# Emergent Service Delivery Technologies

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## ABSTRACT

*An increasing number of industries are choosing to provide self-service technology delivery options for their customers. There are at least three self-service application areas that have benefitted from a collaborative effort in technology advancement: online (e-commerce), kiosk (k-commerce), and vending (v-commerce). Efficient e-commerce companies provide a platform that allows customers to research products, order goods and services, process payments, and/or access online customer support. The success of web-based self-service depends upon the quality and quantity of information available and the ease with which it can be located. The kiosk has become a retailing option that has proven to be an effective unattended point of sale. A recent report noted that the number of installed kiosks has quadrupled in the past several years with no end in the short term. While the vending industry has been stagnant in recent years, newer machines have replaced traditional glass-front panels with interactive digital displays capable of enhancing the customer interface. As the convergence of these three self-service technologies continue to progress, an innovative service delivery model is evolving. Technology is an investment that, if made wisely, can produce a significant competitive advantage in the marketplace.*

***Keywords:*** *self-service technology ( SST), kiosks, vending, web-based, e-commerce, v-commerce, k-commerce, CRM*

## INTRODUCTION

An increasing number of industries are choosing to provide self-service technology delivery options for their customers. Self-check-out at retail stores and supermarkets, pay-at-the-pump gas stations, self-check-ins at airports and hotels, online banking and stock trading, self-order entry at restaurants, and an array of dedicated devices (photo kiosks, DVD rentals, ticket machines, etc.) are becoming commonplace (Meuter, 2007). In most businesses the transition from customer service to self-service is an undeniable trend (Sjodin, 2010). As web-based searches and touchscreen kiosks become more user-friendly and thereby capable of handling more complicated tasks, health care providers, fast-food chains and other businesses are trading face-to-face encounters for face-to-monitor transactions. Implementing self-service technologies is an approach expected to improve speed, accuracy, and operational efficiencies at unattended points of sale (Eighth Annual Kiosk Benchmark Study, 2009).

For example, in banking the phrase ‘full service’ used to refer to a teller capable of handling transactions affecting checking and saving accounts as well as safety deposit box access, and administration of mortgage and loan applications. Now, full service means that the bank provides a wide range of services designed to avoid teller contact in its entirety. Such self-service applications as Internet banking, online lending, ATM machines, and interactive voice response (IVR) systems have become the financial norm. Customers who value the convenience, consistency, and self-control of automated transactions, over assisted transactions, appear to be in the majority.

Another contributing factor is that it is not uncommon for consumers to encounter inexperienced salespeople, long waiting lines, or closed stores when consumers desire to shop (Yap and Sweeney, 2007). As a result, opportunities to conduct transactions online, using a kiosk, or a vending machine have become a welcomed alternative (see Exhibit One). As experts proclaim, an effective self-service technology has to either make a process faster, cheaper, or better for customers to perceive it as worthwhile. There are at least three self-service application areas that have benefitted from a collaborative effort in technology advancement. Kasavana (2008) has segmented self-service technology (SST) into three application areas: online (e-commerce), kiosk (k-commerce), and vending (v-commerce).

## E-COMMERCE

Simply stated, the world's largest self-service endeavor is the Internet. It is primarily responsible for providing an infrastructure and ongoing impetus leading to the movement toward self-service (Oliver, 2008). The fact that the Internet has become a universally accepted platform for product search, product information, and product procurement has had a profound impact on the way business is redefining customer relationship management (CRM) through customer facings, accelerated delivery mechanisms, and customized self-services.

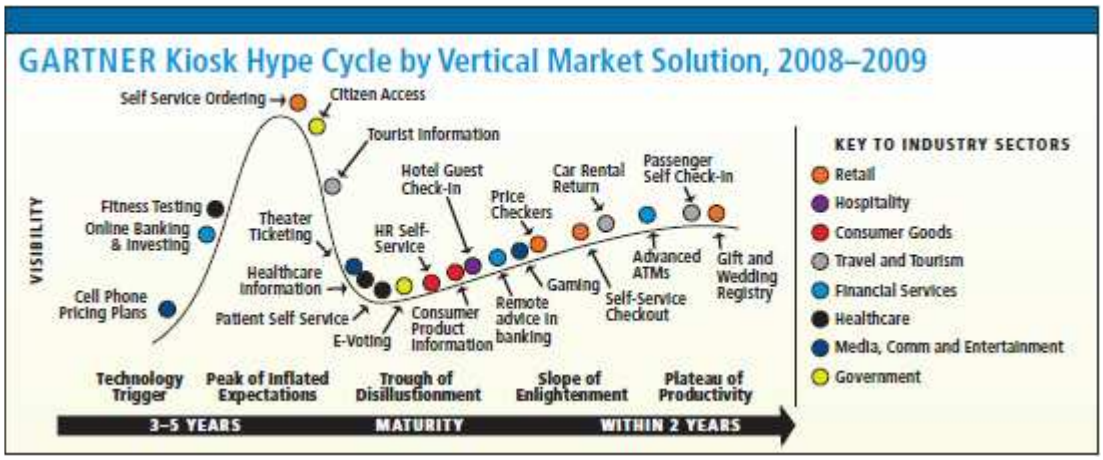


**Exhibit 1: SST Vertical Market Applications**
(source: www.ncr.com/documents/kiosk_benchmark_study_8.pdf)

The Internet represents the ultimate form of self-service (Thomas and Grandison, 2008). A majority of US consumers rely on the Internet as part of a shopping process, even if they eventually go to a store to purchase or pick up an item. Researching product features and conducting price comparisons online, before actually shopping, appears to empower customers while creating a more informed buying experience. Forrester Research (www.forrester.com) reported domestic online sales grew steadily from $48 billion in 2002 to more than $130 billion in 2006 to a record $155 billion in 2009. With a ten percent compounded annual growth rate, Forrester projects a $250 billion dollar online sales volume in 2014, noting that more than seventy percent of Americans engage in cyber shopping. Forrester further prognosticates that e-commerce sales will represent eight percent of all US retail sales by 2014, up from six percent in 2009.

Efficient e-commerce companies provide a platform that allows customers to research products, order goods and services, process payments, and/or access online customer support. The success of web-based self-service depends upon the quality and quantity of information available and the ease with which it can be located (Dooley, 2008). Online self-service has been shown to have a more positive return on investment (ROI) than other customer-facing self-service technologies. Known for cost savings, web-based self-service also fosters customer relationship management since customers are routinely required to create an account profile prior to initiating a transaction. In addition, incremental revenue can be gained through up-selling or cross-selling related products.

## K-COMMERCE

The kiosk has become an effective point of sale option that is rapidly being adopted; sometimes in place of a standard vending machine. In a recent report, Summit Research Associates (2010) noted that the number of kiosks installed in North America has quadrupled in the past few years and estimated there were more than 1.2 million customer kiosks (not including ATMs) in place in 2009. In 2007 consumers spent more than $525 billion at self-checkout lanes, ticketing kiosks, and other unattended retail kiosks according to the IHL Consulting Group (2010); this is a huge increase in revenues from $438 billion in 2006. The volume is forecasted to exceed $1.3 trillion by 2011.

Payment accepting kiosks are usually divided into three broad categories: self-check kiosks, ticketing kiosks, and self-ordering kiosks. Self-check kiosks are dedicated to linking both check-in (registration) and check-out (settlement) activities associated with airline travel, hotel accommodations, events and meetings. Ticketing kiosks print or transmit information authorizing entry to an event or transportation venue. Self-ordering kiosks primarily focus on goods and services at a quick service or family style restaurant or access to a takeout location or delivery center. McDonald's, Burger King, Subway and other eateries have been actively testing self-service kiosks in preparation for widespread utilization in late 2010 or early 2011. Quick service restaurant (QSR) kiosk structures have become proficient using standard PC hardware running on either a Windows or Linux operating system. Basic QSR kiosks allow customers to self-order and pay with credit, debit, prepaid, or gift cards, while full-service models are capable of internet connectivity, coupon processing, and coin and currency acceptance (www.qsrweb.com). In addition, kiosks have proven successful in selective outdoor locations for drive-through and drive-up self-service applications (www.selfserviceworld.com). The IHL report similarly segments the kiosk marketplace into six main categories:

- **Self-Checkout Systems –** automated systems that allow shoppers to complete the purchase of tangible products unassisted in a retail setting.
- **Ticketing Kiosks –** devices located at airports, amusement parks, bus terminals, parking lots, movie theaters and train stations that enable a customer to purchase an admissions ticket for transportation or an attraction.
- **Check-In Kiosks –** free standing machines that confirm previous payment and provide registration entry. Common in lodging, travel, tourism, and related hospitality settings.
- **Food Ordering Kiosks -** devices that allow either quick service or casual dining customers to place orders and complete payment without input from employees who may be redeployed to order fulfillment.
- **Postal Kiosks -** innovative kiosks installed in post office locations to enable the handling and mailing of letters and packages {including the sale of stamps and related services).
- **Other Retail Kiosks -** This group consists of a wide variety of transaction kiosks that may be found in retail, hospitality industry, and various touch-point locations.

Web and kiosk applications typically include tools for centralized remote monitoring and network management (Kasavana, 2008). Most applications serve multiple purposes, for example, a website or kiosk can present a detailed product catalog and gift registry for customers and a job or loan application center for prospective employees. For most web-based and kiosk applications there are several appealing features embedded in the self-service programming that may not be obvious. Consider these hidden capabilities (All Business, 2010 and Castro et. al, 2010):

a) Upselling -- ability to suggestively 'upsell' at the point of purchase by offering add-ons, modifiers, and/or bundling options; for example, in addition to flight registration, airlines are also using the web and self-check-in kiosks to 'upsell' preferred seating based on fees or reward points as well as promote single-day airport club membership and related travel amenities (e.g. trip cancellation insurance).
b) Incremental Revenue -- using a sophisticated application capable of tracking, storing, and recalling prior purchases, by customer, may influence incremental revenue. For example, recalling a customer's last purchase can help accelerate order entry and/or settlement given retrieved data remains accurate. This feature can also strengthen and enhance CRM and loyalty.
c) Affinity – account creation and administration of a comprehensive loyalty reward program to monitor purchases for points, rewards, discounts or special promotions to be applied at website and/or kiosk locations.
d) Cost Containment – development of intuitive programming that enables intelligent processing without human intervention can produce cost savings. For example, it is estimated that customer check-in with an airline agent costs about $3 per transaction as compared to about 14 cents or less at a kiosk or website. In fact, surveys indicate that both the website and kiosk-based selling can more effectively perform upselling than a live agent.

## V-COMMERCE

Consumers often have the option of choosing to use self-service technology (Lazarony, 1998). At a bank, a customer may choose between using a teller and using an automated teller machine (ATM) and at a hotel, a traveler

may choose between using a vending machine and using room service. Consumers continue to choose self-service technology for a variety of reasons including faster service, more convenience, and ease of use. Price can also be a factor when there are monetary advantages associated with a self-service option. For example, there may be a lower price from for a product purchased online than in a physical retail outlet.

The business aspects of vending technology are encompassed in the concept of v-commerce (Kasavana, 2002). The fact that a vending machine is likely to feature a glass-front that permits the customer to view physical products, but not handle them, is somewhat like the digital product display available over the Internet. The ability to further differentiate a vending machine from a web-based application is not difficult as immediate product delivery of v-commerce sets the two modes of operation apart. Differentiating between a vending machine and a kiosk, however, is not so easy. The distinction has been blurred as placements and applications often appear to overlap. According to a recent article, there are approximately 8 million vending machines in the US; compared to 1.2 million kiosks (www.digitaltransactions.net and www.kiosk.com). Despite the fact the vending industry has existed for more than a century and the kiosk industry just passed its tenth anniversary has not simplified the process. A Redbox DVD rental station, generally considered a vending machine-based operation, has been recognized for its outstanding design as a state-of-the-art kiosk (www.redboxpressroom.com). Similarly unattended machines that market non-traditional vending products are often described as kiosk-based outlets.

## COMPARISONS

The three most popular self-service platforms are: vending, kiosk, and web applications. While vending focuses on product presentation and delivery, kiosks typically are limited to dispensing information and related services, while the web provides unparalleled search and e-procurement capabilities. The fact that more kiosk applications are being built with product distribution in mind, and web connectivity overlaps every aspect of transaction management, will likely transpose vending into a more expansive and comprehensive unattended point of sale application (Mentor Group, 2010).

While most vending machines handle only cash transactions, the opposite ratio applies to kiosks which predominantly favor electronic payments; web-based transactions are cashless. While the percent of vending machines accepting cashless payments is projected to approximate 20% by 2011, kiosks likely will continue to process a significant proportion of transactions as cashless. A kiosk is defined simply as a self-standing technology-based unmanned device in the 2010 North American Self-Service Kiosks report. A definition that might also describe a vending machine .

Many industry observers (Kasavana, 2008 and www.mobileread.com) have sought to differentiate a vending machine from a kiosk based on the nature of transactions being handling. Some experts have postulated that a vending machine becomes a kiosk when it begins accepting electronic payments (regardless if it continues to accept cash). This does not seem to be a reasonable or sufficient criteria since a payment device is merely a peripheral component added to the base of a more complex system; not the system itself. Others have proclaimed that a vending machine becomes a kiosk when it has an extended range of functionality. But specific functionality is hard to define and also tends to fail to differentiate one device from the other. For example, when a manufacturer of a large capacity glass-front machine adds a touchscreen interface and chooses to classify the machine as a retail kiosk, then the vending industry has difficulty understanding the distinction. Deciding whether a device is a vending machine or kiosk is not simple. When the vending industry categorizes a device as a vending machine; it is possible the kiosk industry classifies the same device as a kiosk. Again, consider the Redbox DVD rental machine. Although always considered a vending application, this device also received an outstanding design award from the kiosk industry. A few differentiation characteristics for consideration (with references to web-based retailing) are:

- **User interface** – a vending machine incorporates push-buttons for product selection; kiosks rely on touch-screen monitors for selection; the web relies on clicks and hypertext linkages.

- **Information** – vending machine information is limited to product pricing; kiosks and web applications are best known for their information search and retrieval techniques that can provide detailed data about a multitude of factors.
- **Product Display** – vending machines traditionally place products behind a glass front; unless a kiosk supports a product delivery mechanism there is no product delivery, only information referencing; similarly websites feature a variety of products, presented in digital format, with delayed shipping requirements.
- **Architecture** – vending machines are governed by a vending machine controller (VMC) that monitors inputs, processes, and outputs; kiosks are PC-based devices normally running a Windows or Linux operating system; the web is a network of networks amenable to a variety of computing platforms.
- **Payment Processing** – vending machines are equipped to primarily handle coins and currency payments and occasionally open (credit and debit card) or closed (paykey, RFID, payroll direct) payments; kiosks are built with a high expectation of electronic payment transactions but may be equipped to handle cash payments; the web is strictly a non-cash payment business.
- **Marketing** – a vending machine features product packaging, displayed behind a glass-front that conforms to mechanical (spiral and coil) restrictions; kiosks and web marketing usually involves dynamic digital displays with multiple product views as well as extensive product information. Many applications also provide a mechanism for package customization or personalized purchasing.
- **Products** – vending machines are limited in product offerings based on the number of columns or selection options on the machine; kiosk screens can feature a large number of products and product sizes and unless connected to a delivery mechanism are flexible in product mix; websites can feature almost an infinite array of products through hyperlinks and search engine capabilities.
- **Services** – vending machines are incapable of offering concierge services and are limited to the product inventory of the machine; kiosks and websites can link to the power of the Internet and numerous remote sites for access to a wide variety of concierge services.

For simplicity, suffice it to conclude that differentiation may be made based on the fact that vending tends to be product-centric while kiosks tend to be information-centric. Table 2 contains a comparative listings of several features from the three main self-service technology applications (Kasavana, 2008).

**Table 2: Comparative Features of Self-Service Technologies**

| Feature | Web-based | Kiosk | Vending |
|---|---|---|---|
| 1-Business Trend | High Popularity | Growing | Stagnant |
| 2-Cash Payments | No | Uncommon | Yes |
| 3-Open Payments | Yes | Yes | Maybe |
| 4-Closed Payments | Yes | Yes | Yes |
| 5-Accessibility | Worldwide | Select Location | Select Location |
| 6-Delivery Speed | Prolonged | Delayed | Immediate |
| 7-Replenishment | Consignment | Varies | Manual |
| 8-Inventory | z-inventory | Varies | Warehouse |
| 9-Product Mix | Infinite | Wide Variety | Restricted |
| 10-Custom Product | Yes | Maybe | No |
| 11-Purchase Units | Multiple | Multiple | Single |
| 12-Base Technology | Non-proprietary | Windows/Linux | Proprietary |
| 13-User Interface | Graphical | Graphical | Physical |
| 14-Peripherals | Unlimited | Diverse | Limited |
| 15-Product Selection | Mouse Click | Touch Screen | Press Buttons |
| 16-Protection | Secure layers | Optional Devices | Prone |
| 17-Signage | Dynamic Digital | Dynamic Digital | Optional |
| 18-Interactivity | Yes | Yes | No |
| 19-Real Time Data | Yes | Yes | Possible Add-on |
| 20-Networking | Yes | Yes | Possible Add-on |

## REINVENTION

The future of vending technology will be impacted by the explosion of self-service technologies that are permeating nearly all aspects of the economy. The shift is expected to bring significant changes in how vending operators plan, control, manage, and evaluate operations. While most in the vending industry will consider the convergence of innovative applications as evolutionary, others anticipate the changes will more likely be revolutionary. Self-service technologies are expected to revitalize an otherwise stagnant vending landscape in an effort to enhance customer experience, improve profitability, and create a more efficient management model. Some possible changes to the vending industry, as a result of the convergence of self-service technologies, are identified in Table 3 and followed by a brief explanation for each application or capability (Kasavana, 2008).

**Table 3: Anticipated Advances in Vending Technology**

| Application/Capability | Current | Future |
|---|---|---|
| 1- Coin and Currency | Predominantly cash | Hybrid Payment System |
| 2- Machine Frontage | Glass-front /Closed Front | Dynamic Digital Displays |
| 3- Customer Interface | Push Button Selections | Touch Screen Activation |
| 4- Interactive Promotion | No Interactivity | Avatar (Interactive) |
| 5- Product Information | No Product Information | Product Info Display |
| 6- Product Variety | Category Management | V-Engineering |
| 7- Technology Platform | DEX/MDB | Windows/Linux/USB |
| 8- Machine Topology | Sporadic Networking | Route-wide Networking |
| 9- Affinity Programming | No Formal Tracking | Rewards Programming |
| 10- Product Packaging | Fixed Format Packages | Customizable/BTO |
| 11- Transaction Basis | Single Product | Multi-Product |
| 12- Operational Data | Delayed Collection | Real-time Availability |
| 13- Purchase Point | None Available | Remote Purchasing |
| 14- Product Marketing | Posted on machine | Intranet Marketing |
| 15- Product Tracking | Handheld Terminals | RFID/NFC Tagging |
| 16- Remote Shopping | None | Concierge Connectivity |
| 17- Industry Awareness | Occasional Campaigning | Social Networking |
| 18- Product Pricing | Static Pricing | Dynamic Pricing |
| 19- Tech-Conformity | Standards/Guidelines | Industry Certification |
| 20- Investment Model | None | Supplier Partnerships |

- **Hybrid Payments --** since consumers are becoming accustomed to self-service devices capable of processing both cash and cashless transactions, vending will likewise adapt this range of settlement options, including open system (bank clearinghouse payments with a fee), closed system (private in-house payments without a fee), and payroll deduct (or similar processing) with no external fees.
- **Dynamic Digital Displays** -- the ability to place small and large digital screens on a vending machine or along-side the machine (networked to the machine) can provide unique and powerful product information/promotions. Dynamic content can be loaded at the machine or downloaded to the machine for displaying. In addition, commercial or public service information can also be displayed on the screens as an additional source of revenue or for customer service broadcasting.
- **Touchscreen Activation** – the placement of an intuitive touchscreen display on a vending machine allows the customer to request detailed product information via screen navigation. Nutritional data, diet considerations, product expiration date and pricing, and related information are readily displayed upon inquiry.
- **Avatar** – the term avatar is used to describe a virtual actor or online personality usually reserved for website interactivity – giving a vending machine a personality (voice and on-screen image) will significantly alter the customer experience. This feature has entertainment value but is also capable of up-selling and cross-selling products and bundled products.

- **Product Information Display** – regardless of whether there is a digital display or touchpad activation, vending machines will have some form of product display. The displaying of nutrient content, expiration date, pricing, promotional features, etc. are important factors to consumers.
- **V-Engineering** – similar to the popular foodservice industry software entitled menu engineering. The application of category management and product mapping techniques have been effective in identifying product offerings based on sales mix and trend analysis. V-engineering represents the next stage in the progression from product mapping to category management. V-engineering blends sales data with item profitability to produce a powerful evaluation.
- **Technology Platform** – less than 20% of the installed vending machine base reports using DEX capabilities. Microsoft Windows, although may carry an unreasonable incremental cost, or Linux are two possible operating systems for replacing DEX.
- **Machine Topology** – vending machines will be built with remote machine monitoring and networking as standard component parts. Machines will be networked across a venue, route, and company. Data will be aggregated for enhanced operational efficiencies and 'best practices' comparisons.
- **Affinity Programming** – development of a location, supplier, distributor, and/or machine manufacturer system that encourages repeat purchasing and awards customers for selecting vending as a preferred automated retail location. Consumer reward points, discounts, e-coupons, or free vends based on purchase patterns would be available.
- **Product Packaging** – some machines will possess the ability to customize or personalize machine-based products as well as support new product introduction. The ability to build-to-order (BTO) product offerings (sandwiches, salads, meals, entrees) will be a reality. Might an automat format return?
- **Transaction Basis** – consumers will be able to make multiple purchases with the presentation of coin, currency, or cashless payment media. Operational preferences that prohibit multiple products purchasing with arbitrary cash and currency escrow limits, or credit or debit card authorization, will be configured to enable multiple selections.
- **Operational Data** – the availability of real-time data will be a regular occurrence. Machines will be configured in a network that will provide a basis for data collection, analysis, and display on the web, PDA, cell phone, or elsewhere.
- **Remote Purchasing** – ability to order items from a vending machine from a handheld PDA, cell phone, desktop PC, or other communication device. Allows product purchasing without having to be physically located at the machine. Product is placed in reserve and an item purchase code is provided. Customer uses the touchpad to enter the code and complete the pre-arranged transaction.
- **Intranet Marketing** – for vending operations in an office, factory, or other closed venue the application of intranet marketing can be effective. Intranet marketing involves having access to the clientele at the location and using the company's network or email server to communicate product promotions, incentives, introductions, discounts, specials, and the like. Often a powerful push technique.
- **Product Tracking** – the idea of product tagging with RFID or NFC technology may soon be a reality. Product tagging will allow operators to know exactly what is available and sold in each spiral or column and have greater access to sales specific data for efficient replenishment and v-engineering analysis.
- **Concierge Connectivity** – consumer interface through a touchscreen display hung on either side of a traditional vending machine to be used to access an online concierge for external, remote shopping (products not in machine) for remote delivery. Akin to web shopping but through a dedicated, machine mounted screen featuring a shopping agent (concierge) capable of accepting orders, payment, and delivery data. Use the screen to send restaurant foods, personal products, flowers, gift cards, and an array of premier goods and service options. A way to increase machine revenues without more products or space.
- **Social Networking** – concept similar to myspace.com and facebook.com social networking -- online connectivity to self-service location information, product promotions, and downloadable e-coupons. A website for information related to products and consumer affinity rewards. Something like: myvending.net.
- **Dynamic Pricing** – ability to change prices remotely or at the machine using LCD or LED displays at each product location.

- **Industry Certification** – an industry technology certification program (TCP), supervised by NAMA, could be developed and implemented to ensure compliance with industry standards and that innovation and emerging technologies would be monitored. Such a program would provide assurance to consumers, operators, and distributors that proper handling, processing, and reporting procedures are followed. Industry-wide certification program governing hardware, software, and netware are appropriate as more self-service technologies evolve.
- **Technology Investments** -- perhaps the most effective means to achieve increased industry-wide technological advancement is through a Technology Investment Partnership (TIP). In this arrangement technology providers and industry practitioners would work together to develop a working model for wider industry consideration and adoption. A TIP program has the potential to prove the potential of systematic applications that support healthier industry performance.

## SUMMARY

An effective self-service application should be a benefit to both the customer and business operator. For the customer the gain is in convenience, efficiency, and ability to control aspects of the transaction (e.g. product selection and payment). From a business operator perspective it involves reducing administrative expenses while providing quality service with meaningful customer relationship management (CRM). When executed correctly, self-service technology can allow consumers a range of product choices with an assortment of methods of payment. The capabilities and features that are becoming so popular in web-based business (e-commerce) and kiosk operations (k-commerce) should be considered viable candidates for upgrading v-commerce functionality.

As the various self-service channels consider the implementation of advanced self-service technologies, three key items should be addressed: 1) clarity (will customers know what to do), 2) ability (will customers have the ability to use the technology), and 3) motivation (will customers perceive a benefit for using the technology). If the convergence of self-service technologies is to be effective, the resultant application must alter the customer experience, enhance industry's image, and improve operating margins. Technology is an investment that, if made wisely, can provide a competitive advantage in the marketplace.

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