Research Article

Incorporating Human-Centered Design at Merck: How One IT Organization Became More Entrepreneurial and Enhanced Its Role in the Process

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Abstract

For decades, IT leaders have sought to become more innovative and responsive to their respective organizations, and in the process strengthen their relationship with their end-user community by delivering systems on time and within budgets that also surpass end-user expectations. Adopting a more entrepreneurial mindset within IT has been suggested as one way to achieve these goals. The premise presented in this paper is that Design Thinking -- or more specifically "Human-Centered Design" -- is a process and mindset that will help create a more entrepreneurial culture in organizations. In the paper we outline the major tenets of design thinking: a focus on human values, radical collaboration with the end-user, empathy-driven requirements determination, a relentless focus on the end-user's point-of-view, and rapid prototyping/testing in close proximity to the end-user. In addition, we present a chronology of how Human-Centered Design has shaped the innovation process at a large consumer-based pharmaceutical firm and how design thinking is now serving as the basis for energizing the company's IT organization and its end-users in driving real business value.

Keywords: Innovation, Entrepreneurism, Design Thinking, Pharmaceutical

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Introduction

"Intrapreneurial" behavior – that is, having employees within an organization behave like entrepreneurs – has been linked to improved organizational innovation according to Park, Kim, and Krishna (2014), as well as firm performance according to Antoncic and Antoncic (2011). Furthermore, Benitez-Amado, Llorens-Montes, and Perez-Arostegui (2010) suggest that this connection applies within the IT context as well. Therefore, it seems reasonable for IT executives to find ways to help foster entrepreneurial behaviors within their organizations.

This effort seems all the more reasonable when one considers that the Society for Information Management (SIM), through a series of commissioned studies over the last few decades (for example, see Brancheau, Janz, and Wetherbe's "key issues" study (1996)), has learned that IT leaders have repeatedly identified the following issues that may also be addressed by a more innovative and entrepreneurial IT organization:

- Aligning IT strategies to better match their business's strategy
- Creating more responsive IT organizations in terms of IT service delivery as well as time to market with IT-enabled products and services, and
- Improving the standing and relevance of IT organizations within their respective businesses.

This paper argues that Human-Centered Design (HCD) – a novel, user-centered design and development process – may serve address the needs for improved firm performance and innovativeness as designers and developers begin thinking more like entrepreneurs who promote innovative product development and marketing efforts. In addition, as HCD is known to serve as a means to enhance the ability of design teams to better understand their customers, and to help the designers deliver products and/or services in a more timely manner, it may also serve to address the key IT issues

described above. Finally, as a by-product of the HCD approach, designers and developers may develop stronger and healthier relationships with their customers.

Merck and Company ("Merck") is one of the largest pharmaceutical companies in the world, and is headquartered in the U.S. Their product line includes vaccines, prescription and oncology pharmaceuticals, veterinary medicines, and consumer health products. The Merck Consumer Care subsidiary oversees a broad product line of consumer-based and over-the-counter products, including well-known brands like Dr. Scholl's®, Coppertone®, Afrin®, and Claritin®.

In this paper we outline how Merck Consumer Care's IT organization has adopted HCD as a way to improve its innovative capacity in product design, its responsiveness to its end-user and customer community, and in so doing has created a more entrepreneurial culture and elevated its leadership stature within the Merck Consumer Care organization. We offer the insights gained in their HCD journey – in terms of best practices and lessons learned – and suggest that other IT organizations can derive similar benefits by incorporating the ideas and approaches inherent in design thinking.

The Role of Human-Centered Design in Addressing Perennial IT Challenges

As alluded to earlier, IT organizations have long faced a fairly static list of challenges as evidenced by results in numerous SIM "key issues" studies. One of these challenges includes configuring the IT organization's mission, goals, and strategies to be more closely aligned with the mission, goals, and strategies of the overall business. Such alignment, it is posited, enhances IT's ability to assist the organization in meeting its goals and objectives in the most efficient and effective manner possible.

A second time-honored challenge includes issues related to the provision of better service to the broader company and ultimately its customers. These issues

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include being more flexible in responding to the dynamic nature of end-user requirements for new or enhanced IT platforms as well as being more agile in responding to changes in business climates and customer tastes and preferences. The logic here suggests that if the IT organization can possess this kind of agility, they will be better positioned to deliver IT-related products and services to their end-user community in a more timely manner, which will then translate to the IT organization being able to positively affect the overall organization's time-to-market – the ability to deliver new products and services to the ultimate customers more quickly.

A third perennial challenge relates to improving the perception of the IT organization vis-à-vis the other functional areas in the organization. This has been portrayed in a myriad of ways, from having the IT organization being viewed as the organization's thought-leader for innovation, to viewing IT as a new source for the organization's revenue stream.

In essence, these three challenges can be met if the culture of the IT organization were more entrepreneurial in nature. That is, if employees were to view their efforts within a context of being more autonomous and innovative in how they design, develop, market, and deliver IT products, all stakeholders – the IT organization, the larger corporate organization, and the end-using customers – would all be better served. We believe HCD can help achieve this entrepreneurial mindset. In the next section, we introduce HCD in more details, and discuss how it specifically addresses these IT challenges. Following that, we illustrate how Merck Consumer Care's IT organization has achieved positive results by adopting an HCD mindset in its system development efforts.

A Human-Centered Design Primer

HCD is an offshoot of a school of thought known as *design thinking*. Depending on whom you ask, you may hear that design thinking is a mix of scientific thought and artistic thought applied to problem solving, where the problem is coming up with a functional and innovative design. In fact, design thinking is a broad and amorphous concept, with an equally broad heritage.

The History of Design Thinking

Some embrace the notion of "design" from an artistic perspective – fine arts, graphic arts, etc. – and the history of these origins can be traced to archeological artifacts at the dawn of humankind. Interestingly, the field of IT played an important role in the evolution of design when Herbert Simon's (1969) "Sciences of the Artificial" introduced a scientific approach to design, where design process is conceptualized as a problem-solving task. At about the same time, the concept of "visual thinking" emerged in the field of psychology and can be seen in the book by Rudolph Arnheim (1969) and later in the engineering domain at Stanford University, as seen in the book by Robert McKim (1973).

More recently, today's notion of design thinking as a creative and innovative endeavor can be traced to follow-on efforts at Stanford, most notably Horste Fast and his colleague David Kelley. Here the focus of design continued to evolve on campus (at Stanford's "d.school"), as well as within Kelley's design firm, IDEO. Probably as a result of IDEO's mission to aid its clients in coming up with innovative solutions and the d.school's mission to educate its participants in innovative design, design thinking began to be equated with innovation. Today's design thinking has taken on a more human-centered flavor, and is often referred to as "Human-Centered Design", due to it's emphasis on engaging the user/customer/consumer early and often in the design process.

HCD Today

The Stanford d.school's version of HCD can be broken down into the following five steps as illustrated in Figure 1:

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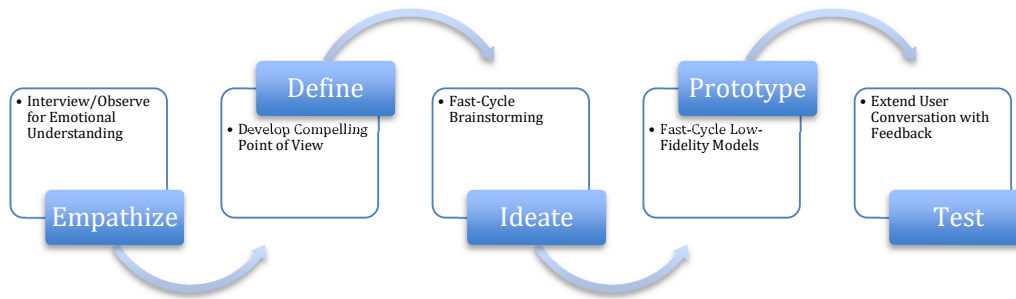
Figure 1: 5-Step Process for Human-Centered Design

During the **Empathize** phase, designers immerse themselves in the world of the customer in an attempt to understand their challenges, needs, and desires pertaining to a certain "design challenge" faced by a user or community of users. As part of the process, designers first observe users within the context of interest, develop hypotheses as to what the challenge is, and then engage the users through field-based intercept interviews in an attempt to gain an empathic understanding of the user perspective at an emotional level. For example, rather than just soliciting the user for a list of needs and requirements, the designer will push the user to share *why* they have these needs, and *how* meeting or not meeting these needs makes the user *feel*. Asking the user to share personal stories related to the challenge is one way to achieve empathy during this phase, and is the essence of the "human-centered" nature of HCD. Typically, after this phase, the designers will have a collection of such user stories.

The **Define** phase is akin to the problem definition phase of the traditional problem-solving process, but rather than defining the problem, the designers use the stories collected from the Empathize phase to generate a *point of view* (POV), which describes a typical user with a unique set of needs within the context of interest, along

Upon inspection of Figure 1, one might surmise that HCD is similar to many product or system development processes, including the traditional "waterfall"

with insights related to why meeting the needs is compelling.

The **Ideate** phase is similar to traditional brainstorming in an effort to generate as many innovative ideas related to the POV as possible. The typical rules of brainstorming apply here: go for quantity of ideas, don't judge the value of the ideas too early, encourage a diversity of perspectives, etc. It is in the Ideate phase that you strive to experience the radical, collaborative energy of the design team.

The construction of tangible potential solutions occurs in the **Prototype** phase. Here the emphasis is on building physical models that embody the most promising ideas revealed during the Ideation phase that can be shared with users, as opposed to just telling users about the ideas. "Show, Don't Tell" is the mantra during this phase.

Once a prototype is constructed, the process moves to the **Test** phase where the prototypes are shared with users, feedback is received from the users, and the prototype is iteratively further refined and shared again with users for additional feedback. Adopting an experimental mindset is important here in that failed prototypes are valued for the additional information they help to provide.

The HCD-IT Relationship

systems development approach and agile methods. Whereas the waterfall methodology employs a more linear, structured, and disciplined approach

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(disciplined in the sense of adhering closely to the tasks outlined in the method), both HCD and agile methods are more incremental and iterative in nature, and rely heavily on prototyping while working very closely throughout the process with the user community. However, where HCD sets itself apart from Agile methods is in HCD's extreme focus on users. Whereas both methodologies stress the importance of working closely with users throughout the development process, HCD revolves around the notion of empathy – understanding users at an emotional level. In addition, HCD has more of a focus on innovation throughout the process as compared to Agile methods.

In terms of the IT challenges introduced at the outset of the paper (better IT alignment, improved IT agility, responsiveness, and delivery, and improved relevance and innovation from IT), it is clear that HCD has the potential to play an important role in addressing them.

First, from an entrepreneurial perspective, spending a significant amount of time and effort on the front end in gaining a deep, empathic understanding of the user in terms of their challenges, desires, and needs, helps the IT organization better understand their "market." From an IT perspective, this enhances the chances that the designer/developer will gain a better appreciation of both the articulated and un-articulated goals, objectives, and strategies of the user community, which can only help in better aligning IT with the rest of the organization. Similarly, the prototyping approach espoused by HCD is focused on learning rather than confirming design specifications. This too should help with alignment.

Second, the focus on rapid, iterative prototyping enables the IT organization to be more responsive and better able to deliver solutions in a timely manner which can also positively affect the larger organization's time-to-market. Having an appreciation for "time-to-market" is another consideration important to entrepreneurs.

Third, HCD is first and foremost known as an effective way to design and develop innovative solutions to address market-driven problems as well as capitalize on market-driven opportunities. Where agile methods tend to be associated with software development, HCD is broader, including product and service development. As developers become more aware of the end-products or services associated with the software they develop, they become more aware of the end-customers of the products or services, as well as the markets they occupy. This broader knowledge and appreciation sets up more opportunity for entrepreneurial behavior for IT staff. Taken together, this enhanced the entrepreneurial way of thinking for the IT organization which can only help in elevating how the IT organization is perceived in terms of its ability to serve as a thought-leader for innovation as well as a potential contributor to new sources of revenue.

In the following sections we will introduce Merck Consumer Care's IT organization in more detail, outline how the organization adopted HCD, and discuss what benefits accrued to Merck Consumer Care as a result.

Merck & Company

At the time of this writing, Merck & Company (known as MSD outside of the U.S.) is a $44 Billion global healthcare company operating in three general lines of business: Pharmaceutical, Animal Health, and Consumer Care. The Merck Consumer Care (MCC) business develops and sells nearly 1600 products around the world in the areas of upper-respiratory care (e.g., Claritin®, Afrin®); sun-care and therapeutic skincare (e.g., Coppertone® sunscreen); digestive health (e.g., MiraLAX®); and foot health (e.g., Dr. Scholl's®).

MCC has deep history in developing innovative products to help people take back their lives. This history is very entrepreneurial in nature and begins in 1908 in Memphis, Tennessee when Abe Plough created the Plough Chemical

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Company where he manufactured and sold "Plough's Antiseptic Healing Oil," and quickly grew to include St. Joseph's children aspirin. Throughout the next 100 years, this business has created many innovations that have literally changed the way the world works. These innovations include developing the scientific measurement known as the Sun Protection Factor (SPF) that is now a global scientific standard, using open innovation to bring technology from other industries in revolutionizing sun-care again with the continuous spray bottle that works at any angle (so we can protect our wiggling children and our own backs), launching the first ever drug to move from prescription to over-the-counter "Rx to OTC" in the US with Coricidan®, and continues today with Dr. Scholl's® Custom Fit Orthotics self-service kiosks.

Over these same years, the Plough Corporation grew through a merger in 1971 with the Schering Corporation to create Schering-Plough, and later became Merck Consumer Care in 2009 after Merck acquired Schering-Plough as a means to diversify Merck's business.

Prior to the acquisition by Merck, the IT function for MCC was initially part of the larger pharmaceutical business and was steeped in traditional IT methods, including the company's standardized software development life-cycle (SDLC), which codified the time-honored waterfall development process. The traditional IT structure was further hardened by historical views of how Health Authorities, the Food and Drug Administration (FDA) in the US in particular, view the proper control of electronic records and IT development in general.

In 2010 with the formation of the "Merck Consumer Care" (MCC) business unit within Merck, MCC established a direct team of IT professionals to focus on the consumer business and changed the way IT was viewed by bringing it closer to both its internal and external customers.

Merck Consumer Care's Entrepreneurial Journey with Human-Centered Design

Like many organizations, MCC found that the historical ways of creating innovation were increasingly less effective (and less entrepreneurial) in driving significant revenue growth. The company was very adept at driving "product-centric, incremental innovation," a.k.a. nuanced changes that were focused on the product: a slightly higher SPF sunscreen, a new flavor of children's cough syrup, melt-in-the-mouth tablets, etc. To be certain, incremental innovation was a very real and meaningful driver in growing the company's portfolio, but MCC executives realized that without more "Big Bang" or "New to the World" ideas, Merck's future revenue growth would decelerate over time.

To address the need for more breakthrough ideas, MCC benchmarked what successful innovative companies were doing. They soon learned that for innovation to be meaningful, it had to be centered on the consumer, the person. When the innovation arm of MCC's R&D division was first introduced to HCD at a Stanford University executive seminar, they knew that they were on to something.

While MCC was changing the business development process from product-centric to consumer-centric innovation, Merck was also changing the role of IT in the business. Historically, IT was managed under the general governance of the Pharma business and its work fit traditional patterns. In this traditional pattern, the business comes up with strategy and annual objectives, and IT does its best to align its objectives and support the business. Driven by user requirements and user requests, the technology team focused on site-specific initiatives and tended to be geographically focused.

The MCC IT leadership team set off with a strategy to bring value to the MCC business by: a) embedding the IT leadership personnel within business teams, b) focusing on innovation, and c) providing the business with deeper understanding of

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the "end-to-end" business process. As such, HCD became a catalyst for these changes to the IT function. Rather than focusing on software applications maintenance and enhancement, MCC IT's organization started thinking about what new innovations IT could bring to MCC's business. Rather than looking to just automate existing business processes (a traditional IT approach), MCC's IT leadership began to focus on driving real product design.

Human Centered Design in Action: The Case of Dr. Scholl's®
One case in particular demonstrates the value of HCD to the MCC business and to

the MCC IT function: Dr. Scholl's®. Similar to Plough's entrepreneurial beginnings, the Dr. Scholl's® brand began when William M. Scholl invented the category with his groundbreaking podiatric research in the early 1900's. In 2004, Dr. Scholl's® redefined the category again with the Custom Fit Orthotic Kiosk (CFO), helping millions of people get close to the benefits of a custom orthotic with a graduated matrix of products, fit to the person through a proprietary foot-mapping process. These CFO's could be found in large U.S. retail department stores and pharmacies

HCD Design Phase	Phase Activities Carried Out by the Merck Design Team	Relevant Vignettes, Quotes, Etc.
Empathize	MCC's best practice "consumer center" allowed the team to not only engage in individual interviews and group focus groups, but also allowed them to observe potential users using existing and prototype products. Observation is a key component in inferring feelings, emotions, thoughts, etc.	User comments prove very helpful in this phase when using the current CFO product. A woman remarked that, "...current options are too bulky and can't be worn with normal shoes," while a man said, "I can't get the right level of support. None of the current options fit someone my size."
Define	After collecting large amounts of user data, the team began to get a picture of the types of consumers they might serve with the CFO kiosk. For example, one user segment included females with chronic foot/leg pain that have given up on traditional healthcare and are now looking for do-it-yourself care options that also provide some level of advice.	POV statements typically refer to a specific type of user with a specific need. One especially compelling POV focused on an injured woman that needed a way to keep working because her elderly mother counted on her for physical assistance and help around the home. Understanding user needs at this emotional level helps to deeply engage developers and results in very compelling "use cases."
Ideate	Brainstorming sessions were largely co-creation sessions, i.e., potential users worked alongside MCC staff to come up with innovative solution ideas for both the CFO kiosk and the user interface.	The need for some level of advice on future products became apparent when a gentleman commented, "I get confused at the shelf, I don't know what product would be best for me." This helped the MCC team understand the level of information that the user interface needed to provide.
Prototype	Low-fidelity prototypes of the	When working with the kiosk's interface,

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		orthotics, the kiosk, and user interface were co-created with basic art supplies in order to "show" ideas vs. only talking about ideas. Fast-cycle iteration was the norm; ideation-prototype-test cycles were often completed in one day. Over the course of 3 weeks, the MCC team completed 10-12 iterations.	one gentleman wondered if he, "...could customize the level of support" he received from the interface, again pointing to the need for advice from the kiosk. In terms of direct orthotic testing, one woman mentioned that she, "...wanted something that is sleek and easy to wear with my normal clothes." Interestingly, men seldom mentioned this concern.
	Test	Potential users were encouraged to interact with the CFO kiosk, the user interface, and the orthotic products in MCC's Consumer Center. Two versions of usage were tested -- one where users could ask questions about the prototypes, and one where users were not allowed to ask questions, and were instead encouraged to figure out how to best use the prototypes. After Consumer Center testing, users tested the prototypes in in-store settings.	"I can't trust a solution unless it gives me the same answer no matter how often I try it..." suggested that the CFO kiosk system not only had to provide advice, but was going to be assessed by some consumers as to the reliability of the advice provided.

Figure 2: HCD Phases with Attendant Activities and Vignettes

As the years passed, MCC knew it was time to further innovate on the CFO platform (both the kiosk and the kiosk's user interface (UI), and enlisted the tenets of HCD to do so. During the Empathize phase, the IT team worked as part of the joint business team to understand how a variety of consumers think of themselves in the context of physical mobility. This included observing actual consumers describe their individual situations. In this phase, the MCC joint business/IT team looked for "extreme consumers" e.g. people who rarely or never use a Dr. Scholl's products as well as people with chronic, all-day needs for the products. Armed with this empathy data, the joint business/IT team defined a design "point of view" (the POV is akin to defining the problem), and set about developing several hundred alternative solution paths, starting with the original hypothesis of moving to a truly customized insole.

The MCC team then rejoined with consumers to ideate on variations of these paths. This close working relationship where designers/developers work with potential users is central to HCD and is known as co-creation. These co-creation sessions were conducted during the Ideation phase, and continued through the Prototyping phase were the MCC/user team created low-fidelity prototypes – rough sketches as well as quickly-built models using readily available, inexpensive supplies like paper, tape, pipe cleaners, etc. – to test with consumers. The benefit of testing low-fidelity prototypes with consumers is that the MCC team learned more about what the consumers liked and disliked, and in the process kept the consumer-developer conversation active.

As a result of numerous, fast-cycle ideation/prototyping/testing iterations, it became evident that the team's original hypothesis resonated with consumers *less* than the existing CFO product offering. The HCD process elicited new, alternative solutions that garnered not only a higher positive emotional response from

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consumers, but also would move the brand into adjacent product categories and expose the product line to a new untapped customer base. As a result, the original hypothesized solution approach was replaced with one that more deeply resonated with consumers. Ongoing market testing suggests the new product will result in a significant new revenue stream. See Figure 2 for a summary of MCC activities as well as short vignettes that illustrate what users were experiencing in each HCD phase.

Benefits to MCC's IT Organization

HCD has had several benefits for MCC IT: The first and foremost is IT's new-found, entrepreneurial role in driving business value. The solution resulting from HCD relies heavily on IT-enabled systems, and the IT-business revenue linkage has been significantly strengthened within Merck.

MCC IT's role as revenue driver has also heightened the perception of their relevance to Merck. Because HCD requires a radically diverse team from many functional areas of Merck (including IT) to engage in co-creation with consumers, the IT organization moves from the background to the foreground. The MCC IT team has found that rather than begging to attend meetings, they are now "required" to attend -- held accountable for significant timetables that have direct line-of-sight to the company's mission and revenue.

A third and equally significant benefit is purpose. Teams working in an HCD environment enjoy their work, are committed to helping consumers, and find deeper meaning in what they do each day. In one example, a team member commented during a period of business uncertainty that their work on one HCD project kept them loyal to the company.

Benefits to MCC

Adoption of HCD has changed Merck Consumer Care in profound ways. First, the company changed the way they evaluated innovation. MCC began to understand that the traditional measures of value for

incremental innovation do not apply to breakthrough innovation, i.e., the gestation period for breakthrough ideas often result in lagged realized revenue streams. To prevent the seeds of ideas from being stopped in their tracks, MCC changed their early stage gate criteria to make them more appropriate for early stage ideas to survive.

MCC also changed the way work was structured, as well as where the work took place. Recognizing this, MCC created a set of innovation hubs. These open space work areas where employees from all levels of the organizational hierarchy work together have greatly increased the interaction between personnel, increased the amount of fun people have, and significantly reduced the number of formal meetings people scheduled.

Finally, MCC changed their organization by creating a team of innovation "navigators" charged with helping to build HCD capabilities throughout the company. These navigators are very much entrepreneurs in the true sense of the word. All in all, these changes have increased our product pipeline by 300% and established the company as a leading innovator among its peers. At the time of this writing, it is public knowledge that Bayer Healthcare has agreed to purchase Merck Consumer Care for $14.2 Billion USD. This transaction, one of the largest in the industry and at one of the largest earnings multiple ever in this industry is due in large part to the innovative culture and processes developed at MCC. Adoption of HCD literally made all of this possible.

Discussion

As MCC matured with the HCD process, we found some recurring themes that may be helpful for others pursuing this entrepreneurial approach. First, the HCD process more clearly discovers both articulated and un-articulated wants and needs. As such, the solutions identified will often be new-to-world or new to the organization. While HCD entrepreneurs will be somewhat accustomed to these breakthrough ideas, the rest of the organization may not. Patiently working

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with them to see the value of these potentially disruptive innovations is often necessary. On a related note, it is very important to involve key business and process owners early in the effort. Otherwise, the business could reject a truly breakthrough result.

In addition, the HCD team will benefit greatly by being interdisciplinary in nature and by including a wide range of types of thinking – some that are often not on staff. For example, spending the money to bring anthropologists and graphic designers on to the team, especially on first efforts, is money well spent. Finally, HCD's focus on the drive for quick results and conclusion on real business objectives helps to enroll stakeholders in the new process. Nothing enrolls others faster than a win.

Concluding Thoughts

As discussed at the outset, IT has long been looking for ways to more closely align themselves with the business, drive bottom-line revenue, be more understanding and responsive to its users, and be viewed as a true peer with other functional areas of business. Merck's HCD journey presented here suggests that by adopting this innovative type of design thinking, IT departments will begin to behave more like entrepreneurs, and will have an important role to play in their organizations as they seek out innovative solutions to drive future performance.

Often, product development initiatives are driven by marketing, R&D, or product line areas of the business. Given IT's long history in understanding systems development, requirements analysis, and prototyping, there is no reason why they can't pick up the HCD mantle and lead future innovation efforts in any organization.

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Notes

Human-Centered Design: The Hasso Plattner Institute of Design at Stanford University (the "d.school") has done much to bring design thinking concepts to the world through their design thinking "bootcamps" (http://dschool.stanford.edu/).

St. Joseph's children aspirin: Source: The Tennessee Encyclopedia of History and Culture, Version 2.0, http://tennesseeencyclopedia.net/entry.php?rec=1064.

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