As health care moves to value orientation, radiology’s traditional business model faces challenges to adapt. The authors describe a strategic value framework that radiology practices can use to best position themselves in their environments. This simplified construct encourages practices to define their dominant value propositions. There are 3 main value propositions that form a conceptual triangle, whose vertices represent the low-cost provider, the product leader, and the customer intimacy models. Each vertex has been a valid market position, but each demands specific capabilities and trade-offs. The underlying concepts help practices select value propositions they can successfully deliver in their competitive environments.

Key Words: Business model, value proposition, operational excellence, product leader, customer intimacy, information business


THE MARKET

Much discussion now centers on viable future directions of clinical radiology as a subspecialty business given new trends and uncertainties in health care, especially consolidation into larger systems [1]. Many analytic business constructs can be applied to radiology. An interesting one uses a “value disciplines” concept to categorize business models on the basis of their value chains [2]. It uses the customer’s view of value to explain how different companies position themselves in the market. Simply put, different customers buy different values. This analysis assumes a market capable of differentiating value. Current third-party payment does this only indirectly because customer value is not an explicit parameter. Hence, current radiology value disciplines are fairly undifferentiated, generating similar competitive strategies, thus steering payers or radiology business models toward simple price comparison (ie, commoditization) [3]. If health care is moving from volume to value, value differentiation comes pari passu, whether the radiology business is an independent market player, a component of an accountable care organization (ACO), or a cog in an integrated health care system.

Health care has not been a value-discriminating market because third parties pay for radiologic services on a transaction rather than a customer value basis, hence the historical focus on transaction documentation rather than value. The radiology business model has, thus, evolved into an efficient service composed of discrete, well-documented transactions. Practice innovation has concentrated on increasing service volume rather than service value.

VALUE DISCIPLINES

Although clearly a simplification, the value discipline approach uses 3 market-based categories: the operational excellence (or low-cost provider) position, the product leader position, and the customer intimacy position [2] (Fig. 1). Despite changes in the basis of competition, these values remain durable representations of purchasing decisions. Portrayed as a triangle, it is clear how they relate to one another and how one could navigate between them (Fig. 1). The statistician George Box warned, “All models are wrong, but some are useful.” This one seems useful.

Well-known companies exemplify these value positions. The low-cost vertex is home to Walmart, McDonald’s, Amazon, Honda, and Toyota. The product and service leader vertex is exemplified by Apple, Ritz-Carlton, and Tiffany (Fig. 1). The customer intimacy position is well represented by IBM, McKinsey & Company, and SAP. Although these vertices are stable, competitive market positions, their inhabitants are not. Movement and extinction occur. Movement from low cost to product leadership is often sought by going “up-market.” Sometimes companies seek to occupy two value propositions, thereby increasing total market share. This requires an intricate strategic maneuver used by Honda and Toyota. The maneuver does not try to balance in the middle between two vertices, but occupies each vertex

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0091-2182/13/$36.00 ● http://dx.doi.org/10.1016/j.jacr.2012.09.001
Why is this precarious? It depends on the level of competitive environment. To focus and ultimately a defensible position in a company, it is critical, so as not to be caught in the middle with an unclear brand (ie, not a brand). The move from product leader to customer intimacy does occur, albeit infrequently. IBM, as a computer mainframe leader moving to a business analytic consultant, illustrates this move to customer intimacy (Fig. 1). Moving from the low-cost position to customer intimacy is unusual, but Kaiser Permanente may be attempting the transition via its 7-year Thrive campaign (Fig. 1). A shift in the basis of competition driven by “ACO-esque” reorganization may facilitate migration from product or service leadership to customer intimacy. This conceptual triangle illustrates three different value propositions: operational excellence (low cost), product or service leadership, and customer intimacy. This analytic approach recommends that organizations occupy one of the triangle’s vertices. Companies can move between vertices, with the most common migration being from operational excellence to product or service leadership. Migration from product or service leadership to customer intimacy occurs, although it is difficult. Being positioned between vertices is being “caught in the middle” and can be a precarious position between strong competitors.

Separately by creating distinct brands, Acura and Lexus respectively, on the basis of different production sites, cultures, and management teams. Creating a new brand is critical, so as not to be caught in the middle with an unclear brand (ie, not a brand). The move from product leader to customer intimacy does occur, albeit infrequently. IBM, as a computer mainframe leader moving to a business analytic consultant, illustrates this move to customer intimacy (Fig. 1). Moving from the low-cost position to customer intimacy is unusual, but Kaiser Permanente may be attempting the transition via its 7-year Thrive campaign (Fig. 1). A shift in the basis of competition driven by “ACO-esque” reorganization may facilitate their migration.

Although every market participant must possess a threshold level of competence in each of these value dimensions, ultimately trade-offs become necessary. The market position being sought determines the dominant direction of inevitable business and cultural trade-off decisions, which deliver the chosen value proposition. An interesting secondary phenomenon of this triangle diagram is the abandonment of middle ground between 2 adjacent vertices occupied by 2 strong competitors [3]. Not unlike tennis, one can play competitively at the net or at the baseline, but not in the middle. The middle is an attempt to be everything to all customers, and no one organization has the resources, time, culture, and management ability to competitively deliver 2 or 3 of these value propositions simultaneously. Such attempts abandon focus and ultimately a defensible position in a competitive environment. Businesses certainly do occupy the middle ground. Why is this precarious? It depends on the level of competition from the adjacent vertices. If it is weak, the middle offers an existence. If the competition is intense, the middle ground becomes inhospitable. The value chain, the culture, and even individual talent that support a low-cost position differ significantly from those supporting a product leader company. The middle ground creates cultural confusion and vacillating business process trade-offs. To quote an economist, “Too many goals blur responsibility and accountability, causing decision-makers to choose one goal sometimes and another goal at other times in an effort to chart a middle course” [4]. Individual talent geared to either low-cost or to high-performance positions would be attracted to and recruited by stronger, respective competitors flanking the middle company. The middle provides an existence as long as weak adjacent vertices do not poach customers and talent. In general, one does not choose the middle, but ends up being nudged there by entities on adjacent vertices that strengthen their positions with new technology and new business processes.

Successful radiology businesses, either in private practice or academic settings, will likely gravitate to one of these corners of the value triangle, while maintaining a threshold position in the others (Fig. 1). This holds true at various levels of organization. Although major academic health care systems may acquire community hospitals and primary care sites, their major value proposition hopes to be market leadership. Major trade-offs will favor product and service leadership. Nevertheless, operational excellence cannot be ignored as it must hit a functional threshold. The University of Wisconsin Department of Radiology has a sizable community practice, but it is run separately. This is not playing the middle because there is a clear, dominant value model for the university system. This is not equivalent to being mired in the “middle” (Fig. 1).

A health care system of predominantly small community hospitals and primary care offices may have a designated center of excellence. The latter is not the dominant model. Radiology practices in this type of system must adopt the low-cost position. Given the strong cost reduction trend, most large health care systems will adopt the low-cost position, pushing radiology practices to conform except for a small threshold presence in the product and service leader position at a selected center of excellence. Understanding this nondominant value proposition is, therefore, still useful.

**LOW-COST POSITION: OPERATIONAL EXCELLENCE**

Walmart and McDonald’s are excellent examples of low-cost, operational excellence. This value translates into lowest price or lowest total cost at acceptable quality (ie, midrange), but not low performance. Total cost can en-
compass dependability, durability, and convenience, which recognizes customers’ time cost:

\[
\text{value} = \frac{\text{midrange performance}}{\text{low price}}.
\]

Design features of the value chain demand high-capacity utilization, high labor efficiency, shortened production time, high return on capital investment, standardization, and exacting operating procedures to reduce variation. McDonald's has a 600-page manual to standardize products around the globe [5]. The goal is a low-cost structure, with low overhead and low production cost per unit (ie, economy of scale).

This model focuses innovation on process. Globalization ensures “frugal innovation,” or so-called reverse innovation, is adopted [6,7]. Walmart, having created “small-mart stores” in emerging countries, will import them to the United States [6,8]. Emerging nations, such as India and Thailand, are generating frugal innovation in health care.

This vertex is dynamic and a common site for new market entrants: Amazon's online shopping is challenging Walmart in the low-cost category. Starting as an online bookstore, Amazon has become an online department store using economies of scale to create economies of scope, a wider selection of products and services based on low unit costs. In doing so, it challenges Walmart. In health care, this is where low-cost, efficient, standardized health care will appear, such as CVS Minute Clinics. Radiology needs to monitor this vertex.

LOW-COST PROVIDER (OPERATIONAL EXCELLENCE) IN RADIOLOGY

What would a low-cost position in radiology look like? It would economize on its highest expense category, radiologists, by limiting their number and their compensation. It would minimize professional labor costs by employing nurse practitioners, physician assistants, radiology assistants, or radiology practitioner assistants when legally possible. Recognition of radiology practitioner assistants and radiology assistants is quite variable; a change in licensing could alter this dramatically.

Investment in expensive imaging equipment and expensive technical staff members would be reduced to achieve a low-cost structure. Just as Walmart invests generously in logistics, a radiology entity would invest similarly in image and information logistics [9]. Investments in mobile and communication infrastructure are made if centralization reduces costs, increases productivity, and minimizes radiologist presence at hospitals to a safe minimum required to perform image-guided interventions and manage operations (Fig. 2). That radiologist is likely to be an “interventionist” to perform procedures and maintain relationships. Midrange performance requires 24/7/365 diagnostic imaging services, and centralized teleradiology provides this. Outsourcing would be common, and computer-aided diagnosis would garner investment. The product or service would be standard and concise, which comports well with the current radiology transaction model. This value position is attainable by groups adding a robust teleradiology value chain or by teleradiology companies integrating downstream into hospitals (Fig. 2). As health care systems become more ACO-like and assume risk, this transaction model will give way to a low-cost information business. Structured reporting serves this model's design need for standardization while opening a way to a low-cost information business.

There are trade-offs. Telepresence dilutes consulting and relationships with referring physicians, even patients, increasing the risk for commoditization. Establishing a customer intimacy threshold position may become difficult. Transition to an information business will not be easy.

PRODUCT AND SERVICE LEADER

Apple is now a prime example. The value of the product or service commands a premium price, which is based on high performance (smaller and faster), creativity (“cooler”), or innovation:

\[
\text{value} = \frac{(\text{very}) \text{ high performance}}{\text{premium price}}.
\]

It is a challenging market position because performance zones move quickly and sometimes erratically. Yesterday’s state-of-the-art may soon become today’s standard or ignored business product. Radiologists may be aware of the precipitous fall of the Blackberry (Research in Motion) smart phone, which was once the “crackberry.”
All technology eventually drifts toward commoditization. This category is metastable because long-term high performance is based on relative competitive features rather than on absolute traits. Performance innovation is not optional. A brand name can stabilize this position. This suits some academic radiology practices or large groups at brand-name institutions. A serious cost-cutting health care mind-set will make it quite hard to occupy this vertex.

Leading up to the end of the 20th century, diagnostic radiology became a service leader by riding multiple waves of technology breakthroughs in CT, MR, PET, and ultrasound. Radiology was a facile, early adopter of these technologies because they sustained its business model as defined by Christensen [10]. Some premium was paid within the confines of the reimbursement system. This premium is clearly receding. Much “advanced radiology” has become standard service. Whereas Apple directly controls iPhone innovation, radiologists control little of the innovation trajectory of imaging technology. Should the basis of competition shift to image information from image technology, radiology could assume more innovation control.

To firmly reenter this “product leader” value position in diagnosis, radiology will have to become an information business [11]. This metamorphosis is described in a sister article [11]. In short, radiology will need organized, consultative, information-rich reports enabling referring physicians or patients to make better medical decisions. Health systems are consolidating to seek economies of scale (lower unit costs) and economies of scope (broader continuum of care) to achieve higher quality at lower cost. These economies yield resources and massive databases, which can create economy of knowledge, increased knowledge at low unit cost. In addition to the clear need for harmonious patient care, health care will increasingly rely on information to reach desired quality and cost targets. Systems will even collaborate in data mining (eg, the Care Connectivity Consortium) to establish the economy of knowledge. Radiology can add considerable value as an information business.

A diagnostic leadership position faces growing competition from innovative molecular diagnostics. Radiology could respond by combining molecular diagnostics with phenotypic imaging to create an integrated product to improve decision making [11]. Integrating “biologic state” imaging using PET, CT, and MRI with nonimaging, molecular information to deliver a new information product could support a product leadership position [11,12]. If decisions use both imaging and molecular information in the same time frame and same place, then integration creates value by saving time and expanding knowledge. Academic and large private practices or centers of excellence, such as in stroke and cancer, have this option. The potential value of such integration is not lost on medical imaging companies. Hologic, a product leader in breast imaging, has been making molecular diagnostic acquisitions, specifically Cytyc and Gen-Probe [13].

**CUSTOMER INTIMACY**

The “customer intimacy” value position provides not what a general market buys, but what a specific customer buys [2,14]. It does not deliver a product or service to a defined market segment but rather a solution encompassing “diagnosis” and “treatment” to an individual customer. This model requires deep knowledge of customers’ needs and problems (ie, an “intimate” relationship). It offers not just products or services, but wrap-around consulting expertise to be sure its offerings create customized, usable solutions:

\[
\text{value} = \text{completeness of solution}/\text{cost.}
\]

In a June 2012 advertisement in the *Wall Street Journal*, IBM explained this position succinctly: “Today, the vast amount of data that customers are generating lets marketers understand them not just as segments or targets, but as actual individuals.” Although the term *customer solutions* is overused, this business model creates collaborative action with the customer, supported by customer training and education, hands-on guidance, and fast, responsive service. The customer is buying the benefits of the product or service rather than ownership of the product or service for its individual characteristics.

This category leverages “economy of knowledge” (ie, lowering the unit cost of specialized knowledge by using it over a wide spectrum of applications and venues). IBM does this by offering business analytics (ie, diagnostics) with consulting services to implement recommended solutions (ie, treatment) [15]. In the aforementioned advertisement, IBM described how it achieves customer intimacy: “using data to create not just a snapshot of a customer, but a lifetime view that can improve with every interaction. Predictive analytics brings science to the art of customer engagement, helping create a seamless experience that can give customers what they want, when they want it.” Some surprising inhabitants in this category elucidate this approach. Rolls-Royce no longer sells jet engines, it sells their benefit (ie, thrust power), which is charged per useful flying hour. In charging this way, one had better deeply understand a specific airline’s operational needs and problems of service [16]. ACOs seek to sell “health,” not individual services. This model demands both successful “diagnosis and treatment,” an approach congruent with personalized medicine.

Radiology’s value chain has disaggregated [11,17]. Disaggregation triggers outsourcing, which offers specialization and economies of scale (possibly scope) because the outsource supplier must compete in its market. Customer intimacy requires reintegration of a disaggregated value chain, sometimes by adding upstream or
downstream components. Downstream is toward the customer and likely more profitable [3]. Does radiology have opportunities to reintegrate its value chain by re-building, re-ordering, or extending it?

Linking “diagnosis and treatment” via downstream extension could build a customer intimacy position. Radiology can develop customer intimacy by offering precise diagnosis, planning, and treatment in a coordinated fashion to deliver personalized solutions. Concentration and extension of the disaggregated diagnostic value chain into treatment planning and image information-guided treatment is a step toward reintegration [11] (Fig. 3). Disaggregated diagnostic components can be repurposed for a real-time environment. This is economy of knowledge. Such extension creates value beyond individual diagnostic and interventional radiology functionality by saving time, by improving outcomes matching diagnosis with cost-effective treatment, and by lowering the total cost of care. This requires precise diagnosis, rapid personalized consultation, and convenient delivery of specialized image information-guided treatment. Christensen et al [18] noted in The Innovator’s Prescription that diagnostic precision will be an essential precursor to personalized treatment. Radiology could become a solution within the ACO solution.

This model seems suited for large multispecialty radiology groups, academic or private. It asks radiology to gain detailed understanding of referring physicians’ or patients’ medical and economic needs, to provide solutions that yield value beyond individual reports or procedures. Digitization of value-chain components and interlinked databases allows for assemblage of the essential customized knowledge.

Radiology could seek to regain a product or service leadership position, move to low-cost operational excellence, or move to customer intimacy. Product leadership will be difficult in a cost reduction environment because financial resources for innovation will be scarce. The low-cost position becomes attractive as health care aggressively pursues cost reduction. Migration to the operational excellence position suggests a value chain similar to that depicted in Fig. 2. The customer intimacy position challenges diagnostic and interventional radiology to form one business, but it builds strong relationships, the very challenge of the low-cost model. The customer intimacy position could use the extended diagnostic and therapeutic value chain shown in Fig. 3. Regaining a diagnostic product leadership position could use the value chain to the left of the medical decision in Fig. 3 [11]. Initiatives to aid patients in tracking cumulative radiation dose will be a threshold step toward customer intimacy for all models. Nevertheless, trade-offs are inevitable. All models benefit from joining the consolidation trend and forming bigger groups to increase flexibility and to access capital.

If isolated from its own market presence, radiology’s value proposition will be determined by the level of organization in which it is embedded. Radiology may become a chain component of a service line. In this case, the service line’s value proposition becomes radiology’s. In a fully integrated system, a low-cost position is the likely assignment. Should variations of this scenario appear, radiology might consider collaborating with pathology to build a comprehensive integrated diagnostic service line,
a product leader position. This is supported by Christensen et al’s [18] concept of precision diagnosis.

THE “ADJACENT POSSIBLE”
The diagrammed value chains, of course, leave out critical details. Details for growth and expansion lie at the “edges” of current reality (Fig. 4). This is the “adjacent possible,” where strategic experimentation outside current business products or services takes place [3,19]. Amazon, starting as an online book retailer, expanded into its adjacent possible to become a total Internet retailer and a major provider of cloud computing. IBM moved to customer intimacy by expanding into its own small subunit named Integrated Systems Services Corporation, an adjacent possible [20]. Gaston Glock used his relationship with the Austrian army to enter the handgun market, becoming the US market leader [21]. Movement to the adjacent possible can be based on technology, core competence, process expertise, unusual insight, or just relationships. Radiology is not without its opportunities.

One can envision a health care future in which value is rewarded. Whether in fee-for-service, bundled, capitated, or ACO-type environments, radiology must deliver value. Even when value is judged internally in a health care system, it will be analogous to market-driven value. To ensure fair and effective participation, radiology should follow Wayne Gretzky’s advice and skate to where the puck, the value position, will be.

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