



**Brave New Web:  
Health Informatics and the Emergence of  
Innovative Technologies**

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**Abstract**

*The sky-rocketing evolution of web technologies and standards has fueled development of a raft of highly interactive, collaborative and personalizable Internet applications. Librarians and other information professionals are exploring innovative and creative ways to deliver increasingly indispensable web-based, media-rich content and services in order to encourage, as well as cultivate, a network of expanding communities across a geographically-swelling patron base.*

*Focusing upon the field of health informatics, we explore a wide range of technologies, based on two key elements of effective communication and value creation: personalization and interaction that will improve patrons' information access experiences; unlocking and unblocking new outreach opportunities; facilitating community building; and lowering delivery cost.*

**Paradigmatically, Shift Happens**

In their bestseller, "The Future of Competition: Co-Creating Unique Value with Customers," authors Prahalad and Ramaswamy promulgate that in today's competitive landscape, the value of a product or service cannot exclusively be determined by the producer anymore. Increasingly, value is jointly created by both producer and consumer. In other words, added value, value which arises beyond products and services in and of themselves, is implicitly embedded in the *co-creative event*: Successful interaction between customer and producer in personalizing the product or service based upon the customer's specific needs, environment and customizable, consumer climate.

Technology plays a vitalizing role in this shift from the traditional vendor-centric, “one-size-fits-all,” mass-productive, “maker knows best” mentality, into today’s consumer-mandated, consumer-producer value co-creation model espousing mass customization. Advances in technologies, process evolution and modular-based production proffer manufacturers the flexibility and economics to tailor their products and/or services according to the individual consumer’s unique needs, conditions and personal tastes. Concomitantly, with the brisk development and convergence of technologies, the all-encompassing, omniscient Web, coupled by industry deregulations and burgeoning globalization, customers, patrons and consumers now have unprecedented powers to access, utilize and constructively exploit abundant resources. Consequently, consumers are vastly more-informed, well-connected, technologically-savvy, networked, actively engaged and thus, evermore demanding with regards to their product options. Talled together therefore, collective values co-arise naturally from the interplay between consumers and product providers vis-à-vis deeply personalized and personalizing merchandise and services. Vendors are compelled to listen to and collaborate with their customers.

Consider the healthcare industry. Unlike traditional physician-centric practices, health consumers are more involved than ever before, with their personal healthcare decisions, choice of healthcare professionals and treatment options. One need look no further than the evolution of television, print and web advertisements in just the past few years, with their emphasis on consumer-informed decision-making regarding the latest prescription medications. It is an understatement that some patients now visit their internists more informed than the physicians themselves concerning the latest medicines and medical breakthroughs.

According to a 2005 Pew / Internet survey, eight in ten Internet users have searched online for information pertaining to healthcare-related topics. Patients currently have access to a veritable treasure trove of web-based health information. Healthcare consumers and their caregivers now actively seek and provide advice and support to and from their clientele, as well as with one another, through so-called “thematic consumer communities,” sharing the same health-system stories, anecdotes, solutions, advices, and suggestions. Patients may likewise consult drug information at pharmaceutical and FDA websites, looking up alternative or experimental treatments; sharing progress with, and receiving sagacious consultation from, online care professionals and clients who’ve been there. Cooperatively, these grass-root activities make up a “personal wellness portfolio.” (Pralhad and Ramaswamy, 2004)

Better informed patients might well be more willing to work with physicians in co-developing their treatment plans. Many healthcare organizations recognize such value arising from the interaction and collaboration between patients and healthcare professionals. With the help from information technology, they have launched so-called “eHealth” initiatives to facilitate or improve patient access to health-related information and to enrich the value of patients’ “co-creation experiences.” Some eHealth features presently include: Access to online health records; personalized health web pages; patient / provider dialogues; health web logs (health “blogs”); condition-specific online communities; and invaluable health tools such as E-quizzes, E-surveys and other online assessment and diagnostic instruments. (Chapman, et. al.)

### **Value Co-Creation Process**

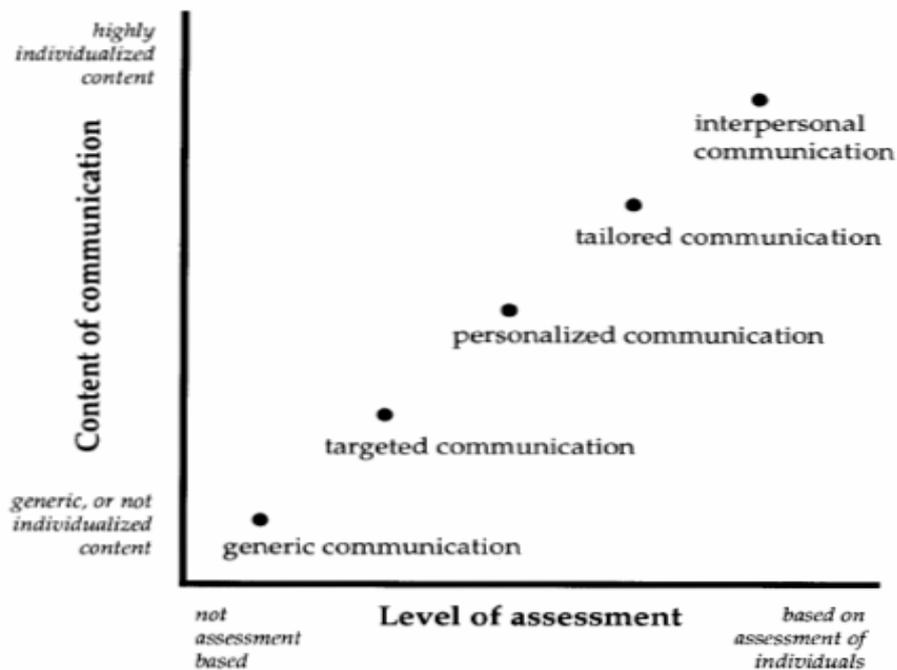
As identified by Prahalad and Ramaswamy, proactive *interaction* between customers and producers, conjoined with *personalization* of the product or services afforded, are the two main co-elements in this *value co-creative process*. The two elements are inextricably intertwined, intimately correlated and mutually supportive. Consumer experience interacting with producer experience becomes “personalized” through individualized, unique needs and situations. The greater the uniqueness or the higher the degree of personalization valued, the more complex and intense the consumer-producer interrelationship evolves. In higher education, coincidentally

enough, these two elements, *individualized services* and *collaboration*, are also recognized in the “2006 Horizon Report,” an annual study by The New Media Consortium and EDUCAUSE, as two of the four major trends and emerging technologies possessing significant impact upon higher education.

A similar conceptual model from the health sciences field can be located in “Tailoring Health Messages: Customizing Communication with Computer Technology” (Kreuter, et. al.). Throughout the book, these researchers discuss the importance and techniques in adapting health information to meet the patient’s educational background, cultural orientation and level of comprehension. They present a two-dimensional diagram (see Figure 1) similar to the Prahalad and Ramaswamy’s dichotomy of customer-producer interaction (central to *value co-creation*), based on personal needs. In this diagram, there are two crucial factors of tailoring health communications. The X-axis represents the “extent to which an individual’s characteristics have been assessed [by healthcare professionals] in order to drive the communication,” which corresponds to the *interaction* element in the “value co-creative” experience. The Y-axis signifies the degree of individualization in the health communication itself, corresponding to the *personalization* element of the value co-creation model. Five types of health communications with varying degrees of assessment between patients and health professionals and content individualization are identified on the diagram below. As the level of assessment increases, the degree of individualization in content rises correspondingly.

**Figure 1. Kreuter et. al.’s “Health Communications Vs. Degree of Individualized Content”**

Classification of Five Approaches to Health Communication by Level of Assessment and Nature of Content.

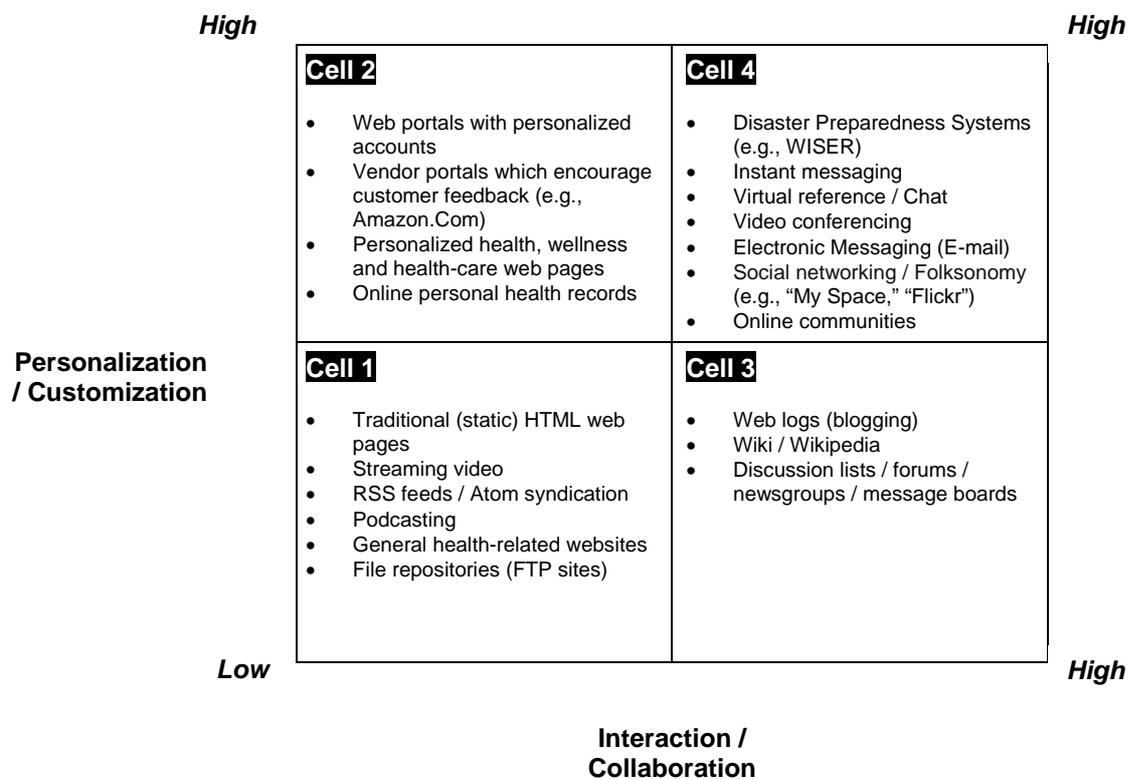


### Value Co-Creation Matrix

*Personalization* and *interaction* are identified as the two key elements in the value co-creation process. Similar to Kreuter et. al.’s Health Communications model, we develop a two-

dimensional Value Co-Creation Matrix (see Figure 2), which illustrates the effects of increased interaction and collaboration amongst information providers (e.g., librarians, information professionals) and their patrons, correlated with increased or decreased personalization and customization of the information tendered to these patrons and clients. The X-axis represents the degree of information provider interaction and collaboration with patrons and others, while the Y-axis conveys the degree to which an information product or service has been catered adequately to patron/client needs and satisfaction. Next, we plot the new information technologies and their associated web applications, in conjunction with other technologies already employed by libraries in disseminating information and interacting with patrons into this matrix based principally upon their capacity to support two key elements, *personalization* and *interaction*, in the *value co-creation process*.

**Figure 2. The Value Co-Creation Matrix**



Collectively as well as individually, this quadrangle of cells represents, in addition to incorporating, valuable information gathering and processing tools, with varying capacities and powers to support the twin indispensable elements of our model, namely *interaction* and *personalization*.

Cell 1:

This quadrant features services with limited capability for personalization and interaction. In the beginning, close to 100% of all websites could be categorized here. Either you liked what a site

had to offer, or you went to another site. Patrons will accept content put out by the producers of a particular web page, but have limited or no input about the product or service itself. Another example is podcasting, a new way to distribute audio and/or video files, such as radio programs or music videos for listening or viewing via mobile devices (e.g., the ubiquitous Ipod) and/or personal computers. It provides limited capacity of content personalization or interaction with content producer. Similarly, there is RSS ("Real Simple Syndication") "feeds" that push web content, including news, blog entries and marketing information, directly onto the subscriber's desktop. Likewise, good old "file repositories" (FTP sites) are another service fitting into the cell of low collaboration crossed with low customization.

#### Cell 2:

In this quadrant, we see applications enabling users to customize or personalize the product or service according to their preference, yet who are limited to minimal if any interaction with service providers. A good example of this type of service is a web portal allowing patrons to configure the components and contents of their login page. Popular customizable web portals, such as "MyYahoo" (<http://my.yahoo.com/>) and the "Google Personalized Home" (<http://www.google.com/ig>), are clear examples of personalizable portals fitting snugly into this category. Within the health care arena, a personalized health page allows patrons to access their health profiles securely, including tailored health information, appointment schedules and contact information.

#### Cell 3:

Users of services in this quadrant will be able to actively interact with service providers or other users. However, they have less control when it comes to tailoring their services to specific personal needs. For example, readers of a particular Health weblog will be able to comment on blog entries. However, they might be limited to initiate a new subject for discussion. Some discussion lists allow participants to post questions or comments related to individual situation, however, the response might not be predictable or they might not receive any feedback at all.

#### Cell 4:

Services in this quadrant offer the most flexible, interactive and dynamic options in our sphere of *personalization* versus *interaction*. Here patrons are empowered to interact directly with service providers based on personal needs or conditions. Social networking sites, such as "My Space" (<http://www.myspace.com>) and "Flickr" (<http://www.flickr.com>), allow individuals to create their personal profiles, post personal information, photos, create communities, and interact with other registered users. Additional equipment, larger bandwidth, software applications in addition to "beefed up" web browsers, plus IT skills might be required for some of services, such as instant messaging. Use of these specialized utilities also tends to be "event based," meaning that a real-life event (such as telemedicine) or contrived event (such as online gaming) are often constituents of this cell's highly personalized, deeply interactive experience.

Compartmentalization of the IT services and applications arranged within this model is based on aspects which library users might consider to be at least to some extent rather arbitrary. Consider: There are degrees of variation amongst services even within the same quadrant. For example, in cell 4, video conferencing necessarily provides greater capacity for personalization than instant messaging, because video conferencing also generates audio as well as video information. Instant messaging, by contrast, allows real-time interaction, whereas E-mail communications are (by design) asynchronous and thus, less timely to a considerable degree.

There is also divergence even within the same type of service. With continuous progress and

convergence of web technologies, we see existing services and products continue to expand, evolve, and improve by adding new capabilities and features. Thus some services grouped into Cell 1 today might be better represented within Cell 2 tomorrow. Eventually this author would welcome, in point of fact, under ideal circumstances, the prospect of seeing all services currently classified converge into Cell 4. The evolutionary process does appear, wherever practical, to be at least *somewhat* inevitable. For example, the “blog format” has widened beyond text-based to include other media, bringing in audio (“MP3 blog”), image (“photoblog”), and video (“vlog”). Various types of service can likewise converge into an entirely new or hybrid service. For instance, podcasting marries two technologies, streaming video and RSS feeds, to automatically deliver or push audio and video files, at will, from media servers to clients.

### **The Value Co-Creative Experience Realized**

With such a plethora of web technology options to choose from, it is of the weightiest consequence to choose the best one based on its capacity to *personalize* and to genuinely *create interaction*, thus providing the most optimally appropriate and efficient services to patrons. Additionally, as de facto knowledge engineers we need to ensure that the necessary infrastructure is in place to support the technologies patrons need and are demanding, and that the patrons themselves are technically sophisticated enough and comfortable with, their chosen technologies. Since technology plays such an essential role in the value co-creative process, any inadequacy or failure along the way will only diminish the patron co-creative experience and damage overall user satisfaction proportionately.

Four factors related to information access can be employed effectively in determining the right technology choices to be made for providing the right patrons with the right, desired value co-creative experiences.

1. Convenience – It is axiomatic that a “one-stop-shop” service permitting patrons to realize their goals in a streamlined, expeditious fashion is a time-saving if not a life-saving event. The library portal which simplifies a patron’s information-discovery process is one good example. Once connected to a library’s website, let’s assume patrons can query multiple databases in one, “Google-styled” search, then link directly from citation-found to full-text article-retrieved through a link resolver; alternatively, parse citation directly to interlibrary loan form for items not available locally, and then download bibliographic information to the patron’s bibliographic-utility program. Yet another case involves online health records that allow patients access in a secured way, to their medical records, physician’s notes, test results and prescriptions.
2. Control – Empowerment of Patrons. In our E-commerce era, consumers are accustomed to conducting business transactions and making decisions online. We regularly make online reservations, transfer funds, trade stocks, and choose product features (such as color, size.) Patrons demand to know all the options available to them, and to be intimately involved in deciding which options are best suitable for their personal needs. Once more, take the personal, health information management system as a prime example (Pratt, et. al.). The system integrates fragmented information from various systems and in disparate formats. Smart enough however, the system then allows patients to manage every aspect of their treatment process, including appointment scheduling; guaranteeing their insurance policy will cover treatment; online billing; prescription refills; and appointment reminders. Many libraries have already implemented the so-called “myLibrary” portal to allow patrons to review and renew items checked out to them, receiving automatic notice for requested items ready for pickup or items about to be overdue, receiving RSS news feeds of their choice, and SDI (Selective Dissemination of Information) alert services.

3. Community – Collaborating with patrons at every step of their information-management process and forming a happy partnership with them can only be. Think blogging, discussion lists and Wiki, which collectively facilitate patrons in sharing information with one another, as well as all-important service providers. Once a sense of belonging has been established, customers are more likely to return to a service. Loyalty – once earned and established – is remarkably self-value-adding.
4. Choice – Libraries must ensure that there are options for all patrons, the emphasis upon “all” meaning, without exception: Patrons arriving online with varying skill sets, diverse backgrounds, differing cultures and eclectic knowledge bases. For example, a library’s “virtual reference service” must allow patrons to submit reference questions via E-mail, online chat, phone calls, etc. (the more choices the better) depending upon individual patron preferences.

In addition to these four salient considerations for creating and equipping the successful “Value Co-Creative Environment” or space, libraries must assure and reassure their communities and constituents that their professional online services are well-secured, ethically sound, fully compliant with industry standards and in line with federal policies governing the privacy of shared personal information (Eysenbach, 2001).

## **Conclusion**

As Marshall McLuhan so cleverly opined, “We shape our tools, and thereafter our tools shape us.” Technologies extend and amplify very human faculties. Yet if we do not proactively work with our patrons and understand their personal needs as well as preferences, we will not be able to employ the right technology in the most adequate fashion and maximize the value of our customers.

Information technologies will continue to shape the way we interact with patients, public, and healthcare professionals alike, even as newer, better, faster, cooler or hotter technologies spring forward to supplant existing ones, reshaping our interaction experiences further. The Web continues to gain importance and prominence as the source as well as means of accessing and disseminating health information. With accurate information ready-made to individual situations and to individuals, wedded with ever-more-easily accessible data in an ever-more-timely fashion, our customers will not be able to make ever-more-sensible, informed, humane decisions.

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