, leverage and create value for the Center.[4] This is especially likely when the connection between Center and Edge is digital, the environment is novel and dynamic, and there is much information exchange and knowledge creation. In digital business environments that change dynamically, the Edge has the potential to challenge and eventually transform the Center (or the traditional core as it is sometimes called). The open source software community has identified Center-Edge organization as an alternative to traditional hierarchy in which the Center sets policy that the Edge activates.[5] In the military, "Power to the Edge"[6] refers to the ability of a military organization to dynamically synchronize its actions through information pull from the Edge and communities of interest through a robust networked grid.

In this article, we use a Center-Edge definition for the enterprise that captures both the spatial and energy/activity connotations. We define the Center as the enterprise, its tight core supply chain, and its set of enterprise systems and technologies. We define the Edge of an enterprise as its customers, community and loosely coupled ecosystem, together with their digital connections. The Edge is also an activity trigger that potentially carries the seeds of transforming the Center.

Even in consumer-centric industries, the Edge includes more than just customers; it is a larger connected community. In this article, however, when we refer to the Edge of an enterprise we are focusing particularly on customers (consumers).

Exploiting the Center-Edge Shift

Transforming the Center-Edge relationship will change the dynamics of interacting with consumers and the deployment of IT infrastructures and

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4   Hagel, J. III, Seely Brown, J. and Davison, L. "How to Bring the Core to the Edge," *HBR Blog Network,* 2009, available at http:// blogs.hbr.org/bigshift/2009/02/how-to-bring-the-edge-to-the-c.html.

5   Meyer, C. "Center-Edge Organization: An Alternative to Tra- ditional Hierarchy," *Working Wider,* 2009, available at http://www. workingwider.com/strategic_innovation/54/.

6   Alberts, D. S. and Hayes, R. E. *Power to the Edge: Command … Control … in the Information Age,* Command and Control Research Program, U.S. Department of Defense, 2003, available at http://www. dodccrp.org/files/Alberts_Power.pdf.

systems. The ability of consumers to interact directly with the Center places new requirements on IT infrastructure deployment and enterprise information, and new challenges for CIOs and line managers. Not only must they worry about the Center of the enterprise and its employees and professionals and their other partners, but they also need to take advantage of consumers and the community at the Edge, recognizing that they are co-creators of value, knowledge organizers and factors of production. Meeting the needs of digitally enabled consumers at the Edge requires an IT infrastructure that can handle rich, engaged and unpredictable interactions.
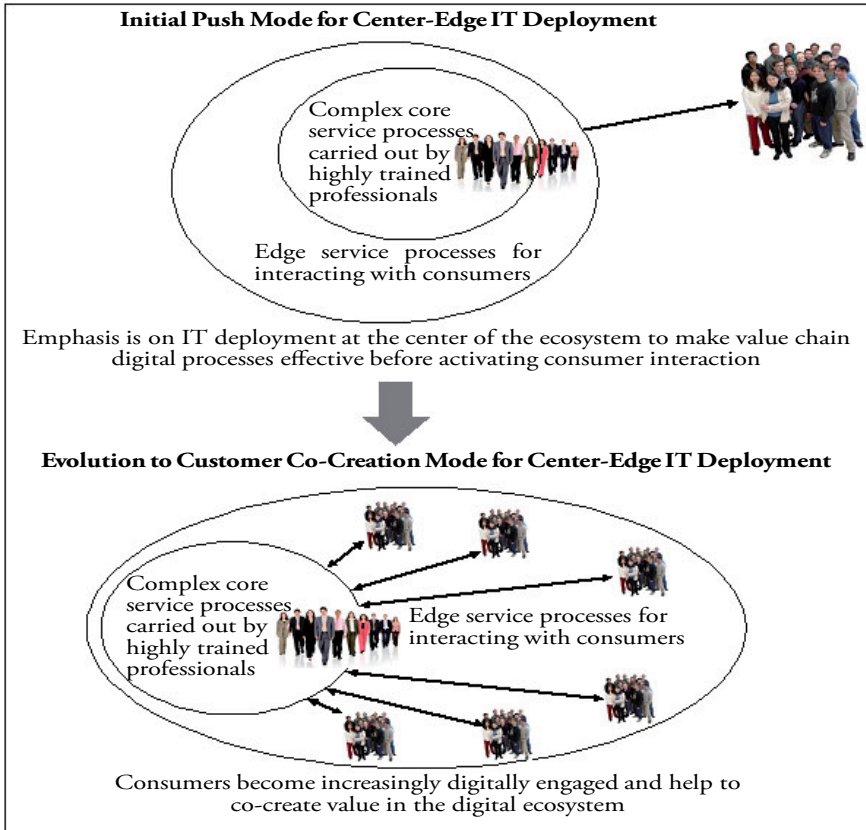
This article addresses the question: *How can an enterprise exploit the Center-Edge shift to realize, capture and assess new strategic value by deploying IT that seeks to transform the way IT-enabled services are delivered for a very large number of consumers?*

First, we briefly describe how Center-Edge IT deployment has to shift from supporting push- mode interactions with consumers to supporting pull-mode interactions. We then introduce three organizational models for alternative value configurations (value chains, value shops and value networks) that can serve as an appropriate lens to understand the realization of value in Center-Edge digital transformation. Next, we present a healthcare case from Kaiser Permanente (a major U.S. healthcare provider) as an example of Center-Edge digital transformation. Drawing on this case, we then use the three organizational models of value configuration to demonstrate how value is created and realized through Center-Edge digital transformation. This discussion also provides a better understanding of the underlying dynamics of the transformation process. Finally, based on this understanding, we provide guidelines for executives in consumer – centric industries who are leading Center-Edge digital transformations, to help them exploit these transformations to realize new strategic business value.

From Push Mode to Pull Mode

It is a considerable challenge to deploy IT that enables Center-Edge digital transformation so that consumers at the Edge can interact with the Center easily with minimum learning, and that is robust enough to handle the unpredictable viral processes increasingly characterizing the Edge. Moreover, as the Edge becomes more empowered to affect the Center directly through IT-enablement and knowledge access, consumers can initiate events in ways that sometimes defy the imagination. The emphasis of consumer interactions with the enterprise shifts from being driven by a push mode from the Center to a pull mode from the Edge.

A simple depiction of the evolution of Center- Edge IT deployment from push mode to fully engaged customer co-creation of value is shown in Figure 1.

Initial Push Mode for Center-Edge IT Deployment

Complex core service processes carried out by highly trained professionals

Edge service processes for interacting with consumers

Emphasis is on IT deployment at the center of the ecosystem to make value chain digital processes effective before activating consumer interaction

Evolution to Customer Co-Creation Mode for Center-Edge IT Deployment

Complex core service processes carried out by highly trained professionals

Edge service processes for interacting with consumers

Consumers become increasingly digitally engaged and help to co-create value in the digital ecosystem

Figure 1. Center-Edge IT Deployment: evolution from push mode to fully engaged

Three Value Configurations for Center-Edge Digital Transformation

To better understand Center-Edge digital transformation, and the natural evolution of the change process, we have identified how value is created, realized and shared both at the Center and the Edge. We have drawn on seminal work by two Norwegian strategic management researchers (Stabell and Fjelstad) who argue that strategic value can be generated and enabled through three different organizational configurations: *value chains, value shops* and *value networks*.[7] Using these three organizational models in combination captures and demonstrates the hidden strategic value of IT implementations in Center-Edge digital transformation.

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7   Stabell, C. B. and Fjelstad, O. D. "Configuring Value for Com petitive Advantage: On Chains, Shops, and Networks," *Strategic Management Journal* (19), p. 413-437, 1998.

Value Chains

Value chains are a common organizational model used to describe an end-to-end horizontal business process in which value is created by transforming inputs into products over a chain of sequential processes. Based on Porter's classic work,[8] the value chain model has guided many of the efforts on IT-enablement and strategic advantage in the last 25 years. Certainly, most large systems for the extended enterprise can be viewed through the lens of a value chain, involving a series of sequential horizontal processes.

Value Shops

In many service delivery environments (such as healthcare, education, professional services and oil exploration), the value chain model is limiting and inadequate. Stabell and Fjelstad[9] suggest a value shop organizational model where value is created by mobilizing resources, expertise and activities to solve and (re)solve specific customer problems. Problem solving, learning and feedback are the hallmarks of the value shop model. Whereas the value chain model is based on sequential horizontal business processes, the value shop model is based on *recursive feedback learning loops*. For example, the self-service aspects of systems are well-captured by a value shop model because it uncovers hidden value that the value chain model does not.

Value Networks

Stabell and Fjelstad suggest a third organizational configuration for generating value: the value network. The value network model is based on creating value by facilitating a network relationship and interactions among the customers or partners of an enterprise through a mediating technology. While the appeal of this value creation model is clear to telecom service providers, banks, and organizations such as eBay, it can apply to any business that can create strategic value through social networks, interactions, communities of practice and knowledge networks – and that would like to capture and measure that value. The relationships between communities representing organizational networks formed by the people who provide services can be well-captured by a value network model and can expose hidden long-term strategic value that neither value chains nor value shops do.

Managing Customer Co-Creation in Value Configurations and the Role of Self-Service

In 1993, a seminal *Harvard Business Review* article by Normann and Ramirez[10] paved the way for rethinking Center-Edge relationships. Their fundamental

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8   Porter, M. *Competitive Strategy,* Free Press, 1980.
9   Stabell, C. B. and Fjelstad, O. D., op. cit., 1998.
10 Norman, R. and Ramirez, R. "From Value Chain to Value Con- stellation: Designing Interactive Strategy," *Harvard Business Review* (71:4), July/August, 1993.

premise was that strategy is the art of creating value and that the focus of strategic analysis is the design of the value-creating system itself within which the various actors in the enterprise's ecosystem (suppliers, partners, consumers, etc.) work together to co-produce value. They contended that the key strategic task is the *"reconfiguration of roles and relationships among this constellation of actors in order to mobilize the creation of value in new forms and by new players."* We have adopted the Normann and Ramirez view for this article as we examine the creation of value in the context of digital transformation across the Center and the Edge.

The Normann and Ramirez model for designing value-creating systems assumes the various types of participants in an enterprise's ecosystem – especially customers – work together to co-produce value. In digital environments, the access and functionalities of digital platforms enable customers to more easily engage in co- production of value through self-service. The self-service concept becomes much more prominent in Center-Edge digital transformation and pervades each of the three value configurations. Customer self-service helps to generate value:

• In value chains by empowering choices easily in transactions and processes
• In value shops through learning and knowledge creation
• In value networks through sharing and engaging with a larger and more diverse network of people and resources.

Thus, in digital contexts, the effective management of customer self-service becomes an important element of co-creating value through any of the three value configuration models.

We describe the application of these three models in more detail later in this article and show how they can be used in the context of Center-Edge digital transformation. We do that through the case of a healthcare organization, which we now briefly describe.

Managing Center-Edge IT Deployments in a Healthcare Company

Healthcare is a good example of a consumer- centric industry ripe for radical Center-Edge digital transformation. In the U.S., the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 is driving the digital overhaul of healthcare businesses, focused largely on achieving "meaningful use"[11] objectives, especially to engage patients and their families

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11 Meaningful use is potentially a key catalyst for transformation. Defined as a set of specific objectives to qualify for the federal HITECH incentive programs, meaningful use is an umbrella concept for the

in all aspects of healthcare provision. Traditionally, the business operations of healthcare providers and caregivers sit at the Center, with segments of consumers or patients or community at the Edge. Meeting the HITECH objective of patient engagement will require Center-Edge transformation.

In the healthcare context, the Edge is predominantly patients, who will be suffering from many types of diseases and at various levels of wellness. The Center can empower the Edge to stay free from diseases and increasingly move toward sustained wellness through better use of data in Electronic Health Records[12] (EHRs – see text box) and patient learning, knowledge and digitally based education. Thus, the Center can actively and intelligently create more value for the entire healthcare ecosystem through effective, higher quality and less costly provision of healthcare services. Particularly promising are disease management and population health programs where patient self-care efforts at the Edge have the potential to be significant and potent viral digital processes that will engage a large proportion of the population.[13] These self-service and feedback loops between the Center and the Edge are a source of strategic value for competitive advantage because they potentially lock in consumers electronically, reduce costs and provide valuable data about the customer base. IT enablement empowers the Edge to become intelligent consumers seeking to understand the quality of their own healthcare and actively participate in it.

Deploying EHRs and their accompanying applications and patient access is a major challenge in terms of complexity and integration. Similar to

Electronic Health Records

An Electronic Health Record, or EHR, is defined as a digital record that includes patient demographics, progress notes, medical problems, medications, vital signs, past procedures and treatments, immunizations, laboratory data and radiology reports. (Note that the HITECH Act specifically uses the term EHR to describe patient record systems with information exchange capabilities, but alternative terms such as EPR (Electronic Patient Record) and EMR (Electronic Medical Record) are used interchangeably with EHR.) The EHR systems maintained by the Center, e.g., a hospital or a medical office, are increasingly being purchased as software suites of in

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usage of electronic health record applications to: improve quality of care, safety, efficiency and treatment variations; engage patients and their families; improve care coordination and population/ public health; and maintain privacy and security of patient health information.

12 The HITECH Act specifically uses the term EHR; other similar terms are EPR (Electronic Patient Record) and EMR (Electronic Medical Record).

13 Murray, C., Monroe, W. and Stalder, S. "Cultivating a Disease Management Partnership: A Value-Chain Model," *Disease Manage- ment* (6:2), 2003, p. 73-82.

tegrated modules. In contrast, the evolving Personal Health Record (PHR) concept refers to a medical record designed for patient access and use – i.e., at the Edge – which may be populated by a healthcare provider's EHR and hosted through a patient portal with capabilities for direct input and communications initiated by the patient.

Kaiser Permanente at a Glance

Kaiser Permanente is the largest managed care organization and largest non-profit health plan in the U.S. According to *Fortune* magazine, it is the fifth-largest privately held organization in the U.S. Its 2011 operating revenues were $48 billion with operating income of $1.6 billion. It is spread across eight regions in nine states and the District of Columbia. Kaiser Permanente is the archetypal massive and complex business with 190,000 employees (including 16,600 physicians) serving 8.9 million members. The company provides its membership both with health plan coverage (insurance) and care delivery (treatment). Its non-profit business model ensures that membership fees (plus co-payments) provide the financial wherewithal for its operations while minimizing costs. From its 1945 founding vision, physicians have been a strong voice in the Kaiser Permanente culture, and have joint roles with the company's executives in running the business. As a very large end-to-end business with forecastable revenues, Kaiser Permanente is able to undertake major IT projects that would be beyond the scope and competence of smaller enterprises. However, the relative independence of its regional companies and the strong physician culture complicates the process of getting consensus on large enterprise-wide information systems initiatives.

enterprise system implementations in other industries, EHRs are complex, but they are also more critical, personal and private than customer transaction records in any other industry. The opportunities are profound for the practice of healthcare organizations, particularly when EHRs become the trigger for radical Center- Edge digital transformation.

The experiences of Kaiser Permanente and the deployment of its KP HealthConnect® system is a pioneering exemplar of Center-Edge digital transformation. The text box provides high- level information about Kaiser Permanente.[14] We believe the lessons learned at this healthcare organization are relevant to companies in any industry.

Historically, Kaiser-Permanente's region-specific IT systems were generally limited in scope and tended to be standalone islands of automation, with each region having several administrative and clinical applications. When a

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14 All factual data reported in this article is from public sources.

national IT organization was established, its challenge was to find pathways to common enterprise systems, and to realize efficiencies of consolidated shared data center operations and operating platforms. Some of the first national efforts were attempts to provide members with self-help and self-service facilities via the Internet.

With the arrival of a new CEO in 2001, Kaiser acquired the off-the-shelf information system that is in use today and called it KP HealthConnect. The chosen vendor, Epic Systems Corporation, provided an integrated software suite that had already been implemented successfully by the relatively small Kaiser Permanente Northwest region. KP HealthConnect is a multi-billion- dollar capital investment and the largest single investment in the history of the company.

Work on KP HealthConnect started in 2003. By mid-2008, all members had online access to My Health Manager, the member accessible portion of the system. From that year, all new medical documents were digital and new medical facilities were designed without storage for the traditional paper patient records. By early 2010, the roll-out of KP HealthConnect was complete, with full system services available at all medical offices and hospitals. By mid-2012, all members could access their health records on mobile devices.

The Kaiser Permanente operating model is an integrated service that covers all aspects of delivering healthcare. While this type of integration may be commonplace elsewhere in the world, it is unusual in the U.S. Kaiser Permanente's integrated model is, however, the preeminent Center-Edge example in U.S. healthcare, and KP HealthConnect is a formidable example of Center-Edge digital transformation in a consumer-centric industry. The system is a result of years of testing a range of value configurations at the Edge. From rudimentary chat rooms in the early days of the Internet to present day empowerment of secure messaging and private email correspondence with personal physicians and care providers, the system has paved the way for consumers at the Edge to ultimately take control of their own wellness.[15]

The other innovative aspect of KP HealthConnect is that, in addition to extending the system all the way to the member/consumer, it is designed to empower IT-enabled self-service in a form that "pulls" members toward wellness. Members can be in charge of aspects of their own healthcare and can directly communicate electronically, without restrictions, with their primary care physicians, thereby reducing the frequency of patient visits and making more effective use of support staff and doctors' time. Moreover, because of

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15 For a comprehensive discussion of the KP Health Connect project, see *Connected for Health: Using Electronic Health Records to Transform Care Delivery*, Liang, L. (ed.), Jossey-Bass, 2010.

Kaiser Permanente's nationally integrated system, a member's health records are readily available at almost all of the company's locations.

In the case of Kaiser Permanente, the Edge is now able to create more value for the Center and the entire ecosystem. KP Health Connect is designed for use both by skilled professionals (doctors, clinicians, nurses, administrators) at the Center and by members (consumers/ patients) at the Edge. The system links every member to the full line-up of caregivers and integrated healthcare services provided by Kaiser Permanente. It is designed for Center- Edge connectivity. The broad range of functions provided by the software modules is summarized in Table 1.

Table 1. Illustrative Functionalities of KP HealthConnect

Location	Center or Edge	System Functionality
Hospitals and Emergency Room	Center	In-patient modules provide hospital and emergency room physicians, nurses and pharmacists with administrative patient bedside control, order entry, medication administration, clinical notes, nursing documentation and workflow management support.
Medical Office	Center	In the outpatient (or ambulatory) environment in medical office facilities, doctors, nurses, and in certain situations other clinical personnel, use the patients' complete EHRs, customize their record views, track and manage chronic medical problems, view and edit encounter and clinical documentation (i.e., doctors' notes), order and manage medications, laboratory tests and radiology images, manage treatment results and communicate them electronically with their patients.
Remote Access by Members	Edge	At any time, wherever members have access to the secure portal on the Internet, they can use the self-service module *My Health Manager* to make or cancel appointments, order medication refills, review laboratory test results and other parts of their health record, and communicate with their providers through secure email.
Pharmacies	Center-Edge	In Kaiser Permanente pharmacies, a member's record and order entry is integrated with the pharmacy's point-of-sale and distribution systems. Members receive prescription refill reminders by email.

Location	Center or Edge	System Functionality
Examination Room	Center-Edge	The system makes the provider-patient interaction more effective. Computers in every examination room allow patients to be shown their data and have it explained to them. Patients receive "After Visit Summary" printouts of their interaction when they leave. This printout is particularly useful for giving instructions on medications and what to do at home. If laboratory tests and x-rays are ordered, by the time patients walk from the examining room to the laboratory, the doctor's instructions are there, ready to be carried out. As a result, the physician and the patient have joint access to patient history, radiology and more during the member-physician interaction. The secure email functionality is also a cornerstone of the patient-physician interaction with approximately half of the membership (4 million) sending 12.2 million emails to their providers in 2011. The providers respond within 24 hours as a matter of standard operating procedure.

Applying Center-Edge Value Configuration Models to Uncover Strategic Value

Using the Kaiser Permanente case, we show how IT creates new value for the enterprise at the Center, as well as for the entire ecosystem, when viewed and assessed through the lens of the three value configuration models described earlier: value chains, value shops and value networks. The advantage of using these three models to uncover value in Center-Edge digital transformation is that there is a natural phased progression that occurs at the Edge (especially with customers). The lowest level and form of customer engagement is best captured by value chains, which is then augmented by a richer level and form of engagement that is best captured by value shops, which is then further augmented by an even richer form of engagement that is best captured by value networks. Thus, each of these three models uncovers and illuminates additional strategic value as the transformation proceeds.

Augmented cumulative value is uncovered by assessing the progressive impacts of the transformation through applying the three organizational value models in turn. We have categorized the impacts in the Kaiser Permanente case as *operational* impacts at the Center and the Edge (1st order impacts), *role reconfiguration* impacts at the Center and the Edge (2nd order impacts), and *transformational* impacts at the Center and the Edge (3rd

order impacts). These impacts, and the value models that help uncover them, are summarized in Table 2.

Table 2. Uncovering Center-Edge Impacts at Kaiser Permanente Using the Three Organizational Value Models

Organizational Value Model	Source of Value Highlighted by Model	Operational Impacts at Center and Edge (1st Order)	Role Reconfiguration Impacts at Center and Edge (2nd Order)	Transformational Impacts at Center and Edge (3rd Order)
Value Chain *Sequential horizontal processes* (→→→→)	Improving the effectiveness of IT-enabled healthcare delivery for both business and clinical processes, including the use of self-service through direct digital customer connection	Scale and standardization impacts: Cost savings, efficiencies, speed. Improvement in quality of healthcare services. Member satisfaction: repeated use, delight, retention, referral	New self-service roles for members in appointments, viewing test results, prescriptions. New competencies for providers to offer digital healthcare compassionately	From paper-based to real-time healthcare. Increased use of remote digital patient/doctor interaction
Value Shop *Recursive learning loops* (ᴗᴗᴗᴗ)	Better mobilization of IT-enabled resources, knowledge and expertise to resolve specific healthcare problems for members, including the use of coaching, learning and knowledge creation	Increased member education and learning through repeated access. Faster mutual learning loops between providers and patients. Faster resolution of member inquiries and medical problems	Enhanced roles for better educated members as care catalysts and innovators. IT functionality enables scarce and specialized clinical resources to be leveraged	Member-driven customization of healthcare delivery. Exploiting EHR data assets for population care
Value Network *Relationship and community networks* (❖❖❖❖)	Building more effective facilitative exchanges through IT-enabled relationship networks among member groups, among providers and among community groups, including the use of social capital and relationships	Social network formation among "birds of a feather" members with common chronic illnesses. Active communities of practice for provider specialties through wikis	Members act as self-help group leaders in online settings. Networked knowledge repositories enhance collaborative role between physician, unions and operational leaders on clinical, operational, occupational and safety issues	Using EHR and patient portals with input from members as basis for information hub for clinical and non-clinical data for members, practitioners and business partners. Integration of medical services with wellness activities

Assessing Impacts Using the Value Chain Perspective

The progressive roll-out of KP HealthConnect was accompanied by a steady surge of member and provider adoption.[16] There has been a steady shift to online self-service among Kaiser Permanente's members. While the operational benefits may be small at the individual instance level, they quickly add up.

1st Order Operational Impacts Identified From the Value Chain Perspective. Call center costs were reduced per appointment because KP HealthConnect allowed patients to make their own appointments online, as well as having their existing appointment information available online. Calls to call centers went down by 44% and office visits decreased by 26%.[17] More importantly, self-scheduling resulted in a drop in patients failing to keep appointments from 13% to 6%, which allows physicians to spend more of their time with patients rather than waiting around. Thus, a change in the digital connection at the Edge has significantly changed the efficiency of the Center.

Online filling of prescriptions and delivery via the U.S. postal service saved between $4 and $13 per prescription compared with going to a pharmacy at a medical center. The annual estimated saving for the 3.3 million members in Northern California alone was $16.5 million for Kaiser Permanente, even after some of the saving was passed back to patients. This was truly a win-win situation for both the Center and the Edge.

Reported efficiencies include improved physician productivity through being able to answer questions on the phone while accessing a member's online EHR. Although there is an initial set-up cost to become proficient in using KP HealthConnect, once past that hurdle there are increasing returns of scale. In other words, there are efficiency benefits for the Center.

Members also reported a much faster and more efficient interaction with their healthcare providers, indicating a much improved Center-Edge interaction. This improvement is illustrated by a member who said:

> I've been using the website intermittently for general info when needed. But yesterday I had some lab work done, and much to my utter amazement the results were emailed to me last night! (Fortunately all good results.)
> … This is a super service: Kaiser Rocks![18]

2nd Order Role Reconfiguration Impacts Identified From the Value Chain Perspective. The increased ability for IT-enabled self-service enables members to have more control of the healthcare delivery process. One mem-

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16 For more information, see http://xnet.kp.org/newscenter/about- kp/healthconnect/timeline.html.

17 Chen, C., Garrido, T., Chock, D., Okawa, G. and Liang, L. "The Kaiser Permanente Electronic Health Record: Transforming and Streamlining Modalities of Care," *Health Affairs* (28:2), 2009, p. 323-333.

18 Retrieved from http://xnet.kp.org/newscenter/pressreleases/ hi/2005/090105kphconline.html.

ber reported that she appreciates Kaiser Permanente's My Health Manager because it's made managing her health, and the health of her two children, easy. Through the site she is able to securely and conveniently view lab results, manage prescriptions, schedule appointments and email her doctors, as well as her children's pediatricians.

> The use of My Health Manager has allowed me to own my healthcare in ways [I've not] been able to own it before, empowering me to be proactive and take control of my health.[19]

This perceived role change for the member at the Edge translates into operational benefits for the Center. For example, a Kaiser Permanente study[20] in the Northwest region found that members who sent messages to their personal physician reduced office visits by between 7% and 10%, and phone calls by 14%. By using email rather than office visits, process savings were about 10 minutes per physician, 5 minutes per registered nurse and 3 minutes per receptionist. (The equivalent savings for telephone contact is 5 minutes per physician and 3 minutes per registered nurse.)

There are also role reconfiguration impacts for healthcare providers. Physicians reported that their telehealth and real-time roles are steadily increasing because they can give instructions for critical cases to their nurses and other caregivers from wherever they are (e.g., at home in the evening) because they have access to the member's test results electronically. Learning is also taking place as physicians gain new competencies for providing healthcare remotely.

3rd Order Transformational Impacts Identified From the Value Chain Perspective. These operational and role reconfiguration impacts cumulatively trigger transformational impacts and make transformations more possible. As the phases of deployment move forward, some bigger leaps are mandated and possible. For example, new Kaiser Permanente hospitals, such as the one in Antioch, California, opened without a file storage room for paper records; it started successfully with all-electronic records. This is a transformational effect that could not have been attempted earlier in the roll-out process as neither the Center nor the Edge was ready for it.

Assessing Impacts Using the Value Shop Perspective

The value shop model emphasizes recursive learning loops between providers and members. In the case of Kaiser Permanente, these loops both

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19 Retrieved from http://www.kaiserpermanentecarestories.org/ easytomanagehealth/.

20 Zhou, Y. Y. et al. "Patient access to an electronic health record with secure messaging: Impact on primary care utilization," *The American Journal of Managed Care* (13), 2007, p. 418-424.

generate knowledge and mobilize expertise better to resolve members' specific healthcare problems. They capture the business value that accrues as IT-enabled services enable members to move closer to the wellness side of healthcare. The value shop perspective also brings to light the value that members start to perceive as personalized healthcare within Kaiser Permanente's standardized process environment.

1st Order Operational Impacts Identified From the Value Shop Perspective. The1st order operational impacts are related to increased increased learning through access to online tools, such as secure email and associated messaging functions, required to manage their health, members can communicate more intelligently with their caregivers and better express their problems in a common language. The healthcare providers, in turn, can better learn about the member's condition and symptoms. The virtuous mutual learning loop formed between the provider and member shortens learning time in the interaction, makes it easier to diagnose the problem and makes it easier for members to understand the care instructions they receive. In the Kaiser Permanente case, much value is uncovered at the Edge using the value shop model.

2nd Order Role Configuration Impacts Identified From the Value Shop Perspective. The 1st order impacts identified from the value shop perspective trigger 2nd order role reconfigurations. More informed members can now participate at a different level in the delivery of their healthcare and gradually enhance their role in the value shop as the Edge evolves in the direction of creating more value.

Physicians suggest that members are getting better at discussing their medical conditions. As a physician said in a private communication to one of the co-authors: *"The level of discourse with members has been elevated."* Thus, as Center-Edge digital transformation proceeds, the Center and Edge communicate differently with each other, and that adds tremendous value.

As patients become more knowledgeable, they are able to participate more actively with the provider in their healthcare options, and their role gradually shifts. Normann and Arvidsson[21] observed this shift of role from being a patient to what they call "care catalysts" – people who actively improve the effectiveness of the healthcare services delivered to them. They also report that some care catalysts may bring innovations to the healthcare process.

Over the long term, the value generated for the elevated and empowered roles for members is substantial. These new customer roles at the Edge partly relieve Kaiser Permanente from the all-encompassing role it previously had, making its role easier and in all likelihood improving the quality of healthcare.

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21 Normann, R. and Arvidsson, N. *People as Care Catalysts: From Being Patient to Becoming Healthy,* John Wiley & Sons, 2006.

We are well aware that learning and better problem resolution from the use of KP HealthConnect. Based on their these effects are difficult to measure, but they are critical to Center-Edge digital transformation.

3rd Order Transformation Impacts Identified From the Value Shop Perspective. The value shop perspective can also capture 3rd order transformational impacts. At Kaiser Permanente, members' continued interaction and learning allows them to increasingly customize and personalize the way they obtain healthcare. They can now select how they set up their wellness information access, or alerts, and how they interact with their physicians.

One of the most exciting transformational impacts enabled by KP HealthConnect is what Kaiser Permanente calls "population care."[22] Population care involves aggregating data on the treatment of individuals available through the system, and then using analytics to provide guidance on how to help all the individuals with a particular problem, chronic disease or symptom. For example, analytics were used to keep track of side effects of Cox-2 drugs, such as Vioxx, enabling Kaiser Permanente to greatly limit their use and thus protect large numbers of its members. In a separate analysis using EHR data, Kaiser Permanente carried out a large study that found evidence for an association between caffeine consumption and miscarriage risk in pregnancy.[23] Combining population care with CRM-type systems allows at-risk patients to be automatically alerted.

Kaiser Permanente management views population care and the use of analytics in medicine as a major revolution that will continue to provide benefits for the future.[24] This type of aggregation and analysis generates improved performance at the Center and allows better services for the Edge.

Assessing Impacts Using the Value Network Perspective

The value network organizational model discovers value by building better exchanges through networks of relationships and community groups. The value generated from this type of perspective is beginning to take hold in healthcare. A recent national [U.S.] survey revealed that one in four Internet users with a chronic illness searches online to find others with similar conditions.[25] Engaging patients in this sort of way is becoming a major focus for mainstream healthcare providers and will be a significant trend for

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22 Liang, L., Unitan, R. and Weissberg, J. *Managing the Health of Populations,* in Liang, L. (ed.), op. cit., 2010.

23 Weng, X., Odouli, R. and Li, D.-K. "Maternal caffeine con- sumption during pregnancy and the risk of miscarriage: a prospec- tive cohort study," *American Journal of Obstetrics and Gynecology* (198:3), March 2008, p. 279e1-e8.

24 See http://xnet.kp.org/newscenter/pressreleases/nat/2010/10011 0ehrpopulationcare.html.

25 Fox, S. *Peer-to-peer healthcare,* Pew Research Center, 2011, available at http://pewinternet.org/~/media// Files/Reports/2011/ Pew_P2PHealthcare_2011.pdf.

years to come. That is why leading healthcare organizations such as Kaiser Permanente are making significant investments in this area.[26]

1st Order Operational Impacts Identified From the Value Network Perspective. For Kaiser Permanente, there are 1st order operational impacts that can be obtained through social networks. Patients with chronic diseases (and possibly some of their providers) build forms of social interaction within their care community. Wiki and messaging technologies can be used to build communities of practice, care delivery and support.

As social networks are created for patients, they can be accompanied by some new roles in the online environment. Using social networks for frequent personal communication is now the norm, and communication is increasingly understood as a critical way the chronically ill can successfully engage in self-managing their illnesses, increasing efficiency at the Center and effectiveness for the Edge.[27] Moreover, the viral process typical of activities at the Edge provides tremendous opportunities for value co-creation, as evidenced by the experience of social media applications in several industries.[28]

Tempered by regulatory and privacy concerns and restrictions, Kaiser Permanente made a conscious decision not to become a pioneer but to restrict itself to the mainstream social media platforms and applications.[29] In 2009, the company recognized the need for a social media policy that acknowledges and allows employee activity and provides guidelines for participation.[30] As a result, the company navigates carefully the complexities of the social media space with the objective of being part of, yet managing, the discourse. It has an extensive presence on all major social media channels, such as YouTube, Facebook and LinkedIn, focusing primarily on news and information, membership service and support, and patient education. Kaiser Permanente manages more than 100 Twitter accounts (handles)[31] and runs the videoblog kaiserpermanentecarestories. org. Kaiser executives have also taken steps to develop tools to enhance the ability of members to act on their data to manage their health more collaboratively.[32] While this is a measured approach, the ac-

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26 Chase, D. *Is there a business case for engaging patients?* Available at http://www.forbes.com/sites/davechase/2012/10/21/is- there-a-business-case-for-engaging-patients/?goback=.gmr_93115. gfl_93115. gde_93115_member_201350038.

27 Hawn, C. "Take Two Aspirin And Tweet Me In The Morning: How Twitter, Facebook, And Other Social Media Are Reshaping Health Care," *Health Affairs* (28:2), 2009, p. 361-368.

28 Gallagher, J. and Ransbotham, S. "Social Media and Customer Dialog Management at Starbucks," *MIS Quarterly Executive* (9:4), 2010, p.197-212.

29 Pereira, D. "Social media in healthcare: a view from Kaiser Permanente," *IBM Social Business School,* 2012, available at https:// www.ibm.com/developerworks/mydeveloperworks/blogs/social- business/entry/social_media_in_healthcare_a_view_from_kaiser_ permanente7?lang=en.

30 Eytan, T., Benabio, J., Golla, V., Parikh, R. and Stein, S. "Social Media and the Health System," *The Permanente Journal,* (15:1), 2011.

31 Kiron, D. "Social Business at Kaiser Permanente: Using Social Tools to Improve Customer Service, Research and Internal Col- laboration," *Sloan Management Review,* March 6, 2012, available at http://tinyurl.com/b89ndwb.

32 Christensen, K. and Silvestre, A. *Making Health Personal,* in Liang, L. (ed.), op. cit., 2010.

tivation of social media at the Edge through numerous channels has enhanced the value-creation opportunities and synergy.

Kaiser has also promoted patient engagement by allowing external input of secure patient information through direct patient intervention in promoting evidence-based medicine. The web-based patient portal has been particularly effective in improving the Healthcare Effectiveness Data Information (HEDIS) measures for patients with chronic conditions like diabetes and hypertension. A study of more than 35,000 adults with chronic conditions in Kaiser´s Southern California region and a study of 170,000 diabetics in the Northern California region showed an improvement in the condition of patients using the portal (an increase of 4% to 11% in the Effectiveness of Care HEDIS measures and increased treatment and follow-up efficiency resulting in statistically significant reduction in blood sugar and cholesterol levels for those patients).[33]

2nd Order Role Reconfiguration Impacts Identified From the Value Network Perspective. While Kaiser has adopted a measured approach to letting the value network generate value on its own at the Edge, it has engaged more boldly in a variety of other value generating opportunities through professional value networks. At the role reconfiguration level, Kaiser engages in a variety of internal and external collaborative arrangements among staff, physicians, unions and operational leaders, as well as consortiums of healthcare organizations. IdeaBook, Kaiser Permanente's internal social media collaboration platform, supports blogs and wikis, and enables virtual groups and cross-functional virtual work teams to have open conversations about the business behind the firewall. Cooperative affiliations such as the Labor Management Partnership[34] and the Innovation Learning Network[35] bring together people across functions and regions to discuss quality and innovation in healthcare, patient safety, risk management, service quality and resource stewardship. In this way, the Center creates value and shares it by forming new networks.

3rd Order Role Transformational Impacts Identified From the Value Network Perspective. Other initiatives involving KP HealthConnect are transforming the network of relationships with Kaiser Permanente. A small pilot, announced in June 2008, enabled voluntary data exchange between Kaiser Permanente's My Health Manager and Microsoft's HealthVault —

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33 See: Wallace, P. Testimony to Quality Measures Workgroup, October 28, 2010, available at http://goo.gl/E4wQh; Reed, M., Huang, J., Graetz, I., Brand, R., Hsu, J., Fireman, B., and Jaffe, M. "Outpatient Electronic Health Records and the Clinical Care and Outcomes of Patients With Diabetes Mellitus," *Annals of Internal Medicine* (157:7), October 2012, p. 482-489.

34 See http://www.lmpartnership.org/home.

35 McCreary, L. "Kaiser Permanente's Innovation on the Front Lines," *Harvard Business Review,* September 2010.

which was a new consumer health platform at that time. Connecting to the HealthVault platform today enables consumers to combine the information from their provider's EHR with personal data from health and wellness applications (such as diet monitoring and exercise regimens) and devices (such as blood pressure monitors). (At the current time, a direct link to HealthVault is not supported for all Kaiser Permanente members.) In 2010, the company entered into a healthcare data exchange program with the Department of Veterans Affairs (VA) and, in 2011, it joined five other health systems to create the Care Connectivity Consortium, an initiative for a secure EHR data exchange. Initiatives of this kind[36] could lead to a whole new set of value networks with the Center and thus add to the potential cumulative value of the entire ecosystem.

Guidelines for Managing the Challenges and Opportunities of Energizing the Digital Edge

We provide three sets of guidelines for both IT and business executives to help them energize the digital Edge and the relationship between the Center and the Edge to realize added strategic value. Each set of guidelines is accompanied by actionable practices.

While our case example is from the healthcare industry, we believe the findings and guidelines can be applied in other consumer-centric industries such as retail, entertainment, real-estate and many more. In healthcare, there are complex service processes carried out by highly trained professionals with life and death consequences, lots of regulations and rules, and potentially dire reputational consequences. This means that any major Center-Edge change in healthcare is especially challenging.

Other industries, for example, the entertainment industry, have less stringent constraints. Consider the case of Live Nation, which produces live music concerts and recently acquired Ticketmaster to become the world's largest concert promoter and ticket seller. Live Nation creates value through innovative "live" experiences by digitally activating the Edge and having fans and music artists directly connect with each other transparently.[37] While this is a very sophisticated Edge interaction, it certainly does not have the critical consequences of the healthcare context.

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36 For more information about these initiatives, see: *Kaiser Permanente and Microsoft Empower Consumers to Take Charge of their Health*, June 9, 2008, available at http://xnet.kp.org/news-center/pressreleases/nat/2008/060908kpmsftpilot.html; *Veterans Affairs and Kaiser Permanente Share Electronic Health Information to Improve Care for Veterans*, January 2, 2010, available at http://www1.va.gov/opa/pressrel/pressrelease.cfm?id=1836; *Five Leading Health Systems Create New Care Connectivity Consortium*, April 6, 2011, available at http://www.prnewswire.com/news-releases/five-leading-health-systems-create-new-care-connectivity-consor-tium-119301529.html.

37 Gustin, S. "Young CEO Seeks to Reset Ticketmaster With Tech and Transparency," *Wired,* March, 2011, available at http://www.wired.com/business/2011/03/ticketmaster/2/.

Nevertheless, in both of these contexts, new strategic value is created and realized through Center-Edge digital transformation and by harnessing the combination of value chains, value shops and value networks. Thus, while the proliferation and type of interaction and knowledge sharing on social media networks, and the extent of use of mass-collaboration techniques such as crowdsourcing, may differ by industry, we believe our findings and guidelines apply to all consumer-centric industries.

Some consumer-centric industries will be faced with massive Center-Edge IT deployments, which bring additional challenges in terms of scale and cost. Coupled with the unrelenting pace of business change, stressful public exposure to any technology-implementation problems and much uncertainty as to how their Center-Edge digital transformation will unfold, these industries may be unsure if their transformation efforts will realize benefits for the Center and the entire ecosystem. We believe that following the guidelines below will help ensure their Center-Edge digital transformation will enable new strategic opportunities for creating business value at a scale that would not have been otherwise possible.

Guideline 1: Use the Value Configuration Framework to Assess Value Realization

Articulating the Center-Edge impacts by examining Table 2 above, row by row, for each value configuration model shows how value can be realized cumulatively as a Center-Edge digital transformation proceeds. We recommend that IT and business executives whose organizations have large ongoing IT deployments and who want to realize more strategic value from them use the three value models described in this article. Doing this will help them uncover ways of generating and realizing new strategic value that may not have been obvious, as illustrated by our case example.

Actionable Practice 1: Executives need to go beyond assessing the impact and added value of IT-enabled horizontal business process change across the supply chain as they migrate the organization's focus from the Center to the Edge. They need also to assess the impact and added value of recursive feedback learning loops between the Center and the Edge, and the impact and added value of knowledge sharing and relationship building across the community of consumers. These value shop and value network impacts may eventually grow to surpass value chain impacts, and executives need to be aware of them and assess them from the start.

Understanding the nature and dynamics of Center-Edge digital transformation helps manage expectations about the deployment of IT systems. Typically, there is an initial push from the Center to deploy IT systems in a predictable and phased manner. However, as soon as the Edge is empowered

and discovers new ways of interacting and behaving through the digital connection, there is a pull from the Edge for new capabilities, increased capacity and new features. With successful IT implementations at the Edge, this pull becomes viral and unpredictable — and often the initial scoping of the IT system becomes obsolete. For example, a surge in the use of mobile devices (whether smartphones or tablets or phablets[38]) at the Edge will require unplanned deployment of new capabilities and features. As the Edge increasingly generates a larger proportion of value for the enterprise, understanding how to deploy new capabilities to respond to pull from the Edge is vital. This response requires dynamically adjusting the supply from the Center to match the demand generated by increased customer engagement at the Edge.

Actionable Practice 2: IT Executives should develop a contingency plan and budget for the successful activation of the Edge as value shops and value networks energize Center-Edge IT deployments. This may require dynamically rescoping the requirements for the digital customer channel as new user-device functionalities multiply at a scale that may not have been anticipated.

Although the pull from the Edge is viral and unpredictable, the evolution of the push-pull process appears to have a natural inclusive progression from value chain to value shop to value network, while preserving the characteristics of each of these three value configuration organizational models. This progression has also been mapped in ecological approaches to the design of services.[39] Initially, the value chain model is dominant and the evolution is fairly predictable. As the Edge becomes more empowered and proactive, the deployment of IT resources becomes somewhat reactive, with resources having to be reconfigured at short notice as mutual learning takes place and the value shop model becomes prominent. As the Edge matures, the pull becomes more stable and self-organizing as value networks among users come to the fore. IT and business executives should be aware of each of these three phases of Center- Edge IT deployment and be able to dynamically adjust resources if they are to maximize the value generated from Center-Edge digital transformation.

Guideline 2: Learn How to Redesign Digital Self-Service Roles at the Edge

Direct digital connections at the Edge are often the trigger for new self-service roles. As digital access to the value chain propagates to the Edge, customers start to take advantage of functionalities and features that enable

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38 Phablet, a combination of the words phone and tablet, describes an informal class of smartphones with screen sizes ranging between 5 and 7 inches.

39 Tung, W. and Yuan, S. "A service design framework for value co-production: insight from mutualism perspective," *Kybernetes,* (37:2), 2008.

them to use self-service to meet some of their needs. They will begin to engage in various stages of the supply process, from design to delivery and discovery, particularly through the use of precise digital touch points. Concurrently, the Center will need to develop new competencies for delivering self-service to a heterogeneous customer base. For example, self-checkout in supermarkets means the checkout role has been replaced by the customer, but there is now a customer support person who will help customers when they have a problem or don't know how to do something. Thus, the supermarket's structure has changed; it now has fewer checkout clerks, more self-checkout stations and new customer support roles. Airline check-in has been undergoing a similar digital transformation through the provision of multiple self-service channels, including smartphones.

As the value shop model, with its learning and feedback between the Center and Edge, becomes dominant, both the Center and Edge become better at managing the learning and feedback. Customers at the Edge become better educated on mastering the interface and learning about services, and taking advantage of them through digital interaction and engagement. The Center learns how to become a better coach and customer-care catalyst. When the value network becomes the dominant model, with social media enabling different customer groups to exchange information and knowledge among themselves, a new level of energy and activity at the Edge is created.

One challenge and opportunity in Center-Edge digital transformation is to better understand how to manage the connection between coaching and self-service and their inter- linked role in empowering the Edge. Coaching is about counseling customers, training them and providing advice on how to take advantage of the services provided through self-service. This requires understanding how to mobilize a heterogeneous customer base to "do it yourself" for things they have not done before. Examples would include customizing a built-to-order men's suit online, figuring out how to choose a doctor or participating in helping an entertainer create a new song through online mass collaboration.

Actionable Practice 3: Managing digital self- service at the Edge is a top priority for creating value in Center-Edge digital transformation. Executives need to ensure their customer support specialists are trained to be self-service support catalysts rather than just traditional service providers. This subtle distinction (support-on- demand vs. do-it-all-for-them) helps to activate the Edge, which helps to continue the generation and realization of business value at the Edge.

Center-Edge digital transformation brings with it IT deployment challenges and design decisions that different enterprises will address in ways that suit their own context. One challenge is to bridge the digital divide at

the Edge. Generally, consumers at the Edge interact with the Center through three dominant channels: 1) browser-based Internet access through computers and smart devices that is often augmented with live chat; 2) mobile apps and text messaging; and 3) traditional voice/phone. For reasons of cost, enterprises increasingly discourage labor-intensive voice communication, unless it is a replacement for face-to-face interaction that cannot otherwise be satisfied (for example, in healthcare). Given the heterogeneous demographics, degree of engagement and preferences of consumers, the digital divide across different channels becomes even more challenging to manage. Bridging the divide requires increased resources, strategic thinking and an understanding that doing this is vital to the business. It also requires an understanding of the nuances of the various digital touch-points used by customers.

Actionable Practice 4: Practices for managing the digital divide at the Edge across channels and devices will continuously evolve. Managing the divide requires more creativity and resources than managing the digital divide at the Center, which is more controllable. Putting a BYOD (bring your own device) policy in place at the Center is a stepping stone to managing the digital divide at the Edge.

Guideline 3: Empower the Center- Edge Relationship to Enable the Value Multiplier

Forrester Research[40] has documented the emergence of Chief Customer Officers in some enterprises to manage the total customer experience—especially the digitally connected experience. Forrester points out that this role goes well beyond the consumer-facing role, and requires a significant organizational change in how the rest of the enterprise is organized around the customer experience ecosystem. In short, the Center needs to change its role to empower the new Chief Customer Officer role of the Edge. Empowerment at the Edge extends beyond customers and to the wider community as well. For example, an organization can empower the apps development community at its Edge by providing APIs (application programming interfaces), so that every application created by the development community can become a channel for reaching new customers or enriching the experience of existing ones.[41]

The attraction of Center-Edge digital transformation is that as the Edge becomes more empowered and activated it generates more value for the enterprise and the entire ecosystem. This additional value often has the

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40 Manning, H. and Bodine, K. *Outside in: The Power of Putting Customer at the Center of your Business,* Amazon Publishing, 2012.

41 Medrano, R. *Welcome to the API Economy,* Forbes, Au- gust, 2012, available at http://www.forbes.com/sites/ciocen- tral/2012/08/29/welcome-to-the-api-economy/.

potential to be many more times the value generated by the Center alone. We term this multiplicative augmentation effect from the Edge as the *Value Multiplier.* The generation of knowledge and its flow at the Edge are vital to this augmented value creation. The more empowered and hungry for knowledge consumers are, the more value IT-enabled services generate for the consumer, the enterprise and the business ecosystem. Most important of all, however, is providing a structure of information and interactions that allows consumers to learn and become as knowledgeable as possible, to the point of becoming a catalyst or innovator for additional services.

For the Edge to generate value, there needs to be engagement as well as transparency and networking.[42] Transparency between the Center and the Edge enables knowledge sharing and the creation of value from activities at the Edge. Engagement at the Edge energizes the use of social networking. When the value network model comes to the fore and is enabled by social media, the generation of value takes off on a trajectory of its own, and the long-term intangible value created makes the trials and tribulations of Center-Edge digital transformation worthwhile. Over time, the Edge generates an increasing proportion of the value for the entire enterprise. That value is co-created through the customers and at less direct cost to the enterprise.

Actionable Practice 5: IT and business executives should enable transparency, engagement and networking practices between the Center and the Edge to accelerate the value creation process through the Edge.

The value multiplier is one of the most under-reported aspects of Center-Edge digital transformation and is thus not taken into account when calculating the benefits of Center- Edge IT deployments. To leverage the value multiplier requires an IT infrastructure that can capture this knowledge for re-use. Over time, the Edge of the enterprise becomes the growing focus of entire ecosystem interaction, and generates a growing proportion of business value. That is why Center-Edge digital transformation will become the new competitive advantage.

Concluding Comments

We have described how to uncover the cumulative value of Center-Edge digital transformation using the three organizational models of value configurations, and illustrated this approach with an example from a healthcare business. Each of these models discovers value in a different way. We have also shown that these models are a useful lens for illuminating the nature and dynamics of Center-Edge digital transformation. We believe that any enterprise in any industry involved in this type of change will find these

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42 Werbach, A. Strategy for Sustainability: A Business Manifesto, Harvard Business Press, 2009.

three models helpful for assessing and tracking different forms of business value.

Although we have illustrated the concepts of Center-Edge digital transformation with a healthcare case study, we believe the principles are equally valid in a variety of consumer-centric industries such as financial services, real estate, travel, entertainment and retail. In these, and other industries, embarking on a Center-Edge digital transformation could become the next competitive advantage.

About the Authors

for Communications Technology Management.
He specializes in digital business strategy in

Paul Gray (1930-2012) was Professor Emeritus and Founding Chair of the School of Information Science at Claremont Graduate University. His recent interests in information systems included business intelligence, knowledge management, data warehousing and e-commerce. This is his third article in *MIS Quarterly Executive*. His Ph.D. is in Operations Research from Stanford University. Before joining Claremont in 1983, he was a professor at Stanford University, Georgia Institute of Technology, University of Southern California and Southern Methodist University. Prior to his academic career, he worked for 18 years in research and development organizations, including nine years at SRI International. He most recently was a Visiting Professor at the University of California at Irvine and an Executive Director of the Teradata Institute. Professor Gray retired in May 2001 but continued to teach, do research, consult and curate the Paul Gray PC Museum at Claremont. He was awarded the LEO Award of the Association for Information Systems for lifetime achievement. He was inducted as a Fellow of the Association of Information Systems and as a Fellow of the Institute for Operations Research and the Management Sciences – and, in both cases, was in the first group of Fellows named. He was a winner of the Kimball Medal of the Institute for Operations Research and the Management Sciences, named Educator of the Year by EDSIG and awarded the NATO Systems Science Prize. Professor Gray also served as President of The Institute of Management Sciences. He is the author of over 130 journal articles and the author/editor of 13 academic books. He was Founding Editor of the electronic journal *Communications of the Association for Information Systems* from 1998 to 2005 and was a long-time member of the Southern California Chapter of the Society for Information Management. The co- authors of this article all regard Paul Gray as their most wonderful and caring mentor.

Omar A. El Sawy (elsawy@marshall.usc.edu) is Professor of Information Systems at the Marshall School of Business, University of Southern California, where he has taught since 1983. Between 2001 and 2007, he was Director of Research for Marshall's Institute turbulent environments and business models for digital platforms. He is the author of over 100 papers and is a six-time winner of SIM's Annual Paper Awards competition. He is an AIS Fellow. He has carried out research on four continents, was an information systems advisor to the United Nations Development Program in Egypt and a Fulbright scholar in Finland. He is the co-author of the book ***Business Modeling in the Dynamic Digital Space*** (Springer, 2012). Most preciously, this is his sixth and last article co-authored with Paul Gray.

Guillermo Asper (guillermo.asper@gmail.com) has been Professor at the University of Brasilia, Administration Department, FACE, since 1994, teaching business process management design and business logistics enabled with information and communication technology. He coordinates Organizational Strategy Nucleus, CEAM. He focuses on information systems process design and innovation implementation, especially in healthcare. Professor Asper has several publications on healthcare issues in Brazilian hospitals. He has led IT departments at the Brazilian Government National Council for Science and Technology Development (1979- 1994) and at Lojas Americanas in Rio de Janeiro (1968-1979), one of the largest retail chains in Brazil.

Magnus Thordarson (magnus@thordarsOnline. com) is currently an IT healthcare consultant and researcher in California. He previously spent 15 years with Kaiser Permanente where he held a variety of IT executive and senior director positions. Thordarson is a graduate of Claremont Graduate University in executive management, where he was taught and guided by Paul Gray in the management of information systems and technology. He also has extensive industry experience in food and beverages, advertising and graphic design, and financial services. His research interests and expertise include the value of information and information systems, electronic health records, healthcare costing and privacy in digital media.