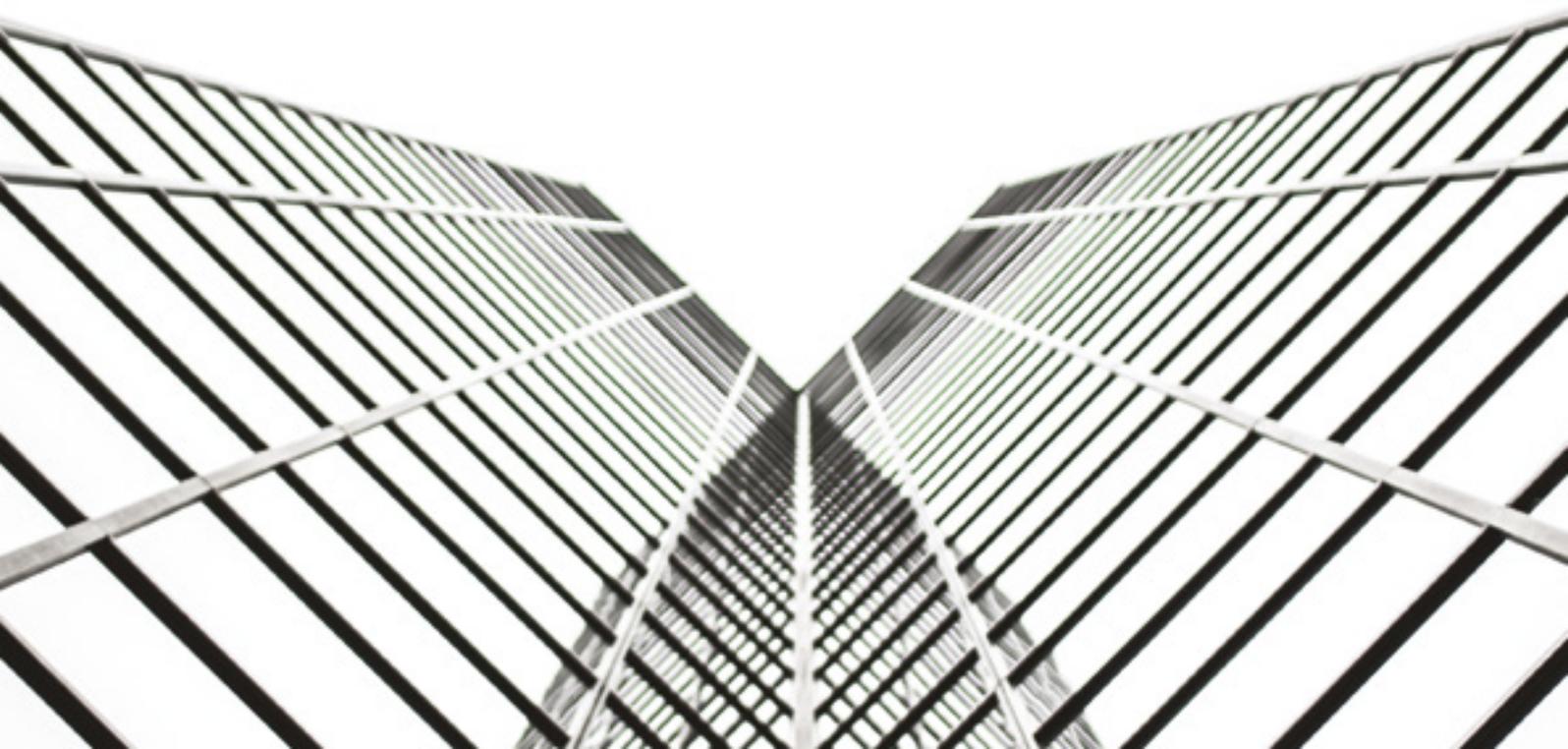


**THE ISM JOURNAL OF
INTERNATIONAL BUSINESS**



INTRODUCTION



Transformation is the backbone of international business. We are currently grappling with the challenges of the digital economy. To succeed in this environment, firms need to master the application of internet-based digital technologies: artificial intelligence, virtual reality, big data, mobile and cloud computing, 3D printing, robotics, blockchain, and so on. These transformations not only have an impact on firms' processes but also on the way we work and communicate. The digital economy impacts governments, education, and society as a whole.

The complexity of the era we live in requires us to mistrust simplifications, both in how we analyze problems and how we design solutions. Jacob Burckhardt, a historian famous for his work on the Renaissance, coined the term "terrible simplifiers" for those who by seeing the world in a simplified way distort reality. We need to beware of simple explanations and ready-made solutions for the challenges imposed by the digital economy.

To kick start a new phase in the life of *The ISM Journal of International Business*, in this issue we wanted to touch on a variety of themes pertaining to international business. The papers featured here explore topics that affect companies in the digital era. They offer new perspectives and creative solutions to problems at the frontier of business and technology.

To start us off, PhD candidate Dara Miller and Joachim Bauer analyze the latest scholarly contribution on "intrapreneurship", a term commonly used to describe the entrepreneurial activities within an

organization. Then, core faculty professor Ivonne Chirino-Klevans connects leadership with one of the pillars of the new digital era: virtual reality. Next, we have recent DBA graduate Paul Thomason looking at the "absorptive capacity" of firms to internalize knowledge and drive change. International MBA student Benjamin Cohen and core faculty professor and PhD alumnus Michael Neubert analyze how companies in the medical technology sector set prices for their solutions and products. And lastly, published author and PhD candidate Christophe Legrenzi argues that companies should concentrate more on information ("the content") and less on IT ("the container").

I am sure you will find the papers featured in this issue enlightening, not only in their analyses but also in the creative solutions they suggest. I'd like to take this opportunity to extend a special thanks to everyone in the ISM community who contributed to this issue: authors, reviewers, and editor.

For the next issue of our journal, we invite submissions on entrepreneurship. The International School of Management provides an ideal platform for the comparative analysis of entrepreneurial activities in diverse contexts. Special attention will be given to submissions documenting entrepreneurial experiences in emerging markets.

Enjoy the reading!

César Baena

**Editor-in-chief
Dean and Director of Doctoral Research, ISM**

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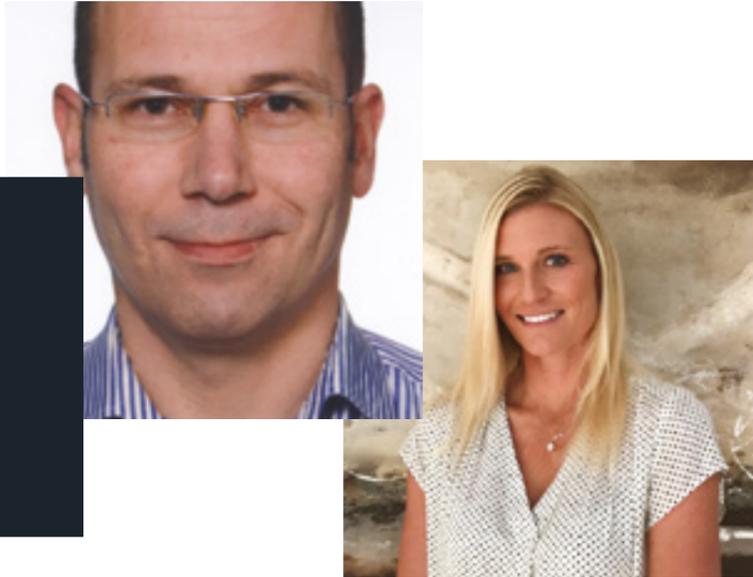
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Defining the Motivations and Capabilities of Young Intrapreneurs: Literature Review and Research Opportunities

**AUTHORS: DARA MILLER
AND JOACHIM BAUER**



Abstract

Since 1985, when Gifford Pinchot made popular the term “intrapreneurship” to represent entrepreneurial activities within an organization, corporations have increasingly worked to create intrapreneurial programs and to identify intrapreneurs within their organizations. In this paper, the authors aim to synthesize existing concepts and research related to the process of intrapreneurship. A view of theoretical frameworks and empirical studies is presented, focusing on the intrapreneurs themselves, including the attributes which comprise their behaviors. Finally, a critical conflict in current research is identified and discussed, and future research needs are identified.

Introduction

Effective innovation programs have been found to improve profitability, increase revenue, and enhance cost efficiency within an organization while simultaneously creating higher stock performance and a stronger ability to capture market opportunities (Zhang, Yu, & Xia, 2014). As a result, innovation remains a top priority for many organizations (Zhang et al., 2014).

Intrapreneurs have been described as employees who innovate from within

organizations (Pinchot, 1985). They can be recognized in the company as the self-motivated employees who navigate corporate politics to bring an innovation to the forefront (but only when it is ready in their eyes), who can pivot strategically when needed, who strategically scan their environment including that beyond their organization, who think visually, and who have authenticity and integrity (Desai & Govindarajan, 2013). These are the individuals that organizations need to identify in order to produce continuous innovations which can lead to top line growth (Desai & Govindarajan, 2013).

The term intrapreneurship, representing entrepreneurial activities within an organization, has regained research interest in recent years, demonstrated by the various works below. The phrase was coined and made popular just over thirty years ago by Gifford Pinchot. Over this time, researchers have analyzed the antecedents of intrapreneurial behavior at the corporate and individual level (de Jong, Parker, Wennekers, & Wu, 2011; Elia, Margherita, & Petti, 2016), the behaviors and actions that comprise intrapreneurial processes (Amo & Kolvareid, 2005; Hashimoto, 2014; Lurdes & Sarkar, 2017), and have defined success factors to pursue and pitfalls to avoid as an entrepreneurial organization (Knote & Blohm, 2016; Kuratko & Goldsby, 2004).

When it comes to the individual, researchers agree that intrapreneurial behavior is a higher order construct reflected in three dimensions of the individual: proactiveness, innovativeness, and risk taking (de Jong et al., 2011). Similarly, at the organization level, these three dimensions are demonstrated in order to sustain innovation and gain competitive advantage (Lurdes & Sarkar, 2017). However, beyond these three dimensions, conflicts and gaps in the research begin to arise.

In this paper the authors aim to assess the existing research by defining the concepts around intrapreneurship like innovation, corporate entrepreneurship, and intrapreneurial motivations and capabilities; and by analyzing current theoretical, qualitative, and quantitative studies. Finally, a critical conflict and gap in current research is discussed, and future research needs are identified.

Definition of Terms

Though intrapreneurship is the main topic of research within this literature review, several congruent topics add context to the nature of intrapreneurial behavior and must first be discussed.

Innovation

First, the topic of innovation is the umbrella under which intrapreneurs operate within an

organization. There are four types of people that drive innovation (Christensen, 2011):

1. Innovative Entrepreneurs (those who launch new companies that offer unique value to the market)
2. Innovative Intrapreneurs (those who launch innovative ventures from within an organization)
3. Product Innovators (those who invent a new product)
4. Process Innovators (those who launch a breakthrough process)

Within these categorizations, innovative intrapreneurs, those who launch ventures from within an organization, are those who are being discussed as part of this literature review. Innovation within an organization can take multiple forms depending on the literature. Hamel (2007) suggests that operational innovation, product innovation, strategic innovation, and management innovation are the major classifications of innovation within the organization. He describes operational innovation as items that improve the operational efficiency of an organization, most commonly like IT systems, or, in the case of Toyota, a complete business strategy focused on efficient operations (Hamel, 2007). Product or service innovation is the creation of an iconic product which can lift a company out of obscurity, like Dyson's bag-less vacuum (Hamel, 2007). The next level up is strategic innovation, which focuses on innovation of the business model as compared to competitors, like Ryan Air offering low-cost and low-frills flights (Hamel, 2007). Finally, management innovation remains as the most difficult to create and the most difficult to replicate. Initially, Ford displayed management innovation by building an organization to efficiently run the assembly line of “what was at the time the world's most vertically integrated firm” (Hamel, 2007, p. 34).

Over time, many researchers have studied the input factors that can lead to successful innovation output (Zhang et al., 2014). These input factors researched include: executive pay (Balkin, Markman, & Gomez-Mejia, 2000), organizational structure (Jansen, Van Den Bosch, & Volberda, 2006), manager background (Bantel & Jackson, 1989), internal resource allocation (Tsai & Ghoshal, 1998), investors (Kochhar & David, 1996), market competitiveness and size (Katila & Shane, 2005), and industry dynamism (Thornhill, 2006) (Zhang et al., 2014). For example, the needs of investors might drive the type of innovation that a company pursues, the financial resources it receives, the ownership taken from within the organization, and the method by which it is implemented. Each of

the input factors above can directly impact the innovative outputs of a firm in a similar fashion. With a variety of input factors that organizations can manipulate, firms will naturally differ in the way that they implement the innovation (Zhang et al., 2014).

With this perspective in mind, it is understood that the process of innovation within organizations is variable and delicate, and the output of what is considered innovation may vary. This process of innovation is the context in which the intrapreneurs in this literature review operate.

Corporate Entrepreneurship

For a firm, entrepreneurial orientation is also demonstrated by the three dimensions which intrapreneurs demonstrate: risk-taking, creating change proactively, and favoring innovation to gain competitive advantage. In a firm, these orientations can be seen through product or market innovations, aggressive innovations, or somewhat risky ventures (Lurdes & Sarkar, 2017).

Many researchers have connected the organizational process of corporate entrepreneurship to a positive firm performance (Antoncic & Hisrich, 2001; Barringer & Bluedorn, 2016). These researchers argue that to achieve this performance in a competitive environment, a firm must have an entrepreneurial attitude, and therefore its employees must exhibit entrepreneurial behavior (Barringer & Bluedorn, 2016). It is through this argument that intrapreneurship begins to be defined. At the contextual level, researchers note that intrapreneurship is an offspring of entrepreneurship (Amo & Kolvareid, 2005; Pinchot, 1985), and it is defined most simply as entrepreneurship within an organization (Antoncic & Hisrich, 2001).

The processes which drive entrepreneurial activity in the organization are important for achieving the desired innovative output. Just prior to the publishing of Gifford Pinchot's book on intrapreneurship (1985), these processes had been categorized into two behaviors by Burgelman (1983): induced strategic behavior, which is an official corporate strategy and method for innovation, and autonomous strategic behavior, which is done by employees that see opportunities beyond those that management suggests (Lurdes & Sarkar, 2016). Zahra (2015) found that both “formal and informal corporate entrepreneurship activities are important for strategic renewal, growth and successful financial performance” (Zahra, 2015, p. 734).

Induced strategic behavior is facilitated by formal corporate entrepreneurship programs (Amo & Kolvareid, 2005; Hashimoto,

2014), like innovation competitions, hack-a-thons, allocated innovation time and others. Autonomous strategic behavior exists when “entrepreneurial participants, at the product/market level, conceive new business opportunities, engage in project championing efforts to mobilize corporate resources for these new opportunities, and perform strategic forcing efforts to create momentum for their further development” (Burgelman, 1984, p. 156). This autonomous strategic behavior is also called informal corporate entrepreneurship (Hashimoto, 2014). These employees, exhibiting autonomous strategic behavior are those who Pinchot (1985) later defined as “intrapreneurs.”

Intrapreneurship

Based on these descriptions, intrapreneurs are those employees who act with autonomous strategic behavior and perform informal corporate entrepreneurship activities. Intrapreneurs exhibit “determination, perseverance, creativity, and boldness because they will put their jobs at risk, face stringent hierarchical structures and lack of support and incentive, and they will have to face repeated rejection to their ideas and proposals, overcome bureaucracy and act clandestinely” (Hashimoto, 2014, p. 388).

Intrapreneurs are resourceful in that they acquire resources wherever they can (Amo & Kolvareid, 2005). They may act for their innovation regardless of resource availability or management approval (de Jong, 2012). They have the capacity to visualize beyond the status quo (Smith, Rees, & Murray, 2016).

Intrapreneurs exhibit entrepreneurial behavior in the organization through their innovativeness, proactiveness, and risk taking (de Jong, 2012). Additionally, the demographics of intrapreneurs like age, tenure, education level (Camelo-Ordaz, Fernandez-Alles, Ruiz-Navarro, & Sousa-Ginal, 2011), or job-types (managers and sales workers are more intrapreneurial) (de Jong, Parker, Wennekers, & Wu, 2011) can influence their innovation success.

But if intrapreneurs act with autonomous strategic behavior, how does the induced strategic behavior of corporate entrepreneurship relate? As a result of their comprehensive research in this area, Amo and Kolvareid state that innovative behavior is the common result of both corporate entrepreneurship and intrapreneurship (Amo & Kolvareid, 2005). The researchers further explain that corporate entrepreneurship generates behavior from the top down (e.g. a management request for innovation), whereas intrapreneurship is at the individual level, from the bottom-up, and is self-determined (Amo & Kolvareid, 2005).

Because both corporate entrepreneurship and intrapreneurship generate innovation behavior in organizations, corporations need to pursue and foster innovation behavior in their employees rather than corporate entrepreneurship or intrapreneurship alone (Amo & Kolvereid, 2005). This connects to the concepts above of induced entrepreneurial behavior (formal activities which are created by the organization to encourage entrepreneurial behavior) and autonomous entrepreneurial behavior (informal activities like information flow and management support which can contribute to the expression of entrepreneurial behavior but is inherent in the individual) (Hashimoto, 2014). It is the combination of both corporate entrepreneurship and intrapreneurship which leads to innovative performance (Amo & Kolvereid, 2005). In order to achieve this behavior, organizations are "advised to put a corporate entrepreneurship strategy in place, to recruit individuals with intrapreneurial personalities or train their current employees in innovation and entrepreneurship" (Amo & Kolvereid, 2005, p. 17).

The concepts of innovation, corporate entrepreneurship, and intrapreneurship are intertwined and provide context for intrapreneurial behavior, which this paper discusses. Corporate entrepreneurship programs and the encouragement of intrapreneurial behavior are methods which corporations can employ to drive innovative output, with top line results being the ultimate goal.

Review of Research

Research on intrapreneurship can be divided into two broad categories: theoretical studies

and empirical studies. The theoretical studies aim to explain intrapreneurial behaviors through models based on identified frameworks. Empirical studies are again broken into two main categories of research: quantitative and qualitative research, which will be presented in future sections. Quantitative research studies use measurable data collected to explain relationships like those between intrapreneurship and company financial performance, between induced intrapreneurial behavior and innovative output, and between individual demographics and characteristics and intrapreneurial behavior. On the other hand, qualitative research studies seek to understand how intrapreneurs and their managers approach intrapreneurial activities in practice and with appropriate descriptive context.

Theoretical Studies

Since the advent of the term intrapreneurship, researchers have been studying the topic and developing theoretical frameworks to outline the process and antecedents of intrapreneurship, to create ways to foster desired intrapreneurial behavior, and to create ways to limit unproductive behaviors in the organization.

At the baseline level of corporate entrepreneurship and intrapreneurship, researchers have identified multiple antecedents that must be present both at the individual and organizational level. These antecedents at both levels represent informal and formal activities of corporate entrepreneurship (Elia et al., 2016). In their study, Elia et al. performed an extensive literature review of all antecedents identified

regarding entrepreneurial behavior, then synthesized all of the constructs and organized them into two large groupings (individual and firm behavior) and four sub-groupings (professional and psychological characteristics, system of values, and management practices) (Elia et al., 2016). Each of the four categories identified is shown to impact the firm's corporate entrepreneurship maturity level. It was then converted into a tool which measures the maturity of the individual and the firm, and applies its findings to a framework regarding corporate entrepreneurship. Organizations can then be classified as entrepreneurship prisons, deserts, tombs, or factories based on the maturity level of individual antecedents and organizational factors (Elia et al., 2016).

The antecedents at the organization and individual level are shown by Elia et al. (2016) to drive the specific type of entrepreneurial behavior within the organization. Other researchers have used these behaviors to begin to define the intrapreneurship process across organizations. In his research in 2012, de Jong discusses how intrapreneurship is a higher order construct of behaviors from corporate entrepreneurship, innovation, and organizational behavior literature. The three main dimensions of intrapreneurship are innovativeness, proactiveness, and risk-taking; and the intrapreneur experiences these dimensions across three phases: opportunity recognition, opportunity assessment, and opportunity exploitation (de Jong, 2012). Using this three by three matrix, the activities of an intrapreneur can be placed according to dimension and phase to begin to build a process of intrapreneurship.

As these activities become repetitive in the organization, other researchers have enhanced previous studies in order to define classifications of the way these intrapreneurial activities are implemented and to create a framework to help identify these types of implementations in organizations. Wolcott and Lippitz (2007) discovered four models of implementation of corporate entrepreneurship programs based on two levers within the business: organizational ownership and resource allocation (Wolcott & Lippitz, 2007). They argue that resource

allocation and organizational ownership greatly impact the way that intrapreneurs will behave in the organization, and the obstacles they will face. The spectrum of results ranges from independent (rogue) actions with individuals bootstrapping for resources, to formal programs with political protection for ideas and designated funding (Wolcott & Lippitz, 2007). This framework of intrapreneurial activity in the organization begins to form a view of the variety of experiences that an intrapreneur may encounter.

Knote and Blohm (2016) develop these frameworks even further, summarizing both the antecedents to intrapreneurship, the activities, the experiences, and the results identified by previous researchers into intrapreneurship success factors which are required in order to foster more successful innovation from intrapreneurs. The table below summarizes their findings into key success factors as derived from the reading (Knote & Blohm, 2016):

Figure 2 - Intrapreneurship Process by Key Success Factor

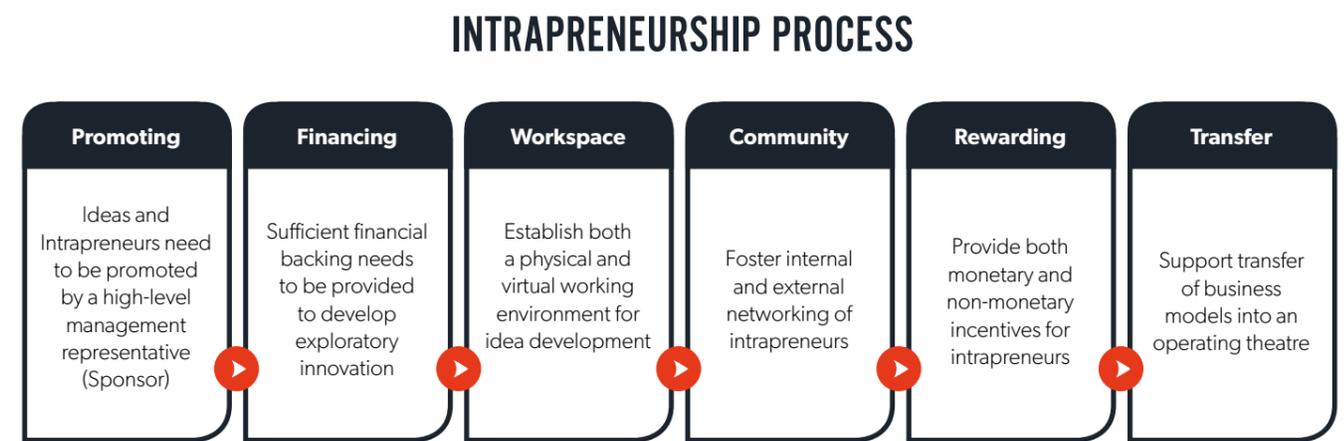
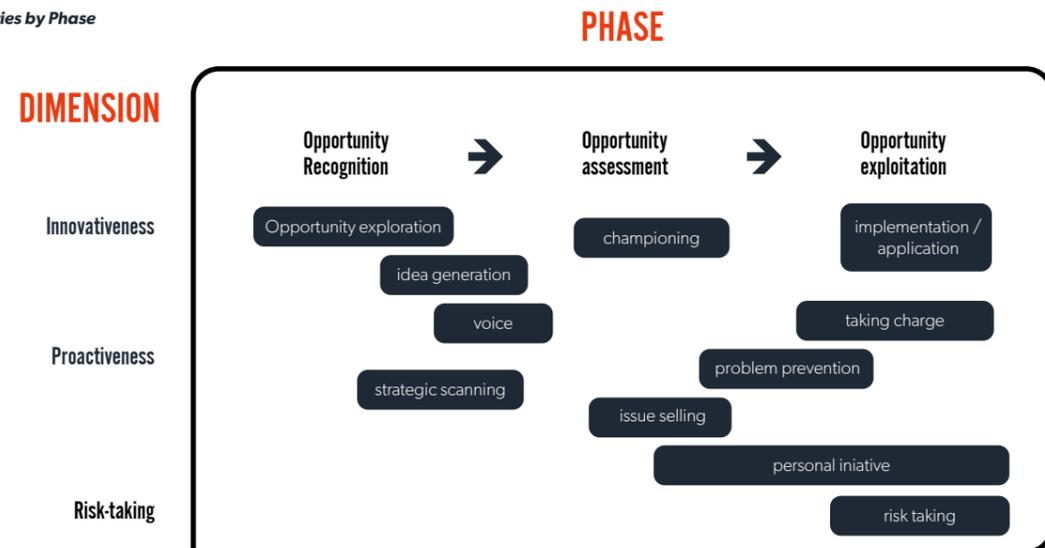


Figure 1 - Intrapreneurship Activities by Phase



(de Jong, 2012, Figure 1, p.2)



Based on their research along similar lines, Kuratko & Goldsby (2004) created a framework of issues and dilemmas to corporate entrepreneurship that are realized from specific organizational obstacles (Kuratko & Goldsby, 2004). These are the obstacles which inhibit innovative output and, if possible, organizations should work to avoid:

Figure 3 - Obstacles to Corporate Entrepreneurship

Internal Network Issues			Leadership Issues			
	Systems	Structures	Policies & Procedures	Strategic Direction	People	Culture
Organizational Obstacles	Misdirected reward and value systems	Restricted Communication Channels	Long complex approval cycle	No vision from the top	Parochial bias	Ill-defined values
Dilemmas		Lack of accountability	Extensive documentation requirements	Lack of commitment from senior executives	"Turf" protection	Lack of fit
			Unrealistic Performance Criteria	No role models at the top		Values that conflict with the managers

(Derived from the readings Kuratko & Goldsby, 2004)

These researchers' theoretical frameworks develop corporate entrepreneurship and intrapreneurship into a phenomenon that will not be present without the right antecedents at the individual and firm level, that has similar activities firm-to-firm but a variety of methods of implementation therefore creating a variety of experiences, and that has shown to create more positive results according to specific success factors and avoidance of known obstacles. While these researchers have added a framework of intrapreneurial behavior that has led to a much greater academic understanding of the topic, the nature of the research is somewhat removed from the practical experiences of today's intrapreneurs. Though their methods and models vary, researchers agree that they should be applied and/or tested in practice (Knote & Blohm, 2016; Kuratko & Goldsby, 2004).

Empirical Studies

Quantitative Studies

Quantitative studies attempt to empirically confirm or reject hypotheses and create measures of intrapreneurship. The researchers most often used comprehensive surveys sent to the management and employees of organizations for completion, as well as administrative data that was provided by the companies themselves.

de Jong, Parker, Wennekers, and Wu (2011) performed a quantitative study to create a measure of intrapreneurial behavior in individuals (de Jong et al., 2011). This study, limited to a few hundred employees, requested in a series of surveys that all participants rate their co-workers' level

of various intrapreneurial behaviors and collected demographic information from human resources. In their results, they found the significant contributor to intrapreneurial behavior to be the combination of innovativeness, proactiveness, and risk taking. None of these elements alone can be considered as intrapreneurial behavior, but, combined, the three are highly correlated with intrapreneurial behavior. These elements are followed by demographic classifications of education level, age, and tenure, with age influencing intrapreneurial behavior more than any of these other demographics (de Jong et al., 2011).

de Jong et al. pursued the relationship of intrapreneurial behavior to the age demographic further, searching entrepreneurial literature for answers. In their study for the 2009 Global Entrepreneurship Monitor, Bosma and Levie found that the relationship of entrepreneurial behavior and an entrepreneur's age is an inverted U, with behavior results being low for the youngest employees, peaking at middle age, and then declining as the employee ages (Bosma & Levie, 2010). de Jong leverages this theory and applies it to intrapreneurs, summarizing that "motivation for intrapreneurship decreases with age, as aging people are less open to new experiences and change. Simultaneously, the perceived capability to exploit opportunities increases with age. Being more experienced, employees feel more capable to persuade others and to acquire missing resources, knowledge and skills" (de Jong et al., 2011, p. 9).

On the contrary, Camelo-Ordaz et al. (2011) analyzed intrapreneurs' age and

innovation results and found that younger intrapreneurs were more successful. Their study surveyed small creative firms and took a cognitive approach to integrate research on demographic characteristics and personal values of intrapreneurs. Their quantitative findings showed that there is a negative correlation between age and intrapreneurial values and the firm's innovation performance (Camelo-Ordaz et al., 2011). Their explanation is that, with age, cognitive reasoning diminishes but personal motivations develop so that flexibility and resistance to change decrease. They explain their findings by hypothesizing that younger intrapreneurs take more risks, are not tied to the status quo, and are willing to try new ways of doing things, while older intrapreneurs become more conservative which leads to lower innovation performance (Camelo-Ordaz et al., 2011).

Though a variety of quantitative studies have been performed to contribute to the research regarding intrapreneurship, intrapreneurial behavior, and intrapreneurial characteristics, through the studies of Camelo-Ordaz et al. (2011) and de Jong et al. (2011), we begin to see a disparity in the findings relating intrapreneurial behavior and demographics, specifically the age of the intrapreneur. Researchers do agree that more analysis is needed in this area. The analysis of the role of individual intrapreneurial behavior with the individual as the unit of analysis should be pursued (Amo & Kolvareid, 2005; de Jong et al., 2011). The results of research to date in this area assume relationships between intrapreneurial motivation and capability based on age, and researchers specifically recommend future studies to understand if

there is truth to the current assumptions (de Jong et al., 2011).

Qualitative Research

In contrast to theoretical frameworks and quantitative research, fewer researchers have approached the topic of intrapreneurship from a qualitative perspective. Perhaps most famously, Gifford Pinchot used case study research in his 1985 book that initially coined the phrase "intrapreneurship" (Pinchot, 1985) providing detail and context. In his book, he includes multiple cases of intrapreneurship in a variety of organizations which are used to analyze the characteristics of intrapreneurs and originally define the intrapreneurship process. In 2014, Hydle, Aas, and Breunig studied employees who perform intrapreneurial roles using phenomenology to explain how these employees that are responsible for service innovation work. This study interviewed a variety of employees who worked on service-innovation projects across five companies and triangulated the results, with the project itself being the unit of analysis. This provided valuable insight into the process and methods of intrapreneurship for these service firms, but did not study the intrapreneurs themselves (Hydle, Aas, & Breunig, 2014).

Pereira and Hashimoto (2015) used case study methodology to study intrapreneurs who are driven to start their own businesses by analyzing a company which identified these employees and engaged them to start business related to the parent company (Pereira & Hashimoto, 2015). This study provides valuable insight on why intrapreneurs might want to leave the company and explores a method of retention and engagement. It also contributes new terminology to the academic community, which identifies intrapreneurs with "internal entrepreneurial orientation" or "external entrepreneurial orientation" (Pereira & Hashimoto, 2015, p. 12). However, the case study was limited to one Brazilian company, focused intensely on these entrepreneurial orientations, and did not expand to other characteristics of intrapreneurs.

However, in an earlier qualitative study, Marcos Hashimoto interviewed 15 executives from various companies to determine the factors that inhibit or encourage entrepreneurial behavior in employees, using the framework of induced vs. autonomous entrepreneurial behavior (Hashimoto, 2014). While this study is intended to describe the characteristics of intrapreneurs, it focuses on the managers' perspective of intrapreneurial behaviors in their workers and therefore does not discuss these behaviors with the intrapreneurs themselves. However, the study develops a rich, descriptive context of

intrapreneurship and discusses the areas of information flow, institutionalized practices, organizational structure, internal climate, tolerance to mistakes, creativity, freedom, rewards, qualifications, and management support (Hashimoto, 2014). Through analysis in each of these areas, his findings indicate that entrepreneurially-oriented managers are the key to facilitating induced behavior and for not stifling the autonomous behavior (Hashimoto, 2014).

The theoretical studies create a desire to use the frameworks identified in a practical application (Knote & Blohm, 2016; Kuratko & Goldsby, 2004). The quantitative studies highlight the importance of the age of the intrapreneur, as well as highlight discrepancies and assumptions included in the explanation of results (de Jong et al., 2011; Camelo-Ordaz et al., 2011). Finally, the qualitative studies lead us to ask why so few researchers have pursued qualitative research studies to understand intrapreneurs as individuals (Hashimoto, 2014; Pinchot, 1985; Pereira & Hashimoto, 2015; Hydle et al., 2014), and, if researchers want to continue studying the individual as the unit of analysis (Amo & Kolvareid, 2005; de Jong et al., 2011), why have they not pursued the perspectives of the intrapreneur themselves?

Problems and Future Research

The previous sections have revealed a significant focus in the existing literature on theoretical frameworks and quantitative surveys as methods of knowledge development in the area of intrapreneurship.

The theoretical research frames the concepts of corporate entrepreneurship and intrapreneurship within the organization and contributes to a greater academic understanding of the antecedents at the firm and individual level, the processes of intrapreneurship, the success factors and the pitfalls (Elia et al., 2016; de Jong, 2012; Wolcott & Lippitz, 2007; Knote & Blohm, 2016; Kuratko & Goldsby, 2004). The quantitative research leads to an understanding of the relationship between intrapreneurship and the innovation results of the company, and also begins to analyze individuals to understand their demographic characteristics that lead to success (de Jong et al., 2011; Bosma & Levie, 2010; Camelo-Ordaz et al., 2011). However, these studies do not hear the stories of the intrapreneurs. Additionally, when discussing the age and intrapreneurial behavior, there are conflicts in the explanation of results of some of their findings.

Within the qualitative research, studies contribute to knowledge of the process of intrapreneurship from a management perspective, but not specifically to the

research on the intrapreneurs themselves as the unit of analysis (Hashimoto, 2014). Others study the process of intrapreneurship (Hydle et al., 2014) or a very limited scope of intrapreneurial behavior (Pereira & Hashimoto, 2015). As a result, we understand the way that managers feel about intrapreneurs, the methods that they may use to nurture and engage intrapreneurial behavior, and the methods that intrapreneurs use in their work. However, there is an apparent need for a better understanding of the perceptions of the intrapreneur, or their reactions to the activities that might be utilized by management to induce desired behavior.

A critical gap in the existing literature exists with regard to the discrepancy of the impact of age on intrapreneurial results. This lies in the dispute that innovative results may not correlate linearly with age as some researchers suggest (Camelo-Ordaz et al., 2011), but rather that the oldest and youngest intrapreneurs display characteristics that inhibit their intrapreneurial results (de Jong et al., 2011).

In general, comparative youth is believed to positively impact the results generated by the intrapreneurs due to assumptions that they will have increased reception to change and a greater willingness to take risks (de Jong et al., 2011; de Jong, 2012; Camelo-Ordaz et al., 2011). However, the impact of the characteristics displayed by the youngest intrapreneurs on company results conflict in the research to date, with some arguing that, like an entrepreneur's age, an intrapreneur's age is reflected by an inverted U-shaped curve, assuming that the more aged intrapreneurs have learned capabilities that the youngest have not yet acquired and therefore limiting their capabilities to perform (de Jong et al., 2011). However, these researchers are aligned on the challenges that the oldest intrapreneurs face in generating results due to their desire for stability, both financially and personally (de Jong et al., 2011; Camelo-Ordaz et al., 2011; Bosma & Levie, 2010).

This conflict may ultimately create a problem as businesses begin to apply this research. As businesses use the academic research to create formal and informal programs to induce entrepreneurial behavior in their employees, this conflict in knowledge regarding the ways that the youngest intrapreneurs can contribute to business success might create bias in the identification of individuals targeted for these types of programs, may create bias in the way programs are developed, and may eventually lead to diminished entrepreneurial behavior by employees and a business with less-than-favorable innovation output. Amo and

Kolvareid (2005) and de Jong et al. (2011) all agree that further research is needed to expand on the role of the individual's attributes on intrapreneurial behavior.

In addition to the conflict regarding age and intrapreneurial behavior, the lack of descriptive studies with the individual intrapreneur as the unit of analysis was also identified as a gap in existing literature. In combination, future research should focus on:

1. Understanding the motivations and capabilities of young intrapreneurs
2. Understanding how young intrapreneurs perceive the impacts of these motivations and capabilities on their intrapreneurial behaviors
3. Assessing how young intrapreneurs respond to formal corporate programs which are created by management with the intention to induce entrepreneurial behavior

Given the nature of these three opportunities for further research, a qualitative research study is needed to provide context and color in these areas.

Conclusion

The process of innovation and entrepreneurship and the evolution into corporate entrepreneurship and intrapreneurship are well documented through research. So are the activities that an organization can undertake to foster intrapreneurial behavior and successful innovation in their employees. Finally, the intrapreneurial characteristics that companies should search for in their recruitment and hiring process are also well defined. However, what is not clear is the impact of age on the intrapreneurs' success, nor are the stories of young intrapreneurs documented and heard. Through surveys and analysis, some researchers have found that young intrapreneurs show more intrapreneurial behavior resulting in innovation output (Camelo-Ordaz et al., 2011) while others have found that the youngest intrapreneurs are less likely to show intrapreneurial behavior than middle-age workers (de Jong et al., 2011). These authors have recommended that more research should be conducted in this area to confirm their assumption that the results are due to a lack of capability in resource attainment for the youngest workers (de Jong et al., 2011).

Along these lines, Gifford Pinchot has recently published an article regarding the fit of the millennial generation into intrapreneurial roles in organizations (Pinchot, 2016). Millennials are the youngest generation in today's workforce, and they want to make a big impact in their

organizations and beyond (Devaney, 2015). Pinchot proposes that intrapreneurship may help workers of the millennial generation to meet that need (Pinchot, 2016). The attributes that millennial workers bring with them to the workforce, like social responsibility and openness to information sharing (Bannon, Ford, & Meltzer, 2011), may cause the processes and behaviors of intrapreneurship to change in the future. It might already be the reason we see evolution towards social intrapreneurship and inter-organizational collaboration of intrapreneurs. Before we can address any of these types of questions, we must better understand the new generation of intrapreneurs, hearing their stories and experiences and gaining understanding of their motivations and capabilities.



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Virtual Reality in Global Business: Using Technology for Leadership Skills Development

IVONNE CHIRINO-KLEVANS



Abstract

One of the challenges in leadership development is the ability to create opportunities for students to apply skills that have been learned in the classroom. The traditional approach to leadership development includes cases and simulations, but these approaches are often not conducive to developing “perspective taking” and empathy which are key in developing leadership skills. Virtual Reality provides an opportunity to create virtual scenarios that recreate “real-life” situations where global leadership skills can be put into practice. This design innovation paper describes the elements considered in the development of a simulation focusing on global leadership skills and using a novel approach to Virtual Reality in the context of higher education. This simulation aims to address the gap in action learning for leadership skills development. This document is intended to provide a novel approach of using Virtual Reality in business education.

Keywords: virtual reality, simulation, leadership, empathy

The field of business education is consistently looking for better ways to develop global leadership skills. Many top higher education institutions have designed very robust programs and initiatives to develop global leadership. One such example is the University of North Carolina at Chapel Hill through its Kenan-Flagler Business School that has developed a global education model. This model identifies different experiences/activities through which global leadership can be enhanced. Among those activities are study abroad programs, short-term immersions, participation in conferences, global leadership labs, and curriculum integration. Although many initiatives to develop global leadership skills have been carefully envisioned and implemented, there exists a gap in the design of hands-on experiences that are able to provide students with opportunities to develop leadership skills that are effective in global business environments.

This paper presents a novel pilot project that integrates Virtual Reality to design virtual scenarios where global leadership skills are required in order to decompose and approach global leadership problems.

Literature Review

One of the challenges that global leadership development programs face is the ability to provide enough immersive real-life experiences that allow students to apply skills that have been learned in the classroom and, more importantly, the opportunity to practice in a “safe environment” where decisions do not have a real impact in a real organization. Virtual Reality provides an ideal option to recreate immersive “real-life” situations in global environments that can be used for leadership development across cultures. Virtual Reality is a relatively new technology that gained its popularity in gaming and entertainment but which is also starting to gain some traction in training and development (Freina & Ott, 2015), in some areas of mental health, particularly in treating phobias and issues related to distorted self-image (Grant, 2008), and in design where architects can show future clients how their projects will look in real life before they are actually built.

In a Virtual Reality Simulation (VRS), an actor is immersed in a virtual scenario where he/she can interact with other actors in virtual worlds. Some of these worlds can be computer-generated or can be designed using real videos with 3D technologies. These environments can provide opportunities for interacting or for observing. The possibilities continue to be explored in different disciplines and are in a state of continuous flux.

Virtual Reality for Leadership Skills Development

Skill development is a fertile ground for the use of VRS for many reasons. First, the nature of skill development requires practice beyond the mere acquisition of knowledge. Traditionally, business schools and executive education programs have used cases for students

and participants to use cognitive skills providing tentative solutions to artificial scenarios (which could or could not be based on reality). Another approach to skill development is the use of mentors which can be very insightful in providing feedback. However, mentoring relationships need to be well structured, and mentees often depend on the mentor’s availability for feedback. Finally, leadership skills are better understood when they are used in situations where high emotions are present, and cases or mentorship relationships very often do not include the element of emotion in the contextualization of the experience (Sternberg, 2007).

Measuring Effectiveness

Critics of computer simulations address the fact that not all simulations used for skill development have a robust strategy for measuring effectiveness. Even when there are measures of effectiveness, the question remains: “Why are these VR experiences effective?” “What attributes contribute to the learning that is obtained?” In a meta-analysis study, Howard (2017) concluded that there were three main factors for a VR simulation to work: excitement, physical fidelity, and cognitive fidelity. This author concludes that a novel situation when presented in an engaging way, such as VR, encourages participants to try new behaviors because of the excitement that novelty produces. Virtual environments are not widely known yet and create a sense of inquiry and curiosity. Having access to an immersive environment can in itself create excitement and get users engaged in the VR experience, more so if the environment includes exploration and an opportunity to play (Bowman, Kruijff, LaViola, & Poupyrev, 2004), even when the required behaviors are not that complex.

The second variable that research has identified associated with the effectiveness of VR is physical fidelity. This means providing the user with an opportunity to practice a behavior in a similar way (or as close to it) as he/she would in real life. This element has proven to be very relevant in situations that involve physical rehabilitation, where it is very important that patients be able to “translate” movements that are observed in a video into movements that are similar to those they use in real life (Lucca, 2009).

The third variable discussed in the literature refers to increased cognitive fidelity, defined as the extent to which a program prompts similar psychological processes as the real environment would. That is, when an individual is rehearsing a new behavior (mental or physical), there are cognitive processes that are happening simultaneously (attention, focus, concentration, and so on). A VR simulation that addresses gaining movement on a limb, for example, can recreate a physical environment where movement of this limb is required at the same time that other cognitive processes are happening (such as seeing a child running, hearing a dog bark, etc.). Heiden and Lajoie (2010) developed a VR simulation to help patients regain balance after they had undergone a stroke. These patients demonstrated improvement in the ability to balance and react to an unexpected stimulus, which reflects cognitive fidelity. Other studies (Shema et al., 2014) have found that a VR simulation has helped patients who were trying to improve their gait to increase their ability to respond to two stimuli, decreasing the likelihood of falls. Nevertheless, it is evident that further studies need to be conducted to reinforce the impact of cognitive fidelity through VR.

One area where the application and measurement of the impact of Virtual Reality are still in infancy is business, specifically the use of VR in leadership skills development. VR technology provides opportunities for managers and future managers to practice skills in a safe environment where, if designed correctly, experiences can evoke cognitive processes that may be similar to real-life scenarios and where the use of these skills can have a consequence. These consequences become the starting point of deep insight about the effectiveness (or lack) of the use of different skills.

Experiential Learning as Framework for VR Simulations

For many years experiential learning (Kolb, 2014) has been used as a framework for helping students acquire knowledge. This model designs learning environments where a combination of experience, perception, cognition, and behavior is required to achieve learning. It is based on action and serves as the perfect canvas for leadership skills development. Kolb in his earliest work defined that learning is achieved when individuals are placed in situations where they have a concrete experience, are aware of the reaction that is triggered in them, create an abstract concept of that experience (reinforced with theories), and are then placed in a new situation where that experience can be put into practice. Experiential learning is the basis for business simulations. Simulations result in greater impact when they are set up as “social environments” where a series of interactions produce outcomes that sometimes are not intended.

Virtual Reality in Social Training Environments: Leadership Skills Development

Simulations are not new to the field of skill development. They gained popularity in the 1920s when small boxes were used to simulate flights when the Army Air Corps in the United States (ASME, 2010) realized they needed to reduce the number of fatalities as a result of aviation accidents during bad storms. Technology has evolved to adopt more sophisticated models of simulation of the physical environment to replicate models of human behavior. The military has taken the lead in the area of involving human cognition in simulations. One prominent program is the Mission Rehearsal Exercise system designed by Swartout, Hill, and Gratch in 2001 at the University of Southern California. This simulation attempted to recreate in a virtual world complex situations that would likely be encountered in military deployments. This system used virtual humans called “embodied conversational agents.” The user (the trainee) would encounter a difficult situation that involved strategic decisions that needed to be taken by interacting with these conversational agents (characters). These decisions had important consequences in the virtual scenario. In the world of business, simulations started to get momentum in the 1970s. Goldstein and Sorcher (1974) pioneered simulations which involved role plays for managers to teach them how to deal with difficult employees. Kesselman (2016) conducted an interesting meta-analysis of the several uses of VR in training and development.

Virtual Reality: How Does It Work?

Newer technologies such as Virtual Reality are just starting to get noticed as a possibility in leadership skills development for global business. Some VR experiences include computer graphics and other different types of sensory input such as sounds, images, and even smells to create a computer-generated world in which the user can interact. The VR environment is experienced through a Head Mounted Display (HMD), typically either a helmet or goggles where a mobile phone can be inserted and with the possibility of using stereo earphones. The user can take the role of an observer or an active character experiencing the “realities” that have been created in that artificial world. Some VR worlds include motion tracking devices attached to the HMD (and sometimes hands or feet), allowing the computer to adapt the field of view to the user’s movements creating a “cognitive fidelity sensation,” mimicking immersion. In other words, a well-designed virtual experience provides the user with a sense of presence as if he/she were physically immersed in the virtual environment. This sensation is achieved by shutting out external stimuli so that only computer-generated stimuli can be seen and heard. Some versions of the technology also provide haptic feedback, which is the sense of touch designed to provide information to an end user wearing data gloves. The use of multiple sensory modalities including sound, touch, and smell adds a further element of reality to the experience. VR allows us to create scenes that resemble insular

real-life experiences where the user becomes part of that reality. VR for leadership skills development is used to recreate a “scene” of the real world, emphasizing some aspects of real life in the business world and providing opportunities for skill development in a safe way. Interactive VR scenes allow users to participate and interact, making decisions in the virtual world that trigger reactions and consequences to those decisions.

Global Competence

Anyone who has worked in global companies has experienced, at one time or another, conflict that could be attributed to many variables. Among the reasons for conflict is the fact that culture can have an impact in how we construct and define what is appropriate within our own realities. That is, we make sense of what is “normal” in different (business) situations according to our values and experiences that shape our thinking and behavior (Ott, 1989). People in different social, religious, cultural, and professional environments have distinctive ways of defining achievement, effectiveness in performance, power distance, and expectations about employers, to name a few job-related dimensions. This is one of the reasons why becoming proficient at working across cultures is of key importance, more so for leaders who are in charge of, among other things, setting a common vision for strategic initiatives. This ability of working effectively across cultures has received several names in the literature. For the ease of this paper we will call it “global competence.” This Virtual Reality simulation aims at developing empathy within the context of global competence.

Virtual Reality for Leadership Development: Empathy

One of the most important skills in leadership development is empathy, more specifically “cognitive empathy” (McCauley & McCall, 2014). This skill addresses perspective taking, which refers to our ability to identify and understand other peoples’ emotions. Perspective taking becomes crucial in working in global business settings as culture can have an important impact on how we solve problems, how we create trust, and how we define achievement, among many other functions (Fairholm, 1994).

The purpose of this document is to present a state-of-the-art approach to leadership skills development through the use of a simulation mediated by Virtual Reality, specifically empathy. In the following paragraphs, we will describe the work involved in the design of the VR mediated simulation aimed at helping the development of perspective taking as a pre-cursor of empathy. This simulation was created to address the gap in action learning practices for skill development.

General Description of the Simulation

The VR simulation provides users with an opportunity to immerse themselves in a Virtual Reality scenario where they take the role of **an observer or an actor** in a global business meeting happening in Asia. The simulation is divided in two parts: the first one where the participant is an observer and the second one where the participant takes on a specific character’s role within the simulation.

The first part of the simulation is set in an office environment. In the meeting, there are several executives who reside in different countries (and come from different cultures) and who have chosen the China office as a meeting point. Their goal is to discuss and define the team’s strategy since they have been charged to work on a global project. The scene represents several interactions among these executives who engage in different conversations that lead to conflict. The second part of the virtual experience allows the user to take the role of **one of the executives** involved in these interactions and to be immersed in the character’s thoughts. These thoughts reveal cultural assumptions that represent different cultural dimensions that are involved in communication. The ability to be immersed in someone else’s thoughts provides an opportunity for perspective taking strongly

associated with the development of empathy.

The Virtual Reality scene must be considered a component of a more comprehensive approach to developing global competence as we understand that global competence goes beyond recognizing differences in cultures but has to include decisions based on this new knowledge. This exercise aims to develop awareness of difference and empathy through action learning which are key components of cultural competence. By no means have we assumed that participants will be culturally competent after this experience. This is just the awareness component of a greater set of skills that being culturally competent in global business settings requires.

The Setting and the Characters’ Psyches

Most digital simulations will face the challenge of creating virtual agents (virtual humans) that can accurately represent human behavior. Simulations that use digital worlds must be able to meet the following criteria: the environments must be 3D; virtual agents need to be able to engage in one-on-one “dialogues” with the user, with other virtual humans, and with other users of the simulation; and agents need to exhibit human-like behaviors and emotions. None of the above is an easy task. Because we believe that the recreation of human emotion and behavior needs to be as accurate as possible in order to trigger cognitive accuracy, we approached this simulation integrating videos of real people as characters in a business setting. These characters need to demonstrate cultural dimensions through their dialogues, thoughts, and behaviors which will be accompanied or influenced by emotions that are triggered during different intercultural interactions. What makes this simulation unique and different from other business simulations is the intentionality in the design of the psyche of each character. This intentionality means that each character will think and react according to pre-defined cultural dimensions. We emphasize the importance of looking at this simulation as a training exercise in global competence; it should not be taken as an exercise in stereotyping. Instructors should be very careful at emphasizing the fact that behavioral and attitudinal manifestations of culture can vary across individuals and that this simulation represents one perspective of how cultural dimensions may be manifested in intercultural business interactions. The design of the dialogues and thoughts within the simulation reflects cultural dimensions and was coded as metadata that includes the emotion as well. Emotions give characters energy and momentum to take action to solve problems during the actual recording of the simulation.

The following three cultural dimensions were integrated to build each character’s psyche reflected through their dialogues and thoughts: power distance, context, and task orientation. Here is a definition of each one of these dimensions. We define **power distance** (Hofstede, 2001) as the “extent to which the less powerful members of organizations and institutions (including family) accept and expect that power is distributed unequally.” A higher power distance reveals that inequality and power are perceived by the followers. It also indicates that hierarchy is clearly established and executed without reason nor resistance. A lower degree of the power distance means that people will question authority and will look for an equal distribution of power.

The second dimension that was included in the characters’ psyches was **context**. When we talk about context as it relates to culture we assume polarities. That is, there are cultures that represent high-context while others will represent low-context (Forsyth, 2010). In **high-context** cultures, meanings are the result of a shared understanding which belongs to a particular group. There are several unspoken rules and symbols that would be difficult to understand to members outside of the group or to the untrained eye. In high-context cultures, a great deal of communication happens through symbols and shared meanings. In **low-context** cultures, “what you see is what you get” (Forsyth, 2010). Communication is more direct and relies on how the

sender uses explicit communication. Messages are generally conveyed through conversation and, generally speaking, engage in business relationships rather faster than high-context cultures.

The third dimension integrated in the dialogues was **task orientation** (Forsyth, 2010). Cultures with task orientation tend to approach business interactions focusing first on the task and then on the relationship. In these types of cultures, achievement and meeting goals are more important than forming a relationship. Task and deadlines are at the core of any business transaction. **Relationship oriented** cultures will consider it important to create trust before any business transaction can successfully take place. Leaders that use a relationship oriented approach will focus on motivating, developing and meeting the needs of their teams, and encouraging teamwork and collaboration. Then, results will flow. Both approaches can be effective. The challenge is having a keen eye, understanding differences in approaches, and finding effective ways to address and act upon each preference when needed.

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Virtual Reality provides an ideal option to recreate immersive “real-life” situations in global environments.

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Empathy Development

Daniel Goleman, in his extensive work related to emotional intelligence, has consistently discussed the importance of empathy in effective leadership (Goleman, 2006). Empathy is defined as the ability to identify and understand someone else’s perspective. This ability starts with “perspective taking” which implies an ability to see the world from someone else’s eyes. It is well known that leaders who are able to take perspective are perceived as people who care about their followers’ development (Bass, 1989). With this in mind, this simulation allows for users to be immersed in any of the characters’ thoughts. These characters are Chinese, Indian, Singaporean, and American. Each of the characters’ thoughts were carefully designed considering the three dimensions of cultural competence previously identified (context, power distance, task-relationship orientation). Conveying emotions through dialogues is difficult enough. Adding cultural dimensions to these dialogues reveals a second layer of complexity in the creation of the psyche through dialogues and thoughts. This is one of the reasons why the creation of dialogues and thoughts for each character in the simulation requires an iterative process where writers are knowledgeable not only about how to express emotion but also what that expression would look like in different cultures. These dialogues and thoughts designed for each character required validation by different individuals who had the ability to describe and understand emotions across cultures through dialogue and contextual cues. We consulted with executives and natives from the countries represented in the simulations. Their observations were integrated, and dialogues and thoughts were modified as needed.

Being able to observe and make sense of these cues is part of the skills required to develop empathy in global competence. The simulation provides an opportunity to experience the world from a specific culture’s point of view by being immersed in someone else’s thoughts, allowing the user to take perspective and open his/her eyes to better

understand the potential sources of conflict that arise from interpreting the world from one’s own cultural perspective.

Videotaping

After the dialogues were created, we hired actors that took on the role of the different “executives” in the VR simulation. These actors represented executives from China, India, Singapore, and the USA. A 360-degree camera was used to record all interactions, and other cameras were used as well on each character to provide the user with the ability to take the role of each actor during the actual simulation. This way the user, when taking the role of the actor, would be able to see the business setting as if he/she were sitting at the table where the meeting was taking place and from a different cultural perspective. The recording was done in such a way that the user could “see” his/her own hands and legs if he/she decided to look down, recreating as much as possible the sensation of “being there.”

Method

Throughout this paper, we have described the relevance of using simulations for leadership development in global contexts. VR provides a perfect means to bring this learning to life through the integration of action learning. In the following paragraphs, we will describe how the VR simulation was used in 3 pilot workshops.

The users are given 360 HMDs where they can see the simulation that has been downloaded to a mobile phone. The user observes the global business interaction that is taking place in an office in China. The user sees this interaction as a “fly on the wall” perspective (third person). The user is then asked to remove the HDM, and the facilitator prompts the group to identify what has happened in the scene. Discussions are around cultural dimensions impacting global business practices. Later, participants are asked to put on the goggles again and to choose one character from the business interaction. When the user clicks on the character in the VR world, the user becomes that character and observes the interaction from the character’s cultural perspective. The user is also able to “listen” to his/her thoughts, revealing cultural dimensions as the character is giving meaning to the interaction. After observing this new scene, participants are asked to take the HMDs off, and discussions are once again facilitated around cultural dimensions that impacted the scene. Participants are given the opportunity to analyze how different views (revealed by thoughts and dialogues) represent cultural dimensions, and, more importantly, result in conflicts and misunderstandings. The user is able to analyze these interactions with the language and theoretical background that was given during the session.

Future Work

At this moment, we are still in the process of delivering more workshops to test this first simulation and to obtain feedback and metrics that will allow us to add to the next VR experiences that we design.

This simulation should be contextualized as the beginning of a more comprehensive approach to global competence development. We understand that perspective taking is only tapping on the tip of the iceberg of what being globally competent means. We see this first simulation as the beginning of a more comprehensive training that will later involve other skills that promote interactivity and decision making on situations that require negotiation, motivation, decision making, and conflict resolution among many other skills related to global leadership development.

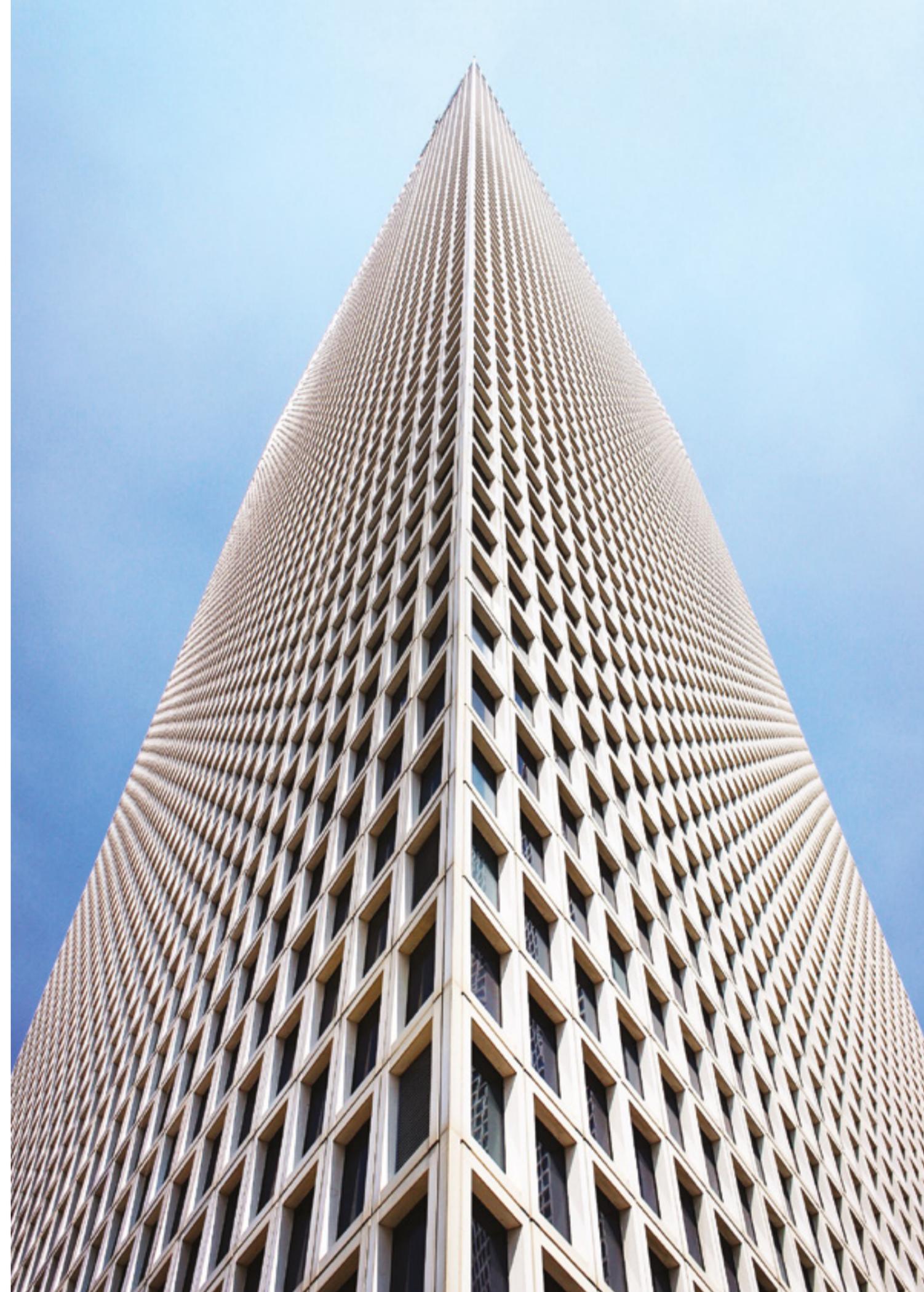
Our final aim is to provide future leaders safe, hands-on experiences mediated through the use of Virtual Reality technologies. We want to provide users with interactive virtual experiences that require the use of different skills to handle a variety of interpersonal and intercultural business situations such as motivation, negotiation, conflict resolution,

and strategic decision making in global environments. We also understand that being global competent is a life-long process that requires an ability to be open to experience, nimble, and respectful while avoiding stereotyping



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Organizational Readiness to Assimilate, Internalize and Use New Knowledge to Drive Change Initiatives

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Abstract

Developing absorptive capacity has emerged as an underlying theme in strategy and organization research. Absorptive capacity can reinforce and refocus an organization's knowledge base. The capacity to assimilate, internalize, and utilize knowledge to drive change initiatives is a construct derived from both individual cognitive abilities and organizational structural components. The problem is that poor organizational readiness impedes an organization's absorptive capacity to assimilate, internalize, and ultimately use new knowledge to drive change initiatives. If deployed correctly, a readiness assessment can help evaluate this capacity and provide the basis for planning the appropriate alignment of resources. This study addresses gaps in the literature on how design thinking as a business model provides a dynamic capability and competitive advantage by enhancing an organization's absorptive capacity to acquire, assimilate, and apply external knowledge.

To fulfill the purpose of the study, the researcher used a descriptive case-study design. Secondary archival data was provided by XYZ Corp.'s HR organization in its assessment of organizational readiness. The study contributes to the research body that examines performance improvements to achieve unique and superior outcomes in organizations. Future research opportunities certainly exist for capturing similar data from other large organizations, to increase the existing data, and to widen the literature on dynamic design thinking and absorptive capacity.

Introduction

Practical insight into how organizations achieving unique and superior outcomes can be designed to enable innovation, and agility remains an under-researched area in the existing literature (Mohrman & Lawler, 2012; Richard, Yip, Devinney, & Johnson, 2009).

This case study contributed empirical data observed and sourced within a large, stable, and highly innovative firm. The purpose of this descriptive case study is to document and describe XYZ Corp. HR Organization's readiness to assimilate, internalize, and use new knowledge to drive change initiatives. The researcher used a descriptive case-study design and a secondary data-collection method to document and describe the organization's readiness process to absorb knowledge and transform these learnings into practical actions. The secondary archival data was collected in preparation for a major organizational change initiative.

Investigating the readiness to absorb and utilize knowledge within XYZ Corp.'s human resources might have important implications for the growing body of researchers interested in change management, and address the research gap in how contemporary organizations redesign

themselves with features that enable agility and drive change initiatives (Smits & Bowden, 2015; Nickerson, Yen, & Mahoney, 2012). With insight from this study, mechanisms can be initiated or reinforced to help accelerate the propensity for learning and to ultimately build appropriate mechanisms to drive change. This study also addresses the lack of theoretical foundation on how design thinking as a business model provides a dynamic capability and competitive advantage by enhancing an organization's absorptive capacity to acquire, assimilate, and apply external knowledge.

Historical Background of Change Management at XYZ Corp.'s HR Organization

XYZ Corporation has experienced unprecedented growth in almost all product and service diversifications since its inception in the mid-1990s. To support this growth,

the HR Organization has needed to adapt to handle the sheer scale of workforce growth. HCM (Human Capital Management) and other systems have needed to scale significantly over time and to include the orchestration of high-volume recruiting strategies and an employee lifecycle support model expanded to support operations in North and South America, in EMEA (Europe, Middle-East and Africa), and the APAC (Asia Pacific) regions. In addition to rapid growth in the physical number of employees, the variety of different worker types has continued to proliferate. This exponential growth has ultimately forced HR to not just scale operations and services, but to ensure that the technical solutions in place can scale appropriately and that support for those systems can be maintained through a greater reliance on self-service automation.

Program Description and Goals

In January 2014, the operations arm of the HR organization stood at 65 employees and has since grown to over 1,400 – projected to exceed 2,800 by the end of 2017 (XYZ Corp. HR Internal Communication Memorandum, October 2016). Until 2014, HR operations were largely supported and conducted by local country HR departments. A decision was made to consolidate regional HR services into four regions: Americas, India, EMEA, and APAC. Between January 2014 and September 2016, HR services consolidated all operations to regional hubs in Costa Rica, Prague, Hyderabad, and Beijing. As part of these consolidation efforts, teams were also built to manage the design and implementation of technology solutions, with the mandate to embrace economies of scale through global service catalogs and a managed product suite. While often successful in actual solution delivery, for those impacted by the change, feedback suggested a less than ideal situation. Poor communication, insufficient training, and leaderless launches often lead to low quality launch delivery with a high level of frustration from those expected to adopt these new systems.

By the end of 2015, it was clear to the leadership team that, if they wanted to scale change initiatives across the globe, appropriate procedural mechanisms were necessary to maintain a consistent framework for orchestrating change project delivery and to build accountability into the delivery pipeline. To meet the needs of those impacted by these change projects, a more formal approach to supporting change was needed, and, to that end, a readiness assessment was initiated. The intent of the readiness assessment was to gauge the sentiment across the organization of its capacity to deliver change initiatives, and to then propose a means to close gaps that

were uncovered during that assessment. Data collection for this study comprises two sets of secondary archival data sourced from XYZ Corp.'s HR organization. The findings from these data sets are described below.

Literature Review

Early change models were based on the psychological state of the organization as the change process progressed (Lewin, 1947). Through the late 1990s, models for change emerged (Kotter's 8-Step Model, 1990; Prosci's ADKAR Model, 1994; Worley et al.'s Integrated Strategic Change Model, 1996) that ultimately developed into an industry of change practitioners and consultants. The field of change management expanded further to consider a range of pre-change factors that could potentially influence successful change outcomes and could be facilitated through the lens of the learning-based organization (Senge, 1990). In recent years, the 2014 Association for Change Management Professionals (ACMP) Standard for Change Management focuses on a wide array of key antecedents in consideration for developing organizational change readiness. However, much of the existing literature on change readiness focuses on change readiness as an early snapshot assessment targeting social cognition (attitudes, commitment, openness, and alignment to the organizational vision) or strategic elements (skills and knowledge, leadership capacity) within the organization (Armenakis et al., 1993; Holt et al., 2007; Shah, Irani, & Sharif, 2016; Vakola, 2013). Stevens argues that these are narrow definitions of change readiness, yielding questionable validity and generalizability, and poor psychometric properties (Stevens, 2013). Instead, a process-based approach for actionable realignment to the change over the life of the change process is suggested.

Other researchers have examined and proposed a multi-level analysis that examines individual, group, and organization interaction as a predictor of change, therefore fulfilling a more realistic and holistic evaluation of the dynamics contributing to change readiness (Rafferty, Jimmieson, & Armenakis, 2013; Bouckennooghe, 2010; Kozlowski & Klein, 2000). Pelletiere (2006) contends a need for a thorough diagnostic investigation that includes cultural and climate gauges of the organization. The successful example of the 1990s Bell Atlantic (now Verizon Wireless) transformation, using a highly-structured approach to accommodate both anticipated and unanticipated change implications (before, during and after the change, which support Stevens's 2013 assertions), mechanisms for managing the impact of change on key stakeholder groups, and appropriate reward and performance

measures exemplify the benefits of taking a holistic and multi-faceted approach to change management. The conceptual framework proposed by Holt and Vardaman (2013) takes both individual and organizational factors into consideration, and therefore shows considerable promise building on calls for multidimensional factors to be included in the readiness assessment. Specific tools for assessing readiness have historically tended to focus at the individual level (Holt, Armenakis, Field, & Harris, 2007; Vakola, 2013) and are more readily available than organizational readiness tools, which have largely been criticized for limited validity (Patterson et al., 2005). While questionnaires have been used extensively, most contemporary research calls for a wider net for studying organizational readiness, effectively using a triangulation method that includes qualitative interviews and quantitative surveys (Piderit, 2000; Rafferty et al., 2013).

R&D spending was largely the focus when absorptive capacity was first formulated as a conceptual framework for examining organizational performance and has largely influenced research focus since that time. Research has converged on the realization that organizational absorptive capacity depends on the absorptive capacity of its comprising individual members (Cohen & Levinthal, 1990; Drzensky, Egold, & Van Dick, 2012; Holt et al., 2007; Lichtenthaler, 2015; Wales, Parida, & Patel, 2013; Vakola, 2013; Volberda, Foss, & Lyles, 2010; Zahra & George, 2002). However, contemporary research has focused on considerable variability in the application of absorptive capacity and its effect on organizational performance, and has shown complexity in the different levels of absorptive capacity. The right balance of AC within the organization has been shown to vary relative to its size (Volberda et al., 2010), and investigation into the optimal level of investment in AC indicates financial returns can be both enhanced and diminished at certain levels (Wales et al., 2013; Lichtenthaler, 2015). The relationship between absorptive capacity and an organization's strategic response to demand for products was also found to be non-linear (Dobrzykowski et al., 2015). Research focusing on social capital, aligned to the Social Identity Framework (Tajfel & Turner, 1979) has shown that a considerable range of social antecedents influence absorptive capacity: past performance and previous history of change (Fuchs & Edwards, 2012); team and cross-team dynamics (Backmann, 2015); individual's identity with the organization itself (Drzensky, Egold, & Van Dick, 2012); the influence of middle management (Drzensky et al., 2012); and the building of trust, norms, and identification

between individuals (Kittikunchotiwut, 2015; Vakola, 2014).

Antecedents of absorptive capacity extend across a range of investigational sources, and investment in these antecedents is directly tied to relevance of knowledge area to organizations' strategy (Lane, Koka, & Pathak, 2005). Therefore, organizations are understandably discriminating and pragmatic when it comes to where they invest resources. Jansen et al. (2005) segmented absorptive capacity into potential and realized AC, whereby potential AC comprises the acquisition of knowledge and realized AC is the assimilation and exploitation of that knowledge. They suggested that a firm's socialization capabilities play a significant role in realizing AC. Building on this, research suggests organizational mechanisms are of critical importance for the realization of transformative learning behaviors of an organization's employees (Martinkenaite & Breunig, 2015). Studies identify external and internal knowledge acquisition as fundamental antecedents for absorptive capacity (Guimaraes et al., 2016; Dobrzykowski et al., 2015; Tzokas et al., 2015; Lichtenthaler, 2015; Müller-Seitz, 2012), and that knowledge acquisition may be relative to the position in the internal knowledge sharing structure (Tortoriello, 2015). Soo et al. (2012) suggested that hiring practices, reward systems, and other aspects of Human Resource Management (HRM) are key antecedents for realized AC, and that to generate performance improvements at the organizational level, managers need to develop collaborative structures and mechanisms to generate capabilities which lead to effectively transforming and exploiting the new knowledge through recruiting and developing talent. Guimaraes et al. (2016) identified both charismatic and transactional strategic leadership as key antecedents, suggesting the former is much more challenging (and therefore rare in today's organizations, compared to the latter). Supporting readiness-increasing organizational cultures characterized by learning, open communication, supportive working relationships, and participative decision-making enhances the readiness for change at both the individual and collective level (Gärtner, 2013; Guimaraes et al., 2016; Soo, Tian, Teo, & Cordery, 2012)

Individual Perceptions and Sentiment for Internal Change Capability

As part of the organizational assessment, XYZ Corp. HR Organization undertook a series of interviews gathered from 30 functional, program, and leadership management employees within the organization, representing HR services directors and respective HR service owners

with HR directors representing global talent management, compensation and benefits, HR operations, product managers, business analysts and project, change, process improvement, learning solutions, and customer service managers. These documents comprise thirty unstructured interviews. The notes captured within these interviews explore various aspects of the change management process including: the organizational structure and culture, general awareness of the change management process, the organization's overall ability to conduct large scale change, communications and learning support for change, individual perceptions as to the ability to deliver projects, existing reporting and accountability processes, project successes, and the involvement of leadership.

For the content analysis on the interview data, the notes were reviewed and broken down into themes as a means to identify related issues and categorize them. Several sub-themes were also identified. For content validity, Lawshe's Content Validity Ratio method was used (Ayre & Scally, 2014; Gilbert & Prion, 2016) whereby three change management SMEs were consulted to align

topics discussed within the interviews into the six main overarching themes, from which the remainder of the analysis would be built and discussed. These six broad primary themes are: Organizational, Customer Experience, Project Management, Change Management, Functional Support - Communications, Functional Support - Learning and Training. Fifty-six distinct topics were found within the interview notes and aligned into themes. Of the 56 topics, just seven items resulted in SME disagreement as to their placement. Each of these outlier topics was discussed with the full group present, and agreement was reached as to the appropriate alignment of these topics within the themes based on shifting assumptions as to how they would be processed during the analysis. Three of the seven items were split across two themes given their multi-dimensional scope, resulting in 59 items being categorized across the six themes.

The results of the classification of topics into themes are as follows:

Training and Skills

The second data set contained a quantitative survey with a wider sampling (5,500) across

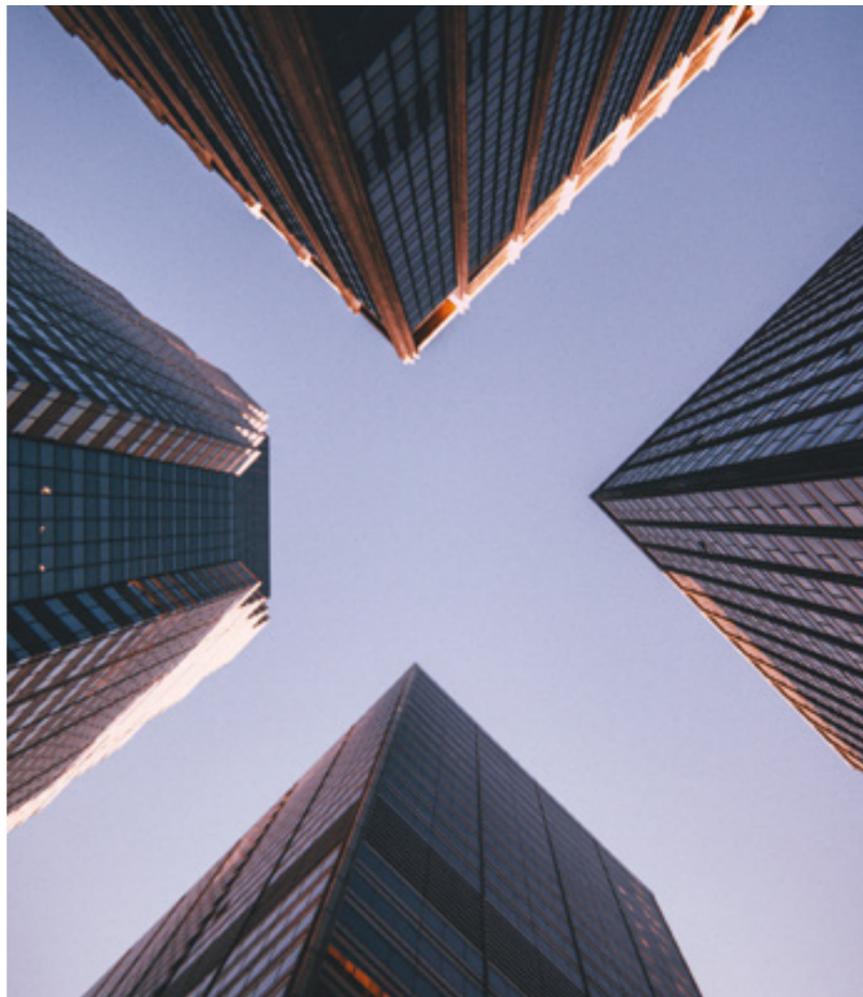


Table 3
Breakdown of interview themes and topics within themes.

Topic (number of respondents > 1 addressing issue)	
Organizational	<ol style="list-style-type: none"> 1. Lack of business continuity planning 2. Large programs with no global owner 3. Need to build a culture to support change (incl. international) 4. Governance of content – policies/retention & storage (2) 5. Sheer volume of changes and decisions needed are excessive (5) 6. Expanding into a 4th region – means consistency needed 7. Consolidation of operational support to regional hubs (2) 8. Team composition – inappropriate staffing (3) 9. Differences in regional org. structure/service models (6) 10. Don't have sufficient mechanisms to create good repeatable processes
Customer Experience	<ol style="list-style-type: none"> 1. Project delivery results in a poor customer experience (3) 2. Lack of follow-up after launch with customers 3. Project delivery must be frustration-free for the customer (3) 4. Quality of deployments is highly frustrating for customers 5. Poor deployments mean poor feedback 6. Planning should start with working backwards from the customer to deliver the appropriate solution
Project Management (PM)	<ol style="list-style-type: none"> 1. Lack of a formal portfolio structure across HR 2. Financial metrics are lacking for any given project 3. No accountability and inconsistent approach used for project delivery (6) 4. Need a standard approach for PM (3) 5. Need to mandate the use of lessons learned after launch 6. Lack of project reviews, results in misalignments and insufficiently thought out solutions with no process rigor 7. No portfolio tool to manage the list of projects globally 8. Uncertain as to how projects get initiated 9. Volume of projects (backlog/stacking of priorities) is a problem we need to fix (4) 10. Prioritizing projects needs regular discussion (5) 11. Change management should be integrated as a function of the project plan 12. Need to drive a project portfolio with transparency and with regular audits (3)
Customer Experience	<ol style="list-style-type: none"> 1. CM has historically been a last mile exercise 2. Need to build consistent processes for delivering repeatable high quality delivery for the customer with consistent branding and using a variety of communications channels 3. More people need to understand CM process – some good tools available, but need to understand the 'how' (4) 4. Fire-load-aim is the typical modus operandi for change 5. Considerable lack of CM expertise common across teams 6. A consistent templated approach has been set up 7. Localized communications is key to successful CM 8. Its challenging creating momentum for change 9. Better stakeholder management is necessary with appropriate socialization of the pending change (3) 10. How can I get support from the CM support team on my projects? (5) 11. CM efforts are sorely lacking: poor quality, no real effort on behalf of the customer; don't work well at all (3) 12. Execution sequence is inconsistent (front-end good, back end-poor) 13. Reinforcement of the change is non-existent 14. Change projects need the right team composition: Change Manager, Communications Specialist, and Learning SME 15. Critical need for CM training: hands-on instruction and a component to socialize the approach globally (8) 16. Consistent change model because we use an inconsistent approach to change 17. Change Management toolkit (6) <ol style="list-style-type: none"> a. Is widely known across HR since launch b. Contains good user-friendly templates c. Provides access to CM tools d. Re-evaluate the UI to easily find resources e. Serves a purpose but more 'hands-on' education needed

Topic (number of respondents > 1 addressing issue)

<p>Functional Support Communications</p>	<ol style="list-style-type: none"> 1. Need a global standard approach to communications with local delivery (5) 2. Email is the usual delivery of communications (6) 3. Communications are usually handled late in the process 4. Overuse of email: we should encourage use of the full spectrum of communication modes: posters, badges, reports, all-hands meetings, etc. (5) 5. Whenever a communication is sent that describes a change in a role, this results in a fear of job losses 6. Sponsor communications need to be vetted appropriately for accuracy and target the right population 7. Evolve a global communication strategy that explains how to effectively use proper communication channels 8. Consistent messaging and branding (4)
<p>Functional Support – Learning and Training</p>	<ol style="list-style-type: none"> 1. Learning teams are involved much too late in the launch process 2. Learning teams need greater headcount to meet the demand for an ever-growing launch portfolio 3. Front-end training often lowers adoption (when delivered too early) – need a ‘just-in-time’ training delivery model 4. Need greater awareness for the appropriate learning approach to take for each respective project or change 5. Need to repurpose materials and use them consistently across project launches to save time and costs 6. Translations to be handled consistently in local market

the same population. The purpose of the survey was to determine gaps in change management training: to both expose the extent to which untrained personnel were already working to deliver change projects, and their desire for further skills training. The survey comprised 14 total questions, 13 scaled items, and one open-ended item. Twelve scaled questions used the Likert approach for scaling responses across the categories: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. One of the scaled questions used a range to quantify the number of projects managed by the respondent. The open-ended item posed the question, ‘What change management topics would you like additional training in?’ The survey was initially sent to HROA leadership for dissemination to their respective teams, and then on to the wider HR groups across XYZ Corp. with roughly 5,500 potential responders. The response rate was approximately 10.4% (570).

The first three questions in the survey concerned existing roles and expectations, and produced interesting results. Of the 570 respondents, the majority – 485 and 424 respectively – are expected to perform project or change management functions, but have a role within the organization that does not require project or change management credentials to perform in the role. This suggests a potential skills gap, particularly given the next revelation. Of the 538 responders, 96 claimed to have not run any significant change projects to date. 227 had managed three to five projects, 127 had managed six to nine projects, and 86 had managed ten or more projects. So, at least 440 of the 570 respondents have managed change projects without an official

project or change manager designation. The one caveat here is that some of these employees may in fact have familiarity with change or project management, and therefore the remaining questions help to assess the extent to which training is desired or necessary. 87.7% (500) of respondents stated that they were interested in developing their skills as a change manager, and 67.7% (386) reported that their responsibilities as a change manager were not clearly defined. 61.4% (350) would like to lead larger change management projects suggesting an appetite for skills enhancement or professional growth opportunities.

The next section in the survey sought to examine the skills gap in more depth. Five areas of change management tactical delivery were the focus of five items in the survey. Surveying specific skills competency required for delivering change projects produced mixed results, indicative of self-bias.

- Asked if respondents had the skills capability to competently manage a Stakeholder Analysis produced a composite agreement of 50.8%; 8.6% (49) strongly agreed, 42.2% (241) agreed versus a composite disagreement 41.8%; 34.6% (197) disagreed, 7.2% (41) strongly disagreed. 7.4% (42) neither agreed nor disagreed.
- Asked if respondents had the skills capability to competently manage a Change Impact Analysis produced a composite agreement: 37.9%; 6.5% (37) strongly agreed, 31.4% (179) agreed versus a composite disagreement: 54%; 45.6% (286) disagreed, 8.4% (48) strongly disagreed. 3.5% (20) neither agreed nor disagreed.

- Asked if respondents had the skills capability to competently manage a Communications Plan produced a composite agreement: 73%; 17.4% (99) strongly agreed, 55.6% (319) agreed versus a composite disagreement: 19.1%; 16.3% (93) disagreed, 2.8% (16) strongly disagreed. 7.5% (43) neither agreed nor disagreed.
- Asked if respondents had the skills capability to competently manage a Learning (Training) plan produced a composite agreement: 59.7%; 12.5% (71) strongly agreed, 47.2% (269) agreed versus a composite disagreement: 31.5%; 28% (160) disagreed, 3.5% (20) strongly disagreed. 7% (40) neither agreed nor disagreed.
- Asked if respondents had the skills capability to competently build a Change Strategy produced a composite agreement: 42.8%; 7% (40) strongly agreed, 35.8% (204) agreed versus a composite disagreement: 49.2%; 43.9% (250) disagreed, 5.3% (30) strongly disagreed. 7.4% (42) neither agreed nor disagreed.

Limitations of the Case Study Analysis

Lawshe’s content validity method identifies five or more SMEs for the Content Validation Panel (Ayre & Scally, 2014; Gilbert & Prion, 2016). This researcher coordinated and utilized a panel of three SMEs for interview topics categorization among the six primary themes. Inter-rater reliability was strong however among the 56 topics, and disagreement on seven of the topics was further discussed to align the topics to themes, resulting in the breakout of three topics into two additional topics to then align

to the themes, resulting in 59 topics in total.

For the qualitative archival data, non-probability sampling was used. In conducting the interviews, the initial researcher deliberately chose the individuals to participate in the study to obtain a cross-section of the relevant groupings within the organizational structure and distribution in other global regions. The quantitative data however is representative of probability sampling, whereby every individual in the population had an equal chance of being selected as a subject for the survey. As biases affect the perspective of the research being conducted, this researcher must consider biases based on the social, economic, cultural, and educational circumstances causing skewed research. Self-assessment data from survey respondents is highly likely to contain self-perception bias either positively in the form of self-enhancement bias or negatively in the form of self-diminishment bias (John & Robins, 1994).

Another limitation is that employee data provides a snapshot in time of perceived sentiment, which may of course change when viewed with a temporal lens or through a longitudinal study. However, the actual analysis from the archival data is reproducible and therefore is not cause for concern when interpreting the study’s implications. The limitation of examining a single organization, which may reduce the possibility of generalizing the results (Vakola, 2014) is also worth stating. To counter this, common-method variance was used (both qualitative interview and quantitative survey data) to help converge and tie in the relationship between data and key sentiments identified. The findings from both sources of data resulted in specific outcomes aligned to themes identified in the analysis of the data. The organization took specific measures to address gaps in core competencies to realize its strategic outcomes. The concept of a readiness assessment (knowledge acquisition) leading to the assimilation and utilization of that knowledge is of course the purpose of the current research. With regards to the survey data, while a wider population sample was used (570 respondents from 5,500 surveyed, a 10% response rate), the data is subject to the limitations on self-report data.

In terms of validity, the questionnaires contained in the secondary data were constructed specifically for the purpose at hand. While both the questionnaires and the interviews were specifically designed for use in XYZ HR organization, these tools use common language and lines of questioning that in terms of external validity and reliability could easily be generalized for developing a similar readiness approach beyond the XYZ HR organization. Comparable studies

across organizations within XYZ Corp. would find this data useful, in addition to cross-organizational studies. Unfortunately, given confidentiality constraints, data used for the current study may not be available for the latter research.

Evaluation of the Findings

Evaluation of the data suggests a baseline of change management and some significant challenges deploying change projects from a process and structural mechanisms standpoint. Another key finding was concern for volume of projects, prioritization and limited project accountability. Analysis of the survey results suggest a critical gap in skills capability. Individual and collective sentiment from the survey and the interview findings are combined and discussed in terms of the readiness assessment categories below. The categories used, align to the four primary factors to determine individual sentiment towards change based on the work of Holt, Armenakis, Field, and Harris (2007), Vakola’s Systematic Inquiry Model (Vakola, 2012), and the readiness assessment work of Holt and Vardaman (Holt & Vardaman, 2013) whereby change is defined as, “the extent to which employees are individually and collectively primed, motivated and technically capable of executing a change.”

Category 1: Appropriateness of the proposed change. Across leadership, middle management and functional teams, interview respondents indicated that modifications to the way in which change projects were managed needed to be re-examined, and the processes tightened up for change projects to be successful. This indicates a vested interest in the change and an inherent appropriateness for conducting the modifications to existing processes, primarily as an output from the readiness assessment and part of the proposed change in and of itself. Respondents specifically described the need for a formal portfolio tool and a set of project gates to manage the list of projects consistently around the globe. Each project would move through a series of review gates as the project progresses through each respective phase. This would accomplish another concern, accountability for project deliverables and an inconsistent approach used for change and project launch. Lack of project reviews had in the past resulted in misalignment between teams and, in some cases, projects being initiated in multiple teams! Poorly designed solutions with no process rigor was another symptom of the lack of accountability.

Also articulated was the need for a standard project management methodology that should align to the project portfolio tool. To make things more useful for the project

team, establishing a process for change management that transparently ties into the project management methodology and integrated deliverable checklists into the stage gate reviews would complete the picture. Another expectation for the revised approach was the need to address the concern that project teams were staffed insufficiently. Often, analysts were asked to perform the function of the change manager or the project manager without the skills or discipline to manage the process effectively, essentially setting the individual up for failure. Having appropriate resources staffed from the appropriate functional team as a matrixed organizational approach would help resolve this issue.

The use of lessons learned during post-project reviews was also articulated as an essential process that would be necessary if the organization was to focus on a process of continual learning, such that project teams could use tribal knowledge from one project for the benefit of the next project and hopefully mitigate issues from repeating. Respondents also suggested that initiating projects was not only a different process in each region but a black-box of uncertainty as to where the approval to begin a project would originate. A formal process would be the means to address this issue. Given the lack of skills, a targeted and well-designed training program would help close the gap in project and change expertise common across teams.

Category 2: Leadership support of the change. While the individual leader’s self-perception of their role within the existing state comprised largely self-enhancement bias, the interviewed leaders were self-critical in not fully understanding their ongoing role as change sponsors and lacked the necessary understanding of how to fulfill that role. This would manifest later in a skills module for leadership and a series of discussions to implement a specific role for project sponsors. Other respondents confirmed this and were critical of leadership when it comes to sponsoring change and presenting timely communications at the target customer base. Their perceptions suggested that, while pre-launch email communication to the targeted customers can be requested of leadership, reinforcement messaging of the change is non-existent post launch.

Category 3: Individual capability for making the change successful. The survey surfaced much of the data indicating a skills gap in both project and change management. However, many of the interview responses suggest that individuals are hindered from delivering successful change projects due to the lack of awareness for change management processes or use of

the tools and templates already in existence within the organization. Respondents stated that they were aware of the website for change management, the processes outlined, and the templates available, but were not aware of the appropriate use of the templates and how to effectively manage and implement change. Many of the how-to concepts were missing from their capability to make changes successful.

In addition to a lack of change management expertise across teams, the volume of projects was called out as a huge detractor for quality change implementations due to the need to switch between projects quickly, multiple projects being worked on simultaneously, and no down time between projects being delivered and the next one being started (this also accounted for why lessons learned were not part of standard operating procedures). Responses from those working on projects also surfaced a lack of consistent project management, and accountability for decisions made during the planning and execution phases of each respective project. The lack of project reviews with no process rigor was again highlighted in terms of poorly designed solutions, and insufficiently staffed teams resulted in a lack of personal discipline and fundamental skills for focusing the direction and function of the project team.

Category 4: Personal benefits of enacting the change. Referred to as 'What's In It For Me' (WIIFM), these sentiments speak to the individual's need to tie the strategic vision for the change to personal goals or benefits. From the survey and from the interview data, the primary request from respondents focused on the need to build personal skills enhancement in both project and change management respectively. Sentiment suggested that respondents saw training to enhance their abilities and prepare them for greater responsibility within the department and organization as a whole, and possibly leading to a promotion or alternate assignment. Some saw the opportunity to drive larger projects as a driving force for being involved in the change process. Respondents also proposed that given a lack of an existing training program, the means to obtain consulting assistance from subject matter experts would help resolve some of the challenges on a case by case basis in the meantime.

Findings in the Context of the Research Questions

The research questions for this study form the basis of the inquiry. Findings from the analysis of both the interviews and the survey data are discussed in the context of the research questions below.

RQ1: What evidence from XYZ Corp. indicates the organization's readiness to assimilate new knowledge for driving change initiatives?

The Project Management Institute first published the Project Management Body of Knowledge (PMBOK®) in 1996 as a guide to help the development of the project management profession. Since that time, the integration of project managers as an integral discipline across all industries has proliferated across the globe. As of January 25, 2017, there were 650,000 Project Management Professionals (PMP®) worldwide (PMI, 2017).

Similarly, change management courses have been offered by institutions of higher education and other private training organizations for many years. However, as a discipline with a professional following, a global standard was released by the Association of Change Management Professionals in 2012, and a globally recognized title, the Certified Change Management Professional (CCMP™), was only established in 2016. The relative youth of change management as a recognized profession has in many ways only just started to yield impactful growth. XYZ Corp.'s HR organization hired a principle change consultant in the spring of 2016 in anticipation of, and in preparation for, scaling operations to meet intended employee growth projections.

In terms of evidence indicating the organization's readiness to assimilate new knowledge for driving change initiatives, XYZ Corp.'s HR organization had the foresight to hire change managers to conduct a readiness assessment and propose a framework to close gaps for delivering change initiatives. In determining the appropriate steps to take (i.e. interviews of key personnel and surveys to evaluate skills), gaps were used. These data have formed the basis for the present research study. The interviews outlined a number of very explicit concerns for the organization including the lack of accountability on projects, no standard processes for change project delivery, ineffective use of communications, and an organizational structure that differed across regions. Sentiment from staff that team composition was inconsistent and insufficient and that integrating change management should come earlier in the process were worthy of attention. Many called for greater understanding of how change management processes work, which translates to the need for training. As a response to concerns about skills, a survey was used to specifically define the gap. From the results of the survey, roughly 50% of respondents did not feel competent to build a change strategy, and between 42 and 73 percent felt they

lacked the skills to adequately manage a training plan, a communications plan, a change impact analysis, or a stakeholder analysis. Interestingly, ten percent (57) stated they have little interest in learning anything beyond the basic information to get the job done. The one open-ended item asked respondents to suggest additional change management topics (in addition to stakeholder analysis, change impact analysis, communication and training plans) that they were interested in learning about. These suggested topics included various aspects of change management and delivery: change measurement and evaluation: using metrics, leading others through change, influencing stakeholder teams and resistance management, planning change stabilization, having agile change management, dealing with the impacts of using change management and learning plans, adapting change management across different corporate and international cultures, developing an effective change strategy, and defining best practices. The survey and the interview notes contribute directly to a readiness assessment from which a planned approach to address these deficiencies can be proposed and enabled.

RQ2: What evidence from XYZ Corp. indicates the organization's readiness to internalize new knowledge for driving change initiatives?

In terms of assimilating or integrating the new knowledge, the readiness assessment components of which the two data sources used in this study comprise a part were used to build consensus for building the programmatic mechanisms. The change consultant used the interview and survey data, along with other indicators from leadership across the organization, to develop a proposal to address the issues uncovered. Once the proposal had been socialized with leadership and other key personnel across the organization, specific structural mechanisms were designed, reviewed, built, and deployed in rapid succession in the next three quarters. As one example, a project portfolio tool was developed and launched across all regions over the course of two months, and a gating process (essentially a means to analyze the progress of a project from initial business case through to post-launch results) was introduced. This gating process ensured accountability was embedded in a formal framework that then enabled a consistent approach to project delivery.

From the information gathered in the readiness assessment, leadership concurred that support mechanisms were indeed needed and were put in place as a direct result. A change management community began to meet quarterly to discuss and

present change management topics as a group for discussion, and to discuss project launch challenges as a retrospective on how to refine the process moving forward. A quarterly newsletter was also established to notify of upcoming workshops on change management, to highlight high profile change projects and support, and to announce the availability of consulting help from certified change managers. A network of qualified change managers was hired, with a subject matter expert located in each region around the globe to advocate for the change management framework, and existing online support materials were refined for easier access and search-and-find capability. In addition, a multi-tiered internal training and certification program was developed specifically targeted to staff working on change initiatives. This program incorporated both external change models and documented best practices to produce a grounded, externally relevant development tool. An added bonus was that this course could be used as a professional development goal and motivator with internal managers, and was useful in the fulfillment of external professional learning credits towards reissue of the PMP® or CCMP™ designation.

To help close the change management skills gap and address a variety of different needs, the training was tiered as level 1, level 2, and level 3 training. Level 1 focused on basic awareness of the change management process, useful for staff that work on small change initiatives and that need a basic primer on the overarching process and tools. Participation in Level 2 and beyond was devised to be by invitation only. This more advanced level paired participants with mentors for three to six months and was targeted at individuals in strategic roles that need a more fundamental grounding in change management practices. Level 3 requires the participant to manage a self-driven change project under supervision of the mentor, culminating in a certification review board meeting and the certification designation. The program was considered a bar-raising experience and several hundred took the Level 1 training. Level 2 training was piloted on SMEs and launched in Q1 2017. On the heels of the change management training program, a project management training program is due to launch in Q1 2017 (XYZ Corp. HR Internal Communication Memorandum, September 2016). This training program uses a similarly multi-tiered approach, incorporating mentors in the advanced levels.

RQ3: What evidence from XYZ Corp. indicates the organization's readiness to utilize new knowledge for driving change initiatives?

The efforts to embed this new knowledge into the organization's operating practices was a large change project in itself and was managed as such. The utilization of new knowledge following the work undertaken for the organizational readiness assessment manifested in two primary forms. Building out procedural, systemic and workforce support mechanisms assimilated and utilized the knowledge captured in the readiness assessment components and demonstrates absorptive capacity at the organizational level. Often, organizations hire consultants, pay large sums for those consultants to explore and report over a series of weeks or months, and then ultimately ignore the recommendations for any number of reasons. The capacity to absorb this knowledge demonstrates a unique level of design thinking that ultimately can result in extraordinary outcomes for the organization. In the case of this particular organization, this has been demonstrated time and again. Using consistent feedback loops, evidence has surfaced that suggests the team feels more empowered with these new support mechanisms and has greater capability for driving projects to a higher standard of customer satisfaction, largely due to better quality deliverables from a more rigorously challenged execution process.

At the individual level, utilization of the knowledge from participation in the training programs will, it is hoped, permeate knowledge into the core of the organization for the immediate betterment of change project initiatives and their corresponding outcomes. The extent to which this permeates into all regional change initiatives remains to be seen. At the individual level, enhancing a person's ability builds self-worth, and the perception that the organization is helping an individual grow through more targeted recruitment and personal development (Soo et al., 2012). These intrinsic motivators have already manifested themselves internally, as staff lobby for admission to the advanced levels of the training program. The training program has contributed to building rewards and recognition as part of a more positive performance evaluation process, based on strengths and tangible goals. The ultimate measure of whether these change initiatives have truly made a difference will be realized over several quarters, as the organization deploys trained personnel to change initiatives and then measures the results relative to before the organizational overhaul. Preliminary data looks promising.

Summary and Recommendations for Future Research

This paper began by outlining the historical background of XYZ Corp. HR Organization's exponential growth and restructuring to

accommodate this growth. The program description and goals were then discussed aligning toward a readiness assessment for a significant organization change. Next, the data from both the interviews and the survey were analyzed, and the findings discussed, as they converge to describe the individual and overall organizational sentiment toward change. The data was then discussed in the context of the three research questions determining XYZ Corp. HR Organization's capacity to acquire, assimilate, and utilize knowledge to drive change initiatives.

The limitations and recommendations section outlined limits to the content validation exercise conducted with subject matter experts that helped to independently align the key interview topics into the overall themes. The content validation panel consisted of three SMEs, but, given that forty-nine of the fifty-six items aligned unanimously, inter-rater reliability is within acceptable limits for this study. Limitations were also noted as to the data representing point in time sentiment, or temporal data: the use of a single organization for the study which could potentially limit the capacity to generalize the results, and the plausibility of the data containing interview bias in addition to self-perception bias, both positive and negative, from the respondents themselves.

Further analysis of the data might well be useful for researchers examining the interdependencies between individual sentiment at the beginning of a major change initiative and the individual sentiment at the end of the change initiative, deemed beyond the scope of this paper. Comparable studies across organizations within XYZ Corp. would find this data useful, in addition to cross-organizational studies. Unfortunately, this data may not be available for the latter. The final section evaluated the findings from the converging sentiment data and plugged them into the readiness assessment model framework described earlier in the document. The evaluation then discussed the findings and subsequent actions taken by the organization in response to each of the three core research questions within this study.



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Price-Setting Strategies for Product Innovations in the Medtech Industry

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Abstract: This article analyzes the research problem of price-setting strategies for product innovations in the medtech industry. It is based on the conceptual framework of price-setting practices, strategies, and models. A multiple case study research is then performed on six medical technology companies, focusing on how they set their initial product price for a new technology solution to either existing medical conditions or technology limitations. The research results show that medtech companies opt for competition-informed price practices and buy pricing models. The pricing strategies vary between skimming and market-based pricing strategies. Price innovations are limited due to regulation and financial considerations.

Keywords: Price-setting, pricing practice, pricing strategy, pricing model, medtech

Introduction

Price-setting for any new product is crucial in determining its future in the market. After years of research and development (R&D), product design, testing, market research, and marketing, the first real interaction a product has with the customer is through its price. It is not the idea of how its utility will benefit the customer nor the vision and excitement given about how things will change. Those are unrealized expectations preserved until after the customer has ownership. The price is the real, hard currency promise of what this product will mean to the customer.

There is a great need for all companies to understand and optimize their pricing strategy. Price-setting determines a company's profit margin as well as market share – the ease in making sales or the difficulty in gaining adoption. It is perceived as a profit opportunity invitation to future competition and a territorial grab to existing competitors. Marn and Rosiello (1992) studied the economic parameters of 2,463 companies and found that a 1% improvement in price yielded an 11.1% improvement in operating profit, all else being equal. This compared dramatically high as compared to a 1% improvement in either the variable costs, sales volume, or fixed costs, which yielded operating profit gains of 7.8%, 3.3%, and 2.3%, respectively.

With the possibility of any product or industry to focus on, this paper has chosen the medical technology (medtech) industry. This focus has been chosen because of the amount of money spent on R&D investment, the rapid advancements made in recent years, the growing worldwide demand in advanced medtech products, and the absence of existing research. Further, medtech products often consist of physical products, consumables, and services, the combination of which increases the pricing complexity.

Medtech companies are providing cutting-edge technologies to patients, hospitals, and care providers around the world. It would appear that as the world becomes more interconnected toward a single common marketplace, the faster the rate of technological development becomes. With an increasing rate of technological development at the same time as larger customer exposure, greater necessity is placed on a medtech company entering new markets with the correct marketing and pricing strategies.

The purpose of this study is to identify various international pricing strategies and models used in real world companies. From this selection, comparison can be made of their relative strengths and proper implementation. The problem in this research is that international pricing decisions are more complex than domestic, frequently incurring currency value swings, differing inflationary pressures, and difficulty in having production facilities in different markets, which leads to frequent price reviews (Hollensen, 2014).

This study has been performed in part by the call for research from Ingenbleek, Frambach, and Verhallen (2013). In their paper, they call for further research on existing pricing processes with the intent of applying them toward optimal application for new product development. Thereto, it is suggested to address this need through qualitative research methods such as multiple case study research.

Literature Review and Theoretical Framework

Successful price-setting strategies and models can be derived from a large number of literature sources centered on either the conceptual derivation or empirical results. However, sources of failure risk are often more easily learned from case studies found in literature research. In short, the success and failure risk factors relevant to bringing a new product to market can be generalized as originating from either the product, company, competition, customer, international market complexity, or new sub-industry oriented focus. Evidence for each of these focuses is found in a selection of recently published literature.

Product-Oriented

Product expectation from customers of a new product's performance should be adequately met by appropriate price-setting strategies. Proper pricing leads to a balance between the product's usefulness and the expectations placed on it from consumers. Ingenbleek et al. (2013) find that inappropriate selection of price-setting practices can counter the positive advantages of new product development. By pricing a product high, customers will have high initial expectations for quality, durability, application, and ease of use among others which the product must fulfill. Customer opinion may begin to undervalue the benefit it brings by comparing it with the standards applied to other products at similar prices. Undervaluing a product decreases the consumer confidence in performance and durability, as well as pride of ownership. The consumer is only content when the balance between cost and benefit is met. This selection of a pricing strategy is therefore dependent on the relative level of product advantage, intensity of competition, and relative product costs. This multiple case study research uses the theoretical framework of Ingenbleek et al. (2013) to analyze the pricing strategies of medtech companies.

Specifically, for a new product entering an existing market or creating a new market, value-informed pricing strategy provides the greatest support for a product's pricing strategy. After this, competition-informed pricing adds substantially in situations where competitive intensity is low, whereas cost-informed pricing helps when competitive intensity is high. Likewise, managers pursuing a profit margin objective should express the advantage of their product, thus using value-informed pricing while avoiding cost-informed pricing. In total, Marn, Roegner, and Zawada (2003) estimate 80-90% of new products brought to market are priced too low, and consequently reach a smaller market size and level of profitability than is possible. This has significant negative effects on the company's revenue stream by decreasing short-term profit as well as long-term customer confidence and loyalty (Lowe & Alpert, 2010).

Lowe and Alpert (2010) identified a clear causal effect for the pioneer's price-setting decisions on product price and value perceptions, whereas a follower company's product price seemed to influence perceptions of the follower, not the pioneer. These findings imply that reference price is brand specific, and that the pioneer, due to its prototypicality, has a stronger influence on reference price perceptions than the follower. However, these effects were stronger for the more innovative product categories being examined.

Online distribution channels greatly increase price transparency, which leads to reduced price differentials between countries and a global standardization of prices (Gorodnichenko & Talavera, 2016). Prices in online markets have been found to change faster than in traditional stores, including a higher pass-through of exchange rate fluctuations.

These changes depend on the products and on market conditions such as level of competition.

Specifically, for medical devices, the clinical trial procedure is found to be the best way to estimate a product's cost effectiveness for future customers (Kirisits & Redekop, 2013). These trials are able to reach a broad and diverse range of potential customers with varying levels of severity of the condition being targeted by the new product. From these trials, the performance of the device and degree of benefit can be identified and weighed against its ease of use and any potential harms. The degree of rigor and completeness to these clinical trials is the best way to forecast its acceptance by the public.

Company-Oriented

When a firm develops a high-technology product filling a small market niche, its full potential needs to be quickly exploited in order to generate sufficient revenue needed to cover its R&D costs, to finance growth, and to offer competitive prices (Neubert, 2015; Trudgen & Freeman, 2014). Therefore, significant product growth is necessary, as well as creating and completing the product's distribution path to the public. Proper relationships with the company's supply chain as well as distributors, import/exporters, and retailers is critical as the performance of one company will depend on the performance of the entire chain (Wei & Zhao, 2014).

Luostarinen and Gabrielsson (2006) studied 89 companies in Finland which became international within their first three years, and thusly named born global companies (Neubert, 2015). They found that these companies often bypassed cost-informed pricing (setting a product's price floor) by choosing below-cost pricing for their first international customer and thereafter applying value-added pricing based on the benefits brought to its customers. This method was found to be hugely beneficial to the company creating the product in terms of creating the first international partnership, acquiring initial market share, and finding a more optimal partnership that conveyed confidence in customers not already familiar with the manufacturing company. This brings compounded returns in the form of additional business being brought-in more easily.

Even before focusing on the product and customers, the best qualities of successful lean start-up companies have been identified as controlling overhead costs and automating as many of the company procedures as possible (Grohn et al., 2015). These actions are often indicative of proper cost-control efforts set by the management, and a focus on the bottom line. Examples of such efforts include the purchase of used equipment or negotiation with vendors and suppliers after a more thorough market research of asking prices.

Competition-Oriented

Knowledge of the pricing strategies, product development, and marketing practices of a company's competitors leads to greater positioning of a company within the overall market. Success of any product originates from one or more advantages that it has over other available product options. Kuznetsova and Roud (2014) performed an industry survey among Russian manufacturing firms to rate their relative company advantages as compared to their competitors. From the results, they found that the highest perceived advantage of the survey respondents' companies was product quality over their competitors, with 76% of respondents believing their own company produced products at higher quality as compared to 17% of respondents believing in their competitor's product quality advantage. The next largest discrepancy in perspectives was of fast, on-time delivery, in that 43% believed their company had the advantage as compared to 9% giving advantage to their competitors. Roughly 6% of respondents believed that their company possessed no competitive advantages at all, whereas 30% believed that the competitors possessed no advantages. The survey results showed roughly even numbers

between the respondents' companies and their competitors in the categories of price, cutting-edge products, adaptation to consumer needs, and service.

Placement of one product helps the product and company succeed in the short-term. However, long-term planning and investment in product improvements and further technological advancement are vital in assuring continual benefit from the product line. Copeland and Shapiro (2015) found that continual and significant innovation increases the competitive advantage of a product, thus leading to higher prices for the innovator. The constant reworking and renewal of a product's strengths, capacities, and features creates a moving barrier to entry for competitors. Likewise, slower rates of innovation make the retail market more competitive, leading to decreasing company markups and profits.

Customer-Oriented

No greater entity exists for the protection of customers' best interests than the multitude of government sponsored healthcare programs around the world. Assuring patient safety as well as cost control from healthcare providers are the top two priorities. Specifically relating to overall cost, Gobbi and Hsuan (2015) determined that nearly 65% of the public sector in the US medical industry used collaborative purchasing (CP) power in 1995 to reduce the price of complex medical equipment purchases. They found that purchase of said equipment equates to the largest portion of total expenditure in the realm of healthcare. Because the healthcare providers (predominantly hospitals) have strikingly similar requirements of the machines, equipment, and devices purchased, the potential for CP to decrease overall costs is high. Proper purpose and functionality for the customer must be addressed in order to gain customer adoption of a new technology, as more often than not the needs of customers create the product opportunities for companies. Specifically, for medtech companies, aging demographics and increasing availability to modern medicine for most of the world have created significant growth opportunities. For example, the leading healthcare demands within the United States include decreasing costs, patient safety, personalized care, and advanced cancer research (Deloitte, 2016). Compare that with the Gulf Cooperation Council (GCC) states where healthcare concerns stem from the region's increasing population such as lifestyle diseases (including ischemic heart disease, stroke, type 2 diabetes, and obesity), high incidence of road traffic accidents, and consanguinity (Howard, 2014).

Other countries have made medical tourism a primary focus for the growth of their economy. Such countries as Thailand, Singapore, India, Jordan, Turkey, and the United Arab Emirates have each incurred rapid growth in their healthcare infrastructure in order to satisfy their growing domestic markets as well as attract the international patients (Ebrahim & Ganguli, 2017). These countries aim to benefit from increased demand for the healthcare products and services beyond the level of domestic demand. This effectively causes the hospitals, retailers, and healthcare providers to increase their customer base without the need for export/import concerns and costs.

Foreign Market Complexity Oriented

International expansion of a company is a significant milestone in its global growth and capture of market share. Yet for many companies this step proves to be a substantial inhibitor to smooth progress. The benefits of an increase in potential customer base are offset by increased costs burdened by consumers, additional governmental regulation and safety controls, cultural or language difficulties, and increased competition. This market adaptation includes a revision of pricing decisions (Neubert, 2016b).

Therefore, entry into a foreign market is only possible after extensive analysis of the market factors and competition (Neubert, 2013). Pricing

decisions require regular reviews and structured decision-making processes in order to prepare for and mitigate disturbances caused by changes in foreign competition, currency exchange fluctuation, and inflationary pressures (Snieskiene & Cibinskiene, 2015). Thereto, exporting companies have been found to experience greater rate of success depending on the relationship and partnerships formed with importers (Obadia & Stöttinger, 2015). Exporters can increase the performance of their importers through their pricing strategies, especially by allowing higher margins or other incentive schemes. In response, importers then invest in the products where they can expect the best results, predominantly based on the marketability and the price margin.

Creation of a new product market or niche comes with the significant advantage in that high-tech firms have a high price-setting power to set the reference price for their new product categories. New niche creation has historically come with roughly one to two years of market control before competitor companies can technologically catch up (Lowe & Alpert, 2010). This advantage is substantially decreased in foreign markets that don't enforce patent protection. Geng and Saggi (2015) analyzed pricing strategies of patented (e.g. pharmaceutical) products sold into markets without patent protection and found that local competition was quickly generated. Such presence led to price competition for market share, meaning lower markups and profitability.



There is a great need for all companies to understand and optimize their pricing strategy. Price-setting determines a company's profit margin as well as market share.



New Sub-Industry Oriented

New products don't always have to conform to existing standards and processes. A relatively recent trend in market growth is in the remanufacturing of medtech products from used or recycled old products. Companies around the world, but particularly in Europe, are being held responsible for the collection of end-of-life products. With the added responsibility of either recycling or safely and environmentally disposing of what remains of the medtech products, many companies have found ways of reintegrating the recycled materials into new products (Bulmus, Zhu, & Teunter, 2014). Certain low-tech items such as single-use cameras and refillable containers have been found to be best suited for a remanufacturing process and can be repeatedly refurbished, refilled, and resold to the customer at nearly the same initial price. To the contrary, high-tech products such as mobile phones and personal computers (PCs) were identified as being of greater reliability and durability concern for customers and thus cannot fetch sales prices anywhere near the new product price. These products would then need to be sold to completely different secondary markets where the perceived quality of remanufactured goods is higher or at highly reduced prices.

Companies who incorporate remanufacturing into their existing manufacturing business have been found to capture higher market share than companies who do not (Mitra, 2015). This comes from the socially conscientious perception and positive imaging that a decrease in mining and generation materials is an ecologically sensitive and

morally positive practice. It is suggested that both the market share capture and the environmentally friendly marketing should serve as sufficient motivation for early life-cycle companies, especially in higher eco-friendly or sustainability focused industries or customer bases.

Unfortunately, the remanufacturing process isn't without its complications and sales challenges. The most positive effects of the remanufacturing process are in energy saving and pollution reduction, whereas the negative effects are most likely concerns from consumers regarding product quality and service of remanufactured products (Zhu et al., 2015). Early analysis suggests that modifications to the product offering could offset these consumer concerns with optionality including extending the product's warranty length or offering free product replacement should anything fail or operate improperly.

Research Method

A multiple case study research method shall be used in order to best compare and contrast existing pricing strategies used by medtech companies. This study uses a multiple case study research question to answer the explanatory (why and how) research questions (Yin, 2014). According to Hennart (2013), a qualitative comparative case study research would help to answer the research question. In contrast to an experimental design or a survey, a multiple case study has more flexibility (Stake, 1995), allows an in-depth analysis of a complex research problem within a highly contextualized environment (Rosenberg & Yates, 2007), and a comparison between different cases (Baxter & Jack, 2008; Eisenhardt & Graebner, 2007).

The medical industry in general is a very difficult but interesting industry to identify pricing strategies, particularly within the United States and other countries with large governmental healthcare payer systems. In most countries within the Organization for Economic Cooperation and Development (OECD), the majority of prices for medical services, equipment, and prescription drugs are fixed or set in reference to these government-established reference prices (Brandt, 2013). In the US, it is commonly known as the Centers for Medicare & Medicaid Services (CMS) billing rates. Therefore, the new medtech companies are principally targeting technology innovations not currently outlined in these governmental payer systems.

Sampling

The choice of the sampling strategy is based on the purpose of this study. This study uses a purposive case selection strategy (Seawright & Gerring, 2008) because it produces a representative sample with typical (Gerring, 2006) and successful examples of the total population. According to Yin (2014), this sampling strategy produces a statistically representative sample if at least six to ten cases are selected. This study uses a sample size of six case study firms to allow a better triangulation of data and to strengthen the results of the whole study.

The six case study firms, EnteroMedics, Alphatec Spine, Inogen, Skyline Medical, GE Healthcare, and Intuitive Surgical, are born-global firms using the global exporter business model (Neubert, 2016a). These companies are all publicly traded companies (5 on NASDAQ, GE on NYSE) with market capitalization ranging in size from \$8 million to \$260 billion. Five of the six companies specialize uniquely within the medical equipment and supplies industry, while GE is a multinational conglomerate with exposure in a broad range of industries. This sample was determined sufficient for the study due to the breadth of pricing strategies and models identified between them.

Research Questions

The statement of the research problem has led to the following two research questions:

1. What pricing strategies and models are currently being

implemented in the medtech industry?

2. Where are the observed differences and benefits between the pricing strategies and models?

Research Findings

Through researching dozens of companies, it was found that a company cannot state outright its pricing strategy. This is firstly because the terms and definitions of pricing strategies and models are in no way standardized and, secondly, because in doing so a company may substantially weaken its market position and brand quality, inviting in new competitors. Therefore, inferences must be made as to why and how a company chose its pricing models. In order to make such inferences, enough detailed information must be revealed about a company's product line revenues and costs, thus leading the research to focus on publicly listed companies on US stock exchanges. For the sake of reducing repetition, the comparison between companies described below can be found in Table A1, along with description of the pricing strategy and model keywords found in Table A2.

A substantially large number of medical device suppliers were found which focused their product offerings within the most standardized and wide-spread sub-sectors of medical equipment. Specifically, in the areas of EKG/ECG, MRI, ultrasound, and x-ray machines, the level of competition is so significant that the price a new entry company could receive for its product, regardless of any superiority in quality, reliability, or features, would likely be a significant barrier to entry. Substantial market competition puts substantial R&D expenditures at risk for ever being recovered. The technology behind this equipment and the expertise of installation and utilization have been disseminated around the world quickly, and therefore, for the sake of this research, are not included as being cutting-edge technologies. They have been, however, included in the comparison table for completeness of review.

Findings RQ 1: What pricing strategies and models are currently being implemented in the medtech industry?

The companies of EnteroMedics, Alphatec Spine, and Inogen were researched, each belonging to a different specialty sector within the healthcare field. EnteroMedics manufactures its Maestro device that uses its neuroblocking technology known as vBloc Therapy to treat obesity, metabolic diseases, and other gastrointestinal disorders (EnteroMedics, 2016). Alphatec Spine manufactures a variety of products for the surgical treatment of spine disorders (Alphatec Spine, 2017). Inogen specializes in the design, manufacturing, and marketing of portable oxygen concentrators for patients necessitating oxygen therapy (Inogen, 2017).

The first finding is that each case study company bases their product pricing in the US on the CMS billing rates. By doing so, the prices are thus established by the US Medicaid reimbursement rates, meaning a competition-informed price-setting practice. Therefore, the price-setting strategy of all companies is that of market pricing. Each company additionally operates primarily under the buy only pricing model, with Inogen mentioning the service segment of their business generating significant revenue.

Skyline Medical is a company specializing in the collection and disposal of infectious fluids that result from surgical procedures and post-operative care (Skyline Medical, 2017). Their principle focus is the Streamway System, with features such as automated measurement of volumes, prevention of cross-contamination, and a tissue trap that allows for tissue retrieval. Disclosed in their 2015 annual report, Skyline implies that their pricing strategy is one of penetration pricing, specifically singling-out their competitor Stryker Instrument's comparable system and citing notable differences (Skyline Medical, 2016). The significant differences mentioned are a 33% savings in device purchase price, an industry common installation process

that can be performed by distributors, independent contractors, or customer in-house engineering, as well as underpricing the disposable kit needed for each patient operation by \$1. Therefore, the pricing practice detailed in the report is that of competition-informed, although undoubtedly an underlying degree of cost-informed practice evaluated to set their product price floor. The company's pricing model is dominantly through the sale of the Streamway units, with the sale of non-reusable filters and cleaning solutions making up a smaller revenue component.

General Electric (GE) is a global conglomerate company with divisions in the aviation, power generation, electricity distribution, healthcare, oil and gas, transportation, household appliances, and financial industries (GE, 2016). In researching cutting-edge medtech technologies, the recent 3.0-tesla (3T) magnetic resonance imaging (MRI) machines developed at GE were identified as being cutting-edge technology in terms of their magnet strength, bore size, and quieter running status. However, pricing information was discovered only through distributors and then only from contact with sales associates. Consequently, a previous model, the 1.5-tesla (1.5T) LX MRI, was found with sufficient pricing information.

Not only had the 1.5T machines been sold initially at higher prices only to be lowered in time with increased competition from other companies and technologies, but sales were initially only available through GE authorized dealers, later opening up to affiliates and then third party vendors. From uncovering the historical change in pricing as well as sales practices, it is evident that GE uses value-informed price-setting practices to establish skimming price-setting strategies for its MRI products. GE does offer both the sale and lease of its MRI units, although not all vendors offer a leasing option. Undoubtedly, GE must have developed its pricing strategy through years of experience in the healthcare as well as other industries in order to maximize returns to the company.

The sixth and final case study included in this report is from Intuitive Surgical (Intuitive). They manufacture the da Vinci Surgical System used in robotic surgeries, along with related instruments and accessories (Intuitive, 2016). Being a young and ambitious publicly-listed medtech company, Intuitive has disclosed the largest amount of pricing information found for this research. In their annual report, Intuitive defines its business strategy priorities all in relation to value to its customers: patient, surgeon, and hospital. With the customer in mind, Intuitive has focused its product technology and further improvements on maximizing the value of the system for its customers, primarily through conversion of standard open surgeries to be compatible with the da Vinci system, to better train surgeons for a larger range of complex minimally invasive surgeries (MIS), and to develop procedures that could convert multiport laparoscopic surgeries into single port surgeries. In all, it is clear that Intuitive employs a value-informed price-setting practice.

Intuitive lists the revenue streams in 2015 from the sale of its surgical systems, sales-type and operating lease options, annual service plan, as well as the non-reusable or gradually degrading instruments and accessories. An impressive 492 robotic systems were sold in 2015, yielding 30% of its annual profits, with another 63 systems delivered to customers under lease terms, yielding less than 1% of profits. On top of that were a combined total of 3,597 systems in use and covered under annual service contracts, bringing in 19% of 2015 profits. Most substantially was the sale of non-reusable or replacement instrument and accessories equaling over 50% of the annual profits. From this information it is clear that Intuitive primarily employs a buy and use pricing model, with a much smaller percentage of clients choosing the leasing option of a recurring pricing model.

Also in the annual report are the ranges of prices charged to its customers for the da Vinci Surgery System, the annual service

agreements, and the non-reusable or gradually degrading instruments and accessories. The range values are not necessarily important, but the magnitude of the discounts given to some customers is substantial. Sale of the da Vinci Surgery System ranges from \$0.6 to \$2.5 million each, meaning some customers may receive up to a 76% discount. The annual service agreements range in price from \$80 to \$170 thousand per year (up to 53% discount), and the instruments and accessories, on a per-use basis, equate to a \$700 to \$3,200 per surgery cost (up to 78% discount). Calculating the average cost for these three categories from the total number of sales, operational units, and procedures in 2015 shows indication that the average price paid is roughly halfway between the maximum and zero discount range. They describe their customer base as being primarily US-based (71% of revenue) as well as being larger governmental hospital chains that purchase the system in bulk, which explains why significant discounts are being offered.

Intuitive also describes its competition in the industry as being the traditional MIS, open surgery, interventional or pharmaceutical options. They describe the robotic option for surgery as an advanced technology, albeit with higher costs, that results in increased and quicker success rates. In all, due to the high cost of the system and limited necessity for the limited specialized surgeries currently with guidelines written for execution using the system, Intuitive is implementing a skimming price-setting strategy with substantial price negotiation (discounting) with the customers.

Findings RQ 2: Where are the observed differences and benefits between the pricing strategies and models?

As seen in the six case study companies, the price-setting practices of competition-informed and value-informed are the dominant ones implemented. Where they differ is when the new technologies are applied to more patient-centered medical conditions (as is the case for EnteroMedics, Alphatec, Inogen, and Skyline) or towards the hospital-centered medical devices (GE and Intuitive).

The first three medtech products are addressing new higher technology solutions to existing patient conditions and therefore have pricing restricted by the US Medicare CMS reimbursement price listing, or more generally a market pricing strategy. Bottom line profit for these companies is therefore most strongly determined by total cost reduction to the customers plus decreasing their own operating costs and expenses. Skyline's product is not patient-specific, and, because of the company's ambition towards significant market share, they have chosen to underprice the product, following a penetration pricing strategy. Bottom line profit for them will come from effective marketing, product performance, and market share growth. Both GE and Intuitive's products are providing higher technology solutions to hospital equipment limitations or competition amongst hospitals for patients needing specialized procedures and tests, thus necessitating skimming price-setting strategies. Bottom line profit for them will come in terms of relative advances their equipment technology has over competitors plus value appeal to the surgeons and patients.

Within this case study selection, the first five companies primarily utilize the buy only pricing model as a result of them all manufacturing machinery or equipment that generate the majority of their revenue, with little to no additional instruments or accessories needed. The sixth company utilizes the buy and use pricing model, thereby having significant revenue coming from both its surgery system and the non-reusable components.

The selection of a pricing model is not a function of company preference but a matter of product delivery and operation by the customer. Perhaps advances in technology can modify the operation or utility of the product, but such solutions often lead to new sub-industries which then carry new areas for growth, opportunity, and pricing strategies and models.

A new sub-industry has been growing in recent years that provides third party sales, servicing, and parts for medical equipment. As a result, many third party service and repair companies have been created which effectively deteriorate the value of original equipment manufacturers' (OEM) pricing models that include maintenance, servicing, and even installation.

This sub-industry grew out of what Scot Mackeil, a biomedical engineer at the Massachusetts General Hospital, describes as large manufacturing companies refusing to allow their customers to self-repair the machines beginning in the 1980s (Bassett, 2014). Mackeil says manufacturers began password protecting the software on the machines, refusing to sell parts, and removing servicing procedures from the so-called service manuals. This created a dependency relationship where the purchaser of the machine had to pay any price that the manufacturer was charging for maintenance.

Companies such as Medical Equipment Repair Associates (MERA), Advanced Ultrasound Electronics, Horizon Biomedical Equipment Services, Tenacore, Curagita, Medical Equipment Solutions and Applications (MESA) among many others have all been created to bridge the gap between technical, machine-specific knowledge and high customer service. These third parties are rapidly growing their market share and eating away at the number of service, repair, and insurance contracts signed with OEMs through offering vendor-neutral advice and operational cost savings. Also worth considering are the multitude of OEMs like Steris who have been acquiring third-party service and repair companies in order to capture market share of the growing new sub-industry.

The Association for the Advancement of Medical Instrumentation (AAMI) has been strongly supporting the legislative front towards the requirement of OEMs to disclose their equipment service manuals and to adopt policies similar to the automotive industry wherein independent service and supply companies have created their own sub-industry.

Conclusions

Through this six-company case study, several advantages and disadvantages to the price-setting practices, strategies, and models were found. In short, the price-setting practice will be determined based on the customer being either single-use patients or large customer throughput hospitals, with the focus being on finding the greatest value for the targeted customers. The price-setting strategy is largely related to the price-setting practice with modifications based on the relative newness of the technology, level of competition, and trade-off between growth in market share or higher profit margins. The pricing model is primarily dependent on the product delivery method and/or operation by the customer, but with modifications possible based on product customization, relationship with the customer, and specialized financing options.

Advantages in competition-informed price-setting practices plus market price-setting strategy include assurance of a fair price along with associated market share, but the disadvantages include significant competition and lower profit margins in order to grow market share. Advantages in value-informed practices as well as the skimming price-setting strategy include higher profit margins leading to quicker profitability while not growing your customer base faster than supply lines and infrastructure needs, but with the disadvantage of lower market share with higher R&D and marketing costs. Advantages of cost-informed practices and the penetration price-setting strategy include setting a price floor and gaining market share, whereas the disadvantages include lower profitability and potentially setting a low reference price from which your customers will continue to demand low prices.

Advantages to the buy pricing model include the largest customer payments at the earliest time to product delivery, which decreases the OEM's financing requirements. The disadvantages to the buy pricing model are that it is more financially intensive for customers, and if the technology advances quick enough will leave customers feeling left behind or disappointed. The lease pricing model is a favorable step for the customer, allowing additional payment options and thus an increased customer base. Disadvantages for the OEM include delayed revenue streams and increased staff to track the various accounts. Pay-per-use pricing models are not applicable for all healthcare device companies, but when they are they bring additional revenue for the OEMs as well as a fairer pricing model between customers who use the product more or less than others. Disadvantages include continual inventory monitoring for both OEMs and customers.

No particular ranking of the price-setting practices, strategies, and models can be made generically. A specific product and target customer are to first be identified, working next to the price-setting. However, it is noted that in general the larger and more successful companies have product lines with price-setting practices and strategies that evolve with the product and industry age, and that contain diverse pricing models to draw in the largest possible customer base.

Future study must include a larger amount of case study companies within the medtech industry, expansion into other new technology industry segments, and could also incorporate the change in price through a particular product's life cycle.



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Appendix A

Comparison between medtech companies

The pricing strategies and models used by the medtech companies researched in this report are consolidated in the following tables. The data and information found within were personally collected from a variety of company official websites, annual reports, and investor

relations documents, as well as third party websites. Because there are no industry standard definitions of the pricing strategies and models, the definitions used for the sake of this report are also included.

Company	Product Line(s)	Discription	Price-Setting Practices (Specifically)	Price-Setting Strategy (Additional Strategies)	Pricing Model	
					Primary	Secondary
Intuitive Surgical	da Vinci Surgery	robotic surgery	Value-informed	Skimming (Price negotiation)	Buy & Use	Recurring
GE Healthcare	1.5-tesla LX MRI	MRI scan	Value-informed	Skimming (Upgrades / Trade-ins)	Buy	Lease
Skyline Medical Inc	Streamway FMS	fluid disposal	Competition-informed	Penetration pricing (Price negotiation)	Buy	Pay-per-use
EnteroMedics	Maestro (vBloc Therapy)	neuroblocking v obesity	Competition-informed (US Medicare CMS)	Market Pricing	Buy	-
Alphatec Spine	-multiple-	spine surgery	Competition-informed (US Medicare CMS)	Market Pricing	Buy	-
Inogen	Inogen One	portable oxygen	Competition-informed (US Medicare CMS)	Market Pricing	Buy	Service

Table A2: Definition of price-setting practices, strategies, and pricing models used (Hollensen, 2014; Ingenbleek, Frambach, & Verhallen, 2013).

Price Setting Practice	Price Based on...
Value-informed pricing	Customers' perceptions of the benefits that the product offers and that they trade off against the price
Competition-informed pricing	Competitors' prices relative to their market positions
Cost-informed pricing	Variable, fixed, direct, and indirect costs for developing, producing, and marketing the new product or service
Price Setting Practice	Price Based on...
Skimming	The market segment with the highest reference price is targeted first, and the market is subsequently skimmed to capture segments with lower reference prices
Market pricing	Price influences market share
Penetration pricing	Set a low price in attempt to stimulate product adoption
Non-Price Setting Practice	Price Based on...
Selecting price models	Not all purchasing options available for customers
Price negotiation w/ customer	List price minus customer-specific discounts
Bundling	Discounted price when multiple products or services purchased
Upgrades / Trade-ins	Discounted price when an older model/version is exchanged
Captive finance companies	Purchasing price dependant on financing terms
Pricing Model	Revenue Based On...
Buy	One-time payment
Lease / Rent	Recurring monthly/ yeary payments
Lease back	Real estate: sale of asset, lease/rent back from buyer (takes the form of a loan)
Pay-per-use	Pay for each use, do not pay for on-site location or maintenance
Combination buy & use	Sale of product, plus recurring payments for service and non-reusable components
Recurring	Recurring payments comprised of lease/rent, service, and non-reusable components
Reimbursement	Government payer reimbursement of costs, smaller immediate patient copay
Auction	Highest bidder
Dynamic/ Time-based	Price changes as a function of time and supply/availability
Remanufactured	Used goods refurbished or remanufactured and sold as new or lower quality
Second hand	Used goods resold on secondary market
Remarketed	Unsold goods being sold for a different purpose

THE DIGITAL PARADOX: INFORMATION, INFORMATICS, AND INFORMATION SYSTEM

Author: Christopher Legrenzi



Abstract

Information systems (IS) are a key strategic challenge especially in the new digital era. Depending on the economic sector, they represent the first item of expenditure: 20% to 100% of the annual operating budget, 20 times more than the mere IT budget. However, the vast majority of decision makers ignore these amounts because of “vertical” accounting, historically built to better control spending by major function. Despite the fact that “digital revolution and transformation” is in every mouth, top executives are facing one of the biggest managerial paradoxes: focusing on the annual cost of IT while digital and IS budgets are respectively 10 to 20 times bigger.

The purpose of this paper is to demonstrate that the real challenge of our current economy is to focus on its main asset, information, which represents “the content” and all its related activities, instead of the tool, IT, which represents the “container.” These digital and IS paradoxes (summarized as the digital paradox) echo, if not explain, Solow’s paradox. The objective of this paper is to better understand the economic and managerial issues and to explain how to calculate digital and IS budgets. Finally, we propose to discuss the key success factors on how to master and manage digital and IS activities and budgets.

Even though this paper addresses a new field of research, it is far from comprehensive. Its aim is also to help researchers and top executives to better understand the key challenges of the digital revolution and to give them new levers and opportunities to strengthen their overall competitiveness to enter effectively and efficiently in the digital era.

Keywords: Data, information, information technology, information systems, digital, definition, revolution, transformation.

Introduction

In the digital era, information systems are a major strategic challenge for organizations. For their only digitized portion, they already represent, depending on the activity sector, the first item of the company’s expenditure: between 10 and 30% of the annual operating budget for the industrial sector and 30 to 50% – or even more – for the tertiary sector (Legrenzi & Rosé, 2011; Legrenzi & Nau, 2012). Moreover, they have become the main drivers of growth and performance. Compared to the traditional IT budget, the digitized part of the information systems weighs almost 10 times more (Legrenzi, 2012). The entire information system that incorporates non-computerized practices represents a double average amount representing 20 times the IT budget. Even more significant, the total cost of information is approximately 100 times bigger than the annual IT budget.

However, the vast majority of decision makers ignore these issues because of “vertical” accounting, historically built to better control spending by major function of the business (Lorino, 1991). At the time of the first real analytical accounting, the main costs were related to the purchase of raw materials or components and the use of machinery far in front of the wage bill. Today, payroll makes the majority of spending in developed economies.

The consequence of “vertical” management is that the costs of processing information in all its forms, either “horizontal or transverse” by nature, are virtually impossible to grasp quantitatively in our current accounting and management systems, while they are often the first item of expenditure. This is one of the major reasons for our decision makers’ lack of interest in the subject (Ackloff, 1967; Johnson & Kaplan, 1991). For example, it is common to observe managers give a product’s unit cost of 2 or even 3 digits after the decimal point for a manufactured product and at the same time be unable to know even with a 50% margin failure the unit cost of the last reporting, or more simply of secretarial activity or management control.

The objective here is to better understand the economic and managerial issues and to explain how to calculate digital and IS budgets. Thanks to our different studies, publications, literature review, we propose to discuss the key success factors on how to master and manage digital and IS budgets and related activities instead of the sole IT budgets and IT activities, which is not the point.

Finally, this paper targets a new field of research. To this end, its aim is mainly intended for both researchers and top executives to open new perspectives in order to better understand the key challenges of the digital revolution and to give them new levers and opportunities to strengthen their overall competitiveness to enter effectively and efficiently in the digital era.

Economic Issues

In this section, we will present a first assessment of the IS budget using definitions and a comparison with the traditional IT budget based on several studies we performed for different customers. Then, we will explain how we calculate IT, digital, and IS budgets and focus on the order of magnitude. Finally, a concrete example will be given where we applied these concepts, showing new opportunities for optimization.

First Empirical Approach

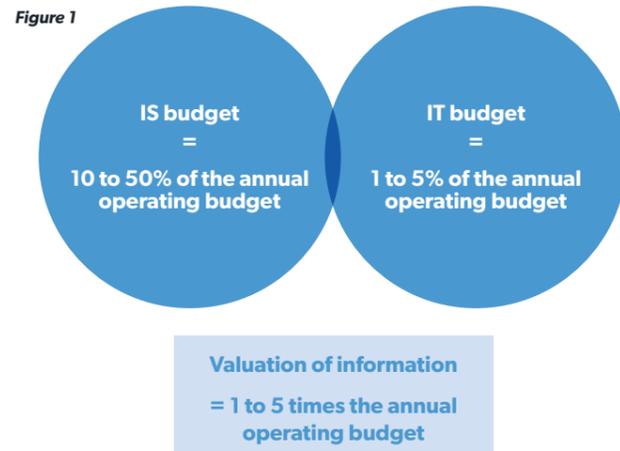
If we take the definition of information systems with respect to informatics, we observe a semantic evolution that marks the genesis of a real awareness of the new managerial challenges of our companies in the digital age. It symbolizes the transition from the container to the content. It is a real paradigm shift, with far-reaching consequences. The technology would become less important than its use in the service

of information and knowledge management. Now that technology is under control, information management must be placed at the center of the debate. Now is the time to control the management: information and all its processing involved, whether manual or automated.

On a company-wide basis, the average IT budget for the vast majority of organizations ranges from 1 to 5% of the company's operating budget according to such major benchmarking institutes as the Gartner Group or Compass.

What about the budget for the information systems? By adopting a very minimalist and conservative position, considering only the use of IT tools by employees, the budget of the information system is then reduced to its computerized part. With this assumption and according to numerous "field" studies carried out in the framework of information systems master plans (Legrenzi & Gapaillard, 2013) or surveys conducted in seminars for the past 10 years, it represents at least 10 to 30% of the total operating budget of the organization for the industrial sector and 30 to 50% for the tertiary sector. Also, the budget of the information system represents a stake ten times higher than the IT budget. It is, therefore, neither more nor less than the first factor of expenditure of our companies.

Yet, in spite of the stakes, neither the general management nor the operational or functional departments such as the financial department are aware of it. The "vertical" approach and the "shackles" of the accounting and budgetary systems are at the origin of this "collective blindness."



Main components of information system: budgetary assessment of IT versus IS

What is interesting in the figure above is that it is easy to see the disparity of the stakes between computing and information system, assimilated to the digital one, on the basis of a simple monetary valuation. Thus, the costs of the information system are much greater than the IT costs alone. More importantly, data stored on computer systems is a very important intangible asset. Accumulated for years, the information assets of organizations represent an amount nearly ten times the annual budget of information systems and a hundred times higher than the annual IT budget.

Estimation Method

In order to assess these economic stakes, an estimation method was applied to proposed definitions. It is based both on resources, relevant parties, the IT tool utilization rates, and the share of work devoted to manual information processing.

Table 1

Definitions of informatics, digital, and information system: calculation method

Putting It into Perspective: Digital vs. Information System

Compared to the first empirical approach that associates information system with the digital system, distinguishing the digital dimension, which represents the time spent by the users to work with the IT work tool from non-computerized information, the stakes are even more striking:

Figure 2



Main components of information system: budgetary assessment of IT, digital, and IS

This time the budget of the information system represents 20 times more than the IT budget and twice the digital budget.

Still on the basis of numerous field studies carried out in the framework of information systems master plans (Legrenzi & Gapaillard, 2013) or surveys conducted in seminars, the information system budget represents between 20 and 50% of the total operating budget of the organization for the industrial sector and from 40 to 100% for the tertiary sector. In the latter case, it is hardly surprising to consider the case of certain administrations, where the totality of the operating budget can be absorbed by the processing of information.

Illustration

We applied this approach in different organizations: real estate engineering company, R&D of a cosmetics company, Chamber of Commerce and Industry, private insurance providers, and so on. Each time, the orders of magnitude were verified. This vision, which is overlapping in nature, is opposed to traditional approaches to optimization that continue to persist within organizations. What is more, the benefits of this new approach are very important as our field studies have shown.

As an example, a company was chosen: a subsidiary of a major French industrial group in the energy sector specialized in maintenance interventions. Its annual operating budget makes around 800 million euros; the company employs nearly 6,000 people. It showed operating results below the group's standards of around 20 million euros in profits, representing a profitability of 2.5%.

The management culture is very cost-oriented. Each expense must be fully justified before being considered as incurred, from the hiring of a trainee to the dismissal of an employee, in each case with the approval by a member of management.

The comprehensive IT budget aggregating total expenditure as defined above is much higher than the official version announced by the Chief Information Officer (CIO). It amounts to approximately 10 million euros, or 1.25% of the total operating budget. By introducing the concepts such as informatics, digital, and information system, new performance fields were identified that had been previously ignored:

Table 1

	Informatics	Digital	Information System
Definitions	Informatics represents the function or profession that is intended to design, develop, integrate, exploit, and maintain hardware and software solutions, and provide all related services	The term "digital" represents both information and all the uses and processing of this information based on a computer tool with a view to a business purpose	The information system represents all the internal or external resources - users, tools, data - that contribute to the processing (digital or otherwise) of information
Resources	All IT tools (hardware and software) and associated services within the company managed directly by the ISD or by the business lines. The aim here is to identify the exhaustiveness of a company's IT expenditure	IT resources, in particular all "visible" equipment for accessing IT solutions (terminals, monitors, computers, laptops, telephones, etc.)	Digital resources by adding information in all its forms, whether digital or not
Actors	IT professionals and external service providers (IT services companies, IT consultants, cloud providers, outsourcers, telco operators, etc.) and users if they spend time on purely IT work (see "shadow" IT)	IT operators + Users (both internal and external to the company)	Digital operators + Users or collaborators working on information in "manual" mode
Calculation	IT budget = Sum of expenditures related to IT resources plus the salaries charged for IT specialists (or even users with an "official" important IT activity) and expenses for external service providers	Digital Budget = Computer Budget + Percentage of time spent using IT x Associated payroll	Information System Budget = Digital Budget + Percentage of time spent on manual processing of information x Associated payroll

Table 2

	Challenges	Optimization Potential	Estimated Earnings
Informatics	€ 10 M	10% by centralization, homogenization of IT tools and practices	€ 1 M
Digital	€ 70 to 90 M	10 to 20% minimum on computer use and existing processes	€ 7 to 18 M
Information System	€ 80 to 100 M	20 to 40% for digitizing and dematerializing manual processes and tasks	€ 16 to 40 M

Definitions of informatics, digital, and information system: illustration of earnings potential

Very clearly, the traditional approach of the IT budget optimization reveals a maximum potential of one million euros or 5% of the company's profit. A digital optimization approach would allow envisaging earnings of the order of 7 to 18 times more and almost doubling the company's profit.

Finally, there is even a better vision of the information system optimization added to the digital and informatics approach, which represents a potential of 24 to 59 million euros, far superior to the current profitability of the company.

Reinventing Management and Governance of Information Systems

Before proposing a new approach to the management and governance of information systems, it seems important to review the current state of practices and the fact that few companies are interested in the numerous productivity fields resulting from the digital and information system approach.

We have identified three major causes that prevent companies from taking full advantage of these opportunities:

- The lack of awareness of the issues related to digital and information systems due to the lack of a clearly accepted definition and the limitations of traditional management systems
- The technological utopia coupled with the organizational homeostasis often conveyed by the IT industry suggesting that it is enough to adopt new technology to obtain the benefits

- Poor governance resulting into the lack of managerial involvement or lack of courage to initiate changes that are essential to creating value

A Deficient IT Governance

Many previous studies have shown that the involvement of the general management in the computerization process is key (Delone, 1988) as well as their level of understanding the challenges (FITI, 1986) together with the quality of their relationship with the IT manager (Austin, 1988).

In 2004, Weill and Ross demonstrated, based on a global study of 250 companies, that the value generated by computer-based projects was directly dependent on the level of maturity in IT governance (Weill & Ross, 2004). They pointed out that nearly 62% of decision makers were unable to define precisely what IT governance was. In addition to the 2006 book by Gérard Balantian, The IS Governance Plan, a very endemic definition is found in the Franco-French microcosm, associating international benchmarks such as ITIL, ISO 27002, or CMMI with computer governance, in complete contradiction to the formal definitions of ISACA/ITGI and ISO 38500. It is a mistake to confuse the "good practices of internal management" which represent above all an "endogenous" vision and those of "governance" whose orientation is mainly "exogenous," oriented towards the company, its trades, or even its shareholders and other involved parties (Legrenzi, 2009).

In 2010, we were able to confirm that during the computerization process, the performance of the company is determined not so much by the quality of the solutions envisaged but by the level of maturity in IT Governance (Legrenzi & Salzman, 2010).

Professor Almiro de Oliveira and Claude Salzman, founders of the Information Systems Governance European Club, affirm in their Manifesto:

In a quaternary economy dominated by the information and knowledge sector, information management emerges as a new factor of distinction and differentiation, providing competitive advantages for both companies and public organizations in a context of accelerated globalization.... Thus, knowledge of the costs and value of information allows taking into account the variety of information management problems and contributes to the Good Practices of Governance of Information Systems. (de Oliveira & Salzman, 2009)

Executive Managers are those who are responsible for Governance of Information Systems as confirmed by ISACA/ITGI and ISO38500 standards.

New Performance Fields

The real question for decision makers is whether to control only informatics, the digital work, the information system, or information itself? This is a fundamental question, with far-reaching consequences, which can call into question the traditional “vertical” management models of the industrial sector.

Although it seems essential to manage the IT function (Salzman, 1989), which is probably the most complex function to control, it would be a mistake to stop there (Legrenzi, 1996; Legrenzi & Nau, 2012). The distinction between IT control and the information system management reconciling the technocratic visions with the business challenges is unavoidable.

Also, and without being exhaustive, we propose in the table below a number of indicators specific to each concept: informatics, digital, and information system, as well as possible measures of optimization.

Table 3

Definitions of informatics, digital, and information system: differentiated KPIs

For informatics, it is no longer a question of seeing this function in relation to itself, as Claude Salzman indicates:

As far as informatics is concerned, the objective is to try to bring it closer to the rest of the company and even, if possible, to melt it into the various functions of the company... This requires learning to think of informatics as a tool for business development and not just as a machine capable of handling administrative procedures. (Salzman, 1989)

On the digital level, a major challenge is the productivity of uses and the management of information assets. Peaucelle says: “The strongest gains are often ignored because they appear at the level of users” (Peaucelle, 1997). More importantly, data stored on computer systems is a very important intangible asset, and its role becomes progressively important. Accumulated for years, the information assets of organizations represent amounts nearly ten times the annual budget of information systems and is a hundred times higher than the annual IT budget.

For information systems, the opportunities are even more important. They concern both the dematerialization of certain activities, the overall productivity of processes, as well as innovation. The executives and the operational or functional departments must be aware of the overlapping character of many activities. Computerization has insidiously engendered notorious pockets of low productivity by decentralizing processes and distributing many tasks to all the employees of the company.

Drucker states that “The greatest challenge faced by managers in

developed countries is increasing the productivity of information and knowledge workers” (Drucker, 1993). The information system is no more or less the backbone of the intangible activity of the modern corporation; it is undoubtedly the first lever of the performance of future organizations.

New Research Perspectives

Far from having covered all management issues related to digital and information systems, many lines of research are beginning to start with the increasingly systematic and precise measurement of the weight of digital and information systems of our organizations, sector by sector, while putting into perspective the four concepts: information, informatics, digital, and information system. The estimates given deserve further study.

Since these four concepts are interrelated, their interactions must be understood. The performance of the “digital” company of the future plays well at the confluence of these concepts. Another way to go deeper would be the factors of governance and the information systems governance most affecting the company’s performance.

Concluding remarks

Our purpose with this paper was to demonstrate that the real challenge of our current economy is to focus on its main asset (information) which represents the ‘content’ and all its related activities, instead of the tool (IT) which represents the ‘container’.

To this end, we tried to define “data”, “information”, “information technology”, “digital” and “information system”. Based on these definitions, we explained how to calculate Digital and IS budgets. Finally, we introduced the key success factors on how to master and manage Digital and IS activities and budgets.

It is important to mention that in an early research we undertook on the field of information systems governance, a particularly important assumption emerged concerning the duality of science progress and measurement (Legrenzi, 1994). Numerous studies on the evolution of science show that scientific progress is very often related to the evolution of measurement tools. Chemistry with the microscope or astronomy with the telescope are excellent illustrations of this phenomenon.

Thus, our ability to measure is often ahead of progress. However, this is not the case in the digital world or in the IS world. Most of companies are clearly not addressing what is the major challenge of our current economy. Therefore, how is it possible to master both digital and IS activities and optimize them and produce value, if we do not measure them?

This particular assumption has been preventing technological progress from bringing measurable benefits to companies. This is symbolized by Solow’s Paradox analyzed by the 1987 Nobel Prize for Economics Robert Solow (Legrenzi, 1993) and is still valid today (Gordon, 2012). Solow stated that “you can see the computer age everywhere but in productivity statistics”.

While the IT industry, the “producer”, is generating massive value, the “consumer”, our companies, are not showing benefits. Why? Simply because the measure has never not been adapted to the technological progress in informatics.

It is now time to question our practices and to put control and governance at the heart of debates by clearly defining concepts while clarifying the economic challenges of:

- informatics (tool and associated services)
- digital (automated use in addition to the IT tool and associated services)

Table 3

	Informatics	Digital	Information System
Definitions	Informatics represents the function or profession that is intended to design, develop, integrate, exploit and maintain hardware and software solutions, and provide all related services	The term ‘digital’ represents both information and all the uses and processing of this information based on a computer tool with a view to a business purpose	The information system represents all the internal or external resources - users, tools, data - that contribute to the processing (digital or otherwise) of information
Key Performance Indicators	Maturity in IT Governance Total IT cost (in and out the IT department) Estimation of “shadow IT” (time, tools, etc.) Breakdown of operations and studies/projects Breakdown of IT costs by nature and by destination (see company value chain) Evolution of IT assets Cost per major IT activity (ABC logic) Cost per equipment (PC, server, etc.) or per application (TCO logic) Service quality Know-how and skills of IT specialists including project management IT professionals satisfaction rates Annual productivity gains by equipment and by application Etc.	Digital Governance Maturity Total digital cost Distribution between official and “shadow” tools Estimated hidden costs (workstation, applications, etc.) Measuring digital productivity Cost spent on projects Rate of equipment and applications use Distribution of digital cost by nature and by destination (see process and/or value chain of the company) Evolution of information assets Level of information assets management Rate of information entered manually or automatically Cost per large information domain (ABC, TCO) Number of defects found Know-how and competence of users and owners Rate of satisfaction of users and owners Annual productivity gains by process and/or value chain domain Etc.	Information System Governance Maturity Total cost of the information system Distribution between digital part and manual part Estimated hidden costs (related to manual tasks) Measuring the information system productivity Distribution of information system costs by nature and by destination (see process and/or value chain of the company) Evolution of non-computerized information assets Level of non-automated information assets management Cost per large non-computerized informational domain (ABC, TCO) Number of malfunctions found Know-how and skills of employees on manual activities Satisfaction rate for employees working on manual activities Annual productivity gains by process and/or value chain domain Etc.
Potential measuring	Development of an IT strategy Analysis of value applied to IT IT risk mapping Centralization of IT functions Standardization of IT practices (see ITIL, project management, etc.) Identification and reduction of ‘shadow IT’ Decommissioning or replacing expensive equipment or applications Shifting services to the cloud BYOD ATAWADAC Industrialization of IT practices Analysis of IT productivity Implementation of IT dashboards IT professionals training Etc.	Development of a digital strategy Analysis of value applied to digital Digital risk mapping Creation of digital service centers to centralize office or other types of activities Standardization of digital practices (see naming rules, data, information, etc.) Outsourcing of low-value digital practices Big Data Digital process analysis Analysis of user productivity Implementation of digital dashboards Training for project users and owners Good digital practices User charts Etc.	Development of an information system strategy Analysis of the value applied to IS Information System Risk Mapping Creation of IS service centers to centralize office or other type of activities Dematerialization of manual tasks Standardization of IS practices Outsourcing of certain low-value IT practices (administration, storage, filing, etc.) Connected objects Virtual Reality IS process analysis Analysis of employee productivity Implementation of IS dashboards Employee training Good IS practices Employees charts Etc.
Calculation	IT budget = Sum of expenditures related to IT resources plus the salaries charged for IT specialists (or even users with an “official” important IT activity) and expenses for external service providers	Digital Budget = Computer Budget + Percentage of time spent using IT x Associated payroll	Information System Budget = Digital Budget + Percentage of time spent on manual processing of information x Associated payroll

- information systems (manual use in addition to the digital dimension)

Finally, it seems fundamental to modify the managerial paradigm in a changing world. The work of Foster, based on the 500 largest US companies (S&P 500 index), shows that their lifetime has dropped sharply from 60 years in 1960 to 15 years today. This significant decline is due in particular to the change of business models and the digital revolution that profoundly impacts the value creation process of companies.

Boulding said more than half a century ago: “The concept of the knowledge industry contains enough dynamite to send traditional economies into orbit”! (Boulding, 1964). That has never been as true as today. Since the processing of information has become so widespread in our modern economy, we are most likely at the dawn of a true “aggiornamento” of our governance and measurement practices. This is the role of new managers according to Schumpeter: “To undertake is to change an existing order” (Schumpeter, 1911). This is particularly true in the new digital era. Not differentiating informatics, digital and information systems and not reinventing management and governance practices is the best way to fail and not to profit from the greatest revolution we ever faced.



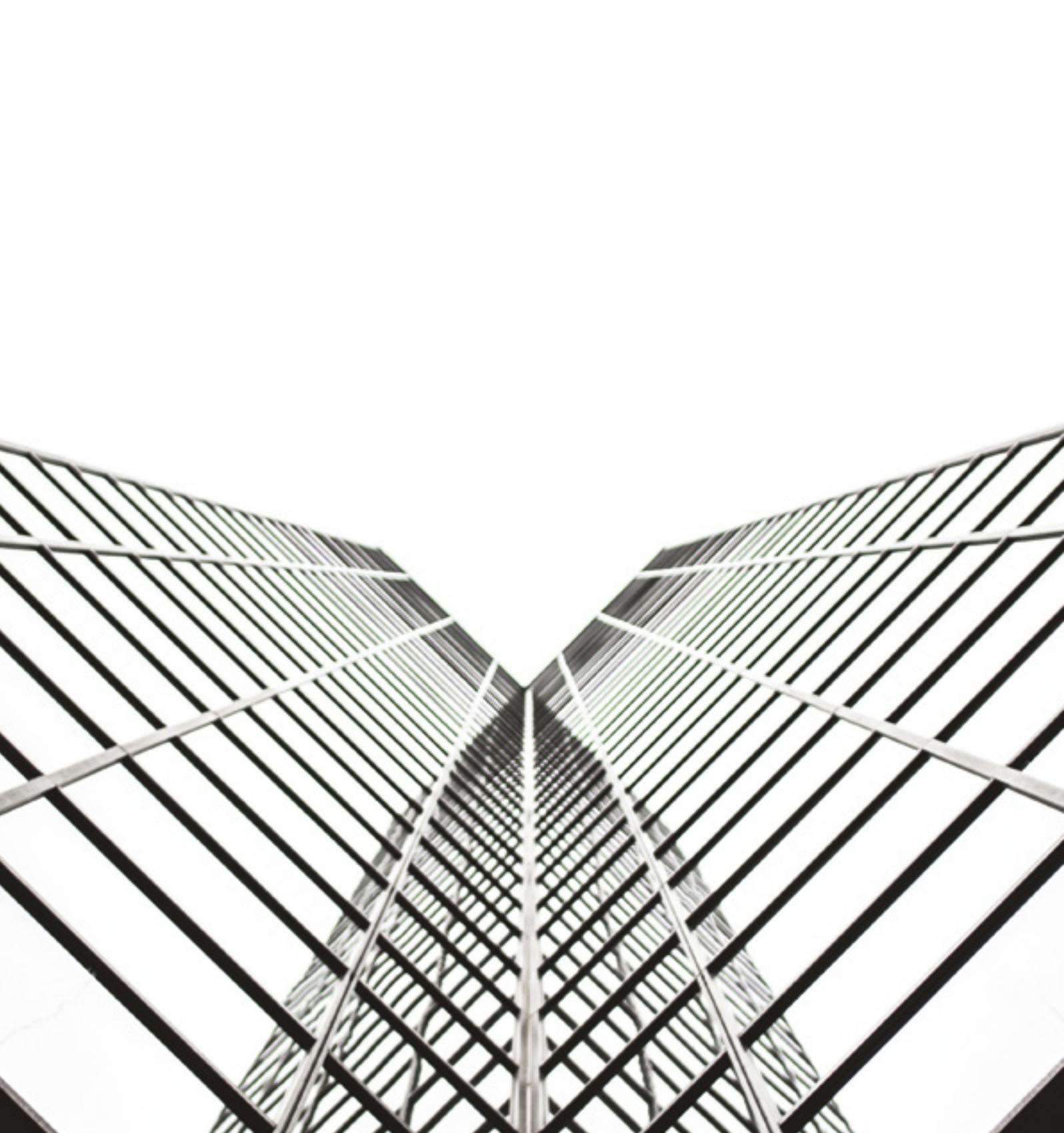
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