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Building Business Relationships Through the Web: How Medical Technology Companies Enroll Stakeholders in Innovation Development and Uptake

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Abstract: Websites are perceived as an additional communication space where public and private institutions and their stakeholders can interact and develop sustainable relationships. Although public relations scholars argue that both companies and consumers may benefit from virtual interactions, the growing online direct-to-consumer advertising and sale of health-related products has raised social and ethical concerns. Our study seeks to clarify the scope and nature of the virtual relationships that are specific to medical devices companies. Through a qualitative analysis of website, we show how four Canadian medical technology companies sought to enroll three types of stakeholders into their innovation development and commercialization strategies: investors, healthcare providers and patients. Our findings show that by reinforcing stereotypical relationships with investors, the websites maintain certain disconnect between the worlds of business and healthcare, and by creating proactive roles for healthcare providers and patients, they contribute to forge ethically convoluted relationships.

Keywords: *medical technology industry, stakeholder management, enrolment strategies, website analysis, ethics of communication.*

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The Web as a Space for Corporate Relationship Building

The Internet has become an important channel of health information. Its interactivity and the possibility to tailor messages are increasingly associated with pro-health behavioral outcomes (Rimal and Adkins, 2003; Sundar et al., 2011). However, using the Internet to raise public awareness on health issues or to influence unhealthy behaviors is not limited to health authorities and practitioners. For-profit companies that develop health-related products and services also take advantage of the Internet attractive characteristics to engage actively with their potential consumers. In fact, public relations scholars tend to encourage companies to build and develop sustainable virtual relationships with their stakeholders (Ng et al., 1998; Taylor et al., 2001; Capriotti and Moreno, 2007; Park and Reber, 2008; Springston and Lariscy, 2003). They argue that consumers benefit from virtual relationships as they gain greater control over information search and product acquisition process (Ng et al., 1998). From this perspective, becoming through the Web a more active participant in the commercialization process is seen as positive.

Nevertheless, for health communication and health policy scholars, such uncontrolled exposure to information on sensitive products like drugs, genetic testing and innovative medical interventions are cause for concerns, raising social and ethical issues (Williams-Jones and Ozdemir, 2008). Several studies on direct-to-consumer online advertising and sale in such areas concluded that it can threaten information privacy, challenge equitable and safe access to healthcare, increase exposure to unreliable and biased information (Williams-Jones, 2006; Geransar and Einsiedel, 2008; Boden and Diamond, 2008; Berg and Fryer-Edwards, 2008), impact negatively the patient/physician relationship (Mitka, 2008; Racine et al., 2008), corrupt the physician/industry relationship, and increase overall spending in medical care (Jost, 2010).

While such concerns emerged from studies that focused on pharmaceuticals, medical procedures and emerging biotechnologies, not much research has specifically examined 'hard' medical technologies, usually described as devices or equipment (i.e., ultrasound, radiotherapy, programmable intravenous pumps) (Jost, 2010). Such technologies are generally used by clinicians (with a more or less direct involvement of patients). They may be fairly expensive and they require user training, onsite installation and after-sale support. Hence, they may be advertised but not sold online since their acquisition is usually made by hospitals. Furthermore, while the pharmaceutical industry is mainly comprised of 'big players' (e.g., multinationals with sophisticate marketing strategies), the medical technology industry is populated mostly by small and medium-sized enterprises (SMEs), including spin-off companies whose core business revolves around the development and commercialization of an innovative technology. For such innovative companies, pursuing close collaboration with clinicians, as well as obtaining continuous feedback from, and providing key information

to healthcare providers and patients are paramount. Since a sizable portion of their activities remains devoted to research and development (R&D) and to obtaining regulatory approvals and market clearance in many countries altogether, they also need to build trustworthy relationships with capital investors and shareholders, otherwise their survival may be at stake.

Thus, innovative medical technology companies occupy a niche of their own and the virtual relationships they are likely to develop and maintain may raise ethical and public relations challenges that differ from those already known. Hence, our study seeks to clarify the scope and nature of the virtual relationships that such companies may entertain with their various publics. More specifically, through a qualitative analysis of four Canadian medical technology corporate websites, we examined how these companies sought to enroll investors, healthcare providers and patients into their innovation development and commercialization strategies. Our findings show that the websites not only promote health technologies, but also assign different identities to these three categories of stakeholder and foster multiple roles, including some that shape how they engage with healthcare institutions.

We first examine the literature on the development of virtual relationships and expose the concepts on which our analyses rely. After introducing our four cases and analysis methods, we examine the different online strategies by which the four corporate websites seek to enroll stakeholders, that is, to assign to each group certain identities and 'configure' them into actors more responsive to the development and uptake of their innovations. Finally, we discuss the research and ethical implications of such relationship building strategies.

Building relationships through the Web

Studies of corporate websites have developed various conceptual frameworks to describe the corporate culture of firms (Overbeeke and Snizek, 2005), the nature of their corporate social responsibilities, the way they frame these issues (Coupland, 2005; Van de Pol and de Bakker, 2009), and the attention they give to them (Capriotti and Moreno, 2007). Connolly-Ahern and Broadway (2007) have also demonstrated how websites have become powerful impression management tools used by companies to control their own image in order to increase their capacity to fulfill financial and social goals, secure support, deal with competitors and manage the consequences of their actions. Grounded in the normative assumption that excellence in stakeholder management is based on *two-way* communication strategies, public relations researchers have turned their attention to how corporate websites foster or facilitate exchanges and dialogue between companies and their various publics (Taylor et al., 2001; Capriotti and Moreno, 2007; Park and Reber, 2008).

Taylor et al. (2001) have operationalised five principles of dialogic relationship building to describe how dialogue between companies and stakeholders may

emerge and how relationships may develop and thrive in online environments. Their conceptual framework examines: 1) the usefulness of information provided on websites; 2) the user-friendliness of interface; 3) the conservation of visitors; 4) the generation of return visits; and 5) dialogic loops that include opportunities for visitors to send messages to companies, vote on issues, request information or updates, etc. (Taylor et al., 2001). According to these authors, this last feature of dialogic websites is the most important since it is the only web device that allows a real two-way communication between companies and their stakeholders. Several authors have used – or taken inspiration from – this model to evaluate the extent to which corporations use their websites as relationship building tools (Capriotti and Moreno, 2007; Park and Reber, 2008). Such research has found that most corporate websites meet several of the requirements for virtual relationship building. However, they do not fully engage in two-way communication with stakeholders, leading researchers to conclude that the potential of websites to create and foster interactivity is not being fully exploited.

These studies document, from a business point of view, the *performance* of corporate websites in successfully reaching stakeholders, but they do not ponder *the nature and scope of the relationships* companies are attempting to build through their websites. Such research may compare different industries, but does not necessarily take the specific nature of the technologies and services being marketed into account, and it rarely questions the heterogeneity of the targeted publics. Yet, when companies advertize highly specialized and sensitive products like innovative health technologies to stakeholders as diverse as capital investors, healthcare providers and patients, virtual relationship building strategies need to be carefully examined since they may not benefit all stakeholders to the same extent. Hence, one must not only assess corporate websites' capacity to engage in two-way communication, but also examine the implications of the relationships they seek to build with various publics. Furthermore, when it comes to innovative medical technologies, one need to ponder how complex scientific, technical, medical and commercial information is being mobilized and shared in such virtual environments. Thus, a conceptual framework that enables characterizing the specificities of the online relationships health technology companies try to develop, that allows analyzing in greater depth the content of online narratives, and that is sensitive to the ways in which virtual tools may be deployed to address and entice different stakeholders is required.

Enrolling stakeholders online

Clarkson (1995: 110) defines a company as a *system* of primary stakeholder groups whose survival and continuing profitability depend upon its ability to create and distribute wealth and value sufficient to ensure that each primary stakeholder group stays on board. According to this framework, the success and sustainability of a company

require relationship maintenance. Yet, emerging companies such as those we examined need to *attract* and eventually retain stakeholders' attention at a time when wealth and the values associated with their innovative products are still in the making.

Following the Actor-Network Theory (ANT) concept of enrolment as adapted by Ranerup (2006) for examining electronic markets, we define enrolment as getting other actors to follow or act in accordance with one's own intentions. This may be achieved by a group of actions by which an organization or group of actors 'attempts to impose and stabilize the identity of other actors' (Ranerup, 2006: 284). Enrolment thus represents a particular type of relationship-building through which stakeholders are assigned an identity — which they may of course contest or reject — and a putative role to play in a company's endeavor.

In virtual environments, the 'group of actions' by which a company attempts to assign and stabilize the identities of its stakeholders encompasses content *narratives*, which combine information, knowledge claims and arguments, and *interactive devices,* which entice action from visitors. Figure 1 indicates that enrollment strategies rely on two specific types of web resources: expositive and interactive (Capriotti and Moreno, 2007). On the one hand, expositive resources consist in content that *passively* inform visitors (text, images, photos, graphics, audio-visual material, etc.). Yet, by explicitly presenting one argument rather than another, and by emphasizing certain scientific, medical, managerial, commercial or technological characteristics when addressing a particular group, corporate website narratives assign to various publics different identities since a selection of what is deemed to be of interest to them is made. On the other hand, *interactive resources* provide web visitors with putative roles since they 'permit information to be obtained through active interaction, with a mainly active and participative visitor' (Capriotti and Moreno, 2007: 86). These may include hypertexts, downloadable documents and forms, interactive graphics and contact information.

According to Taylor et al (2001: 268), for business-stakeholder 'rela-

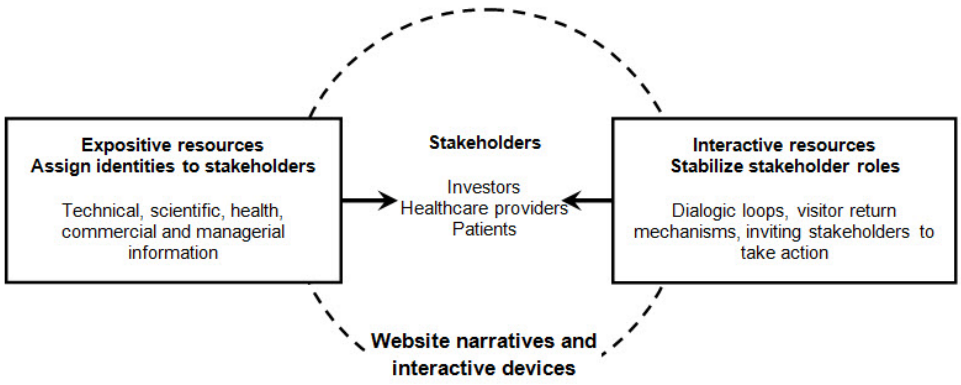

Figure 1. *Conceptual framework for examining enrolment strategies in virtual environments*

tionships to thrive, maintenance and satisfactory interactions must occur.' Relationship building requires trust, which develops over time. For these reasons, corporate websites offer features that encourage visitors to return regularly or to interact with certain actors directly. This is why, in our conceptual framework, interactive resources comprise *dialogic loops* (Taylor et al., 2001), which enable visitors to interact with the company (i.e., hypertext such as 'keep up to date with us' or 'call us for information on prices'), and *return of visitor mechanisms*, which are content features likely to change over time and be updated such as lists of upcoming scientific or corporate events, webcasts and clinical web resources. Such frequently changing features aim at encouraging regular visits, but other interactive resources may invite stakeholders to take specific action, for instance, a hypertext such as 'to discuss [name of product] with your physician, download this brochure.'

To summarize, our conceptual framework posits that health technology corporate websites, through a combination of expositive and interactive resources, seek to enroll in their endeavor three key stakeholders — capital investors, healthcare providers and patients — by assigning different identities upon these groups and by enticing putative roles.

Methods

This paper stems from a broader research program based on a multiple case study involving four companies. The website analysis, on which this paper is based, represented the first phase of the whole program. As per qualitative research standards, we selected the four companies purposefully. Prior to our study, we consulted key informants, relevant policy documents and websites describing the Canadian health innovation industry. This preliminary investigation led us to select cases whose 'information content' was likely to be rich and accessible (Flyvberg, 2011). More specifically, they were all Montreal-based companies who had started their R&D operations at the same period (mid 1990s) and whose core products were in the early stage of commercialization when our study began. They also possessed several of the characteristics of the medical technology industry described above. For instance, at the time of our study (2008), they were all seeking to commercialize, in European and North American markets, a *fairly expensive innovation* that involved *significant user training*, as well as *after-sales services and maintenance*. Their *core business was the innovation* they had just developed. Hence, their growth and survival directly depended on their ability to attract capital investors by making a solid case for their business and innovative capacity, and to convey to healthcare providers and patients the value of their innovation.

Company 1 developed an optical breast imaging device designed to improve the diagnosis and treatment of breast cancer. It uses a molecular imaging technology to display and discriminate between normal and malignant tissue. At the time of the study, the technology was available in Canada and Europe as an *adjunct*

to mammography — the mainstream method for breast cancer screening — and as a *potential* treatment monitoring tool. The company was pursuing clinical studies in Canadian and American clinical centers to complete the market approval requirements of the United States Food and Drug Administration (FDA).

Company 2 developed a range of cryoablation catheters for the treatment of various cardiac arrhythmia problems. Cryoablation is a technique that involves freezing tissue that is interfering with the normal distribution of electrical impulses in order to restore normal electrical conduction in the heart. This technology is an alternative to radiofrequency (RF) ablation, which is based on the same principle but uses heat instead of cold. It is also an alternative to using cryoablation probes in a much more invasive intervention that requires opening the patient's chest in order to work directly on the heart. At the time of our study, three types of catheters were available on the European, Canadian and American markets. A fourth one had been approved for sale in Europe, but was still undergoing clinical trials in the United States.

Company 3 developed a suite of decision-support software to help clinicians working in obstetrical wards anticipate risks during labor and so prevent birth injuries. This software comprises three modules. The first compares a laboring mother's progress in real-time to a reference population, thus aiding in the diagnosis of prolonged labor and anticipating women at risk for uterine rupture. The second module assists in the identification of patterns associated with an increased risk of birth-related brain injury. The third module assesses the risk of shoulder dystocia before labor begins. At the time of our study, the software was available for sale in North America and Europe.

Finally, Company 4 developed a home telehealth package that encompasses remote patient monitoring, disease management and a set of coordination tools to promote continuity of care in chronically ill patients being treated by a multidisciplinary group of healthcare providers. It was developed in one particular hospital and, at the time of the study, was being used by a few other health institutions in Canada and Europe.

Analyses of the websites' narratives and interactive devices

Our analysis is based on website content retrieved between October and December 2008. Each webpage was transformed into PDF format to capture its form at the time of the study and keep track of its textual and visual content. Then, in order to conduct an in-depth qualitative analysis, we transferred into MSWord™ documents the website content of the sections that were dedicated specifically to investors, healthcare providers and patients. Three of the four companies had such clearly labeled sections. The website of Company 4 had one section about the company, while the remaining site content was addressed to healthcare providers. Thus, for Company 4, we analyzed the whole site as an entire section dedicated to healthcare providers and treated

the section describing the company as one dedicated to investors. This decision was prompted by the literature (Esrock and Leichty, 2000) and aimed at increasing analytical consistency since the other three websites gave a description of their company in the investors section. While information of interest to the three stakeholder groups may be found in different sections of the websites, our analysis focuses on the website content explicitly targeted at each group since it is more likely to reveal the company's relationship building strategies.

The first step of our analysis consisted in organizing the website content by companies and by stakeholder categories, creating a case-ordered matrix (Miles and Huberman, 1994). The coding strategy involved iterative analyses guided by our conceptual framework, which sought to increase the fit between the concepts and the empirical observations. The goal was to define as precisely as possible what information the website narratives were conveying to the visitors and what the interactive devices were enabling in terms of interaction. We thus created a detailed matrix in which we compared and contrasted, within each case and across the four cases, the narratives and devices that had been extracted from the websites (Miles and Huberman, 1994).

The second step was to obtain a more refined classification that distinguished expositive from interactive resources in order to condense accordingly our key observations and create two final tables summarizing our findings. As per our conceptual framework, the codification of expositive resources (see Table 1 further) required an in-depth analysis that attributed specific units of content to either one of the following five categories: 1) *technological information* – the technology itself along with its components, purpose, functions and benefits; 2) *health information* – the health conditions addressed by the technology; 3) *scientific information* – the results of studies, clinical trials and research achievements; 4) *commercial information* – the technology's market penetration, from regulatory approvals to sales; and 5) *managerial information* – the people who work for the company and the company's management strategies and financial achievements. Interactive resources were codified under dialogic loops (e.g., enabling interaction with the company) and return of visitor principles (e.g., enticing regular visits) (see Table 2 further). To support the presentation of our findings, we determined the respective importance of the expositive resources provided for each stakeholder by examining the position occupied on the web section as well as by the level of details given.

Results

We first examine how the websites' expositive resources, by emphasizing certain arguments over others, differentially addressed investors, healthcare providers and patients, thereby assigning to each of them certain identities. We then describe how interactive resources attributed different roles to these stakeholders, by inviting them to take specific action.

Assigning identities to stakeholders

Table 1 summarizes the expositive resources used by each company when addressing the three types of stakeholders. The categories of resources are ranked in order of importance in the Table. For example, managerial information appears first in a cell when it constitutes the core information provided to a given type of stakeholder.

Scope of information conveyed to investors: All four websites provided similar managerial information to investors, such as milestones,

Table 1: *Expositive resources used to assign identities to stakeholders*

Investors	Healthcare providers	Patients
Company 1 - Imaging device		
Managerial information - Milestones, mission, vision, values, awards, governance - Presentation of senior management, Board of Directors, advisory committees **Scientific information** - Status of clinical and pilot studies, on-going and future research/publications, business implications - Clinical, technological and research partnerships **Commercial information** - Intellectual property (patent acquisition and portfolio) - Regulatory approvals (pre-market and market clearance) - Product launch: first sale, total sales, prospective sales, marketing strategies - Agreements with distributors and other companies	**Technological information** - Innovation, components, functions, mode of operation, use and safety information - Potential benefits for providers and administrators - Testimonials from clinical users **Commercial information** - Target market niche: adjunct to mammography and treatment monitoring - Market approval in Canada and Europe, pre-market approval in US - Reimbursement information **Managerial information** - ISO certifications	**Technological information** - Benefits compared to mammography (e.g., can image dense breast tissue, inclusive of younger women) - Testimonials from patients **Commercial information** - Regulatory approvals (pre-market and market clearance) - First sale and accessibility
Company 2 - Cryoablation catheter		
Managerial information - Company culture, milestones, mission, vision, values, commitment to customers, awards - Presentation of senior management, Board of Directors **Commercial information** - Intellectual property (patent acquisition and portfolio) - Product launch: total sales, centers using the catheters - Regulatory approvals (pre-market and market clearance) - Agreements with distributors and suppliers, partnerships **Scientific information** - Positive clinical studies, peer-reviewed publications **Health information** - Success rate and successful use of cryoablation	**Technological information** - How cryoablation works - Each catheter's features and functions - Catheters compared (favorably) to other technologies - Professional education and training (extensive) **Managerial information** - Awards	**Health information** - Arrhythmias: incidence, causes, symptoms, ways to diagnose and treat **Technological information** - Cryoablation compared to radiofrequency and medications - Alternative treatment options for arrhythmia

Table 1 (cont'd): *Expositive resources used to assign identities to stakeholders*

Company 3 - Labor decision-support software		
Technological information - Product functions, purpose, components, mode of operation, benefits of decision-support software **Health information** - Risks of birth injuries and consequences **Managerial information** - Milestones, corporate governance policy - Presentation of senior management, Board of Directors, advisory boards **Scientific information** - Status of clinical studies and impact analyses **Commercial information** - Regulatory approvals (pre-market and market clearance) - Product launch, total sales - Agreements with distributors and medical insurers	**Technological information** - Key features and benefits of decision-support software and its components - Compliance with technical standards - Training programs (minimal) **Health information** - Providers addressed as 'you'; personalized messages for nurses, physicians and biomedical engineers - Objectives and challenges of providers, how the technology helps them achieve their objectives	**Technological information** - How the innovation works for you' - Benefits **Health information** - Use of the technology versus experiences of patients when this innovation did not exist
Company 4 - Home telehealth solution		
Technological information - Functions, purposes, components, benefits, mode of operation **Managerial information** - Presentation of senior management, Board of Directors; emphasis on collaboration with customers - Names and logos of partners with acknowledgements	**Technological information** - Function, purposes, components and mode of operation - Benefits for providers and patients - Examples of clinical applications for 5 chronic illnesses - Compliance with technical standards (confidentiality and interoperability)	Although there was no dedicated section, the technology is geared at 'empowering' patients, enabling them to play an active role and interacting frequently with providers

Note: The categories of information (scientific, technological, managerial, commercial, health) are listed, within each cell, according to their respective importance, which was assessed by their positioning on the Web page and the amount of information presented.

philosophy, vision, mission, values and awards. Also described in varying degrees of detail was the composition of the senior management team, boards and advisory committees. Yet, while technological information was absent from the narratives of Companies 1 and 2, it was significantly emphasized on the websites of Companies 3 and 4. The investors section for Company 3 started off with health information about birth-related injuries, before turning to detailed information about the labor decision-support software. Company 4 used a similar strategy, introducing its home telehealth solution and its components, functions and healthcare benefits. Across the first three cases,

expositive information was framed in terms of *achievements,* associating success to investors' identity. For instance, Company 2 mobilized health information to underline the medical achievements of its catheters (success rates and successful use), stating that 'as important as our R&D and commercial successes are, *we are also driven by our ability to improve peoples' lives profoundly* [sic].' Likewise, commercial information was conveyed in terms of *milestones*, such as number of sales, agreements with distributors and suppliers, various partnerships, and lists of centers already using the technologies. Scientific information was conveyed in terms of *R&D achievements*, such as the status of clinical trials and establishment of international scientific partnerships.

Scope of information conveyed to healthcare providers: In all four cases, technological information constituted the core expositive resource provided to healthcare providers. The companies described at length the purpose, functions, components and benefits of their particular technology. Yet, the websites conveyed this information by making appeals to providers' clinical identity. Companies 1 and 2 provided testimonials from healthcare providers in support of their innovations. Company 3 made specific efforts to personalize its message to healthcare providers by addressing them directly as 'you'. It carefully adjusted its message to address specifically nurses, obstetricians, IT managers or biomedical engineers. In a section called 'your role', the website intertwined technological and health information through which it described the objectives of healthcare providers along with potential obstacles, showing how the decision-support software, through its various functions and components, could help them do their work. While managerial information was absent or extremely limited in the section dedicated to healthcare providers, only Company 1 provided commercial information related to its imaging device.

Scope of information conveyed to patients: While the companies approached patients with technological arguments, their identity was constructed as individuals who are asking themselves questions associated to their likely profile as health care 'consumers'. The core expositive resources used to address patients on the websites of Company 1 is technological information, while Companies 2 and 3 focused on health information. The bulk of Company 1's narrative consisted in exposing the benefits of its imaging device versus mammography for patients. These benefits were further supported by patient testimonials. The legitimacy of the company's imaging device was also established by referring to a scientific publication that highlights the risks of breast cancer for women with *dense breast tissue* (which may include younger women who are not necessarily targeted by current breast cancer screening programs). The company asserted that only its technology could properly image such tissue. Company 1 also used commercial information to inform patients about the current regulatory status of its innovation and the complementary nature of its device. Company 2 provided little information about its catheters. Rather, the narrative adopted an educational

approach and provided a great deal of information about arrhythmia itself (types, causes and symptoms, how and why to diagnose and treat it). Consistent with an information savvy patient identity, the website described all possible treatment options available on the market and discussed cryoablation in relation to other treatments. While Company 3 addressed patients directly as 'you', it did not seek to *educate* them like Company 2 did. Using a real-life type of narrative, Company 3 described how providers would use the decision-support software to take care of pregnant women and posited them as compliant patients who needed to be reassured: 'you will easily understand your progress and *feel more confident in consenting to any actions* your caregivers recommend to improve your progress and ensure both the safety of yourself and your baby.' Finally, Company 4 website did not have a specific section dedicated to patients, but its home monitoring system was described as geared at empowering patients and providing them with a home-based system to interact frequently with health care providers. The identity assigned to patients is thus one of an active patient.

To summarize, the four websites framed the identity of investors as sensitive to managerial, commercial and scientific achievements, whereas only two provided them with some information on the technology itself and the health problems it addresses. While the four websites emphasized healthcare providers' clinical identity, they left aside expositive information that would have framed them as consumers or as mediators of business transactions. Finally, several different identities were assigned to patients, ranging from an active patient in search of detailed health information to a passive recipient of healthcare.

Constructing putative roles for stakeholders

Table 2 summarizes the websites' interactive resources that attributed to stakeholders rather clear roles to play in the companies' endeavors.

Scope of information conveyed to investors: Table 2 indicates that Companies 1-3 clearly sought to entice investors to return regularly by offering several kinds of interactive resources likely to change on a regular basis, such as stock exchange information, annual and quarterly reports, financial statements, and date and place of annual meetings. Companies 3 and 4 also made scientific research directly accessible via hyperlinks where scientific publications and presentations, clinical trial results and case studies could be downloaded. In the case of Company 3, these hyperlinks were even introduced on the website before the management team, featuring web-based seminars and links to latest TV reports, thereby facilitating access to information on birth-related injuries and the decision-support software. While only Companies 2 and 3 used dialogic loops to entice two-way communication with investors, Company 4 solely emphasized access to clinical studies. Overall, investors were invited to actively follow the companies' achievements and future development, e.g., to keep the companies on their radar, stabilizing their role as *horizon scanners* in search of business opportunities that tap on scientific innovation.

Scope of information conveyed

Table 2: *Interactive resources used to define stakeholder roles*

Investors	Healthcare providers	Patients
Company 1 - Imaging device		
Return of visitors - Stock exchange information, stock listing, auditors, transfer agents, names, contact details and coverage by financial analysts - Information on investments, venture capital, and company's finances - Date and place of annual meetings, webcast of CEO conference on quarterly results, annual and quarterly reports, financial statements, management proxy circular, regulatory filings, SEDAR - Peer-reviewed articles	**Dialogic loops** - Contact information for pricing information and support - Access to scientific publications and presentations - Purpose and nature of a pivotal clinical study for which company is recruiting patients; list of clinical centers where trials are taking place and hyperlinks to enroll	**Return of visitors** - List of web resources on cancer - Invitation to download a patient enquiry form to help them discuss the technology with healthcare providers; brochure for their doctors **Dialogic loops** - Invitation to enroll in clinical study as part of submission to the FDA (link provided)
Company 2 - Cryoablation catheter		
Return of visitors - List of past and upcoming scientific events - Press releases featuring ongoing studies, sales, approvals, new product launches, corporate nominations - Career opportunities - Events for investors: annual meetings, conference calls, investor relations contact information - Annual and quarterly reports, financial reports, SEDAR profile - Stock exchange information/quotes and transfer agent, names and details of financial analysts **Dialogic loops** - Invitation to sign in to receive updates about the company and its products	**Return of visitors** - Visual material for providers to prepare their own presentations - Live webcasts of experts round table, downloadable physician presentations, scientific publications and clinical trials - Slide show and brochures, online virtual hands-on demo of catheters, web resources on arrhythmia - Contact details and specifications for suppliers and distributors - Information on coverage policy, coding systems and reimbursement forms **Dialogic loops** - Coordinates of medical advisory panel - Link to contact representatives, customer services and receive updates - Ordering information section	**Return of visitors** - List of arrhythmia drugs, web resources on arrhythmia - List of medical advisors and things to do before contacting one, how to prepare for cryoablation - Media highlights of patient stories, hyperlinks to patient testimonials - Live webcast about cryoablation - Brochures and invitation to discuss cryoablation with one's physician - List of clinical trial sites, number of patients treated, lists of clinical centers and things to do before contacting one **Dialogic loops** - Invitation to sign in to receive updates (trials, product launches) - Invitation to share their cryo stories

to healthcare providers: Across the four cases, not only healthcare providers were framed as primary users of the technologies, but securing their participation in commercial, promotional and development processes seemed also important. Overall, positioning healthcare providers as *primary users* was achieved by relying on return of visitors mechanisms, including: live webcasts of expert discussions; contact information for representatives, customer services, suppliers and distributors, as well as ordering details; downloadable presentations,

Table 2 (Cont'd): *Interactive resources used to define stakeholder roles*

Company 3 - Labor decision-support software		
Return of visitors - Links to web resources on obstetrics, nursing and prevention of birth injuries - Press releases featuring ongoing studies, scientific events, corporate nominations, corporate calendar, awards, financial report publication and investments - Stock exchange/quote information, annual and quarterly reports, regulatory filings - Career opportunities - TV coverage and webinars (perinatal care, risk management) **Dialogic loops** - Contact information for distributors - Name and contact info for investors	**Return of visitors** - Webinar and brochure on the technology **Dialogic loops** - Request information form	Did not use interactive resources
Company 4 - Home telehealth solution		
Return of visitors - Hyperlinks to clinical studies - Careers opportunities, email address for sending resumes	**Return of visitors** - Hyperlinks to clinical studies and case studies - Hyperlink for clinicians to perform a cost/benefit analysis **Dialogic loops** - Invite clinicians to contact them to see how they can together develop protocols meeting their needs	N/A

virtual hands-on demonstrations and reimbursement forms (associated to health insurance coverage). Company 1 enticed healthcare providers to become *partners in the path toward commercialization* by embedding dialogic loops in the description of a pivotal clinical study for which patient were being enrolled and that would enable obtaining FDA market clearance. This device consisted in a list of the clinical centers where the trial was taking place and a hyperlink for patient recruitment, encouraging healthcare providers to enroll volunteers to the study. For healthcare providers to act as *spokespersons*, Company 2 provided downloadable resources such as visual material (pictures, videos) and slides to help them prepare their own presentations on cryoablation. Company 4 enticed healthcare providers to act as *partners in the development* of its home telehealth solution by inviting them to contact directly the company so they would see how 'together' they 'can combine their respective expertise to develop protocols that meet [clinicians'] needs.'

Scope of information conveyed to patients: Patients too were invited to get involved in the promotion and commercialization of the technologies, but the roles assigned to them varied greatly. Companies 1 and 2 offered

patients to act as *spokespersons* for their innovations by providing access to downloadable brochures specifically designed to help them inform their *own* physician about the purpose and functions of the technologies. Both companies also enticed patients to become *partners in the path toward commercialization* by volunteering to on-going clinical trials. Company 1's website informed visitors about the limited availability of its imaging device and invited women to enroll online in a clinical study that would hopefully lead to FDA approval. Company 2's strategy consisted in providing a list of clinical trial sites (including the name of the principal investigator, the phone number and email of a contact person) as well as a list of things to do before contacting such center. Company 2 framed patients as *proactive consumers* in search of a solution and willing to actively participate: the narrative addressed them as 'you' and concretely explained how they should prepare for the treatment and how it would be performed. Furthermore, the website provided a list of medical advisors and centers already using the technology, highlighting concrete actions to take, such as: 'Please have the following information [date of first AF episode; number of episodes, type of AF, etc.] ready before contacting a physician.' Company 3 did not use interactive resources to reach patients. No commercial information was provided to facilitate their access to the technology, and no specific effort was made to enroll them as spokespersons or participants in research. This absence of interactive resources may reinforce their identity as compliant patients already constructed by expositive resources.

Thus, the corporate websites cast investors in a role of horizon scanners who would return regularly to follow the company's evolution. Healthcare providers were invited to act as users and spokespersons of the technology and as partners in its development or commercialization. Finally, three websites deployed a great variety of interactive resources to establish and maintain relationships with patients whose putative roles included proactive health consumers, spokespersons, partners in commercialization and compliant patients.

Reinforcing Certain Identities and Fostering New Roles

We began this paper by underscoring the need to clarify the specificities of the online relationships that health technology companies seek to develop with their stakeholders. Our findings show that the websites not only promote health technologies, but also assign both traditional and new identities to stakeholders, and foster multiple roles (Table 3).

Now, turning our attention to the implications of such findings for research, policy and practice in health communication, we argue that by reinforcing stereotypical relationships with investors, the websites maintain certain disconnect between the worlds of business and healthcare, and by creating proactive roles for healthcare providers and patients, they contribute to forge ethically convoluted relationships.

Relationship building shaped by companies' needs

While our findings support the observation that the building of real,

Table 3: *Summary of the putative roles each company assigns to the three stakeholder groups*

Company	Investors	Healthcare providers	Patients
Company 1 Produces a breast imaging device approved as an adjunct to mammography. Limited access in Canada and Europe; ongoing clinical trials for approval in the US.	Horizon scanners, interested in managerial achievements	Primary users Partners in commercialization	Spokespersons Partners in commercialization
Company 2 Produces cryoablation catheters as an alternative treatment for various arrhythmia conditions. Three catheters are available on the European and North American markets; one catheter is under clinical trials for approval in the US.	Horizon scanners, interested in managerial and scientific achievements	Primary users Spokespersons	Spokespersons Partners in commercialization Proactive consumers
Company 3 Produces a decision-support software for obstetrics to help clinicians anticipate risks during labor and prevent birth injuries. Available in North America and Europe.	Horizon scanners, interested in healthcare challenges and the technology itself (its scientific foundations), and in managerial and commercial achievements	Primary users	Compliant consumers
Company 4 Produces a home telehealth solution that can be adapted to monitor various chronic diseases. Available in a few institutions in Canada, the US and France.	Interested in the technology itself and somewhat in managerial achievements and scientific foundations	Primary users Partners in the development	The technology is geared at 'empowering' patients by enabling them to play an active role in their health and interacting from home with providers

sustainable two-way relationships through the Web is not easily realized in practice (Capriotti and Moreno, 2007), our study adds to current knowledge by showing how the roles attributed to stakeholders were geared at fulfilling corporate needs that were salient at a particular stage in each company's development (see Table 3). For instance, Company 1's breast imaging device was available in a few hospitals in Canada and Europe, but was used only as an adjunct to mammography. The company was pursuing costly clinical studies to complete the US FDA's requirements. Thus, the company needed to convince investors that it was solid and on its way to success. Its website emphasized its managerial team along with its scientific and commercial achievements. This impression management strategy, also used on other websites, is consistent with the literature indicating that venture capitalists (VC) primarily select investment opportunities that offer strong management teams (Muzyka et

al., 1996) and tend to favor teams whose professional background is similar to their own (Franke et al., 2006). Hence, personalizing the management team and Board of Directors may help 'make the case' and build confidence and trust with VCs (Shepherd and Zacharakis, 2001). Furthermore, one way for entrepreneurs to build trust is by signaling commitment and consistency, and by frequent and open communication, which can be supported by virtual interactive resources (Taylor et al., 2001). Company 1 deployed such resources and shaped healthcare providers and patients identities as partners in the path towards commercialization. It did so by inviting them to participate in clinical trials directly online, a feature that, to our knowledge, has not been reported in the literature. As the diffusion of the imaging device was fairly limited, patients were also provided with online brochures they could take to their physicians, thereby acting as spokespersons to promote the new technology.

Company 2 already had three catheters on the market and was developing a new one. Like Company 1, it provided investors with information about its managerial capacity to achieve its commercial goals, but it also needed to spread the idea that cryoablation was a promising alternative to an existing procedure. Thus, it sought to enroll healthcare providers and patients as spokespersons by offering downloadable brochures and visual materials that would help them talk about the innovation. In addition, patients were invited to participate in clinical trials, so the company could finalize its commercialization process. Since patients with a non-threatening heart condition are in a position to examine and discuss options with their physicians, it is not surprising that Company 2 shaped their identity as proactive consumers and sought to build trust with detailed information about various treatment options.

Company 3 adopted a very different approach to shaping its stakeholders' identities: it provided investors with health and technological information and assigned traditional roles to healthcare providers and patients. Nevertheless, the decision support software implied reframing birth injuries as predictable and preventable. As such, the company needed to persuade clinicians to trade their clinical skills and know-how for 'objective' data, so they could intervene more effectively. Its key challenge was not only to sell a new technology, but also to modify the current clinical understanding of birth-related injuries, which called for a significant transformation of the adopting system (Denis et al., 2002). To enroll investors in such a project, the company chose to emphasize the technical assets of the software and the health problems it addresses. The messages to healthcare providers resonated with their clinical identity and role in obstetrical wards. Yet, the company provided its *own vision* of the obstacles providers faced and how its technology would positively transform their practice. Similarly, patients were constructed as individuals who simply needed to be told that the technology was in their best interest. In short, although the company's product ultimately called for a reconfiguration of the adopting system, it assigned conservative roles

to providers and patients that better suited the company's short-term needs.

Company 4's relationship building strategies show some similarities with those of Company 3, providing investors with information on medical and technical issues instead of emphasizing managerial and commercial assets. And its technology similarly implied a significant shift in current practices; by monitoring chronically ill patients at home, it fostered virtual contact between patients and healthcare providers. Whereas its website shaped clinicians into primary users, it is the only company that sought to enroll them for their *content expertise*, enticing them to act as partners in the development of its clinical tools. Paradoxically, even though Company's 4 solution sought, in practice, to empower chronically ill patients and foster a more active role on their part, its website did not have a specific section dedicated to patients or interactive tools for them, as if active relationships with them were not a priority.

Overall, when the corporate websites we examined did foster two-way relationships with stakeholders, it primarily revolved around the fulfillment of the companies' short-term expectations toward its publics. This observation may be partly explained by the fact that, contrary to other kinds of business, medical technology companies cannot target their marketing efforts on one 'single' consumer. Various changes in clinical practice and healthcare institutions have to be brought to accommodate the commercialization of a new medical technology. Within this perspective, the websites we examined may serve to prolong or complement other corporate and public relations strategies that seek to influence healthcare institutions (Boden and Diamond, 2008; Jost, 2010).

Ethical implications of online building relationships

Considering that a company has a duty to provide its shareholders with any social, ethical or contextual information that may affect its financial position (Hummels and Timmer, 2004), it is striking how the websites contributed to keep investors away from healthcare concerns by providing them mainly with managerial and commercial information and assuming a lack of interest in healthcare issues. This was particularly salient in the case of Companies 1 and 2. One may wonder whether and how investors are informed about the ways in which an innovation 'in the making' will affect clinical practices and the trade-offs its adoption by healthcare institutions will entail. Many health innovations raise organizational challenges that need to be addressed for their future adoption to be safe, effective and successful. Furthermore, when the development of medical innovation is not sufficiently informed by healthcare system concerns, a significant waste of research and development resources occur (Lehoux et al., 2008). Because investors are key players in the development of new health technology, it remains unclear why their identity would be framed as being narrowly business-oriented, as if the vitality of the business itself was not in any way also affected by the broader societal

implications of the products it brings to market (Hummels and Timmer, 2004).

Our findings also illustrate the significant interdependence that characterizes the relationship between medical technology companies and healthcare providers, which is at the center of heated debates over potential conflict of interests (Rothman and Chimonas, 2008). In the past few years, there have been significant changes in the policies governing industry-physician relationships and, in many jurisdictions, permissible interactions between these two groups have been restricted (Rothman and Chimonas, 2008; Nakayama, 2010). Nevertheless, web-based relationships, involving for instance patient recruitment in clinical trials, have not been specifically addressed in such policies. For the medical device industry, healthcare providers are not simply users of their products, but they also significantly partake in their product development activities and their knowledge and skills do affect the clinical outcomes of the technologies being commercialized (Chatterji et al., 2008). Hence, frequent communications and regular interactions between clinicians and technology companies are pivotal.

That being said, the websites we examined ignored the potential conflicts of interest that may follow from enrolling healthcare providers as spokespersons to promote innovations or as partners in commercialization. Critical observers find problematic when clinicians report to their peers the results of clinical studies that were sponsored by the industry. They fear it will influence physicians' 'decisions about which devices to use and how to document patient outcomes and, in turn, will compromise patients' welfare' (Chatterji et al., 2008: 1532). Others maintain that overlapping roles like the ones we observed can 'corrupt the physician/industry relationship' (Jost, 2010: 326). Our study suggests that the Web is adding another layer of complexity to these already contested relationships.

The literature on direct-to-consumers-advertisement (DTCA) of health products has raised concerns regarding patient welfare and autonomy, suggesting that it tends to create unrealistic expectations among patients (Mitka, 2008; Geransar and Einsiedel, 2008; Williams-Jones, 2006). While this observation is supported by our findings, our detailed analyses identified the virtual tools and messages by which companies enticed patients to play multiple roles, even though they are not direct purchasers of their technologies. These observations may offer useful guidance to scholars and policymakers since, as Racine et al. (2007) note, current regulations for DTCA were developed for prescription drugs; not only they seem ill-suited to cover 'hard' technologies, but they also focus on traditional media (broadcast or print media), leaving unaddressed the specific communicative properties of the Web.

Our study highlighted more specifically how patients were shaped into spokespersons, pro-active consumers, partners in commercialization, compliant patients or patients to be empowered. For each of these rather different roles, online resources were provided so they could take specific actions. Patients were even invited to register directly online for clinical trials,

thus bypassing their own physician while gaining access to an otherwise inaccessible technology. Patients were also provided with contact information for clinicians already committed to a certain technology. While observers agree that patients' expectations may transform the clinical encounter, there is no consensus as to whether this is for better or for worse (Nakayama, 2010; Racine et al., 2007; Wald et al., 2007; Sundar et al., 2011). Nevertheless, our study underscores how websites are approaching patients with positive messages, seeking to enroll them as advocates for particular technologies or as candidates for clinical trials, all active roles that can alter the way they engage with healthcare providers and institutions.

Limitations of the study

While our findings show that the Web creates concrete opportunities for medical technology companies to enroll stakeholders in the development and uptake of their innovations, the case study design we adopted precludes us from ascertaining the extent of such practices. Given the rapid pace at which websites are being updated, modified and rendered more sophisticate, researchers who wish to examine their content face particular challenges. We selected four companies that offered empirical diversity because of the core innovations they developed, but our observations cannot be generalized to the whole population of SMEs that can be found in the industry. The online promotion of some technologies may raise more complex ethical issues than those we have observed. The same caveat applies to the advertisement of online technologies that patients may access and buy directly, i.e., insulin injection devices. Even though our study findings stress the importance of taking the heterogeneity of stakeholders into consideration when examining virtual relationship building strategies, our analyses should be interpreted recognizing that a web visitors, in practice, may read the sections of their choice, not just those flagged as of interest to the category to whom they belong.

Our study also took place before the use of communication devices such as Facebook and Twitter became widespread in the business world. While such communication devices offer new ways of building virtual relationships between companies and stakeholders, we believe the narrative and interactive mechanisms we observed remain very informative because what seems to matter is how identities are assigned and roles framed in the digital world. Further research could explore if and how different digital tools do enable the creation of different identities and roles.

Finally, it should be underlined that, from a normative point of view, our goal was not to assess the potential value or benefits of corporate virtual relationships with healthcare system stakeholders. The identity-constructing activities we summarized, like any well thought-out marketing strategy, may succeed in powerfully shaping visitors' understanding of a given technology and, eventually, in playing a specific role in its use and diffusion. While some stakeholder groups may benefit from the virtual relationship building opportunities we observed,

the websites' capacity to shape specific identities, such as clinician-partner and patient-spokesperson, foster, we argue, ambiguous and potentially conflicting relationships. Although our study cannot determine the extent to which such enrolment strategies may be successful in practice, it contributes to current knowledge by clarifying the multiple and complex relationships that may be built on the Web. It also suggests that innovative health technology corporate websites require particular attention from health communication and health policy scholars and practitioners.

Conclusion

While websites have become powerful impression management tools (Connolly-Ahern and Broadway, 2007; Pollach and Kerbler, 2011), clinicians, patients and hospitals increasingly rely on the Web to gather information on medical products and treatments. This is why a better understanding of the ways in which companies may build virtual relationships with stakeholders is necessary. Accordingly, our study clarified how online resources may be used to this end and provided a conceptual framework that may guide further research in health communication.

This framework emphasized how companies deployed on their websites expositive and interactive resources to procure specific identities to investors, healthcare providers and patients. Most of these resources were geared at enabling each company moving forward with its technology development and commercialization. The websites not only promoted health technologies, but also assigned different identities to stakeholders and fostered multiple roles, including some that shape how such stakeholders may engage with healthcare institutions. By defining investors as narrowly business-focused, the websites maintain certain disconnect between the worlds of business and healthcare and, by placing healthcare providers in potential conflict of interest and raising patients' expectations, they added confusion to already complex relationships.

Where sensitive issues come into play — and the healthcare industry is by no means the only type of business dealing with sensitive issues — corporate communication strategies may explicitly adopt a responsible approach and seek ways to bridge the gap between the companies' interests in promoting innovative products and the concerns of those who adopt them (Guttman, 2011). Further research could seek to assess the respective outcomes of virtual enrolment strategies. Because the impact of industry-stakeholder virtual relationships may vary across publics, one should examine those who are in a powerful and strategic position and those who are more vulnerable to commercial strategies.

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