IT and Agility in the Social Enterprise: A Case Study of St Jude Children's Research Hospital's "Cure4Kids" IT-Platform for International Outreach

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Abstract

The agility literature suggests a positive relationship between IT-investments, agility, and performance for firms operating in turbulent contexts. However, agility studies have primarily focused on conceptual concerns, leaving these relationships empirically unexplored. In addition, the literature has focused on for-profit firms operating in commercial markets, thereby leaving other important organizational types unexamined; one such type is the social enterprise (SE). SEs are entrepreneurial organizations with a mission to improve complex social challenges (i.e., healthcare, hunger, education, etc) rather than profit maximization. This void leaves SEs in the dark as to how they can leverage IT to become more agile and improve performance. We draw on the agility perspective to examine how one exemplary SE operating in the context of pediatric global health utilized IT to enhance its agility and improve performance. We identify how the SE's IT-investment decisions resulted in an IT platform that facilitated increased agility in launching new products aimed at improving survival rates of children. Specifically, we analyze how the SE's IT platform positively impacted customer, partnering, and operational agility, and demonstrate how this led to dramatic improvements in performance. Finally, we offer evidence to support positive relationships between IT, agility, and performance in social sector contexts.

Keywords: *Agility, Social Enterprise, Global Health, Health IT, Collaboration, Non-profit.*

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1. Introduction

Firms invest in information technology (IT) with the hope of improving process efficiency, lowering costs, gaining access to better information, improving relationships with customers and business partners, and ultimately improving financial outcomes (Banker, Bardhan, Change, & Lin, 2006; Kohli & Devaraj, 2003; Nazir & Pinsonneault, 2008). IT is increasingly viewed as a critical resource for enabling firms to both sense and respond to threats and opportunities in turbulent and competitive markets (Oosterhout, Waarts, & Hillegersberg, 2006; Overby, Bharadwaj, & Sambamurthy, 2006; Sambamurthy, Bharadwaj, & Grover, 2003; Tallon & Pinsonneault, 2011). By applying agility principles, IT facilitates the generation of digital options that can result in business infrastructure that shapes a firm's ability to launch frequent and varied competitive actions (Nazir & Pinsonneault, 2008; Neumann & Fink, 2007; Oosterhout et al., 2006; Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003, Tallon & Pinsonneault, 2011). Digital options are unique IT-enabled capabilities in the form of flexible digitized enterprise work processes and knowledge systems that can facilitate improved managerial insight, which lead to faster and higher quality decision-making (Sambamurthy et al., 2003). Firms that integrate IT with strategies, processes, knowledge, and relationships increase the potential for creating digital options, and, as such, are more likely to realize increased IT value. This suggests that IT can be a digital options generator that serves as a strategic differentiator between market competitors to enhance a firm's competitive advantage and performance (Sambamurthy et al., 2003).

Enterprise agility is a relatively new perspective that proposes a positive connection between a firm's IT-related decisions, level of agility, and business success (Sambamurthy et al., 2003). Agile firms have been identified as those with the capability to recognize opportunities for leveraging IT in order to rapidly sense and respond to market opportunities (Oosterhout et al., 2006; Overby et al., 2006; Sambamurthy et al., 2003) by shaping digital options into competitive actions that result in improved business outcomes (Sambamurthy et al., 2003). The current agility literature is largely theoretical. Sambamurthy et al. (2003) introduce the notion of agility to the IS literature, refine the concept by defining three types of agility (i.e., customer, operational, and partnering agility), identify the role of IT as a strategic differentiator in competitive market environments, and offer a conceptual framework that suggests a positive relationship between IT, agility, and firm performance. Overby et al. (2006) differentiate agility from other related concepts by deconstructing enterprise agility into two core components, sensing and responding, and offer a conceptual model that explains how specific IT characteristics impact a firms' sensing and responding capabilities. Oosterhout et al. (2006) offer a conceptual framework that identifies specific environmental change factors that serve as drivers of agility in competitive markets and demonstrate the role of IT as both an enabler or disabler of agility. Hovorka and Larsen (2006) conduct an exploratory case study and demonstrate how the use of IT in a distributed network-organization positively impacts a firm's level of operational agility. More recently, researchers have adopted the agility perspective to frame empirical investigations of the relationships between IT and enterprise agility. For example, Tallon and Pinsonneault (2011) empirically explored the relationship between IT strategic alignment and a firm's level of agility and found that alignment enabled agility. Collectively, the current body of knowledge begins to define enterprise agility, identify drivers of agility, explores the link between organizational form and agility, and demonstrates a relationship between IT alignment and agility in for-profit firms operating in competitive markets.

To date, the agility literature has focused solely on for-profit firms operating in the boundaries of commercial markets (Neumann & Fink, 2007; Oosterhout et al., 2006; Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011; Tseng & Lin, 2011), which has left other important organizational types unexamined. One such type is the social enterprise (SE). SEs are similar to commercial for-profit firms in that both utilize entrepreneurial practices to transform materials and labor into products and services of greater value; therefore, similar organizational functions are likely to be present in both (Bornstein, 2007; Collins, 2005). Unlike commercial for-profit firms, SEs exclusively embrace a social mission in that they work to address complex social challenges (i.e., healthcare, hunger, education, poverty, etc) rather than profit maximization. SE's

strive to create social value. Social value results from SEs using and combining resources to produce positive social change (Austin, Howard, & Wei-Skillern, 2006; Dees, 1998; Drayton, 2006) that enhances the well-being of people and the planet (Brickson, 2007). SE's operate in turbulent environments characterized by unstable revenue mechanisms (i.e., fluctuating donation levels, competition for grants, and the customer's inability to pay for services) that make it difficult to match market prices for labor, materials, and other assets. Complex government regulations and a heavy reliance on a volunteer workforce also add instability to social sector environments. As a result, SEs can benefit from understanding the relationships between IT, agility, and social value creation.

This paper offers contextually anchored contributions (Chiasson & Davidson, 2004) to the current agility literature based on a longitudinal case study of IT-enabled agility in one SE, the International Outreach Program (IOP) at St. Jude Children's Research Hospital (SJCRH). The IOP strives to improve diagnosis, treatment, and survival rates of children with cancer and other catastrophic diseases worldwide, with a particular focus on low-income countries. The IOP is recognized as an exemplary SE that has successfully used its Cure4Kids IT-platform to positively impact global health (Quintana, O'Brien, Patel, Becksfort, Schuler, Nambayan, Ogdon, Chantada, Howard, & Ribeiro, 2008). We explore the differences between commercial for-profit contexts and social sector contexts, and investigate the relationships between IT, agility, and success for SEs. To our knowledge, this is the first study to use the agility perspective to investigate the relationship between IT investments, agility, and the creation of social value.

This paper contributes to the literature by extending existing concepts of agility to the social sector environment by conducting an empirical contextual case study analysis of how one SE's IT-investment decisions positively impacted agility and ultimately performance. In addition, this paper is the first to use the Sambamurthy et al. (2003) agility framework to investigate the relationships between a firm's IT-related decisions, levels of agility, and performance outcomes. In doing so, we demonstrate that the framework is beneficial for analyzing a firm's tactics for agility, and, in the context of our study, we identify examples of all three types of agility and demonstrate a link between an SE's IT-related decisions, agility, and improved performance. Finally, we identify a new set of performance measures for social sector organizations. This paper proceeds as follows. First, in Section 2, we offer a theoretical background related to both enterprise agility and social entrepreneurism. Next, in Section 5, we demonstrate how the IOP leveraged IT to effectively respond to the demands of the turbulent environment of global health outreach. In Section 5.4 we apply the Sambamurthy et al. (2003) conceptual framework in an analysis of the IOPs IT-related decisions, the resulting capabilities embedded in its Cure4Kids IT-platform, and increased levels of agility that ultimately enabled the IOP to launch more impactful actions aimed at overcoming the limitations of traditional outreach methods. Finally, in Section 6, we identify the IOP's performance measures and illustrate how its IT investments resulted in markedly higher levels of social value creation. In Section 7, we discuss our findings, possible future research directions, and the study's limitations and contributions.

2. Theoretical Background

2.1. Enterprise Agility

The concept of enterprise agility originated from concerns in manufacturing regarding the failure of organizations to make internal changes fast enough to meet the evolving requirements of rapidly changing markets and increasing customer demands (Dove, 1994; Youssef, 1992; Yusuf, Sarhadi, & Gunasekaren, 1999;). Sambamurthy et al. (2003) introduced agility to the information systems literature. They define enterprise agility as a firm's ability to detect opportunities for innovation and seize those competitive market opportunities by assembling the assets, knowledge, and relationships necessary to react to these opportunities with speed and surprise. They also proposes a conceptual framework that suggests the value of IT is in its role as a "strategic differentiator" and identifies agile firms as those that utilize IT to identify and launch a variety of initiatives to gain competitive advantage and improve performance.

In their conceptual framework, Sambamurthy et al. (2003, p. 256) define three separate dimensions

of agility: customer agility, partnering agility, and operational agility, and suggest that, by integrating IT into each dimension, firms can develop unique IT-platforms that enable a "business infrastructure that shapes the capacity of firms to launch frequent and varied competitive actions", which results in improved performance. Customer agility is defined as the involvement of customers in the exploration and exploitation of opportunities for innovation and competitive actions (Sambamurthy et al., 2003). It is proposed that a firm can enhance its customer agility by utilizing its IT platform to build and enhance customer relationships and leverage the voice of the customer to gain market intelligence, detect opportunities, inform product development, and conduct product testing. Partnering agility is defined as the ability to leverage the assets, knowledge, and competencies of suppliers, distributors, contractors, and logistics providers through partnerships that result in competitive opportunities for innovation that are difficult for competitors to duplicate. It is possible for a firm to enhance its partnering agility by utilizing its IT platform to enable greater inter-firm communication, collaboration, knowledge creation, and sharing. Operational agility reflects the ability of a firm's business processes to develop speed, accuracy, and cost economy in the exploitation of opportunities for innovation and competitive action. For example, a firm can enhance its operational agility by developing flexible, reusable, IT-platform capabilities that facilitate cost reduction.

Entrepreneurial alertness is a critical capability for developing agility. Entrepreneurial alertness is a firm's ability to recognize and respond to opportunities to detect market ignorance and identify appropriate actions that result in improved competitive actions. Sambamurthy et al. (2003) characterize entrepreneurial alertness by a firm's strategic foresight and insight. Strategic foresight is a firm's ability to identify threats or opportunities in the market, including potentially disruptive actions by its competitors. Strategic insight is a firm's ability to visualize connections between digital options, capabilities, and emerging opportunities.

The agility perspective highlights the role of digital options in building agility. Firms that integrate IT-assets with existing processes, knowledge, and relationships can develop an IT infrastructure that facilitates the creation of digital options. Any one digital option may support one or more of the three dimensions of agility, resulting in higher-order capabilities that enable quick adaptation to changing market conditions and the development of innovative inimitable products that differentiate a firm in the market and result in a competitive advantage (Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). Digital options extend the reach (breadth of information) and richness (quality of information) of a firm's knowledge and processes (Overby et al., 2006; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). For example, Amazon.com originally constructed its IT platform to support online book selling. The platform included the IT infrastructure necessary to support Amazon's book-selling business (networking hardware, web servers, databases, etc) and customized software (customer feedback systems, shopping carts, one-click ordering). Systems that were optimized for web-based retail became digital options embedded in the IT platform and were utilized by Amazon to reconfigure its resources and launch competitive actions aimed at new markets (e.g., digital books, music, tablets, and other goods). Digital options enabled Amazon.com to apply innovative customer focused services (e.g., recommendation and feedback systems) to new markets, and to offer new services including application hosting, web services, and cloud-based computing. While for-profit firms such as Amazon utilize digital options to improve profitability, we propose that SEs can benefit from using digital options in the pursuit of a different mission—the creation of social value.

2.2. The Social Enterprise

What is a social enterprise? The ongoing discussion concerning this question has resulted in several definitions (see Appendix A). For the purposes of this research, we adopt the position of Peredo and McLean (2006). To clarify their definition, they first conceptualize SEs on a continuum ranging from organizations whose mission is exclusively focused on addressing a social need (SEs) to organizations whose primary mission is profit maximization but who may also engage in some form of social responsibility. As Table 1 illustrates, elements of social entrepreneurism and social responsibility can be found in traditional for-profit organizations, but few definitions of SEs are so broad as to include commercial for-profit organizations that engage in corporate social responsibility activities (Martin & Osberg, 2007).

Table 1. Range of Social Entrepreneur Actions (Adapted From Peredo and McLean (2006))			
	Mission	**Role of commercial exchange**	**Example**
Social enterprises	Exclusively social	No commercial exchange	SJCRH (IOP)
	Exclusively social	Some commercial exchange, but profits are directed exclusively at addressing social goals	Newman's Own
Social responsibility	Socially focused business goals, but not exclusively	Commercial exchange, profits in part benefit entrepreneur	Tom's Shoes
	Social goals are prominent among other goals	Commercial exchange, profit-making is a prominent goal	Ben & Jerry's
	Social goals are subordinate to other goals	Commercial exchange, profit maximization is primary goal	Coca-Cola

Therefore, following Peredo and McLean (2006), we define the social enterprise as an organization: (1) whose primary mission is the creation of social value, (2) that demonstrates a capacity to recognize and respond to opportunities to create social value, (3) that employs innovation in creating and/or distributing social value, (4) that accepts a degree of risk in creating and disseminating social value, and (5) is unusually resourceful in dealing with the scarcity of assets that is unique to the social sector context. In summary, SEs apply the entrepreneurial practices of business to the pursuit of opportunities for social value creation and social transformation rather than for traditional profit maximization (Dees, 1998; Mair & Marti, 2006; Martin & Osberg, 2007; Murphy & Coombes, 2009; Zahara, Gedajlovic, Neubaum, & Shulman, 2009).

SEs are somewhat unique in the non-profit sector because they specifically focus on entrepreneurial actions and the development of innovative solutions aimed at addressing pressing and complex social needs (Bornstein, 2007; Dees, 1998), and because they typically strive for large-scale social transformation that reaches well beyond the confines of a single disadvantaged community (Drayton, 2006; Martin & Osberg, 2007; Murphy & Coombes, 2009). This focus on large scale change in disadvantaged populations differentiates SEs from other non-profit organizations that primarily focus on providing a social benefit for a local or specific community.

The markets that SEs service can also differentiate them from commercial firms. Commercial firms are organized to service markets that can comfortably afford new products or services and, as a result, are designed to create financial profits (Martin & Osberg, 2007). In contrast, SE's target social needs, and, to do so, they purposefully locate their activities in contexts in which commercial markets function poorly (Dees, 1998; Zahara et al., 2009). Their "customers" are aid recipients who do not have the luxury of market choice (Beamon & Balick, 2008) and often cannot pay for products and services (Oloruntoba & Gray, 2006).

SEs operate in extremely turbulent environments that may be even more susceptible to macroeconomic instability than for-profit organizations due to their reliance on donations, grants, government funding, and the intense competition for these limited funding sources (Austin et al., 2006). These resource constraints make it difficult for SEs to pay market rates for labor, which results in a reliance on a largely volunteer workforce characterized by high turnover. In addition, SEs often operate in areas of the world with limited infrastructure and unstable governments that present additional challenges. We propose that SEs provide a valuable context for extending our knowledge of the relationships between IT, agility, and performance.

3. Research Design

The primary motivation for this study is theory elaboration, a process of comparing pre-existing

understandings with observed events in an effort to extend existing theory (Lee, 1999). We chose to conduct a qualitative, contextually anchored longitudinal case study (Miles & Huberman, 1994) with an exemplary organization (Yin, 2003)—St Jude Children's Research Hospital's (SJCRH) International Outreach Program (IOP) based in Memphis, Tennessee. Qualitative methods are helpful when extending theory because they provide rich descriptions of phenomena and events in organizational contexts (Langley, 1999). Contextually anchored research is commonly conducted in industries unexplored in IS research, and it facilitates the interweaving of existing IS research with novel contexts (Chiasson & Davidson, 2004). The case study method provides an opportunity to explore significant phenomena in a unique context in which existing theory only provides a partial explanation and descriptive data can be especially revelatory (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Walsham, 1995; Yin, 2002). Case studies that explore exemplary organizations take advantage of rich, yet rare, instances of a phenomenon that has not previously received contextually sensitive research attention (Yin, 2002). For these reasons, we found a longitudinal case study fitting for understanding how the IOP's IT decisions determined its agility and associated success.

3.1. Research Site

St. Jude Children's Research Hospital (SJCRH), located in Memphis, Tennessee, was founded by Danny Thomas in 1962 with the mission to "find cures for children with cancer and other catastrophic illness through research and treatment" (www.stjude.org). SJCRH is internationally recognized for its pioneering work in both treatment and research related to cancer and other catastrophic pediatric diseases. It freely shares its research and medical discoveries, and its research has led to discoveries that have increased survival rates for pediatric cancer patients worldwide (Howard, Metzger, Williams, Quintana, Pui, Robinson, & Ribero, 2008). SJCRH has over 3300 employees and operating expenses of over $1.4 million per day that are primarily covered by donations from individual contributors. SJCRH is unique in that patients or their families are never asked to pay for treatment. They currently treat, on average, 250 patients per day and support 5400 patients in active status. After treatment, patients transfer to the After Completion of Therapy Clinic and receive annual evaluations until they are 18 years of age or for 10 years after diagnosis.

SJCRH estimates that 160,000 children worldwide are diagnosed with cancer each year. The number of annual cancer-related childhood deaths is rapidly increasing in low-income regions of the world (Howard, Marinoni, Castillo, Bonilla, Tognoni, Luna-Fineman, & Antillon, 2007). An estimated 20 percent of newly diagnosed children are fortunate enough to live in the United States, Europe, or other parts of the developed world where the cure rates currently approach 80 percent. The outlook is much bleaker for the remaining 80 percent of these children. Effective treatments for children in resource-poor countries are often unavailable in their community, limiting treatment to those with the resources to travel abroad (www.stjude.org/international). In response to this disparity, SJCRH established its IOP in 1993. Initially, the IOP relied solely on traditional methods of healthcare outreach. However, in 2002, the IOP launched its Cure4Kids IT platform, which transformed the way the IOP pursued its mission. We selected the IOP for our case study because it is an internationally recognized SE that has won several awards for its use of its Cure4Kids IT platform to positively impact pediatric healthcare and survival rates in the complex and turbulent environment of global health (Quintana et al., 2008).

Our case study is revelatory in nature (Yin, 2002); it was designed to examine how the IOP took advantage of its IT capabilities, and how these capabilities shaped its relationships and operational processes in a way that increased its agility in launching new products that dramatically improved performance. We were offered virtually unlimited access to the firm, which made it possible to investigate the context in detail by observing the processes involved in the continual shaping of the Cure4Kids IT platform.

3.2. Data Collection

Data collection occurred over a four-year time period between January 2008 and June 2012. Our primary sources of data include unstructured and semi-structured interviews, non-participant observations, direct interaction with the Cure4Kids IT platform, and organizational documents. In order to become familiar with SJCRH, the IOP, and Cure4Kids, we began our data collection process

with four general data gathering meetings. Participants included an IOP physician, the IOP Administrative Director, the IOP Director of Education and Informatics, and the Coordinator of Content Development. At the end of each meeting, the IOP Director of Education and Informatics provided us with a number of organizational documents (e.g., strategic plans, financial data, etc). We then made specific requests for interviews with the principle stakeholders associated with the IOP including managers, IT staff, education coordinators, users, volunteers, and IOP and SJCRH physicians. The Director of Education and Informatics agreed to our requests and facilitated access to these individuals. In all, we conducted 59 interviews. Table 2 summarizes the types and number of interviews conducted (see Appendix B for the interview protocol). In addition to our specific interview requests, the Director of Education and Informatics also invited us to a number of Cure4Kids planning meetings so that we could interact with additional physicians, fellows, and volunteer consultants. He also provided access to the Cure4Kids IT platform, and invited us to attend (as a non-participant observer) weekly "feedback and improvement" meetings with two clinics in Central America (participants included physicians, nurses, hospital administrators, and data entry personnel). During these meetings, we learned how the physicians at these clinics used the Cure4Kids IT platform to help make treatment decisions for their patients, interact and collaborate with physicians at other clinics, exchange patient and clinic related experiences, structure and conduct clinical trials, develop standardized treatment protocols, and improve internal clinical processes. In addition, we learned how clinic administrators used Cure4Kids to develop patient medical records, track patient data, and improve information flow.

Table 2. Summary of Interviews Conducted				
Position	**Number of interviews**	**Type**	**Time**	**Context**
Director Education & Informatics for IOP	4	Semi-structured	2 hours ea.	SJCRH
	12	Unstructured	1-3 hours ea.	SJCRH
	5	Unstructured	1 hour ea.	Cure4Kids (online)
Director of IOP (Physician)	1	Semi-structured	2 hours	SJCRH
Director of Medical Informatics & Clinical Trials (physician)	3	Semi-structured	2 hours ea.	SJCRH
	5	Unstructured	1-3 hours ea.	SJCRH
Administrative Director IOP	2	Semi-structured	2 hours ea.	SJCRH
Programmer (lead)	1	Semi-structured	2 hours	SJCRH
	2	Unstructured	1-3 hours ea.	SJCRH
	5	Unstructured	1-3 hours ea.	Cure4Kids (online)
Educational Outreach Coordinator	2	Unstructured	1 hour ea.	SJCRH
Content Development Coord.	2	Semi-structured	2 hours ea.	SJCRH
SJCRH IOP Physician	2	Unstructured	1 hour ea.	SJCRH
Live Events Coordinator	1	Unstructured	1 hour	SJCRH
C4K User - Clinic Physician (Central America)	5	Unstructured	1 hour ea.	Cure4Kids (online)
	1	Unstructured	1.5 hours	SJCRH
C4K User – Clinic Administrator (Central America)	5	Unstructured	1 hour ea.	Cure4Kids (online)
Research Fellow (Central America)	1	Unstructured	1.5 hours	SJCRH
Total:	59			

4. Data Analysis

Data analysis was conducted by each of the four researchers (three had process analysis experience and the last had contextual expertise). Our interpretation of how the IOP's iterations of IT-investment decisions resulted in specific IT capabilities that influenced agility, and ultimately performance, evolved through data analysis and discussions among the researchers. These discussions were fueled by iterative analysis of the interview transcripts, field notes, and other data sources. Our interpretations were then validated with IOP management and technical staff. Our analysis occurred in four steps.

First, we developed a timeline to facilitate the identification of relevant antecedents and outcomes of IT-enabled agility in the IOP (Yin, 2002). The timeline offered a general chronology of events associated with iterations of the IOP's recognition of opportunities and its IT-related decisions that influenced its agility and shaped its outreach actions.

Second, we created a preliminary list of pattern codes to help identify the relationships among concepts found in the textual data (Miles & Huberman, 1994). First, we identified instances of the IOP's entrepreneurial alertness (strategic insight and foresight) and the associated decisions to reconfigure, modify, or create specific IT-capabilities on the Cure4Kids IT platform. Using these as pattern codes, we manually coded the transcribed interviews and other data sources to identify evidence of how the IOP recognized opportunities and responded by investing in IT, creating digital options, and configuring its IT platform and infrastructure.

Third, we established a connection between the Cure4Kids' IT platform and specific instances in which the IOP rapidly reconfigured its IT capabilities, knowledge, and other assets to launch new products. These connections are evidence of the relationship between the IOPs IT-investment decisions, the creation of specific IT capabilities, and increased agility.

Fourth, we analyzed how the IOP's increased agility positively impacted performance outcomes. We identified relevant performance indicators associated with each of the three dimensions of agility (customer, operational, and partnering) identified by Sambamurthy et al. (2003) to demonstrate evidence of the relationships between IT, agility, and performance in the context of the IOP. Performance indicators were compared with those proposed in the agility literature to illuminate any differences associated with the social sector context.

5. Results

5.1. A Technical Response to International Outreach

Since 1962, sick children from around the world have traveled to SJCRH's Memphis, Tennessee campus for treatment. However, travel logistics and related expenses made it difficult for families without adequate resources to travel what were often great distances, leaving many children outside of the US without access to appropriate treatment. Limited numbers of physicians and available hospital beds further restricted the number of children that SJCRH could treat. These constraints remained consistent for roughly 30 years until one patient's case sparked SJCRH to recognize an opportunity to positively impact treatment and survival rates in resource-poor countries.

In the early 1990's, the mother of a SJCRH patient returned from Memphis to her home to El Salvador and asked, *"What happened to all of the other kids who were diagnosed at the same time as mine, but didn't have the money to travel, a visa, and connections?"*. Concerned about the lack of treatment options in her community, she established a partnership with a local doctor and together they started a small foundation. They approached SJCRH to ask for assistance. One Director recalls, "She said we have a little money, a doctor, and a place for kids, now we need technical advice*"*. In response, SJCRH established a formal program to address the need for medical information and expertise in clinics located in resource-poor countries. In 1993, SJCRH established its IOP as "a strategic approach to put some effort and value into treating children in other countries that are poor" (Director 2). The IOPs mission is "to improve the survival rates of children with cancer and other catastrophic diseases worldwide, through the sharing of knowledge, technology, and organizational skills".

Initially, the IOP adopted traditional "twinning" methods for its outreach efforts. Twinning involves a dedicated partnership between institutions in both high-resource and low-resource contexts and is widely recognized as an effective method for healthcare outreach programs (Ribeiro, Steliarova-Foucher, Magrath, Lemerle, Eden, Forget, Mortara, Tabah-Fisch, Divino, Miklavec, Howard, & Cavalli, 2008). Twinning programs in healthcare contexts are aimed at establishing basic clinical infrastructures, education, and community involvement, and at improving healthcare in resource-poor countries (Ribeiro & Ching-Hon, 2005). The IOP focused its efforts on developing local-level relationships with a few clinics like the one in El Salvador, each located in a low- or middle-income country. To ensure sustainability, the IOP also established relationships with local fundraising organizations. In six years, the IOP developed twinning programs with roughly 18 clinics mostly located in Central and South America. The IOP developed relationships through regular visits by an IOP physician to a clinic, typically two or three times per year. Between visits, communication continued via mail and phone, a slow and time consuming process by today's standards. In addition, the IOP hosted "fellows" from the clinics at the SJRCH and provided them with an opportunity to observe and learn.

The IOP's twinning programs facilitated the successful transfer of knowledge and processes to its 18 associate clinics and resulted in improvements in clinical infrastructures, medical treatment, and survival rates at the local level. However, the twinning program required high levels of financial and human resources, which restricted the impact of the IOP's efforts. Director 2 said:

> *The way we impacted those sites was through frequent travel, we had a St. Jude expert go to a country and say, 'I'll provide you with some information, and I'll stay here for a few days, we can treat these kids and develop a protocol and some internal processes for data tracking and record keeping'...It was really effective, but resource intensive, and still limited in the number of kids that were impacted...it wasn't the biggest bang for the buck.*

In 1999, the Director of the IOP observed a number of visiting fellows photocopying medical books while at SJCRH. The experience led the Director to recognize an opportunity to invest in IT in order to improve access to medical research, educational materials, and expertise at the associate clinics:

> *It all started when we noticed that the Fellows visiting us spent a lot of time copying materials before they returned home...the communities didn't have access to information…I even questioned them, saying listen, you are copying the book that is four or more years delayed...but they preferred to have old information than not to have anything… one idea came, how can we use technology to make relevant, current information available to these individuals at home?*

It was a "eureka moment" for the Director. He recognized that IT was rapidly becoming more available globally, and recalled that "At that time, we [the IOP] were betting that the technology in other countries was going to improve. It had in so many countries already—very abruptly, so we bet it would get to these countries too.". The IOP acted quickly and, in 1999, hired a contractor to create a web-based digital library to be shared with its 18 associate clinics: "The idea in the beginning was to have information, books, etc. that would be accessible by them [clinics] when they needed it.". Unfortunately, while the IOP recognized the potential of embedding its knowledge resources into a web-based system, the contractor did not have the necessary insight to effectively integrate the knowledge base into the web-based digital library. As a result, the digital library "didn't make the information available to the clinics...it just didn't meet the needs of web-based education" (Director 1).

Next, the IOP hired a director to oversee the development of the digital library. The director developed a website[1] that had both a digital library and cancer registry capabilities to support research. However, once again the technology was not well integrated into SJCRH's knowledge base. He had developed the correct technical solution, but he did not foresee the need for the knowledge base to mature and

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[1] Note that, although we use the term "website" here, the director more aptly developed the beginnings of an overall IT infrastructure.

"it just didn't grow in terms of content or features" (Director 1). Following the second failure, there was a period of lapse without a director and high employee turnover. The IOP hired a part time programmer to maintain the site and the clinics continued to use the digital library, but usage levels were low.

In 2002 the IOP tried again. It hired a new director who recognized the potential of integrating the IOP's digital library with SJCRH knowledge resources. He quickly targeted a weekly SJCRH seminar series. Each week, SJCRH hosted an expert speaker (some of them SJCRH physicians) to present current topics and teaching cases. The result was a sustainable source of content that would promote growth for the newly named "Cure4Kids" IT platform. Director 1 said:

> *We have a regular series of presentations here* [SJCRH] *and I thought of that as a source for high quality content, and it was new every week... I thought that we could record the seminars, along with the PowerPoint slides, and add that content and make it available...so we captured those on video and leveraged that content first...we revamped the website, it still had the digital library, but now it also had seminars.*

In October 2002, Cure4Kids went live with a "handful of documents" and 5 online seminars. The IOP's Central American associate clinics and clinics in Brazil and Morocco were provided access to Cure4Kids and customer support. A director recalled that "We picked our closest partners at the time to help us with operationalizing and improving Cure4Kids". In 2003, content reached 40 seminars and Cure4Kids began to "fundamentally change the face of how the IOP did business" (Director 2). Director 2 said:

> *The result was there were answers to questions* [for the clinics]*… We also started to use email to talk... The need for travel decreased and the [IOP] physicians could answer questions on a much more time-sensitive basis. This worked so well that we were able to expand into more countries and create new ways to provide information.*

Cure4Kids enabled the associate clinics to access current medical information that was previously unavailable to them. As a result of this success, the IOP increased its focus on using Cure4Kids as a foundation for recognizing and responding to new opportunities to develop new programs and further improve the transfer of knowledge, technology, and organizational skills. Director 3 said:

> *Cure4Kids is the starting point for any initiative now, that is a given... Cure4Kids isn't just a platform to build solutions anymore...it is part of the process to even start talking about any possibility or solution now.*

5.2. Entrepreneurial Alertness, Entrepreneurial Actions, and Cure4Kids

In 2003, the IOP increased its focus on Cure4Kids as a platform for launching new initiatives. In constructing Cure4Kids, the IOP created digital options in the form of a customized IT infrastructure including hardware, telecommunication systems, open-source operating systems and applications, specialized custom-developed code, and the knowledge and expertise necessary to integrate the various components into effective solutions. In this section, we describe iterations of the IOP's entrepreneurial alertness and resulting entrepreneurial actions that led to the creation of specific IT capabilities that shaped the IOP's Cure4Kids IT platform. Table 3 summarizes the recognition of specific needs and opportunities, and how the IOP responded by developing unique IT capabilities that resulted in effective solutions embedded into its Cure4Kids IT platform.

5.2.1. Cure4Kids

Prior to 2002, travel demands and limited communication between site visits restricted the impact of the IOP's outreach activities to its 18 partner clinics. Director 2 said:

> *When you look back to the early 90's you really had three ways to communicate; the phone, mail, and air travel... The reality was that these are poor countries and they can't make that phone call, even that simple technology was expensive and limited what we could do.*

With the introduction of Cure4Kids in 2002, the associate clinics could access current treatment information. At that time, the IOP did not track usage data (e.g., site visits, downloads, etc); however, they received regular feedback that indicated the information on Cure4Kids was beneficial to the clinics. As the IOP Director stated, "They [clinics] would tell us that they read a lot, and the books and seminars really helped them with the treatment of patients". The feedback indicated that Cure4Kids was enabling the IOP to respond quickly and effectively to address the information needs of its associate clinics. "It was clear that we were able to use this technology to extend our knowledge...to help the clinics in a meaningful way" (Director 3). By 2003, content had grown to over 40 seminars and an increasing number of articles. Figure 1 summarizes the evolution of Cure4Kids between 2002 and 2012.

Table 3. Entrepreneurial Actions & IT Capabilities		
Entrepreneurial alertness	**Entrepreneurial actions (IT capabilities)**	**Cure4Kids application**
Recognized need for low cost IT solution to address medical information deficits in low-income countries	Developed web-based knowledge repository and digital library IT-capabilities that support creation of, and access to, codified knowledge, enabling quick reaction to opportunities for knowledge transfer and sharing among stakeholders (extends knowledge reach)	Cure4Kids IT platform
Identified an opportunity for virtual meeting capabilities on Cure4Kids to extend knowledge exchange and facilitate collaboration	Developed virtual meeting rooms, meeting management tools, and document sharing IT-capabilities that support collaboration and enable quick reaction to opportunities to support sharing of expertise, tacit knowledge, perspectives, and resources among shareholders (extends knowledge richness)	Cure4Kids live meetings
Recognized a need for an IT solution to address workflow and informatics deficits in clinics	Developed a clinical repository, electronic medical record capabilities, workflow process support tools, and analytic tools that support the collection of clinical information, analytics, and information transfer to support clinical decision making. Enables quick reaction to opportunities for information use and process reengineering (extends process richness)	POND4Kids
Identified an opportunity to capture content from live meetings to make case information available to the public	Developed knowledge management, relationship management, and messaging capabilities facilitating the integration of teaching cases with the process of providing expert consultations. Enables quick response to opportunities to facilitate the flow of clinical expertise and teaching cases among stakeholders across a variety of geographical regions (extends process reach)	Consult4Kids
Recognized opportunity for an IT solution to support exchange of case information	Developed wiki and knowledge management capabilities to support the collection, validation (peer-review), and distribution of case-based (patient cases) information. Enables quick reaction to opportunities for perspective sharing, and the development and dissemination of tacit knowledge among stakeholders (extends knowledge richness)	Oncopedia
Recognized a need for IT solution to support community based cancer education	Developed collaboration tools and web-based capabilities to support communities of practice focused on education. Enables quick reaction to opportunities for focused web-based education programs (extends knowledge reach and richness)	Cure4Kids for Kids
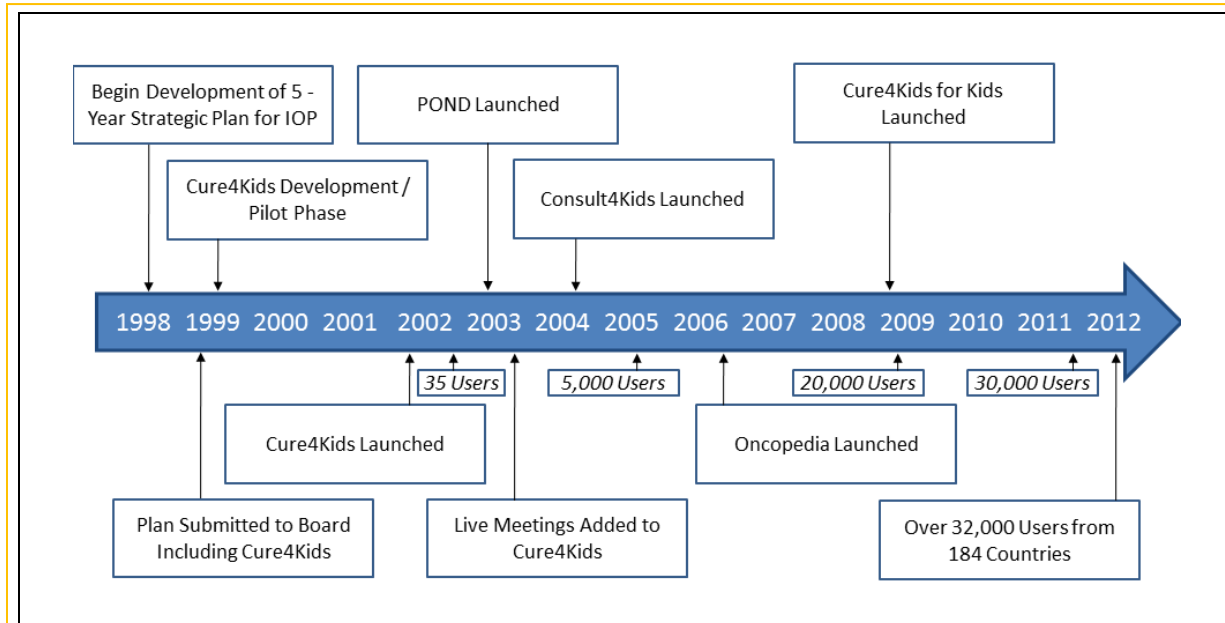
Figure 1. Cure4Kids Evolution

In 2003, the IOP Director attended a conference and while there met with a well-known physician from Italy who had conducted outreach in Nicaragua for over 30 years. The discussions sparked the Director's entrepreneurial energy again, which resulted in the addition of "live meeting" capabilities to the Cure4Kids platform. Director 1 said:

> *They had a great meeting, discussing clinical cases and outreach, and when he [IOP Director] returned he asked, "can't we use Cure4Kids now to continue the discussion?" This is really how our international presence was established, but we didn't know it at the time, we were just looking at how to keep the communication going.*

At the time, social networking technology was not widespread and the Director of Cure4Kids envisioned adding virtual meeting-room capabilities into Cure4Kids. As a technical solution, the IOP created "working groups" and document sharing capabilities with low bandwidth requirements. Registered users could form groups, set up either public or private meetings, and gather in virtual meeting spaces on Cure4Kids. An online meeting management software product that the IOP had previously purchased was integrated so that users could organize meetings (e.g., scheduling, announcements, invitee lists, etc) and share documents. Director 1 said:

> *We had our first meeting with Dr. M in Italy, our Central Americans and us all logged into a virtual conference room...they [clinics] presented their first case in PowerPoint...I can tell you the first year was quite a challenge in terms of getting people to use the technology...the audio quality was poor...but they were getting to know each other and really wanted to have these meetings and they put up with a lot of discomfort to get this off the ground.*

The IOP started to track usage related to site visits, downloads, number of groups, and meetings. Between 2003 and 2006, Cure4Kids had moderate growth in terms of groups, meetings, and downloads. By 2007, word began to spread and there was rapid growth of groups and meetings between 2007 and 2008. By 2012, Cure4Kids had 32,554 users in 185 countries with over 6,000,000 items downloaded (e.g., documents, seminars, etc). A Director recalled that, "Usage grew from about 200 people using per year to several thousand, the growth was phenomenal". In addition, Director 1 said:

> *Everybody was hearing about it at conferences, international meetings, and from local communities, the growth was exponential, we went from about 200 people to about 10,000 that year, we hit about 14,000 the following year, and about 20,000 in 2009...that's a lot of meetings, collaboration, discussion and knowledge sharing, and good will...we were having a much broader impact.*

The introduction of live meetings triggered rapid growth, established an international presence for the IOP, and dramatically improved the depth and breadth of knowledge exchange to levels that surprised even the IOP. They discovered that "the same set of strategies was useful over and over again... if Cure4Kids helps poor kids with cancer in the Philippians then it is probably going to help poor kids with cancer in India—most of our strategies, based on poor kids in Brazil and Central America, just got imported over" (Director 4). Evidence that Cure4Kids had extended the depth and breadth of the IOP's impact began to emerge. Director 4 said:

> *I can think of a case, a doctor from India said "the things that I saw with your patients is probably the same as in my patient profile so I changed treatment", it was a toxicity issue, it makes you wonder how many die from toxicity that could have been prevented if they were just in the US…through Cure4Kids we were able to help that child in India.*

The IOP discovered a dramatic increase in the number of independent working groups that often formed around geographic location and time zones. The groups met regularly on Cure4Kids (at least once a month) to sustain their own local collaborations. Director 1 said:

> *India is a good example...we have no partners there, haven't worked in these communities...but many people in India know about and use Cure4Kids...it's basically social networking at work, people found out about it and word spread.*

In the midst of rapid growth, the IOP continued to emphasize the importance of its close relationships with the original associate clinics. They established weekly meetings on Cure4Kids and realized dramatic improvements in communication and information exchange. Collaboration with the associate clinics was no longer restricted to two to three clinical site visits a year. The impact was illustrated by an unexpected decrease in international children coming to SJCRH for treatment. Director 2 said:

> *Because of the IOP, those international children, their stays here have decreased dramatically...I think a major contribution of that reduction is Cure4Kids and the access to information and live meetings...so the kids that you see here at SJCRH now are not necessarily here because they don't have treatment options in their home countries, but because they can come here and help us to research, it's a win-win opportunity.*

The IOP continually utilized its relationships with the associate clinics to identify new opportunities for outreach, to test new products launched on Cure4Kids, and to provide feedback for improvements. The associate clinics proved to be a valuable asset as the IOP heightened its focus on using Cure4Kids as a platform for developing new outreach efforts.

In 2008, the IOP discovered that physicians in other U.S. institutions were using Cure4Kids as a resource for information exchange and collaboration. A Director described one such user: "it was great, Washington D.C.'s Children's hospital was using it...we were excited about this and created a formal relationship with them". Many organizations would view the independent use of its IT-based products by another organization in the same industry as a threat to its uniqueness or its competitive advantage. The IOP viewed it as an opportunity for collaboration:

> *I have never been afraid to share or collaborate… well that may not have been true the first year or two...but I credit him* [Director of IOP] *with this...when we were partnering with some groups I thought that is going to take away from the uniqueness of what we are doing...if we share content...he said don't worry about it, they want to help kids, that's our mission too, collaborating is consistent with our mission* (Director 1)*.*

The IOP viewed collaboration with like-minded institutions as essential to achieving a meaningful impact on global health, specifically in the context of pediatric oncology.

> *These programs* [healthcare outreach] *will have to be interoperable, there is not enough money or knowhow to solve these problems in the care of complex chronic disease, multiple diseases...those who realize it earlier will move toward success faster than those who try to do it alone because…it's too complex* (Director 3).

The Director of Cure4Kids had a vision: he wanted to collaborate with other global health outreach institutions by sharing content across websites to increase the information available to clinics and the overall impact for the IOP and other like-minded organizations. The IOP viewed collaboration as a way to "help anyone who wants to help kids". The Director of Cure4Kids described the potential of collaboration:

> *We have a mission to share; it is part of our ethic, part of our DNA...what we are doing here is too big for one organization to change alone...if we collaborate we are all working toward our mission and having a bigger impact on the lives of children.*

The IOP focused on systematically promoting collaboration; however, they quickly met with resistance. Many similar organizations held a competitive mindset similar to those in for-profit firms. Director 1 said:

> *I have to be convincing of this collaboration, some others* [outreach organizations] *are still very territorial, they have the mindset that "we want all of our content on our site just for our users", but you know if their site doesn't grow then they aren't meeting their mission, and if they falter then that is another avenue for content that is closed to clinics who need it, no one meets their goals in the long-run.*

The IOP developed a "branding" strategy that would allow each organization to retain ownership of their content by providing a link to its content (e.g., seminars, papers, etc) to be posted on the partner institution's website. When a user clicks on a link, regardless of where the content was hosted, the originating organization's brand (name and logo) appeared. Eventually, through branding, the IOP successfully developed collaborations. Director 1 said:

> *We respect branding so these situations are doable, they work and we will all be stronger if we collaborate, we can help more kids working toward our missions together...and in the end no one cared if one site had more visits.*

The IOP's insight into how it could make use of Cure4Kids to engage in web-based collaboration with other outreach institutions enabled both the IOP and the other institutions to achieve a greater impact. Director 1 said:

> *It worked extremely well, those seminars have been viewed 150,000 times and half of the traffic comes from their site and half from ours, it was a win-win...and if one ends up with more traffic on their site that's ok, the impact on the kids is the important thing and I hope we helped them with that.*

5.2.2. Pond4Kids

Prior to 2002, Cure4Kids did not support capabilities for workflow processes or basic informatics. Clinical registry capabilities, designed as a database to support statistical research, had been developed during one of the two failed pilot tests, but the associate clinics had not used these functions and, as a result, the clinical registry remained in the background. Then, in late 2002, an IOP physician returned from a site visit. Programmer 1 said:

> *He* [IOP physician] *saw a need for improving workflow processes and support for informatics at the clinic...what we had didn't really support that, but we could definitely see an opportunity to help clinics with more of an electronic medical record approach.*

The IOP responded by reconfiguring the original cancer registry functions to develop IT capabilities with a clinical interface, similar to electronic medical records, as a way to support everyday workflow solutions that would meet the needs of the clinics. POND4Kids (Pediatric Oncology Networked Database) was launched in 2003 and represented a hybrid solution situated between a medical record and clinical registry. POND4Kids includes capabilities to support workflow processes and data exchange functions to support information exchange. Programmer 1 said:

> *When you share data through it, POND will automatically remove the names and identifying information of the patient...it removes birthday and name, but provides access to age...so you have relevant information, you can get an age of a person at diagnosis, just not the ability to identify the original patient...it's HIPAA compliant, but still holds some of the useful data sharing components.*

The IOP worked with one of its associate clinics, located in Brazil, to test POND4Kids. Director 1 said:

> *We worked with Brazil to test a new version of POND...the main thing was operationalizing our processes...we set up a team to help set up their medical records…we made some modifications and it turned out to be a nice solution for them...after they helped us test it we launched POND for all Cure4Kids users...and it grew considerably in content and access.*

From a technical perspective, the IOP carefully integrated POND4Kids' capabilities with those on the overarching Cure4Kids IT platform. Director 1 said:

> *They share the same architecture at the core...this was important, so whenever we do an improvement for Cure4Kids it can be migrated over to POND, they are linked at the hip...for example, we did a help system for Cure4Kids because it is a knowledge base, so you can search for information...and then we just moved that help software into POND and now you have a help management system in there too.*

POND4Kids provided workflow solutions for the clinics and also enabled the IOP to capture, cleanse, and integrate all of its data for other users to access.

5.2.3. Consult4Kids

By 2003, Cure4Kids supported information exchange, collaboration, workflow processes, and clinical registry capabilities for its rapidly growing user base. However, Cure4Kids did not have capabilities to connect users in need of specialized advice to experts in the field. The IOP saw an opportunity and, in 2004, it developed Consult4Kids to connect users with experts to facilitate case consultations. The IOP envisioned a system that would bring experts together with healthcare providers seeking advice and facilitate the discussion of treatment options in a Cure4Kids virtual meeting room. Since the information on Consult4Kids would be case specific, the IOP kept Consult4Kids data separate from the main Cure4Kids system to ensure that identifiable information was not improperly shared. Consult4Kids was designed with separate accounts, user names, and passwords from those on Cure4Kids. Director 1 said:

> *So here is an example where we weren't too happy with the result...our mission here was secure consultation and quick timing, two things that didn't happen...so we made entry a single form, but people don't like to do it because they have to log in, scroll multiple boxes, and compared to the immediacy of email where you don't log on or select anything, it didn't work...they just found it easier to email each other once they were in contact and circumvent the system and we couldn't capture that content...they just didn't use it so it didn't grow the way we had thought it would.*

Consult4Kids experienced slow growth from 2004 to 2007. In 2008, to address the usability issues, the IOP integrated Consult4Kids into the Cure4Kids platform and introduced single password capabilities for both. To address the tendency of users to rely on email to circumvent the system, they

developed message board capabilities. In addition, they used POND4Kids capabilities to remove identifiable information. Director 1 said:

> *It has grown a little faster since 2008, but we are still working on it...so we won't be sharing patient data, and the actual recommendation doesn't have the name of the patient, it just gives advice...it's working now and people are finding each other and using it more.*

5.2.4. Oncopedia

Onocopedia was launched in 2007 as a reaction to the exponential growth in the number of meetings on Cure4Kids and growing use of Consult4Kids. Oncopedia is a wiki-style system that enables users to upload patient case-based information for sharing. The patient cases are peer reviewed by a team of volunteer physicians who confirm information accuracy and HIPAA compliance. Director 1 said:

> *Both because of Consult4Kids and because of live meetings we saw an issue and thought, "there are a lot of good teaching cases out there that aren't being captured"...we started talking and we thought about Wikipedia which was really growing then, and we said "couldn't there be a way in which you could submit an online case?" We then thought about adding a formal peer review, quality check, and make sure it's accurate information and we started working on Oncopedia.*

In addition to hosting case information from experts, the IOP recognized that local communities, often in resource-poor countries, had unique cases or solutions. They envisioned Oncopedia as a way to support the exchange of case-based information among users who could benefit from the experience of others in similar communities. Director 2 said:

> *There was an issue regarding the diversity of pediatric cancer in the world...we know it* [cancer] *from the US and Europe, but not other places in the world, maybe it's the same, but maybe it's different...people were discussing cases that we had never really seen here...so we decided to create something like Wikipedia to encourage people from other countries to report very interesting cases and open them up for discussion to a much larger community.*

The IOP looked to the IT capabilities on Cure4Kids to develop Oncopedia. Programmer 1 said:

> *We reuse architecture as much as we can, and often the merging of capabilities from different systems on Cure4Kids...so with Oncopedia we were able to easily swallow it up as a Cure4Kids service...most of the functionality was already there so it* [Oncopedia] *didn't need a lot of additional work, or an additional log-in for the users...the main thing there wasn't technical, it was really more the peer review process and that has to do with our volunteers not the technology.*

In early 2007, the IOP piloted Oncopedia with one of its associate clinics and then tested the system with all of its Central American associate clinics. Oncopedia went live in late 2007 and, by 2008, there had been 20,000 items downloaded by 3,000 different users. The impact of Oncopedia is illustrated by a post from a user who adjusted the treatment of a child as a result of accessing a case titled "Cheek Mass for a Non-Hodgkin Lymphoma Case" that was posted on Oncopedia by Dr. X. The user said:

> *I tried it with two girls of 18 and 24 months with this tumor, with LNHP 2000 Protocol* [and] *excellent response to three years of survival at the moment, no express Medullary disease or required RXT.*

5.2.5. Cure4Kids for Kids

Launched in 2009, and piloted in Memphis, TN, Cure4Kids for Kids was aimed at developing capabilities to support local-level outreach efforts and positively impact treatment and survival rates by offering tools to support cancer education and prevention. Memphis was a logical choice for the

pilot program because the city of Memphis has a number of grim health statistics related to obesity, diabetes, and cancer that are well above the national average. The IOP developed partnerships with local schools in the Memphis City Public School System, and, as part of the program, IOP physicians visited the pilot schools to teach students about the biology of cancer, healthy lifestyle choices (e.g., smoking, diet, exercise, sun exposure, etc), and science. In addition, video games and educational content designed for children, teachers, and parents were hosted on Cure4Kids for Kids. The IOP leveraged Cure4Kids to develop new capabilities to support the Cure4Kids for Kids program. For example, at one point, the IOP recognized a need for teachers to be able to create individualized websites, and Cure4Kids did not have the web-hosting capabilities. Rather than developing or buying the needed capabilities, the IOP utilized the group functions on Cure4Kids to support webpage capabilities. Director 1 said:

> *So for Cure4Kids for Kids we took the idea of groups and we were able to create self-contained sites...so for the teachers, they will have their own website, but what it* [website] *really is, is a group.*

At the time of our research project, Cure4Kids for Kids was still in the pilot phase. The IOP's goal was to develop a program that includes organizational processes and technical capabilities on Cure4Kids to support users in developing collaboration with local schools aimed at cancer education and prevention.

In this section, we describe our interpretations of how the IOP's IT-investment decisions resulted in the specific IT capabilities on its Cure4Kids IT-platform. In addition, we describe how the IOP reused, modified, and reconfigured existing knowledge, processes, and assets to improve its outreach efforts, which thereby extended the depth and breadth of impact. In Section 5.3, we describe the Cure4Kids' IT characteristics that facilitated these actions.

5.3. IT-Platform Characteristics to Support International Outreach

In this section, we address the key IT characteristics of the Cure4Kids platform, which was driven by an open access strategy that enabled the IOP to quickly react to new opportunities.

5.3.1. Open Access Strategy

The IOP pursued an open access strategy, evidenced by its philosophy to freely share its content, processes, and technology with any organization or individual that shares its mission. The IOP provided technical advice and guidance to help others use Cure4Kids to support their own IT infrastructure, content, workflow processes, and knowledge sharing capabilities. To support these activities, the IOP focused on developing IT-capabilities to enable open access to information and facilitate the transfer to knowledge to clinics globally. This open access philosophy facilitated "branding" and collaboration with other outreach organizations and led the IOP to adopt open source tools to develop an adaptable IT-platform. Director 1 said:

> *Open access is fundamental to us...it's in our organization's DNA to share...the distinguishing factor between Cure4Kids and similar sites, like WebMD, is that we are providing free or open access...open access is critical for "branding" and collaboration... we are encouraging other similar organizations to do that too...but, even within other institutions, such as universities, and even other outreach programs, they have inflexible internal systems that highly restricts the impact of their content.*

5.3.2. Open Source

The IOP elected to develop Cure4Kids with open source tools for two primary reasons. First, it determined that proprietary software was prohibitively expensive. Programmer 1 said:

> *If we didn't use open source this wouldn't be possible, it would cost too much, so it is open source all of the time...for example, the entire operating system is open source – Linux...the web server, Apache...the database system, if we had to buy it all the IOP could not have created Cure4Kids as we know it.*

Second, the open source architecture provides stability since the IOP has access to all of the code. It is also easier to find volunteers, collaborators, and new employees, who are familiar with open source tools. Programmer 1 said:

> *The cost of a Visual C++…development environment… is huge stuff, you can do it, but it costs $5,000 a seat...so just having that in mind I think there would be a lot less Visual C++ developers than there are PHP developers...and it* [open source] *is easier to integrate, and I would say that there are readily a lot of people available out there...if I have a question or problem I can post a question online and you may get 10 answer and a discussion going, so it's an advantage to have all of those points of view rather than a contract with a company and sitting on the phone with tech support.*

5.3.3. Simple & Adaptable IT Platform

The IOP recognized the need for a simple and flexible platform that could be easily adapted for clinics with unpredictable IT infrastructures, modified for varying levels of technical experience, and quickly reconfigured to support the IOP's outreach actions. The open source architecture helped achieve a simple and adaptable IT-platform. Programmer 1 said:

> *We emphasize modularity, extendibility, and scalability and most of those right now are in the open source arena...plus open source is cheaper and more flexible and can match the different environments we work in around the world.*

Adaptability is a key Cure4Kids characteristic: it is critical in supporting rapid growth of users, content, and the ability to quickly launch new applications to meet the needs of users in very different areas of the world in terms of technological infrastructure, language, and culture. Director 1 said:

> *We are providing access to knowledge at no cost, and everything that we have done here with technology is to make the content available and accessible by low income countries with low bandwidth connections, with technology that isn't proprietary, its modifiable and flexible, so we can meet their needs* [users] *very quickly.*

The development of Oncopedia is an example of the adaptability of Cure4Kids. The IOP created Oncopedia almost entirely by reconfiguring capabilities already embedded in Cure4Kids. The simple and adaptable Cure4Kids platform enabled the IOP to integrate POND4Kids and live meetings to capture and share content on Consult4Kids; content that had previously been lost at the end of each consultation. Programmer 1 said:

> *We try not to reinvent the wheel, we think of how we can take our existing resources, it's like Lego's, how do we take our existing technical assets and modify them so that we can reuse them as much as possible.*

By embracing the concepts of open access, open source, and simplicity, the IOP realized its vision of creating a simple and adaptable platform that can quickly and effectively respond to new opportunities and challenges. Director 1 said:

> *Open source, open access, the software is open source and our people also share their knowledge freely and completely, so it's almost as if it reflects the personality of the people involved...open, agile, flexible, describe the platform, as well as the people.*

5.4. Developing IT-Enabled Agility

In this section, we use the Sambamurthy et al. (2003) agility framework to analyze how the IOP's IT-investment decisions, and the resulting IT capabilities on Cure4Kids, impacted agility. Table 4 summarizes how the three dimensions of agility apply to the IOP and Cure4Kids.

Customer agility occurs when a firm utilizes the voice of its customers as a source for ideas for innovation, as co-creators in the development of new products, and as product testers (Sambamurthy et al., 2003). The IOP enhanced customer agility by responding to customer ideas and feedback in

pursuing new opportunities for value creation, and engaging with them in the ongoing development and testing of new products. For example, through this process, the IOP discovered some users were reluctant to criticize or provide constructive criticism for fear of losing the service. The IOP addressed this by reassuring the users and explaining that constructive criticism and feedback are critical to the future success of Cure4Kids. As Cure4Kids matures, more users are providing feedback that will be incorporated into future actions.

Partnering agility is a firms' ability to leverage the assets, knowledge, and competencies of suppliers, distributors, contract manufacturers, and logistics providers through alliances, partnerships, and joint ventures (Sambamurthy et al., 2003). Partnering agility enables a firm to build a network of strategic, extended, or virtual partnerships that facilitates the exploitation of new opportunities and enhancement of its own capabilities (Sambamurthy et al., 2003). IT improves communication and enhances collaboration across firms. As such, it serves as a strategic differentiator that distinguishes a firm from its competitors, which leads to improved performance. The IOP focused on using IT to develop partnerships with like-minded global health outreach organizations in an attempt to extend the impact of its outreach actions. To support these partnerships, the IOP used IT to facilitate the integration of knowledge through collaboration with the aim of extending the reach and richness of each organization's actions. For example, the IOP successfully partnered with organizations such as Medpedia, the American Cancer Society, the International Society of Pediatric Oncology, the United Nations, and others. The IOP recognized that, by breaking down silos and collaborating with institutions with similar missions (i.e., to improve healthcare), together they could overcome knowledge and resource constraints and collectively achieve a more significant impact.

Table 4. Examples of IT-enabled Agility in the IOP		
Key applications	**Type of agility**	**Example**
Cure4Kids POND4Kids	Customer agility	Associate clinics served as the "go-to" testers for all new Cure4Kids programs prior to going live for all users. Users served as a source for ideas for the development of new programs. For example, a physician at a clinic expressed concern about a lack of process workflow capabilities; the IOP saw this as an opportunity to address a clinical need and developed POND4Kids in response.
Cure4Kids Oncopedia Consult4Kids Cure4Kids for Kids	Partnering agility	Cure4Kids served as a "strategic integrator" by facilitating "branding" and outreach collaborations that resulted in the integration of resources among like-minded organizations (i.e., American Cancer Society, etc.) aimed at achieving a greater collective impact on global health. The IOP partnered with local school administrators to launch Cure4Kids for Kids, an outreach to school children focused on cancer education and prevention.
Cure4Kids POND4Kids Oncopedia Consult4Kids Cure4Kids for Kids	Operational agility	Oncopedia is an integrated system that allows users to upload case related content onto Cure4Kids thereby expanding the depth and breadth of knowledge exchange. Cure4Kids' open source architecture provided a simple and adaptable platform that facilitated rapid reconfiguration and reorganization of assets to extend the impact of the IOP's outreach efforts from 18 associate clinics to over 35,000 users worldwide. Cure4Kids resulted in reduced costs, improved communication, and improved clinical outcomes.

Operational agility reflects the ability of a firm's business processes to achieve speed, accuracy, and cost economy, which ensures that it can rapidly redesign existing processes to exploit opportunities and gain a competitive advantage in commercial markets (Sambamurthy et al., 2003). The IOP concentrated its efforts on developing a simple, flexible, and modifiable IT-platform. The choice to use almost exclusively open source tools was a low-cost alternative that made it possible for the IOP, with its operating budget supported primarily by donations, to create the robust Cure4Kids IT platform. The IOP was continually able to utilize the digital options built into the platform to reconfigure resources and quickly react to new opportunities.

The IOP's IT investments led to increases in all three dimensions of agility. As a result, the number of users grew exponentially and more clinics could access content. Collaborative partnerships with other global outreach organizations resulted in a greater depth and breadth of knowledge exchange with communities in need. Operational costs decreased while knowledge transfer increased.

6. Performance Measures-Social Value Creation for Internernational Outreach

Identifying meaningful performance metrics was was difficult for the IOP. The organization repeatedly emphasized the importance of idenitifying meaningful success metrics to determine the efficacy of its existing activities in order to effectively guide future strategy. Director 2 said: "Measurement, we struggle with what meaningful [success] indicators are".

In the previous section, we use the Sambamurthy et al. (2003) conceptual model of agility to analyze the positive impact of the IOP's IT-decisions on customer, partner, and operational agility. In this section, we examine the relationship between increased agility and performance outcomes. We found that the performance measures in the existing agility literature (e.g., return on investment, revenue, market share, etc) did not translate well to the context of the IOP. As Director 2 said:

> So, ROI...there are many ways that we can calculate this, do a cost benefit analysis from let's say 10 years ago to today, so you provide a seminar on Cure4Kids vs. having to send all of those people on a plane trip somewhere, it's simple, and it tells us something about ROI...but I always go back to—it is the "unknowns"…that are more important to us, it's not so much the monetary as providing access on demand and that unknown impact that occurs somewhere...that is the important thing, the real value, and we can't capture that with ROI.

To examine how agility impacted performance, we identified performance measures that the IOP used to determine success, which allowed us to examine the relationship between agility and performance in the context of a SE. We identified the following performance measures: impact on a social need, empowering the user, resource integration through collaboration, facilitating clinical data and process standardization, dissemination of information, and improved operational processes.

6.1. Impact a Social Need

The most important indication of success was a positive impact on survival rates:

> The ultimate metric is a higher survival rate...which we have in our partner cities; we've gone from 30 percent to 70 percent (Director 1).

The IOP's annual reports indicate that at an associate clinic in Recife, Brazil (regular users of Cure4Kids), the cure rates for childhood cancer went from 29 percent to 60 percent. In addition, the probability of 4-year survival for El Salvadoran children with acute lymphoblastic leukemia increased from 10 percent to 60 percent over an eight-year period. A study conducted at another associate clinic determined that survival rates for Acute Lymphoblastic Leukemia (ALL) had risen to 70 percent. The IOP also found that the clinic had realized improvements in survival rates across all diseases: "It turned out that everything got better; it wasn't just ALL [Acute Lymphoblastic Leukemia]" (Director 4).

6.2. Empower Users

The IOP recognized success when the exchange of knowledge, technology, and organizational processes enabled users to improve treatment and increase survival rates in their own communities. Before Cure4Kids, the transfer of knowledge, technology, and organizations processes was restricted to its associate clinics and was a one-way flow of information. Access to Cure4Kids empowered local healthcare providers and communities, extended the impact, and improved sustainability of the IOP's outreach efforts. Collaboration among communities on Cure4Kids, independent of the IOP, is a powerful success indicator for the IOP. Director 3 said:

> *There are so many communities that need help...and we can't help everyone...you can't have one doctor going to Morocco, and to Central America, and the Middle East, and then back here to treat patients...there is just a finite amount of resources…so Cure4Kids helps us reach other places that need access to the expertise at St Jude...we give them that expertise so they can help themselves.*

One example occurred in response to a shortage of specialists in Central America. There are roughly 20 pediatric oncologists in all of Central America (SJCRH has over 40). These 20 oncologists are trained as generalists; however, to meet the needs of their patients, each one must become a specialist in a variety of cancers without the necessary resources and training. A group of Central American oncologists used Cure4Kids to develop a solution. As Director 4 said:

> *They worked out a system in Central America where they assigned each doctor to a specialty…for example, they said for Burkett Lymphoma this doctor in Honduras is going to be in charge of that…So all seven countries use the exact same treatment, review all the patients, and have meetings weekly, and every Friday afternoon is "Burkett Lymphoma happy hour"...the doctor from Honduras sets up the meetings …what is interesting is that this guy had no specific training in this area…he was a pediatric oncologist who saw every kind of patient, and now he has developed into an expert.*

Another example occurred when a group used Cure4Kids to share resources and provide desperately needed medicine to a patient:

> [Cure4Kids] *is enabling people to help people…basically using the technology to communicate their knowledge and help out in material ways...one example, we were having a meeting of the Central American group…they were discussing a patient, the treatment plan, how they were using the protocol, and what needed to be modified in the future. Someone typed a comment that they had a patient with a certain type of cancer. For this cancer there is a medicine that increases survival rates by 30 percent, but they were out of the medicine. So they said…does anyone have any that they could loan us? The chat started going back and forth…by the end of the conversation someone from a neighboring country that had the medicine had made arrangements to put the medicine on a bus and ship to the physician who requested it…they said it will be put on a bus at 2pm and the bus will be there by 6pm…the patient got the medicine that day…that was really, really good, because the whole point is St. Jude can't help everyone, so we try to help people help each other* (Director 4).

6.3. Integrating Resources through Collaboration

No single organization could meet the challenges of treating children with cancer in resource-poor countries. As a result, the IOP viewed collaboration and the integration of resources among global outreach institutions to be essential to achieving a meaningful impact. Director 1 said:

> *So, with the "Y" society, one of their sites wasn't growing, I proactively said "we will give you some links to our content that you can access freely"...it helped them, they grew, and could sustain their site...and you know if their site doesn't grow then they aren't meeting their mission—right? There is no one to drive traffic if their site falters...we don't want that to happen because that avenue for content would be lost to someone who*

needed the information...it wouldn't benefit the treatment of a child somewhere in the world...so I am glad that we were of help to them and their site grew...we have had more downloads too because others share content links on Cure4Kids...collaboration is critical and everyone benefits.

6.4. Data Process Standardization

The IOP emphasized the importance of helping clinics develop standard protocols with data analysis capability and performance metrics. Prior to Cure4Kids, clinics often did not have adequate workflow processes or medical record capabilities. Cure4Kids facilitated the transfer of both knowledge and processes that enabled the clinics to launch new standardization processes to improve treatment and outcomes. For example, when clinics adopt POND4Kids, they immediately engage in processes that support data standardization, which results in improvements in tracking treatment-based outcomes. Director 4 said:

When you have a pull down menu that has five items on it people are forced to put their data into this framework and in a way this forces a level of quality of thinking...I don't know how to quantify the benefit exactly, but eventually I can imagine that POND is the only way that childhood cancer information is collected and stored there and this would make it possible to do some better analysis on clinical outcomes.

The IOP later examined the impact of POND4Kids at an associate clinic and found that POND4Kids facilitated standardization that resulted in improved treatments and survival rates:

If they are tracking, and they know the protocol, then they think "If we are going to deviate from the standard plan there should be a reason why"...We studied this impact in Brazil, and we clearly saw that their ALL results had improved...there were also things done to make that improvement, like to reduce abandonment, improve transportation, housing, job training, a lot of different things...later we studied the effect of this on all of the other diseases and it turns out everything got better, it wasn't just ALL (Physician)*.*

6.5. Dissemination of Information

Sharing knowledge, technology, and organizational skills is at the core of the IOPs mission. Before Cure4Kids, the IOP only shared information with its associate clinics. Since launching Cure4Kids, the IOP's ability to share knowledge, technology, and organizational processes expanded dramatically, reaching over 35,000 users worldwide. One IOP Physician said:

You can't substantiate the impact on these poor countries...you know, access to information about medicine, treatment and plans, how to decrease infections in the hospital environment...even as basic as the benefits of washing hands.

Another example occurred after an IOP Physician visited a non-associate clinic in Africa. He recalled his observation of the availability of information at the clinic before and after Cure4Kids:

Before Cure4Kids we would go to a center in Zimbabwe...even in the year 2000 they were still using information from the 1970's because that is what they had access to...now that is not true today, because of Cure4Kids.

For the associate clinics, Cure4Kids significantly impacted the timely availability of clinical information. Before Cure4Kids, there were long periods of time between site visits and communication with the associate clinics, sometimes with negative consequences. Director 4 said:

Communication and collaboration is the most important thing…and we didn't even know that five years ago…in retrospect we see it…five years ago a physician from the IOP would personally visit each partner site, read everything, meet all of the people, look at the hospital, data, train people…it was very time and labor intensive…and even more sad, sometimes after a year and a half passed and you realized something came up

> *right after the last visit…so for a year and five months something that could easily be addressed was not…by having weekly meetings on Cure4Kids everybody is there…it's informal and things are solved casually, fairly informally, and timely.*

The IOP measures the impact of Cure4Kids on the dissemination of information by tracking usage data. In 2002, there were 35 registered users on Cure4Kids, all of whom were located at an associate clinic. In November 2011, there were 29,000 registered users in 178 countries, over five million items had been downloaded, and over 18,000 seminars were hosted on the site. By June 2012, Cure4Kids had 32,633 registered users with six million downloaded items.

6.6. Organizational Improvements

Internal process improvements were an important indicator of success for the IOP. Cure4Kids enabled the IOP to facilitate internal organizational process improvements not only in the IOP, but also in the entire SJCRH organization. This included improved efficiency, decision-making, and managerial foresight. The use of Cure4Kids by SJCRH increased exposure for SJCRH, and facilitated greater fundraising opportunities and results for SJCRH. Director 1 said:

> *We share our podcasting and knowledge of the technology with the IT Department on the St Jude side...more St Jude employees use Cure4Kids and that's important, we want to add value to St. Jude too.*

Cure4Kids increased awareness, recognition, and associated fundraising for SJRCH. As a result, SJCRH recruited several high-profile visitors that have generously supported SJCRH. Director 1 said:

> *When those high profile visitors come here they often donate $5,000 or $10,000 dollars...the recognition that they bring also helps with fundraising campaigns... so, because of our success we are able to contribute to fund raising efforts at SJCRH.*

Before Cure4Kids, the IOP simply focused on fulfilling the original expectations of extending the impact of SJRCH beyond its Memphis hospital campus. Cure4Kids enabled the IOP to "give back" to SJCRH in terms of improved processes, improved information and collaboration resources, and improved fundraising capabilities.

7. Discussion

Our case study, conducted over a four-year period (2008-2012), has documented the linkage between entrepreneurial alertness, IT-investment decisions, agility (customer, partnering, operational), and performance in the social sector context. Our analysis clearly shows that such a linkage can be found where the overarching goal of the firm is the creation of social value rather than obtaining a competitive advantage and securing higher profits. These findings also provide empirical support for the agility perspective as proposed in prior literature. (Nazir & Pinsonneault, 2008; Neumann & Fink, 2007; Oosterhout et al, 2006; Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). In this section, we discuss our findings and contributions, and offer propositions to guide future research related to IT-enabled agility.

Our study provides contextually sensitive contributions (Chiasson & Davidson, 2004) that extend our existing understanding of IT-enabled agility (Oosterhout et al., 2006; Overby et al., 2006, Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011) to the social sector context by showing how IT helped the IOP become more agile and how increased agility resulted in improved performance. Social sector organizations, such as the IOP, operate in turbulent environments and adopt entrepreneurial business practices to guide the transformation of materials and labor into products and services of greater value (Austin et al., 2006). This study illustrates that SEs can benefit from improved agility. Traditional healthcare outreach methods restricted the ability of the IOP to achieve a positive global impact on the treatment of children with cancer outside of its direct relationships with associate clinics. In response, the IOP invested in IT and developed specific IT capabilities to extend the breadth of its impact; these included a web-based digital library, live meeting capabilities, workflow process capabilities, and a wiki-style resource for user generated case based knowledge exchange.

We documented that these capabilities resulted in increased customer, partner, and operational agility, which lead to improved performance. As a result of these innovations, we found that, in the case of the IOP, the flow from turbulence to success through agility held true. Specifically, we found that, for the IOP, agility was manifest in specific IT platform-related decisions. For example, the decision to develop an IT architecture with open source tools provided cost savings and direct access to the code, which resulted in a simple and adaptable platform that supported rapid reconfiguration and the addition of new features, which, in turn, lead to increased operational agility. The platform improved the IOP's ability to meet the needs of its international users with varying levels of IT infrastructure in over 180 countries. Therefore, we propose that:

> **P1a:** *The use of open source tools to develop an IT platform lead to quicker development of new IT capabilities.*

> **P1b:** *Quicker development of new IT capabilities leads to higher levels of operational agility.*

> **P1c:** *The use of an open source architecture leads to fewer conflicting standards.*

> **P1d:** *The use of an open source architecture leads to higher levels of flexibility resulting in higher levels of international access.*

> **P1e:** *Higher levels of international access leads to higher levels of partnering agility.*

The IOP incorporated mechanisms to support user-generated content that increased customer agility. For example, Oncopedia facilitated user contributions that resulted in an increase in knowledge exchange related to unique, locally relevant treatment contexts. Therefore, we propose:

> **P2a:** *Open source architectures that incorporate mechanisms for user generated content lead to higher levels of flexibility in establishing an information portfolio.*

> **P2b:** *Flexible, IT-enabled user-generated content information mechanisms, lead to increased customer agility.*

Earlier agility studies (Neumann & Fink, 2007; Oosterhout et al., 2006; Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011; Tseng & Lin, 2011) propose that, for agile firms, "IT serves a strategic differentiator" that provides a competitive advantage in the boundaries of for-profit organizations operating in turbulent markets. Our study differed from these conceptions of agility in one important way; we observed that, for SEs, IT serves as a "strategic integrator" that increases social value creation by decreasing differentiation in turbulent social sector contexts by facilitating resource integration among SEs working toward similar social missions. Our results demonstrated how the IOP successfully used Cure4Kids to launch its "branding" program to effectively integrate resources across like-minded organizations and thereby extending the impact of all participating organizations on global health outcomes. This differs significantly from the context of for-profit organizations that could potentially be accused of price fixing or other anti-competitive practices if they engaged in this degree of collaboration. Our study extends current agility concepts by demonstrating how the IOP's decision to create a program to link and share content across websites facilitated resource integration among like-mined organizations and resulted in increased partnering agility and improved performance. In the case of the IOP, the Cure4Kids IT platform served as a strategic integrator that facilitated higher levels of partnering agility and improved performance. Therefore, we propose:

> **P3a:** *In turbulent social sector contexts, IT serves as a strategic integrator that leads to the integration of resources among SEs with similar social missions.*

> **P3b:** *A higher level of resource integration among SEs with similar social missions reduces differentiation among SEs in the social sector market.*

> **P3c:** *Reduced levels of differentiation among SEs in the social sector market results in increased enterprise agility.*

Finally, existing agility studies propose a positive relationship between agility and success in the context of commercial markets (Overby et al., 2006; Piccoli & Ives, 2005; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). Common across all of these studies, improved financial performance is the ultimate performance variable of interest. The impact of agility on performance has been measured in terms of return on investment (ROI), increased market share, return on assets, and net margins (Overby et al., 2006; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). In the case of the IOP, these financial performance indicators were not meaningful. Our study extends the current understanding of the relationship between agility and success by documenting meaningful performance measures for social sector contexts. In the context of the IOP, we found evidence of a positive link between increased agility and increased performance in terms of the following measures: positive impact on a social need, empowering users, facilitating collaboration and resource integration, dissemination of information, data and process standardization, and improved internal processes. We observed that, in turbulent social sector contexts, meaningful performance measures differ from those commonly used to determine success in for-profit organizations. Therefore, we propose:

> **P4:** *In the social sector context, key performance indicators include non-profit related outcomes such as: a positive impact on a social need, empowering users, integration of resources through collaboration, dissemination of information, data and process standardization, and improved internal organizational processes.*

Prior to 2000, the IOP had developed an effective international outreach program focused on improving the treatment and survival rates of children with cancer and other catastrophic pediatric illnesses through the exchange of knowledge, technology, and organizational processes. The IOP had demonstrated, with twinning programs at its associate clinics, the ability to sense opportunities to address clinical needs in resource-poor countries and seek appropriate organizational responses. This existing entrepreneurial alertness (Overby et al., 2006; Sambamurthy et al., 2003) shaped the IOP's IT-related decisions that led to the creation of digital options and the development specific IT-capabilities on the Cure4Kids platform between 2000 and 2012. The IOP's ongoing experience with Cure4Kids resulted in a learning process that emphasized continuous entrepreneurial alertness (sensing and responding) for using IT to effectively address new opportunities and perceived needs. As a result, the IOP emerged a more agile organization adept at using Cure4Kids to strengthen its customer, partner, and operational agility, enabling the organization to quickly launch new initiatives. Our study offers evidence of the relationships between IT, agility, and success. Specifically, we demonstrate that, in the context of our study, manifestations of IT-related decisions are related to increased agility, and we observed increases in each of the three types of agility. In addition, we offer evidence that increased agility resulted in improved performance. Finally, we provide evidence for new success measures that are more relevant in the social sector context of our study.

7.1. Future Research

Our findings have implications for future research into IT-enabled agility. In this project, we documented, in the context of our study, a positive link between entrepreneurial insight, a firm's IT platform, enterprise agility, and increased performance outcomes. We also demonstrated how the Sambamurthy et al. (2003) conceptual model can inform the investigation and analysis of IT-enabled agility in different organizational contexts. Future studies could further develop existing conceptual agility models by examining IT-enabled agility in additional organizational types and contexts where there are differences in managerial competence. Second, we suggest that IT can serve as a strategic integrator that can positively impact agility and performance outcomes. Further studies could empirically validate this insight and investigate the relationship between IT, agility, and value creation in the context of new market environments such as emerging markets centered on social networking technology (e.g., Facebook, Twitter, etc). Finally, we document that existing financially focused measures of performance do not adequately address the idiosyncrasies of some specific contexts, such as those found in the social sector. Future studies can extend this insight by exploring the relationship between IT, agility, and performance in different contexts including other social sector environments, non-profits, health care contexts, governmental organizations, and emerging organizational forms.

7.2. Limitations

As with any research, there are several limitations that should be considered in interpreting the results of this study. While we have conducted a rigorous and in-depth longitudinal case study, our sample is limited and specific in context (healthcare outreach). Therefore, we must be cautious when considering transferring these findings to additional contexts. In addition, our research is interpretive in nature and we recognize that the inherent biases of the researchers influenced our interpretation of the data and the presentation of the results.

We chose to conduct this case study at St. Jude Children's Research Hospital's International Outreach Program because it provided a unique opportunity to examine a context not previously explored in the agility literature. SJCRH, and its IOP, are leaders in the field and the exemplary nature of the organization presents some limitations. Some of the strategies and actions captured in our interpretation may not work as well for SEs with more limited resources. In addition, the leadership and philosophy of the IOP may be very idiosyncratic to the personality, confidence, and competence of this unique SE. As a result, it should be acknowledged that the solution that provides agility for the IOP may not translate well to smaller, less-progressive organizations that do not have the same level of technical capability.

8. Conclusion

We applied the Sambamurthy et al. (2003) conceptual model for agility to help explain how a SE operating in the turbulent context of global health outreach leveraged IT to overcome the limitations of traditional outreach models by developing specific IT capabilities that resulted in greater depth and breadth of impact on the treatment of children with cancer. From a practical point of view, these findings can provide a template that can inform practitioners about how to structure similar programs.

Our research contributes to the understanding of the relationships between IT, agility, and success by demonstrating how IT can help organizations sense and responds to new opportunities to improve performance (Overby et al., 2006; Sambamurthy et al., 2003; Tallon & Pinsonneault, 2011). We examine these relationships in the previously unexplored social sector context by analyzing how one SE's IT decisions to develop specific IT capabilities enabled it to become more agile in the pursuit of its mission. We identify specific decisions that enabled the SE to sense opportunities and challenges in the environment and to respond by reconfiguring its resources to develop specific IT capabilities that increased customer, partner, and operational agility. We demonstrate how the SE developed digital options that were used to shape new capabilities that positively impacted performance. We illustrate that existing financially focused performance measures did not adequately translate to the SE context and we identify new measures of success that are more relevant to social sector organizations. Finally, we discover that, in the context of this study, the value of IT emerged from its role as a strategic integrator that facilitated the integration of resources among like-minded outreach organizations, increasing performance outcomes relevant to the social sector context.

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Appendices

Appendix A.

Table A. Definitions of Social Enterprises from Existing Literature	
Source	**Definition**
Leadbetter (1997)	Engaging in entrepreneurial behavior for social ends rather than for profit objective, or alternatively, that profit generated from market activities are used for the benefit of addressing social needs
Dees (1998)	Being a change agent in the social sector by a) adopting a mission to create and sustain social value (over private value), b) sensing and relentlessly pursuing opportunities to serve that mission, c) engaging in a process of continuous innovation, adaptation and learning, d) acting boldly without being limited by current resources, and e) exhibiting heightened accountability to the constituencies served and outcome created
Drayton (2006)	A major change agent, whose core values center on identifying, addressing, and solving societal problems
Mort et al. (2002)	A multidimensional construct involving the expression of entrepreneurially virtuous behavior to achieve a social mission…the ability to recognize social value creating opportunities and key decision-making characteristics of innovation and risk-taking
Pearce (2003)	Non-profit organizations that pursue social objectives through the sale of goods or services
Alford et al. (2004)	Creates innovative solutions to social problems, mobilizes ideas, capacities, resources, and social arrangements required for social transformation
Dart (2004)	A strategic response to many of the varieties of environmental turbulence and situational challenges that nonprofit organizations face
Tan et al. (2005)	Making profits by innovation in the face of risk with involvement of a segment of society in need, where benefits accrue to that same segment of society
Mair & Marti, (2006)	...creating value through the innovative use and combination of resources…explore and exploit opportunities to create social value by catalyzing social change or addressing social needs
Harding (2006)	businesses trading for a social purpose…an organization with social objectives who surpluses are reinvested for that purpose in the business or in the community, rather than being driven by the need to maximize profit for shareholders an owners
Peredo & McLean (2006)	Aimed at creating social value…shows a capacity to recognize and take advantage of opportunities…employ innovation…accept and above average degree of risk…unusually resourceful…in pursuit of a social mission
Martin & Osberg (2007)	Social entrepreneurship is the: (1) identification of an unjust equilibrium that causes the exclusion, marginalization, or suffering of a segment of humanity that lacks the financial means or political clout to achieve any transformative benefit on its own; (2) identification of an opportunity in this unjust equilibrium and developing a social value proposition to challenge the equilibrium; and (3) forging a new equilibrium that alleviates the suffering of the target group through imitation and the creation of a stable ecosystem that ensures a better future for the targeted group and society
Certo & Miller (2008)	Social entrepreneurship involves the recognition, evaluation, and exploitation of opportunities that result in social value—the basic and longstanding needs of society—as opposed to personal or shareholder wealth
Zahra et al. (2009)	Encompass activities and processes undertaken to discover, define, and exploit opportunities in order to enhance social wealth by creating new ventures or managing existing organizations in an innovative manner.
Faminow et al. (2009)	Innovative learning organizations with a mission to create social value in risky adverse environments characterized by one or more market failures
Murphy & Coombes (2009)	A venture intended to promote a specific social purpose a context of mobilization or a shared orientation about a social purpose which can transcend the boundaries of a venture and subsume many constituents.

Appendix B.

Table B1. Interview Protocol

1. Who am I interviewing?
   a. What is their role?
   b. What is their relationship to Cure4Kids?
   c. What is their educational/experiential background?

2. General Information about Cure4Kids?
   a. How does Cure4Kids fit into the overall SJCRH/IOP?
   b. Why was the Cure4Kids program established?
   c. Why was the Cure4Kids program established?
   d. What is the Mission of the Cure4Kids program?
   e. Is the contribution of C4K partitioned from the overall IOP?

3. How is Cure4Kids funded?
   a. How does the funding structure impact decisions about growth strategies?
   b. What types of "failures" have resulted in the flow of resources away from C4K and toward another IOP project?
   c. What role do your customers play in obtaining funding?
   d. What role do your strategic partners play in obtaining funding?

4. Who are your customers?
   a. How do they become customers?
   b. How do they know about Cure4Kids?
   c. How do they use Cure4Kids?
   d. How do they integrate Cure4Kids services into their organization?

5. Who are your partners?
   a. How do choose a strategic partner?
   b. Who are your strategic partners?
   c. How do strategic partnerships evolve?
   d. How is the Cure4Kids IT-platform leveraged to enable strategic partnerships?
   e. What is the goal of strategic partnerships?

6. Who do you consider your competition?
   a. How is the Cure4Kids IT- platform leveraged to deal with competition?
   b. How does Cure4Kids differentiate itself from the competition?
   c. How do competition organizations fit into Cure4Kids' strategic planning?

7. Describe the Cure4Kids IT-platform/architecture?
   a. Software (purchased, built in-house, etc?)
   b. How did you decide on the individual elements of the IT-platform?
   c. How did the your "customers" shape your choices in developing the IT-Platform?
   d. How did your strategic partners shape your choices in developing the IT-Platform?
   e. How did your competition shape your choices in developing the IT-Platform?
   f. What are the most important characteristics you considers when building the C4Ks platform? (ease of use, scalability, etc.)

Table B1. Interview Protocol (cont.)

8.   How do you decide to build new products or services?
   a.   Triggers for new products/services
   b.   Triggers for improvements
   c.   Problems/failures
   d.   Successes
   e.   Any surprises?
   f.   How do you discover new opportunities to develop products and services?
   g.   How does C4Ks leadership shape the technical IT platform?

9.   How do you go about researching new products and services?
   a.   Where do the ideas come from?
   b.   How do you leverage the Cure4Kids IT-platform when developing new products and services?
   c.   How does the IT platform provide a foundation for new services or solutions?
   d.   How does Cure4Kids handle speed to market (prioritize)?
   e.   In what ways have you had to be innovative and agile in developing solutions based on community need?
   f.   How does the C4Ks IT platform allow you to be creative with limited resources and employing current capabilities to address needs/solutions?
   g.   Percentage of solutions that are improvisational vs. planned (strategic)

10. When a solution or service isn't working?
   a.   How do you know?
   b.   What do you do?
   c.   An example of dropping a program or service?
   d.   An example of reacting to fix a problem?

11. What is success for Cure4Kids?
   a.   How is Cure4Kids evaluated by the IOP/SJCRH?
   b.   Success Measures?
   c.   What is a good outcome?
   d.   How do you know you've been successful (even if you aren't measuring?)
   e.   What changes do you see in the communities, or feedback do you get?
   f.   How do you know when you have implemented something, but could do better?
   g.   What would be a good success measure that you are not currently collecting data on?

About the Authors

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Yuri QUINTANA is the Director of Education and Informatics in the International Outreach Program at St. Jude's Children's Hospital. He has led the development of several international online projects, including *www.Cure4Kids.org*, a pediatric cancer education website used by thousands of health professionals in over 180 countries. Prior to joining St. Jude, He was a principal investigator in the Canadian HealNet Research Network focusing on consumer health informatics; while there, he designed breast cancer decision support systems for the Canadian Cancer Society. Formerly a faculty member at the University of Western Ontario, Quintana also served as director of the New Media Research Lab. He has held high-tech positions at IBM Canada Limited, Watcom Inc., WATFAC, and the University of Waterloo, and has chaired four international conferences on medical informatics, Quintana earned master's and doctoral degrees in systems design engineering and an undergraduate degree in electrical engineering and computer science, from the University of Waterloo. Quintana's research focuses on the development of innovative Internet technologies that empower communities of health care professionals and consumers to communicate, learn, and collaborate worldwide.