Evidence of new forms of information tools via the World Wide Web increasingly indicate that business-to-consumers e-commerce models require real-time data that enable users to make informative decisions. Although the Web has provided a variety of e-health sites, these sites have offered little in the way of enabling the human resources (HR) function. This article examines health care consumers’ views of an existing health maintenance selection process. Data are gathered from employees of a southeastern university that offers a myriad of health maintenance organization (HMO) services. The findings suggest that HR–enabled health care Web portals must include consumer-defined features such as rank-ordered preferences by employees, privacy/security functions, and electronic enrollment during the HMO selection process. Despite these results, participants in the survey did not advocate the elimination of human interaction in this effort, instead supporting the concept of business-to-employee commerce.

1. INTRODUCTION

Electronic commerce (e-commerce), for the purposes of this article, is defined as an exchange over the World Wide Web (WWW). Business Week [1] stated that e-marketplaces are expected to make up 20% of the $1 trillion of the business-to-business (B2B) e-commerce revenue in 2 years. Although current estimations of e-commerce transactions represent less than 1% of the U.S. retail economy [1], forecasts of growth are highly significant. A recent study sponsored by Cisco Systems estimated that revenue derived solely from e-commerce increased 127% from 1997 to 1998 [2]. Moreover, Forrester Research forecasted that online retailing revenue...
would range somewhere between $40 and $80 billion by 2002 and projected B2B e-commerce to reach $1.3 trillion by 2003 [3]. Despite looming privacy concerns [4], this tremendous growth can be attributed to a global population and changing demographics of Internet users [1], who are increasingly accessing the WWW.

One important aspect of e-commerce is how it is transforming current business and personal consumption practices. Consumers are purchasing goods and services via the WWW without entering a store or physically examining the merchandise, and in some instances, this is the preferred method of shopping. Businesses now tailor their marketing strategies toward online communities, incorporating these formerly “fringe” customers into a much larger and diverse pool of existing and potential customers [1, 5].

Moreover, organizations also enjoy the efficiency derived from conducting transactions electronically with the business partners that exist in their supply chains, allowing firms to allocate resources from business maintenance to innovation and discovery. Both consumers and businesses participate in naming their own prices for goods and services due to the introduction of e-auctions and e-marketplaces. Even the economic concept of marginal cost is being challenged by e-commerce as producers of information realize that there is limited additional cost to providing value-added services [6].

Whereas computer-related companies (hardware, software, networking, etc.) account for the majority of e-commerce transactions, other industries are beginning to make their respective marks on the WWW. Big-name Internet-only retailers, such as Amazon.com and eToys, have dominated e-commerce site rankings for some time [7], but now brick-and-mortar stores, such as Barnes & Noble and Toys ‘R Us, are gaining much attention (and revenues) from consumers. On the other hand, the health care industry—a $1 trillion a year market sector—is not largely represented in current e-commerce research. Although there are Web sites that sell pharmaceuticals and give medical advice, there is a limited number of marketplaces that allow patients/consumers, employers, physicians, hospital administrators, and managed care organizations to engage in transactions via the Web or that capture the care delivery supply chain. In this article, I seek to uncover the information that consumers require of an e-health market to facilitate the health maintenance organization (HMO) selection process. Further, I hypothesize that the critical success factors (CSFs) in this process are value-added through information, improved customer service, and appropriate technology. That is, the CSFs are conditional and are a function of data integration and process coordination.

In this article, I provide a review of the literature. This is followed by an analysis of the “Top Health Care Web Sites” as described by The Wall Street Journal. I present data on consumers’ requirements for an e-health portal. I conclude with a discussion of current and potential limitations to e-commerce health care and implications for management.

2. E-COMMERCE AND E-HEALTH LITERATURES

In her 1997 text, Health Net, Ryer [8] detailed online health resources, including support groups, databases, journals, e-mail lists, newsletters, and bulletin boards.
Although the online health care sources were plentiful and the information vast, Ryer [8] advised the patient (consumer) to exercise commonsense filters, as changes in treatment, drug and medical innovations, and research findings are commonplace. Although Ryer [8] synthesized the findings of more than 200 WWW resources that largely focus on information dissemination, she gave little attention to what consumers actually want to accomplish via a health care portal using business-to-consumer (B2C) e-commerce models.

Virtual communities [9] with the potential of convergence to the B2C market, however, have been designed and implemented to support B2C needs of patients. Payton and Brennan [10] determined that such convergence has been delivered via home-health networks that include four levels of functionality to patients: (a) decision support; (b) electronic mail; (c) bulletin boards on a myriad of health conditions, such as AIDS/HIV and Alzheimer syndrome; and (d) on-line encyclopedias. The B, or “business,” in this model has largely been academic institutions, with the infrastructure resting on national funding agencies (e.g., National Institutes of Health, National Institute of Aging). Even in the work of Payton and Brennan [10], much of the network design was rooted in prior applications that had limited consumer involvement in the design specification [11].

David Siegel [12] offered business strategies in the age of the e-customer. Siegel [12] made predictions for the future consumer including the patient of 2005. This patient will have the ability and the right to carry a universal patient chart, update her data via a personal Web site, and disclose only the health information that she deems fit. Further, this patient would have the power to further protect her privacy, bargain for managed care coverage, and track the use of her data through cross-correlated IDs for medical research. To this end, the consumer would not merely personalize her Web design; she would invoke her personal privacy preferences to control and facilitate the flow of medical data.

Like the work of Siegel [12] and Huff et al. [6], a recent study by Gates et al. [13] found that consumers of health care services desire value in and of information. This is the result of more knowledge and sophistication among buyers of alternative delivery systems’ services, such as HMOs and preferred provider organizations. Today’s patients are better versed due to increased Web use as well as the increased educational status of the overall population. With the myriad of health plans offered, employees (patient consumers) can exercise a higher degree of purchasing power despite the overabundance of information needed in the selection of one plan for medical coverage.

More recent work [14, 15] has observed that e-health business models will require a medical data infrastructure that can enable both a private and a public good, resulting in innovation among functional areas, such as human resources management and marketing. E-health models have been categorized into four major frameworks (portals, connectivity, business-to-business, and business-to-consumer), and the business-to-consumer segment includes publicly traded companies such as drugstore.com, PlanetRx, Vivius, and HealthExtras. All of these organizations, and numerous others, provide patient-consumers with diverse capabilities including access to treatment and diagnostic information, online purchases of prescription drugs, and even personalization of health care plans that are enabled via employee-defined contribution plans [14].
Given these emerging e-health models, the barriers and opportunities are significant. Among these are privacy concerns of all stakeholders, consequences of the Health Insurance Portability and Accountability Act, disparate access to the Internet among patients, and lack of state, federal, and global data and clinical standards [4, 14]. Given the scenario presented at the beginning of this article, e-commerce is clearly changing the role and employee expectations of the human resources (HR) function. From benefits administration to HMO selection and tracking, employees are calling for more Web-based tools to personally manage those details that have been typically performed by HR personnel. To this end, e-commerce and Web-enabled tools are significantly transforming physician–patient and employer–employee relationships, resulting in physician-to-patient (P2P) and business-to-employee (B2E) commerce.

3. EVALUATION OF TOP E-HEALTH WEB SITES

In a special report, the Wall Street Journal [16] offered an extensive analysis of health care and the future of care delivery. The Journal provided a listing of top e-health sites, including those of the New England Journal of Medicine, the Mayo Clinic, Medline, and so on. Table 1 shows the Journal’s complete listing. Here, however, I offer a taxonomy classifying these sites as revenue versus non-revenue generators. That is, does the site engage in an “economic” transaction that results in pricing goods and services and facilitates some exchange [17]?

Within the non-revenue-generation class, I observed three types of functions: (a) general information dissemination on diseases and conditions, (b) personal consultations from medically trained staff to consumers, and (c) maintenance of virtual communities via online communications tools such as e-mail, chat rooms, and bulletin boards. Based on these criteria, Table 1 indicates 15 of the 15 sites provided medical information via the Web. Only HealthAtoZ offered personal consultation via online chatting with medical experts. Seven of the 15 (or 47%) offered virtual communities using chat rooms. Although much of this functionality does not require its users to engage in a transaction event, there is information exchange both in personal and in open network forums (virtual communities).

On the other hand, in the revenue-generation class, I detected three additional functions: (a) online subscription information and access, (b) opportunities for product purchasing, and (c) links to other e-commerce web sites. Only the site of the New England Journal of Medicine listed online subscription data, which allowed consumers to order the printed version of the Journal. Forty percent of the sites enable consumers to purchase products such as durable goods, medical supplies, and prescribed medication. Only 33% (5 of 15) demonstrated a degree of large-scale collaboration via links to e-business partners, thereby leading the consumer along the health care supply chain. For example, visitors to WebMD’s Web site can link to CVS Pharmacy’s online store and register for the Komen National Race for the Cure 5K run/walk event.

Despite these diverse services, the need to do comparative shopping for HMO plans and services was not addressed on these sites, although this can
Table 1
Top E-Health Web Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>URL</th>
<th>Non-Revenue Generation</th>
<th>Revenue Generation</th>
<th>Links to E-Commerce Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>General Information</td>
<td>Personal Consultation</td>
<td>Chat Rooms/ Communities</td>
</tr>
<tr>
<td>HealthGate</td>
<td><a href="http://www.healthgate.com">www.healthgate.com</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IntelliHealth</td>
<td><a href="http://www.intelihealth.com">www.intelihealth.com</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mayo Clinic</td>
<td><a href="http://www.mayohealth.org">www.mayohealth.org</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Medline</td>
<td><a href="http://www.ncbi.nlm.nih.gov/PubMed/">www.ncbi.nlm.nih.gov/PubMed/</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>The New England Journal of Medicine</td>
<td><a href="http://www.nejm.org">www.nejm.org</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Wellness Web</td>
<td><a href="http://www.wellweb.com">www.wellweb.com</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Health on the Net</td>
<td><a href="http://www.hon.ch">www.hon.ch</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes^</td>
</tr>
<tr>
<td>American Association for Cancer Research</td>
<td><a href="http://www.aacr.org">www.aacr.org</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Association of Community Cancer Centers</td>
<td><a href="http://www.assoc-cancer-ctrs.org">www.assoc-cancer-ctrs.org</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes^</td>
</tr>
<tr>
<td>CancerGuide</td>
<td><a href="http://www.cancerguide.org">www.cancerguide.org</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>CancerNet</td>
<td>cancernet.nci.nih.gov</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>HealthAtoz</td>
<td><a href="http://www.healthatoz.com">www.healthatoz.com</a></td>
<td>Yes</td>
<td>Yes^</td>
<td>Yes</td>
</tr>
<tr>
<td>Mental Health Net</td>
<td><a href="http://www.mentalhelp.net">www.mentalhelp.net</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sapient Health Network (Now WebMD)</td>
<td><a href="http://www.webmd.com">www.webmd.com</a></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>RxList</td>
<td><a href="http://www.rxlist.com">www.rxlist.com</a></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

^aDiscussion list on Internet technologies and health care. ^bMembers-only newsgroup. ^cLive online chat with experts.
be seen as a desired functionality in a Web portal. Additionally, Table 1 indicates that current services offered by the top e-health sites have limited, if any, functionality to support physician referrals, comparison of HMO costs, or consumer perceptions of physician practices. Many of these services, however, hold significant implications for the B2E marketplace. That is, consumers are seeking more services at the employer level of service because the employing organization typically offers the vehicle for medical coverage and negotiates insurance rates [13]. Thus, e-health marketplaces can offer one mechanism to facilitate price, service, and quality comparisons among HMOs as well as provide the demographics of employee HMO enrollees. To this end, I seek to uncover the information that consumers desire to facilitate the HMO selection process.

4. METHODOLOGY

I requested the names of all new hires from the past 3 years from the North Carolina State University (NCSU) Human Resources Department. To limit my scope, I requested the names of faculty only. Within 3 days, I received an electronic copy listing the 75 new faculty by department. Two e-mail messages were sent to these faculty requesting a 30- to 45-min interview to discuss their health care plan selection process. Both e-mails gave the URL that provided links to the NCSU HR health information and links to managed care providers. Faculty were requested to examine the URL for its utility in assisting with the HMO selection process.

Forty-five faculty agreed to a face-to-face interview or an electronic question and answer session via e-mail. Each interview was tape recorded and transcribed within 24 h. In instances where additional clarity was needed, faculty were e-mailed a request for further explanation. The Appendix provides a list of questions that were asked of each interviewee. All questions were developed and revised based on an initial pilot using a group of business faculty.

Two 1-h focus group sessions followed these interviews. During the focus groups, the same questions in the Appendix were asked of the attendees. I also probed for additional details to gain some consensus on what consumers of health care Web portals wanted to accomplish. Further, these focus groups helped me to confirm the themes as iterated by the faculty and enabled me to prioritize the derived functionality as indicated in Table 2.

To analyze the interview data, common themes or patterns were uncovered to determine what consumers wanted to achieve, problems encountered using the current HMO selection process, and ideas for the future of the HR function in delivering health care information services. Although information systems researchers [18–20] have long advocated qualitative methodologies, I used a word/phrase categorization to define what functionality must be supported by an intraorganizational health care Web portal. Such analysis techniques have been validated in the organizational behavioral literature and allow the researcher(s) to develop categories or patterns from which the data can follow [21].
## Table 2

<table>
<thead>
<tr>
<th>Functionality Derived</th>
<th>Enabling Health Consumers&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of personal privacy</td>
<td>To confirm the security of one’s medical data and/or no undesirable disclosures have occurred</td>
<td>Facilitate consumer trust in e-space via privacy practices and policies as well as security measures</td>
</tr>
<tr>
<td>HMO benefits/coverage, comparison of costs, and provisions based on user-defined options</td>
<td>To compare standardized data and improve comparison shopping</td>
<td>Plans based on consumer needs and preferences rather than a general dump of all provisions; creates a knowledge base</td>
</tr>
<tr>
<td>Employee demographics of current enrollees by HMO</td>
<td>To compare plans based on enrollees with similar position in life</td>
<td>Compare enrollees based on race, gender, age, marital status, dependents, etc.</td>
</tr>
<tr>
<td>Online surveys for consumers’ perceptions of their HMO plan, with employee-published results</td>
<td>To understand how ones’ peers perceive their current and past HMO in terms of service, quality, price, etc.</td>
<td>Periodic surveys published prior to open enrollment</td>
</tr>
<tr>
<td>E-enrollment for employee HMO plans</td>
<td>To compliment, not replace the human resources function by enabling electronic enrollment</td>
<td>Migrate to a B2C model that provides online enrollment, claims processing, prescription ordering, etc.</td>
</tr>
<tr>
<td>Links to physicians, doctor finder</td>
<td>To check physician availability, qualifications, and background</td>
<td>Serve as a physician locator based on user preferences of location, credentials, gender, race, acceptance of new patients, etc.</td>
</tr>
<tr>
<td>Links to general health information</td>
<td>To engage in Web learning regarding medical conditions as well as other health resources</td>
<td>Information dissemination tools and references such as the Wall Street Journal and Ryder lists</td>
</tr>
<tr>
<td>Bulletin boards</td>
<td>To post both positive and negative consumer experiences with HMOs</td>
<td>Qualitative data to compare enrollees’ surveys of their HMO experiences</td>
</tr>
</tbody>
</table>

<sup>Note.</sup> HMO = health maintenance organization; B2C = business-to-consumers.

<sup>a</sup>What consumers stated they wanted to accomplish.

---

## 5. WHAT DO HEALTH CARE CONSUMERS WANT? CONSUMER PREFERENCES IN B2C HEALTH COMMERCE

Data collected during new-hire orientations indicated that employees experienced:

1. **Information overload** as they attempted to absorb the health care coverage requirements.
2. **Inadequate decision making** because much of the data that they wanted to review were unavailable, old, or limited in distribution. For instance, only five HMO directories were available during an orientation of 20 people, or no directory was available for 12 of the 17 health plans.
3. **Abbreviated time frame** in which to select a plan, as 20 to 30 min was allocated for this decision.

Based on the interview data, these problems are typical, and suggested that consumers had a number of requirements for an e-health tool. Overwhelmingly, participants wanted to see the health care selection moved to an employer-sponsored Web space, though one, in particular, argued that dealing with health care benefits is a personal issue that warrants face-to-face interaction. Table 2 details what consumers wanted to attain via an HR-enabled health care portal (column 2 of Table 2). From column 2, I derived a set of desirable function requirements (column 1). Thus, the table lists the functionality desired, what patient–consumers wanted to accomplish, and why this function is significant. When asked to rank the functionality, the focus group provided the order illustrated in Table 2 along with the significance of these features.

Table 2 lists items in order of desirability of the functionality required. Thus, interviewees ranked their personal privacy as being fundamental to the overall transaction process via a health care Web portal. This would involve the organization implementing both sound privacy and security practices and policies while soliciting a cultural shift in the behaviors of employees. Further, the group wanted to compare HMO plans, coverage, and provisions. The current system offers its users information in a flat file format without the ability to spontaneously profile physicians and their office locations as well as online registration of services.

Moreover, participants required that the portal enable its users to uncover the demographics of current HMO enrollees and evaluate online questionnaire responses regarding HMO quality and customer service. To this end, periodic surveys of HMO services were said to be desirable, whereas bulletin board functioning would capture the qualitative experiences of enrollees, who could provide employees with a sense of the ongoing interactions with health care payors.

Based on user requirements in Table 2, I developed several HTML screen shots that can serve as a prototype for e-health B2E models (Figures 1–7). These shots include the derived functionality, such as online benefit registration with personal identification numbers, physician locators with credentialing information, and contact information.

My findings suggest that medical consumers value information, such as physician credentialing and office locators, beyond what traditional e-health sites have provided. Although I captured these requirements in the screen shots shown here, these capabilities were not available on the NCSU Web site at the time of this study. Comparative HMO data (beyond premiums and deductible costs) would offer consumers a tool for objectively assessing each managed care plan. These data have been said to largely influence the employer–plan negotiation effort and potentially hold negative implications. Second, the concept of customer care does not eliminate the need to often have human interaction. Given the heightened expectations of consumers associated with the information age, criteria for e-health and e-business simply translate to a need to have quicker response time. Finally, although NCSU has the appropriate network technologies in place to support an intranet-based model, e-health (as suggested in this article) implies a need to link with HMOs, at a minimum. Thus, a broader definition of the e-health
Figure 1. Screen shot: The Health Benefits Page. This page serves as the menu of options available for health benefits information. Options include details regarding benefits, online registration, forms in PDF format, description of medical coverage options, online search for primary care physicians, other related external Web sites, etc.

Figure 2. Screen shot: Online Benefits Registration: Step 1. This page indicates what information is required of the employee to enroll online. A link to additional assistance is provided as well as the menu of options listed on the Health Benefits Page.
model is warranted if transacting, negotiating, and information sharing are to occur [22, 23].

6. CONCLUSIONS AND IMPLICATIONS

My research examined the health care consumer needs during a typical employer orientation session. The results indicate that consumers desire more than health care information regarding medical conditions. They desire electronic linkages (along the health continuum) with physicians, employers, and HMO plans. The HTML screen shots can serve as a prototype or portal for developing e-health sites that both provide general medical information and, more importantly, serve as an electronic medium among consumers and health care players. Moreover, this study suggests that the HMO selection process is an extensive effort that is contingent upon an individual’s station in life and also suggests that subjective measures play a role into the HMO selection process. Further, e-consumers want to see employers take ownership and provide electronic health care services such as
physician locators, claims submission, HMO registration, and access to current employees/patients’ perceptions of managed care plans. This would require a higher degree of information sharing among health care providers, employers, and physicians. The voids that currently exist among well-informed patients, an expectant society, and cost-conscious employers lead to ineffectiveness and show the need for better information in sharing e-space. The scenario also holds implications for emerging e-health models in the P2P and B2E domains and suggests

Figure 4. Screen shot: Primary Care Physician Search. Once the employee has accessed the benefits system, he or she can search for a primary care physician. There are two ways: either by specialty and location, or physician name. The employee may also narrow the search by specifying preferences for years of practice, board certification, managed care affiliation, ethnicity, gender, and medical group affiliation.
Figure 5. Screen shot: Primary Care Physician Search Results: Overview. Based on the employee’s search criteria, he or she is presented with the results of said criteria. The employee has the option to view additional information such as profiles and office information. Links are also provided to the managed care organization with which the physician is affiliated.

Figure 6. Screen shot: Primary Care Physician Search Results: Profile. The employee is presented with a profile for each physician listed in the search results. Information within the profile includes medical school, rating (on a scale of 1–10 based on patient responses), the institution they currently teach at (if applicable), and clinical interests.
that role reversal is forthcoming as patient-consumers engage in autonomous decision making in their health care choices, coverage selection, and treatment options.

In conclusion, e-health groups, such as Healtheon/WebMD and Health Magic, have recognized the significance of this industry and undoubtedly view patients as primary consumers of health services. Although financial, health benefits, and clinical results are of increasing importance, e-health’s driving force could very well prove to be the patient. To this end, remember the patient of 2005 with her customized portable universal medical chart, which has been said to enable evidence-based care. These mobile technologies offer additional challenges along the health care supply chain, namely data integration and consumer privacy.

7. LIMITATIONS

Although my work offers specific user-defined requirements in the e-health space, this study has several limitations. Faculty members with less than 3 years of experience were the participants of this research. Though the orientation process
remained clear in their minds, the data are retrospective. Additionally, as new faculty, their time was limited and tenure pressures abounded; thus an interview or focus group on health care selection was often termed “important but does not warrant of my time” as indicated by 15 e-mail responses. Further, this research took place in a not-for-profit educational institution, which vastly differs from for-profit organizational settings. Large *Fortune* 500 companies, such as Cisco Systems, IBM, and Nortel Networks, have confronted this e-health challenge. Finally, this work was based on a small seed grant that only offered support for what proved to be an enormous effort on electronic markets and patient education and collaborative efforts among HMOs, employers, physicians, and advocacy groups.

REFERENCES

APPENDIX A:

Interview Questions

Describe your health care selection as experienced during the new employee orientation.
How helpful was the HR group in making your selection of a HMO plan?
How could a Web portal assist in the HMO selection and enrollment processes?
What would you like to accomplish via a Web portal?
What “things” must that Web portal do and rank these features in order of personal preference. Why are these features relevant?
Provide feedback on the following HTML screen shots (see Figures 1–7 of this article) as a prototype for an NCSU health benefits Web portal.
What do you see as the future role of the HR staff if the portal is implemented?
Please provide any additional comments.