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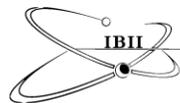
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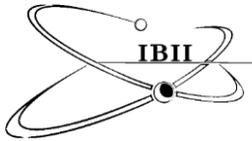
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Integration of Holonomic Thinking in Educational Leadership Development Courses

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Abstract

Educational leaders are prime observers of their school performance and progress. As leaders and active participants in the steps towards school improvement, they must take into consideration diverse stakeholders' opinions, ideas and beliefs, and technical aspects such as data analysis while engaging in the decision-making process. This practice can be enhanced by considering the circumstances and all stakeholders involved from a holonomic viewpoint rather than an egocentric viewpoint. This article explores the holonomic conceptual platform and its strategies as a conduit to broaden emergent school leaders' perspectives.

Keywords: decision-making, holonomics, leadership, school improvement, systems thinking.

Esse est percipi
(To be is to be perceived)
George Berkeley

1 Introduction

Schools nationwide face numerous and complex challenges, from less-than-ideal student scores in standardized assessments to tense school climate, corroding the already debilitating condition of K-12 public education (Ravitch, 2016; National Center for Education Statistics, 2016). Schools identified as persistently low-achieving may choose to receive state funding, which typically is attached to assurances to speed up student achievement. With the authorization of the Every Student Success Act (U.S. Department of Education, 2015), local school leadership teams must generate clear strategies and solutions to tackle these demands.

When teams are unable to develop a solution because of lack of consensus or ideas, they may emulate and implement other schools' initiatives, which may not be suitable for their site, augmenting their chances of failure and negatively influencing student progress. The importance of enhancing teams' problem-solving skills is considered a predictor of many other positive relations, such as student achievement (Chrispeels, Castillo & Brown, 2000). Typically, teams are composed of teachers representing various content areas and specializations, guidance counselors, administrators, parents and school board representatives. In some instances, state law mandates meaningful engagement with parents, pupils, school personnel, local bargaining units, including those representing subgroups, such as English Learners and special education students (CDE, 2016).

To develop schools and districts' improvement, strategic and local accountability plans, educational leaders have been increasingly holding school leadership teams and stakeholders' meetings where the voices of the school community could be heard. Educational leaders are responsible for managing these all-inclusive teams, guiding them in the decision-making process and synthesizing the information into comprehensive plans and action items that can be implemented with fidelity.

Facilitating teams and stakeholders' meetings is a daunting task for leaders, as individuals' opinions vary and may be guided by personal motives and unique cultural values. Additionally, team members' emotional states may play a part in the decision-making process (LeBlanc, McConnell, and Monteiro, 2015). Data can assist teams to keep the focus of the meetings on factual information. Use of data has been shown to result in appropriate decision-making (Gullo, 2013). Although the use of data is valuable and widely popular, it is just one useful vehicle to navigate the winding road towards student achievement and school improvement. Hargreaves, Morton, Braun, and Gurn (2015) argue that:

Data can help in addressing these issues, but in the end, some of our most challenging educational and social problems will not mainly be solved by more or better data, just as they will not be solved by more technology or by any other silver bullet. More and better data can help us make more efficient educational decisions and judgments, but they will not, of themselves, help us make wiser or more humane ones. (p. 5)

Hargreaves et al. (2015) suggest the need to recognize the multidimensional aspects and tools that must be taken into consideration when working to achieve school improvement. This includes the team's capacity for problem-solving and decision-making, each team members'

unique characteristics and input, and the capacity to employ tools such as data in a “wiser or more humane” way. The skill of the educational leaders to identify and work with all of these elements, at times simultaneously, requires conscious effort and practice. The leaders must be able to see the intrinsic as well as the extrinsic dimensions of the situation. The need for multidimensional approaches to educational leadership calls for innovative approaches to educational leadership. Educational leaders need new frameworks that will enable them to appreciate the relationship between the organizational parts and the whole, which together constitute the complex process of working with others on school improvement efforts.

By enabling organizational leaders to see organizational issues as multifaceted and complex, Holonomics offers one such innovative approach to educational leadership. It requires practice and a set of clear strategies and techniques to perceive more than one facet of a situation affecting an organization and to act on that perception. The failures to recognize patterns, to see potential interferences and to accommodate all stakeholders in a situation, often lead to poor decisions made in a hasty manner. Heifetz and Linsky (2002) use a brilliant analogy to understand this concept:

Let’s say you are dancing in a big ballroom. . . . Most of your attention focuses on your dance partner, and you reserve whatever is left to make sure you do not collide with dancers close by. . . . When someone asks you later about the dance, you exclaim, “The band played great, and the place surged with dancers.” But, if you had gone up to the balcony and looked down on the dance floor, you might have seen a very different picture. You would have noticed all sorts of patterns. . . you might have noticed that when slow music played, only some people danced; when the tempo increased, others stepped onto the floor; and some people never seemed to dance at all. . . . the dancers all clustered at one end of the floor, as far away from the band as possible. . . . You might have reported that participation was sporadic, the band played too loud, and you only danced to fast music. . . . The only way you can gain both a clearer view of reality and some perspective on the bigger picture is by distancing yourself from the fray. . . . If you want to affect what is happening, you must return to the dance floor. (p. 53)

In the case of school leadership, poor choices that fail to take into consideration the larger picture may inadvertently provoke chains of events that ultimately have detrimental outcomes on students’ performance and development. On a larger scale, this entrenched modus operandi has been pervasive, as reflected in years of futile attempts to nationwide school reform, such as the legislative efforts of Goals 2000, *A Nation at Risk* and the No Child Left Behind Act.

Holonomics is a pioneering way of enabling leaders to appraise systems models, mental models, as well as organizational and economic models. The word “holonomics” is currently used in physics, classical mechanics, mathematics, and robotics. In the 1990s, Karl Pribram (1991) used the term to describe his “holonomic brain theory.” Pribram’s theory originates from the mapping of particular brain processes, mathematical insights and optical imaging. In the leadership context, the term “holonomics” fits well to define the intrinsic and extrinsic dimensions of complex systems. Holonomics equip us to see the state of affairs from a perspective that allows us to comprehend the entire system – living, working and interacting. It is a groundbreaking approach to implementing profound transformational change in organizations, in which solutions are ones which engage people across the whole organization, developing strong organizational cultures, trust, and effective communication among members. This approach describes a new way of thinking that teaches educational leaders how to innovate and solve problems creatively by using four ways of knowing – thinking, feeling, sensing and intuition (Robinson and Moraes Robinson, 2017).

These four ways are often forgotten or repressed in the world of leadership and administration because the thinking patterns that prevail in educational leadership are Newtonian and Taylorian in nature, which produce persistent linear constructs leading to the same undesirable results. School leadership and management have been acquainted with these principles for decades. A simple illustration of this is the manner in which schools have been and continue to be built and managed, imitating the blueprints and the characteristics of hospitals, prisons, and industrial buildings from the 19th century. Capra and Luigi (2014) put it simply by asserting:

The principles of classical management theory have become so deeply ingrained in the way managers think about organizations that for most of them the design of formal structures, linked by clear lines of communications, coordination, and control, has become almost second nature. This largely unconscious embrace of the mechanistic approach to management has now become one of the main obstacles to organizational change. (p. 59)

Holonomics offers ways of countering the resilient human tendency to categorize, divide and treat predicaments as isolated events without realizing the strong connections that transpire among each one of them. In the case of school leadership, all efforts should be directed towards reaching the ultimate goal of increasing student progress and achievement. However, each initiative is selected in isolation without questioning their alignment towards this critical objective. David Bohm (2002) precisely identifies this human predilection towards fragmentation by stating:

Indeed, to some extent, it has always been both necessary and proper for man, in his thinking, to divide things up, and to separate them, so as to reduce his problems to manageable proportions; for evidently, if in our practical technical work we tried to deal with the whole of reality all at once, we would be swamped. (p. 2)

Disrupting this way of deep-rooted thinking is the first step towards better results. Although this step may sound ingenuous, virtually a fundamental notion, it has tremendous potential to change the present mechanistic and fragmented ways of thinking that are prevalent in education and support teams in their attempts to transform teaching and learning.

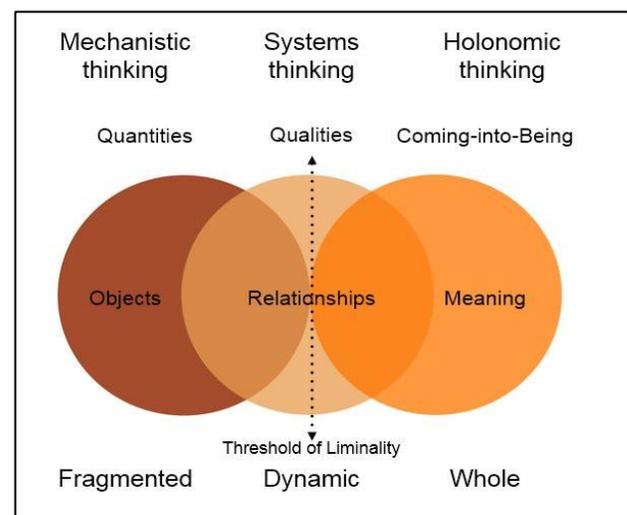


Fig. 1. The liminality point between mechanistic and holonomic thinking. Reproduced from Robinson and Robinson (2014). *Holonomics: Business Where People and Planet Matter*.

The challenge to adopting a holonomic approach arises at the point where individuals are able to see the value of holonomic models yet persist in thinking in mechanistic terms. This point is called the threshold of liminality. Figure 1 represents the point of liminality that leaders must be attentive to, and surpass, in order to navigate the transition from mechanistic to holonomic thinking. This point of liminality can be overcome by first considering the theoretical foundations of holonomics, and by seeing how holonomic thinking can be implemented in educational leadership classrooms.

2 Literature Review

Holonomics Theoretical Foundations

The philosophical foundations of Holonomics are based on new hermeneutic and phenomenological conceptualizations of the whole in systems thinking, particularly those of Martin Heidegger (1962), Hans-Georg Gadamer (1975) and Johann Wolfgang von Goethe (1988). In all of their thinking there is a shift away from a focus on thinking about objects which are out there, independent of us in a physical reality, and move the center of our attention away from what is seen, i.e. objects, and into the dynamic act of seeing. This way of seeing is neither purely dependent on words and symbols, nor entirely dependent on analytical thinking, which breaks problems down into parts, modeling them, limiting them, and then putting them back together into a counterfeit whole. Holonomics, therefore, understands the whole as coming to presence in the parts, as opposed to dominating the parts in a top-down system or being subservient to the parts. The whole can only be experienced in one's intuition as an encounter through the parts. This dynamic conception of wholeness has been with us since Plato's time, and yet often it has remained disguised and not recognized since the form in which it appears has been in many different contexts.

Furthermore, the theoretical foundations of Holonomics originate from two philosophies. The first is the educational philosophy of the Indian educator Sathya Sai Baba who created the program Education in Human Values, which has at its great aim the development of character:

Education nowadays develops skills and intellect, but what good is all the knowledge in the world if you do not have character? Character is the unity between thought, word, and deed. Some say that knowledge is power, but I say that character is power. (Sathya Sai Baba, 1989)

At the heart of the program are five human values, which are taught to all students. These are *love, peace, righteousness, truth, and non-violence*. According to Sathya Sai Baba,

Today, everyone wishes to fulfill his selfish interests at the cost of others. No one acts with a pure heart and good intention to help others. A human being is expected to have the qualities of Sathya (truth), Dharma (righteousness), Santhi (peace), Prema (love) and Ahimsa (non-violence). Devoid of these qualities, he is not a human being at all. (Sri Sathya Sai Education, 2008, p. 2).

This approach to education enables and equips people not only to perform technical tasks but also to develop wisdom and discernment, to give the individual the ability to make better choices in their path in life, from the point of view of everyone and not just themselves. It remind us that a sound and robust foundation of leadership must embrace human values and social justice principles.

The second philosophy is the phenomenological and hermeneutical conception of wholeness articulated by Henri Bortoft (1938 - 2012). This

dynamic conception of wholeness can be found as far back as the writings of Plato. Bortoft introduces the phenomenological approach to understanding experience in the following manner:

But just as, according to Descartes, mathematical physics takes us 'out of' the body and separates us from nature, so the lived body can bring us into the presencing of nature. Such an encounter would be an impossibility within the framework of modern science, and yet it is only by awakening to this that we will really understand what is at stake in our relationship to the natural environment, and at the same time begin to wake up from our enthrallment by the artificial world of technology.

Phenomenology teaches us how to shift our attention within experience, drawing attention back from what is experienced – i.e. where the focus of attention is on the what – into the experiencing of what is experienced. When we do this, we begin to understand how it is possible for objects to appear to us within our lived experience. (Bortoft, 2012, p. 49)

Bortoft's great contribution was to demonstrate how the dynamic conception of wholeness is found in Goethe's phenomenological approach to science, in Martin Heidegger's radical philosophical conception of Being, and in Hans-Georg Gadamer's philosophical hermeneutics.

In his writings, Plato posited a *chorismos*-a two-world system. Gadamer did not interpret the *chorismos* as an ontological separation, i.e. the literal existence of two independent worlds or universes. He took the view that Plato had to posit this separation to help us understand the methodological differences between that which we can experience through our senses and ideal realities" such as abstract thinking and the basic elements of mathematics. (Robinson, 2016) Gadamer concluded that the major concern for Plato was in understanding the nature of the One and the many (or to put it in organizational terms, the whole and the parts). Thus what we discover in Gadamer's writings on Plato is a wide-ranging doctrine for how humans can live together, based on the recognition that we live our lives in a web of meaning. (Wachterhauser, 1999, p. 5)

Hermeneutics allows us a way to explore this human web of meaning. As Robinson and Moraes Robinson (2017) explain:

Hermeneutics is less a written structured methodology, and more a way of approaching the study of a text or a work of art as a conversation. Within the process of having this conversation, one's own self-understanding is restructured. Gadamer always emphasized that, especially in relation to written works, we should always attempt to take the other in their intention and not in their expression. This is by no means easy of course since the majority of the time we do not have access to people's intentions, just their expressions. We can gain an appreciation of the approach that hermeneutics takes to meaning by looking at one particular example, that of legal judgments. This helps us to start to think about what we mean by the One, the whole, the general, identify and how these concepts relate dynamically to concepts such as the many, the parts, the specific, and difference.

One of the greatest issues relating to moral behavior is the tension which exists between knowing what is right in general and knowing what is morally right in any single particular situation. When making decisions about what is morally right, we depend on knowledge of what is right in order to make a particular decision, but at the time of making the decision, we often find that there are no single universal rules which can be applied independently of that particular situation. For this reason, we need the wisdom to guide us between the *general* and the *particular*. This dynamic can be found operating in legal judgments (Wachterhauser, 1999). We

cannot codify the law; clearly, it is written because there will always be a need for discretionary decision-making. We need judges to make legal judgments and juries to decide matters of fact. This opens up the possibility of laws being applied either too leniently or too strictly, resulting in those who are guilty being acquitted of crimes on technicalities while others who are innocent or who have acted out of a genuine moral and ethical obligation are given sentences that the public considers to be far too severe.

Gadamer was concerned with the limitations of the scientific method in relation to claims about the truth, especially in relation to the logical empiricism of the Vienna Circle, which took hold in the early part of the twentieth century. Prior to Gadamer, Goethe published his *Theory of Colors* in 1810, a treatise which also concerned itself with the limitations of the scientific method and the way in which the focus was on a codification of light in the form of abstract lines and geometry, and not on the actual phenomena of color itself. At this moment in the history of science, no other scientist or philosopher was more fully knowledgeable in the study and understanding of color than Goethe, a polymath poet, artist, and scientist. (Sepper, 2002) Goethe, like Gadamer, felt that we could access a form of truth through developing an artistic and aesthetic form of consciousness, grounded in phenomena.

Holonomic thinking goes one step further by expanding the ability to “see” a complex system whole with an amplifying looking glass. The journey of the mind from mechanistic thinking to systems thinking, to holonomic thinking, demands a shift in the way in which we perceive and learn. Mechanistic thinking is absorbed by processes, fragmentality, objects and quantity. Systems thinking is concerned with relationships, dynamics, and quality. Holonomic thinking calls for a reorganization of consciousness. True understanding can only be attained by paying attention to one’s intuition, making meaning and seeing the “authentic whole”-processes, dynamics, *and* meaning. Only then can people be transformed by the system having a richer understanding of the world and their place in it.

The term holonomic derives from the Greek words ὅλος, holos “whole” “entire” and νόμος nomos, meaning “law.” Arthur Koestler originally coined the word *holon*. In his book *The Ghost in the Machine* (1967), Koestler shares a short story about two watchmakers manufacturing an identical watch using one thousand parts. Despite the fact the watch was in high demand, one of the watchmakers was unsuccessful and had to close his factory. The main difference was in the way they manufactured their watches. One watchmaker produced one bit at the time. Every time he was interrupted or distracted, he had to start all over again and was unable to complete an entire watch. However, the prosperous watchmaker understood the interdependency that exists between the parts and the whole within the system. He created subassemblies of 10 parts that could be added to larger assemblies before the units could be brought together to construct the final watch. Through this narrative, Koestler acknowledges there is a hierarchical order in all aspects of an organization. He recognizes that “The reason why any relatively stable society-whether of animals or humans must be hierarchically structured, can again be illustrated by the watchmakers’ parable: without stable sub-assemblies-social groupings and subgroupings- the whole simply could not hold together.” (p. 50) Furthermore, Koestler clarifies that a part, division, holon, contains *self-assertive tendencies* due to their distinctive *wholeness*. This feature of holons is indispensable to run a dynamic organization. Conversely, the holon also exhibits an opposite side of *integrative tendencies*. This part-whole dichotomy, when unbalanced, can preclude us from perceiving both atomistic and holistic approaches.

More than two decades ago, Banathy (1991) warned that the lack of growth in education was due to three factors: “1) the piecemeal,

incremental approach; 2) the failure to connect and integrate solution ideas; 3) and staying within the boundaries of the existing system” (p. 11). Attempting to mend each classroom and individual departments in isolation is unproductive. Failure to see the school as a living ecosystem of mutually dependent parts leads to inefficiency and reinforces the vicious cycle of mediocrity. It should not be perceived as a machine where batched processes take precedent and children are merely supported based on tests results. As previously mentioned, focus on the parts must not dominate or refrain from appreciating the whole. Focusing, on the whole is essential, which comes to presence in the parts and it is not a super-part.

School leaders can influence the path schools are going to take and the steps needed to reach each marker towards improvement and transformation. An educational leader should be mindful of how both forces blend internally and externally in the school community. If there is no conceptualization of the whole system, if there is only a view of results and of departments having goals that conflict with other departments, the organization as a whole loses energy, is not sustainable in the long term and therefore achieves inferior results. Holonomics stimulates leaders to understand: a) their *systems* as organic and dynamic interrelated units, b) to appreciate the lived *experience* of each person (students, parents, employees, the school community), c) how shared *meaning* emerges in the organization over time allowing it to become agile, efficient and transparent, and d) how human *values* are the basis for authenticity, agility, and change within an organization (Robinson and Moraes Robinson, 2014).

To expand on the above holonomic premises, educational leaders managing change must be able to deal with observations, use their intuition, and perceive the hidden connections that exist in between people which are often much stronger than the organizational chart and structure. This leads to organizations being truly sustainable, with the values, mission, strategy and the very essence of the organization being understood and then expressed by each and every member. If we can comprehend, understand and heal these broken and unauthentic relationships, then we can start to rediscover trust and “what it means to genuinely share and co-create, whatever we are attempting to envision, innovate and bring into this world.” (Robinson, 2017)

The journey from seeing from an ego-nomic to a holonomic perspective involves humility. When a leader goes into the act of seeing itself, they develop a sensitivity to the lived experience of others, an extremely powerful ability to have which leads to comprehension, empathy, and understanding of the motives, actions and underlying causes of the outwardly perceived actions and expression of other people. Leaders must develop a more dynamic and systemic appreciation of all the relationships in both their schools and organizational ecosystems, and how these interconnected relationships affect their culture, mission and ultimately their bottom line.

There must be maximum coherence between what an organization says, what it means, and what it does. (Robinson and Moraes Robinson, 2017) This coherence has to run throughout the whole organization, both internally and externally, and across its classrooms, departments, school ecosystem, and the communities with which it interacts.

3 Methodology

Putting Holonomics into Educational Practice

In her book *Changes of Mind: A Holonomic Theory of the Evolution of Consciousness*, Wade (1996) offers a fitting description of the transformational progression that occurs in students’ minds when presenting them

with challenging exercises and situations. In short, their conventional view of reality is disrupted.

Change results from a combination of internal and external factors in the explicated order. The individual encounters a problem he is highly motivated to solve, but for which no resolution exists within the (perceived) reality permitted by his stage of consciousness. Kuhn provides a better description for transitions in consciousness than most developmental psychologists (1970), probably because noetic structuring is fundamentally paradigmatic structuring: the world does not change; the way in which the world is understood does. When confronted by severe and even prolonged anomalies, an individual may begin to lose faith in his worldview and consider alternatives, but he is not easily able to give up or change his point of view. When a conflict of logical inconsistency becomes sufficiently acute, it in effect violates his conception of reality. (p. 262)

“The Ladder of Seeing” is a holonomic exercise which enables students the process of entering into the dynamics of seeing. It helps to clarify to leaders the potential limitations in their ways of knowing the world. In this exercise, Robinson and Moraes Robinson (2017) propose six levels of insightful discovery as illustrated in Figure 3.

The way we “see” the world on a daily basis is entrenched with our singular tendencies that do not let us perceive the essence of the situation. Normally, we think that seeing is that through light, our eyes and nervous system, we can perceive images of this external world and thus invariably know things about it. Our mental models have an authoritative control on our “seeing” and may preclude us from appreciating the whole picture. Only by making a concerted effort to move our attention beyond the objects, or *what is seen*, to the actual *act of seeing* that we discover that our mental models misrepresent reality. The ladder of seeing allows leaders to recognize that their reality is not the right and only way. Regrettably, we seldom take the time or contemplate the fact that other people may have different experiences of realities, that they may understand complex situations and problems in dramatically different ways. A creative organization which uses holonomic thinking has leaders who are able to ascend the ladder to make effective decisions and find solutions which emerge not from one person’s mental models and paradigms dominating the other, but through capturing the rich diversity of individuals’ distinctive ways of thinking and seeing. This exercise is achieved by dialogue and reflection.

In the book *Holonomics*, Robinson and Moraes Robinson (2014) write extensively about Goethe’s theory of color and explain how it can be explored using glass prisms in leadership classes. Students are encouraged to explore natural color phenomena created by the prism and compare their observations with the abstract theories of light of Newton. This exercise has been influential for those taking part. The reason is that our intellectual minds are not on their own able to grasp the phenomenological nature of the natural world. Goethe felt that a phenomenological approach to science could achieve a deeper way of understanding nature by plunging into our senses and fully trusting our senses to explore natural phenomena, rather than viewing the sensory experience as secondary to any quantifiable way of reducing nature to measures. (Goethe, 1988).

Robinson and Moraes Robinson have taken insights from *Holonomics* as the basis for the creation of exercises which allow business leaders to actually experience just how much our mental models shape and filter our view of reality. The exercises take them into the experiencing of the dynamics of seeing. The goal is to lead executives to the astonishing insight that they do not have an exclusive claim to the truth about reality, leading them to understand better just how much genuine dialogue is required for

them to fully make sense of complex situations. Leaders cannot longer see themselves as the one person in an organization who has all the answers. Leaders need to be able to both initiate and nurture participation in dialogue and also participate in it. Before leaders can use dialogue to help people and themselves change their mental models, they have to move from an ego-centric world view to an eco-centric world view. To have a true dialogue, they have to have a detachment from their own perspective and in order to be able to listen to others. This can only come about when the values of a leader are truly authentic, based on human values such as love, peace, righteousness, truth, and non-violence.

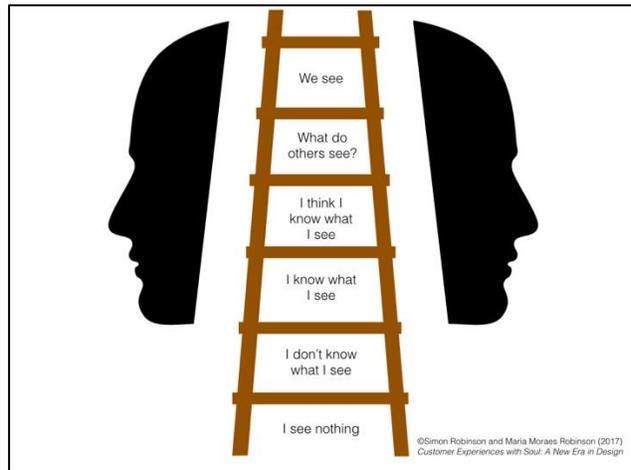


Fig.3. Six levels of the “Ladder of Seeing” exercise. Reproduced from Robinson and Robinson (2017) *Customer Experience with Soul: A New Era in Design*.

Holonomic thinking training activities in educational leadership development courses are inquiry-based, interactive, collaborative and reflective practices with real life applications. Prospective or current administrators make a myriad of decisions influencing the lives of thousands of students. The skills needed to resolve challenging situations can only be acquired by placing educational leadership students under the stress of authentic circumstances. For decades, experiential learning, games, and interactive simulations have been used in the classroom and shown to be effective instructional strategies in education (Stumpf, 1995). As we transition from the information age to a conceptual era, instructors must challenge students of educational leadership to expand their perspectives, their ways of seeing and employ creative solving processes when confronted with ambiguous and complex problems. Now, more than ever, this heuristic approach is invaluable in the preparation of future educational leaders in particular.

Holonomics, as an approach towards a whole way of seeing, helps students of leadership to see and think dynamically, expand their organizational mindfulness and their role in the entire system. As stated by Robinson and Robinson (2014), “It is a mode of consciousness which, while acknowledging the importance of the analytical-logical-symbolic aspect of our minds, fully embraces intuition, feeling and sensing so as to enable us to encounter and comprehend systems in their entirety.” This process supports the development of powerful and innovative organizational solutions.

Holonomics takes students on transformational learning journeys. This path will, in turn, enable their organizations that may be stuck in traditional, linear mindsets to transform themselves, becoming dynamic, authentic, and agile. For example, an organization may wish to receive help

developing a sustainable and long-term strategy. To communicate that strategy to people working at all levels of the organization, organizational leaders might develop experiential and gaming learning experiences that recognize and honor the importance of each collaborator and stakeholder. This is a Holonomic way of comprehending the organization, a way of seeing the organization, not as a command-and-control top-down structure, but which sees the crux of the mission, vision, and values as coming to presence in each and every member (Robinson and Moraes Robinson, 2014).

An example of an experiential activity includes the instructor using a Hoberman sphere as a prop to imagine the interrelations present in all organizations. Holonomics refer to this approach as the dynamics of seeing. This activity enables students to contemplate different perspectives from the center, edge and outer locations of the sphere. An example of a simulation is a game board activity. Students are confronted with thought-provoking scenarios or wicked problems and must use “21 Leadership Lenses” (i.e., the lens of accountability, the lens of simplicity, the lens of leadership, the lens of complexity) to decide the best course of action and envision an ideal outcome. Participants receive 21 cards (each card includes a set of prompt questions), a case scenario, and a board with a timer where chips must be placed as they complete each card.

For decades business executive programs, such as the MIT Sloan School of Management, have incorporated games in their curriculum as a way to introduce students to solving complex system dynamics and organizational change. The Beer Game is a prime example of a successful board game used to train business leaders (Serman, 1989). The “21 Leadership Lenses” game is grounded on the book *The Art of Virtual Games Design: The Book of Lenses* (Schell, 2015) which considers all aspects of the game environment and the players’ decision-making process. Schell is an American video game designer who has had an illustrious career, working at Walt Disney Imagineering for seven years in the capacity of the programmer, manager, designer and Creative Director on several projects.

Following his time at Disney, Schell was invited to join Carnegie Mellon University’s new Entertainment Technology Center, where he developed a range of design methodologies. The thinking that goes into the creation of games; be they computer games, live action games or theme park attractions - applies to the creation of any experience which anyone (a client, a customer, an employee, a stakeholder, or an audience member) may have. Schell is now focusing on the development of what he calls transformational games, games which are illuminating as well as entertaining, having the power to transform education and the classroom. He uses the concept of lenses to offer us one hundred different perspectives on games design, which together emphasize the value of representing the various stakeholders’ perspectives rather than consensus-building when solving problems. The foundation of his philosophy and methodology is the first lens, the ‘Lens of Essential Experience,’ which calls on the game’s designer to stop thinking about the game, and to think about the player, by asking these three questions:

- What experience do I want the players to have?
- What is essential to that experience?
- How can my game capture that essence?

An additional simulation may include a physical activity where students participate in an organizational “systems thinking” exercise called “Med-

itation on Starlings.” (Robinson, 2017) Students reflect about the similarities that exist between nature’s self-organizational patterns and their own organization’s behavior.

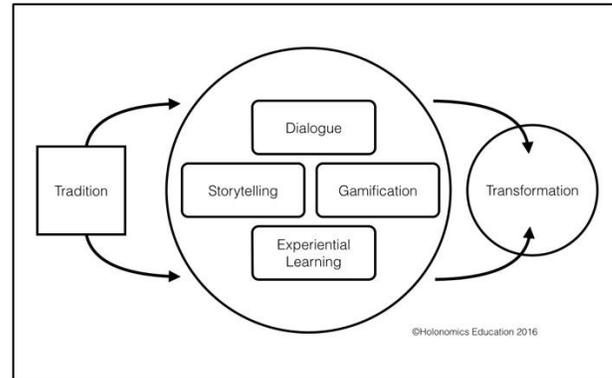


Fig.2. Holonomics Education: The Four Learning Factors

As Figure 2 illustrates, the holonomics instructional approach employs authentic inquiry, profound dialogue, storytelling, experiential learning, and simulations. These methods shift students’ traditional thinking model propelling them to transform their way of thinking.

The following two quotes come from business students who attended a Holonomics module as part of their MBA course at Sustentare Business School in Joinville, Santa Catarina, Brazil. Their comments demonstrate the way in which it is possible to help people reorganize their conceptions of complex systems and how this way of thinking can be applied in business, service oriented organizations and the educational leadership context:

Before attending the module, my mental model and way of thinking only saw the negative features of complexity, seeing only limited possibilities. Complexity has come to mean knowledge, a set of provocations that result in change. It is the possibility of expanding the consciousness to the whole, to make sense, see answers and different ways of thinking. It is the possibility of recognizing the characteristics that relate to thought, sensations, feelings and intuition. For me now complexity means an increase of possibilities, a wealth of options that lead to the results. It is the ability to undress our mental models and experiment, creating new possibilities.

Before the course, I understood the concept of complexity as being linked to uncertainties and contingencies. After the module, I now define complexity as an opportunity. It is the opportunity to be an adaptive, creative, dynamic and more agile in our organization. (Robinson, 2014)

These stories show that by developing experiential games with clear narratives, it is possible to create stories which help people to make sense of what the organization is trying to achieve, regardless of their background, education or experience.

An example of how holonomics can help organizational leaders make sense of what their organization is trying to achieve comes from Hospital Sírío Libanês, one of the most prominent hospitals in Latin America, based in São Paulo. Hospital Sírío Libanês is also a teaching hospital, offering post-graduate and residential courses. Student medics come to the hospital from across Brazil to study, and distance-learning courses are also available. Their growth strategy is based on education, training people capable of opening other units in São Paulo and elsewhere in Brazil. They are a philanthropical not-for-profit organization, and they had spent some years developing their business strategy and their strategic map, which had

people, sustainability, and philanthropy as major pillars. The challenge they had was how to communicate this strategic map to all hospital workers at all levels of the organization.

In conjunction with hospital administrators, Simon Robinson helped to develop a solution based on the philosophy of wholeness in *Holonomics*. (Robinson and Moraes Robinson, 2017)

The overall objective was to communicate the new strategy to all 4,500 members of staff. These staff work at all levels in the organization and the communication would not be limited to particular levels of management. Because of the nature of their work, no single individual could be away from their positions for more than one hour. The urgency of the experience was evident. Robinson used the technique of gamification to create a compelling educational experience which engaged workers emotionally, bringing them together to develop a sense of being one team.

In order to be effective, the solution had to take into account not only the corporate culture of the hospital, but also the national social dynamics of Brazil. Brazil is a country with vast inequality, which has resulted in a society where the distances between social classes (not just between the very top and the very bottom) are far greater than equal societies such as Sweden or the United Kingdom. The design brief was to create an event which brought together people from every level of the hospital: porters, security staff, janitors, secretaries, receptionists, nurses, nutritionists, managers, doctors, executives, directors, and surgeons. With some guidance, workers decided for themselves where to sit at one of ten tables, which could seat up to ten people each. The goal was for each table to be a kind of microcosm of Hospital Sírio Libanês itself, consisting of a wide mix of stakeholders across all departments of the hospital. The mission and character of the hospital were represented by each table group as a whole and also through each person seated there. Every table contained the strategic map told as a story, stretching from one end to the other. Each story was therefore so long that one person could only read a part. Doctors and surgeons listened to secretaries and nutritionists tell the story of how the hospital aimed to get to 2020, and so this was a way to dissolve the social hierarchy almost without people noticing, moving away from hierarchical social dynamics and towards an experience of wholeness.

4 Rationale

Holonomics and the Emergent Educational Leader in the 21st Century

Educational leadership development courses must incorporate learning objectives and instructional strategies that fully prepare students to face the intricacies of the 21st century. Today's schools are complex organizational systems influenced by ever-changing internal and external forces. In a world of uncertainty, traditional mental models can no longer meet the demands placed on emergent leaders. Barry Richmond (2010), a systems thinking advocate, urged the public to understand that, "In order to achieve this evolution, we must overcome some formidable obstacles. Primary among these are the entrenched paradigms governing what and how students are taught." (p. 4) Richmond further described mental models as selective abstractions of reality that we create and fixate in our heads. He affirms that no significant progress will be made until we feel comfortable embracing expansive mental models that transgress horizontally-extended and vertically-restricted boundaries.

According to the Global Cities Educational Network (GCEN) (2014), by the time K-12 students graduate from high school they must be proficient in three competencies: cognitive, interpersonal and intrapersonal. Each one of these broad competencies includes higher levels of critical thinking and creativity, two elements identified as essential in the

transnational economy. Just as important, leadership is considered a necessary 21st-century interpersonal competency.

Leadership can be difficult to define because it includes aspects of communication and collaboration, along with a sense of vision for the future and competencies working with people. More broadly, leadership is not just a competency but a set of competencies. For example, a study conducted across Asian countries suggested leadership involves initiative, building consensus, innovating new strategies, and implementing policies and programs in collaboration with or under the direction of others (Berman et al., 2013). Moreover, because leadership involves working with and managing other people, including their competing priorities, collaboration is an important competency for a leader to possess. Research also suggests that the nature of leadership may be changing. Statistics show that an increasing number of college graduates will find employment in an organization they started themselves. (GCEN, 2014, p. 6)

Incidentally, the GCEN (2014) report indicates that educators can influence the mastery of these competencies. The benefits of integrating holonomic thinking are considerable, particularly for pre-service educational leadership courses, above all because students and the school community would be directly impacted by future school leaders' decisions and planning. By coaching educational leadership students how to grow from mechanistic to holonomic thinking, the results would be richer, varied and long term, and would lead children to accomplish the competencies mentioned above.

The emergent educational leader of the 21st century will encounter multiple paradigm shifts in their careers. Responding to intricate dilemmas with the traditional "this is the way we have been doing business here" is no longer a pragmatic answer. Satterwhite, Miller, and Sheridan (2015) speak of a new trajectory in leadership development as we move towards a new conceptual era. They explain, "that by 2050 many of the paradigms of the modern life will have more fully complete the dramatic shifts that have already begun, further contributing to this new context of leadership." (p. 17) They argue that prevailing or established contextual paradigms, such as leadership, will shift from focusing on the characteristics of the individual to learning about the capacity of the systems. Other contextual paradigm shifts would include education, which is expected to move from knowledge retention as a core objective to instead recognizing the value of systems and emotional intelligence. Practices, such as problem-solving, would no longer be reactionary and risk averse undertakings, but rather a way of creating desired social futures. The integration of anthropocentric and ecocentric perspectives would be necessary to having a collective view of the world, as well as to understanding that we stand as a part of nature. This new context of leadership and practice aligns with the tenets of holonomic thinking.

Higgs (2003) points out that inter-personal relationships and intra-personal learning are essential for emergent leaders in the 21st century. After reviewing several models of effective leadership, Higgs lists conscientiousness, integrity, motivation, self-awareness, and intuitiveness as key intrapersonal elements of an emotionally intelligent leader. Correspondingly, holonomic thinking places particular importance on intuitiveness, one of the four ways of knowing. Higgs defines it as "The ability to use insight and interaction to arrive at and implement decisions when faced with ambiguous or incomplete information." (p. 279) An additional competency is the ability to *engage* others in a collective vision and find appropriate ways for individuals to contribute to the overarching goal. The organization must be valued as a network of relationships that

connects all individuals, the community, and the ecosystem. Management of human resources is acquired by interrelational means, not just based on quantitative results. Hence, developing quality relationships is the root to sustainable and fruitful organizations.

The instructional techniques associated with Holonomics thinking can be accomplished at little to no cost. Gamification, experiential learning, project-based learning, dialogue and storytelling methods can be easily implemented. For this practice to be beneficial, the instructors should be properly trained on the holonomics theoretical and operational frameworks as well as the complementing seminar strategies. Training should be consistent and long-term to guarantee that instructors integrate these approaches efficiently and meaningfully, and so that they may become knowledgeable and proficient themselves at reaching a holonomic thinking level.

The need to improve educational leadership skills is urgent, as unpredictability at all levels of social life is prevalent in the present times. In *Leading from the Emerging Future: From Ego-System to Eco-System Economies*, Scharmer and Kaufer (2013) state:

This inner shift, from fighting the old to sensing and presencing an emerging future possibility, is at the core of all deep leadership work today. It's a shift that requires us to expand our thinking from the head to the heart. It is a shift from an ego-system awareness that cares about the well-being of oneself to an eco-system awareness that cares about the well-being of all, including oneself. (pp.1-2)

5 Conclusion

The integration of holonomic thinking in leadership development courses offers the promise to empower school communities. The capacity to see complex issues from multiple perspectives would be of an extraordinary advantage for educational leaders. Educational leadership and administration programs have the obligation of designing a curriculum that amplifies students' critical thinking and providing instructional methodologies that are better fitted to respond to the existing and forthcoming educational undertakings and social climate.

References

Australian Institute for Teaching and School Leadership (2014). Early teacher development: Trends and reform directions. Retrieved from <http://asia-society.org/files/gcen-earlyteacherdevelopment.pdf>

Bohm, D. (2002). Wholeness and the implicate order (Vol. 10). Psychology Press.

Bortoft, H. (2012). Taking appearance seriously. Edinburgh: Floris Books.

California Department of Education (2016). Parent and community engagement. Retrieved from <http://www.cde.ca.gov/fg/aa/lc/lcffffaq.asp#LCAP>

Capra, F., & Luisi, P. L. (2014). The systems view of life: A unifying vision. Cambridge University Press.

Chrispeels, J., Burke, P., Johnson, P., & Daly, A. (2008). Aligning mental models of district and school leadership teams for reform coherence. *Education and Urban Society*, 40(6), 730-750.

Gadamer, H. G. (1975). Truth and Method, trans. W. Glen-Doppel, London: Sheed and Ward.

Gamification (n.d.). Holonomics education. Retrieved from <https://holonomicseducation.wordpress.com/gamification/>

Goethe, J. W. V. (1988). Goethe: scientific studies. Suhrkamp, NY.

Gullo, D. F. (2013). Improving instructional practices, policies, and student outcomes for early childhood language and literacy through data-driven decision making. *Early Childhood Education Journal*, 41(6), 413-421.

Hargreaves, A., Morton, B., Braun, H., & Gurn, A. M. (2015). The changing dynamics of educational judgment and decision making in a data-driven world. Decision making in educational leadership: Principles, policies and practices, 3-20.

Heidegger, M. (1962). Being and time. 1927. Trans. John Macquarrie and Edward Robinson. New York: Harper.

Koestler, A. (1968). The ghost in the machine. New York, NY: Macmillan.

Kuntz, J., Elenkov, D., & Nabirukhina, A. (2013). Characterizing ethical cases: A cross-cultural investigation of individual differences, organisational climate, and leadership on ethical decision-making. *Journal of Business Ethics*, 113(2), 317-331.

LeBlanc, V. R., McConnell, M. M., & Monteiro, S. D. (2015). Predictable chaos: a review of the effects of emotions on attention, memory and decision making. *Advances in Health Sciences Education*, 20(1), 265-282.

Ida Ortiz, F., & Ogawa, R. (2000). Site-based decision-making leadership in American public schools. *Journal of Educational Administration*, 38(5), 486-500.

Johnson, P., & Scollay, S. (2001). School-based, decision-making councils - conflict, leader power and social influence in the vertical team. *Journal of Educational Administration*, 39(1), 47-66.

Pashiardis, P. (1993). Group decision making: The role of the principal. *International Journal of Educational Management*, 7(2), 8.

Pribram, K. H. (1991). Brain and perception: Holonomy and structure in figural processing. Psychology Press.

Ravitch, D. (2016). The death and life of the great American school system: How testing and choice are undermining education. Basic Books.

Robinson, S. & Moraes Robinson, M. (2014) Holonomics: Business where people and planet matter. Floris Books.

Robinson, S. (2016, August 16). The transition of futurology. Transition Consciousness. Retrieved from <https://transitionconsciousness.wordpress.com/2016/08/26/the-transition-of-futurology/>

Robinson, S. & Moraes Robinson, M. (2017) Customer experiences with soul: A new era in design. Holonomics Education.

Sai Baba, S. (1989). Sathya Sai education in human values. Discourses given by Bhagavan Sri Sathya Sai Baba. Prasanthi Nilayam: Sri Sathya Sai Books.

Sathya Sai World Foundation Education Conference (2008). Proceeding of the Conference. Retrieved from <http://www.sathyasai.org/education/EdConf2008/content.htm>

Scharmer, Otto (2014, May 8). Leading the relational inversion: From ego to eco. Omega. Retrieved from <https://www.omega.org/article/leading-the-relational-inversion>

Schell, J. (2008). The art of game design: A book of lenses. Boca Raton: CRC Press.

Sepper, D. L. (2002). Goethe contra Newton: polemics and the project for a new science of color. Cambridge: Cambridge Univ. Press.

Sheard, A.G., and A.P Kakabadse. A Role-based perspective on leadership decision taking. *Journal of Management Development*, 26.6 (2007): 520-622.

Sterman, J. D. (1989). Modeling managerial behavior: Misperceptions of feedback in a dynamic decision making experiment. *Management science*, 35(3), 321-339.

Soland, J., Hamilton, L. S., & Stecher, B. M. (2013). Measuring 21st century competencies: guidance for educators. Retrieved from <https://asia-society.org/files/gcen-measuring21stskills.pdf>

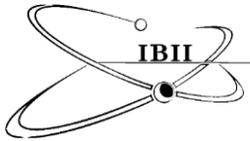
U.S. Department of Education (2016). U.S. Department of Education names committee members to draft proposed regulations for Every Student Succeeds Act. Retrieved from <http://www.ed.gov/news/press-releases/us-department-education-names-committee-members-draft-proposed-regulations-every-student-succeeds-act>

Wachterhauser, B. (1999). Beyond being: Gadamer's post-platonic hermeneutical ontology. Evanston, IL: Northwestern University Press.

Wade, J. (1996). Changes of mind: A holonomic theory of the evolution of consciousness. SUNY Press.

Weiner, J. (2014). Disabling conditions: Investigating instructional leadership teams in action. *Journal of Educational Change*, 15(3), 253-280.

Wodak, R., Kwon, W., & Clarke, I. (2011). 'Getting people on board': Discursive leadership for consensus building in team meetings. *Discourse & Society*, 22(5), 592-644.



Managing Cybersecurity and e-Commerce Risks in Small Businesses

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Abstract

Cybersecurity is a topic of discussion at boardrooms of businesses of all sizes as recent breaches have shown that every sector is vulnerable. Small businesses are becoming aware that their size does not provide safety from breaches. This paper discusses the pattern of increase in cyber breach incidents in businesses of all sizes around the globe, the challenges to cyber resilience found by the Ponemon Institute 2016 survey, offers steps to strengthen cybersecurity and builds customer trust, and reviews available tools on website security to help protect critical data such as SSL encryption.

Keyword Cybersecurity, e-Commerce, small businesses

1 Introduction

Recent disclosures by FBI of a scheme by hackers to profit by distributing market sensitive information from firms that handle official press releases of corporations and the infiltrations into the databases of small companies like Ubiquiti networks and Car phone Warehouse drive home the urgent need to strengthen cyber security procedures. Most small businesses are finding that a vital factor for success in e-commerce is to gain the online customers' trust in the security of their sensitive data. Customers are justifiably concerned about identity theft, and are reluctant to provide information such as their credit card and social security numbers, passwords, health details, and other confidential data. Many times this sensitive information is intercepted in-transit, or the destination website is operated by fraudsters with malicious intent. When businesses cannot provide customers assurance of their data being protected almost 21% of users abandoned their online purchase transactions, according to an AICPA online survey (Vien, 2015). Some customers make smaller than intended purchases for fear that the transaction will be compromised. Such consumer fears are documented in the study "11th Annual Online Fraud Report" which estimates \$3.3 billion in fraud losses to U.S. and Canadian online retailers in 2009.

Small businesses are becoming painfully aware that their small size does not provide them immunity from the risk of a cyber-attack. Today's highly sophisticated hackers can and will attack any target they choose. While most small businesses understand the need for cybersecurity, many still have not taken sufficient measures to protect themselves against hackers. A survey (NCSA, 2012) by the National Cyber Security Alliance (NCSA) found that 71% of security breaches target small businesses, and

about 50% of small businesses have suffered from cyber-attacks. The credit data provider, Experian reports (PwC, 2015) that 60% of small businesses go out of business 6 months after suffering a security breach. The Department of Commerce's National Institute of Standards and Technology study also found a sharp increase in hackers and adversaries targeting small businesses in the past 2 years. Small businesses may be more attractive to hackers because they do not take the time to develop a contingency plan or response plan to cyber-attacks, and do not have the resources to recover from an incident when it happens.

According to Symantec's 2014 Internet Threat Report, 30 percent of all cyber-attacks last year targeted small businesses. A cybersecurity incident could shut an entire network for many days until the problem is researched and fixed. A small business may not be able to withstand the loss of income, or have insurance that helps to defray those costs or any liabilities that might occur as a result of the breach. A highly public breach could also damage the business's brand and lead to long-term loss of income (Home Depot, Target, and many others). NCSA's research (NCSA survey, 2015) identified 3 major reasons hackers target small businesses: They are not well equipped to handle an attack due to lack of resources; their partnerships with larger businesses provide back door access to a hacker's true targets; and they do not guard the information that hackers desire such as credit card credentials, intellectual property, personal information, etc., effectively.

2 Problem and significance

Small businesses with e-commerce operations are increasingly using cloud services for expense savings, but they do not always ensure that the services use strong online security measures. This combination of cloud

services and lack of strong online security provides the hacker the opportunity to easily access reams of sensitive data. However, online businesses can realize substantial benefit and increase potential incremental business revenue streams by taking steps to alleviate customer fears such as use of technology to protect sensitive customer data, authenticate their websites, and build consumer trust. With the availability of many trusted e-commerce sites, consumers have the ability to shop for the best choice that protects their private information. More businesses are beginning to establish systems that monitor and alert as the probability of a particular scenario increases, setting up cross-functional crisis management teams, and identifying processes to quickly react to risks when they occur. A culture of risk awareness throughout the business is an essential platform for effective risk management. This paper offers steps to strengthen cybersecurity and cyber resilience. It reviews the tools available currently on website security to help organizations protect critical data and build trust with customers such as Secure Sockets Layer (SSL) encryption, need for data encryption offered by SSL, and additional measures such as authentication of website legitimacy and trust building with one's customer base.

The California Attorney General's office released its 2016 Data Breach Report which analyzes breaches that occurred from 2012 through 2015. The report stated that office received reports on 657 data breaches involving more than 49 million records of Californians. There were 131 breaches involving 2.6 million records of Californians in 2012, and the comparable numbers for 2015 were 178 breaches putting more than 24 million records at risk which equates to nearly three out of five Californians. The report cited that these cyber incidents occurred in all sectors- retailers, banks, medical services, spas, hotels, restaurants, government agencies, schools, and universities, mostly caused by both unintentional and intentional actions by insiders (employees and service providers). Although small businesses can increase revenues by accepting credit cards, but there are costs and risks.

The threat of having customers' payment card data stolen is real, but it can be reduced by adhering to the Payment Card Industry (PCI) Data Security Standard (DSS). A Symantec survey found that 77% of small businesses in the US think that they are safe from cyber threats, and 83% of them do not have security plan. However 40% of the cyberattacks Symantec prevented in 2012 targeted businesses with fewer than 500 employees (Symantec 2012). In 2014-15, several major private-sector and public-sector organizations suffered breaches including, Yahoo!, Anthem Blue Cross, the Home Depot, Target, Neiman Marcus, Adobe, RSA, Lockheed Martin, Oak Ridge National Laboratories, and the International Monetary Fund. A Ponemon Research survey conducted in 2012 of 583 U.S companies ranging from small businesses with less than 500 employees to companies with more than 75,000 employees found that 90% of the respondents admitted that their organizations' systems had suffered at least incident in the previous 12 months, and 60% reported more than 2 breaches.

The joint study by Ponemon Institute and IBM's Resilient Company on cyber resilient organizations around the world involving 2400 security and IT professionals from USA, UK, France, Germany, UAE, Brazil, and Australia during 2015 and 2016 found that:

- 66% of the respondents felt that their organizations were not prepared to recover from cyber-attacks,
- 75% admitted that they did not have a formal cyber security incident response plan (CSIRP),
- 41% said that time to resolve the cyber incident had increased from previous year, and
- 52% felt that complexity of business processes is a significant barrier to achieving cyber resilience.

Other key discoveries from the study were:

- 74% of the organizations said they had been compromised by malware and 64% by phishing,
- 66% of the organizations were not confident in own ability to recover from an attack,
- Only 25% of the organizations have an incident response plan applied consistently, 23% have no plan at all, and 14% test their plan for effectiveness.
- 70% of organizations felt that the time to resolve a cyber-incident has been the same or has increased from previous years.

The study respondents listed the top 5 barriers to cyber-resilience as insufficient planning, complexity of business processes, insufficient risk assessment, complexity of IT processes, and silos and turf issues. The same trend was observed by a subsequent 2016 study by Ponemon Institute and A10 Networks dealing with Indian organizations. India's economic growth rate combined with its adoption of digital technology has increased its vulnerability to malware attacks to be among the top 5 in the world. Sophos India found that 55% of the organizations surveyed (790) were reporting attacks by ransom ware, but only 5% of the spending in IT is earmarked for cyber security plans. The next section discusses the current practices and status of online security in small businesses.

3 Current status

Cloud computing enables today's small businesses and their employees to work from anywhere, anytime using multiple devices. They are able to transfer files using Drop Box, video-conference globally with Skype and other sites, and remotely access work from their smartphones and tablets. But as some small businesses have learned painfully, the price for these collaborative benefits is the potential for a serious data security breach. If the small businesses have Fortune 500 companies as customers, they provide an easy entry point to a much larger treasure trove of data. Examples of such breach are the incidents at Target and Home Depot where the hackers used the access of a relatively small vendor in the supply chain as the entry point to a major credit card data theft. As companies turn to digital technologies for business solutions, the risk of a security breach continues to rise. For the last 11 years, the security of information technology and data has been rated as a top technology initiative in surveys conducted and published by the AICPA (2014). In addition to concerns about the loss of data and sensitive information, the AICPA surveys (2014) identify controls for mobile devices and cloud computing as ongoing concerns.

Businesses of all sizes need to assume a state of compromise today, because not doing so can lead to considerable costs from loss of data or stolen intellectual property, interruption to business operations, and damage to the business's reputation which can lead to customers switching to competition. All businesses need to assess their cybersecurity weaknesses so that they can develop a strategy to safeguard sensitive data. A basic question to ask: what is the most sensitive data for the business? A pharmaceutical company might have the formula for a new drug in a document that is securely stored on its hard drive, but the data has also been shared by the researchers via email without encryption. Similarly government and non-profit agencies have large troves of sensitive taxpayer data in their files which are loaded onto employees' laptops or flash drives for work reasons without encryption. It is important to ask specific questions about how data is handled and transported, what media are used for data storage, where did the data originate from, and who has been granted access to the networks. The data most valuable to a hacker may not reside in business's own database, but it can provide access to their customers. Knowing the

answers to these questions is essential for effective management of the cybersecurity risks.

Some small businesses have started using “penetration testers” to test the strength of their defenses. However, they are finding that such “counter-intelligence” measures have to be constantly updated to keep ahead of the thieves in the game of cyber security (Schumpeter Aug. 2015). One such technique is to sacrifice some of the convenience of integrated data, and keep sensitive information in separate groups. Such a strategy will require a lot of thought into the information needs of managers, and defining and enforcing rules for information sharing. Another technique used by counter-intelligence experts is to offer tempting targets as “Honey pots” to entice the attackers, and enable monitoring their moves (Martin, May 25, 2001). This technique is effectively used by some banking institutions who can alert the law enforcement agencies. A successful security system design must include a checklist of preventive, detective and corrective steps to increase the chances of success for designing and implementing a security system. Some examples would be:

Preventive- (1) understanding the landscape of computer and network security; (2) putting together the basic safeguards.

Detective- (1) identifying security threats; (2) identifying security measures and enforcement. Corrective- (1) understanding the services of computer emergency response team, (2) preparing a comprehensive security system, and (3) the business continuity planning.

Regardless of the strategy, managers must develop “constructive paranoia” and start thinking of ways in which data can be breached. They need to be ever vigilant to unusual incidents or patterns, and follow security protocol without fail.

The primary reason for the small businesses’ failure to invest in cybersecurity appears to be the mistaken view that such investment is a discretionary spending item, and not understanding it to be an essential, defensive cost for staying alive. Studies (Pwc, 2015) have shown that 89% of consumers avoid businesses that do not protect their online privacy, as evidenced by the sales decline at companies like Target and Home Depot. Business partners also require proof that their interests and privacy are protected. Adequate security has become a requirement for companies to collaborate or outsource work. 54% of US businesses have baseline standards that they expect their external partners, suppliers, and vendors to meet (Ponemon survey, 2014).

While small businesses lack resources and time to researching the most appropriate cybersecurity tools, a "one-size-fits-all" approach to cybersecurity by installing the bestselling package is not the answer. The businesses need to adopt new strategies for risk management focusing more on the consequences of a wide range of potential risk events and less on the probability of the events occurring. The new threats from trends of globalization, rapid technological changes, and re-alignment of economies are increasing volatility in the markets, and disrupting ideas about “black swan events”, i.e., low probability, high impact events. For small businesses making no change to their risk management by considering the security breach events as “black swans” may pose the biggest risk to their strategy and future growth. They need to review their current risk-management approach and decide whether it can take them to their desired future state. That may require a mindset change to viewing risk management as a business enabler that helps propel the organization forward, rather than a rigid structural shield.

To understand any cyber breach event, the motivation of the attackers needs to be understood. Most attacks are low-skill and low-focus i.e., hackers using low-end attacks by sending spam mails out to millions of

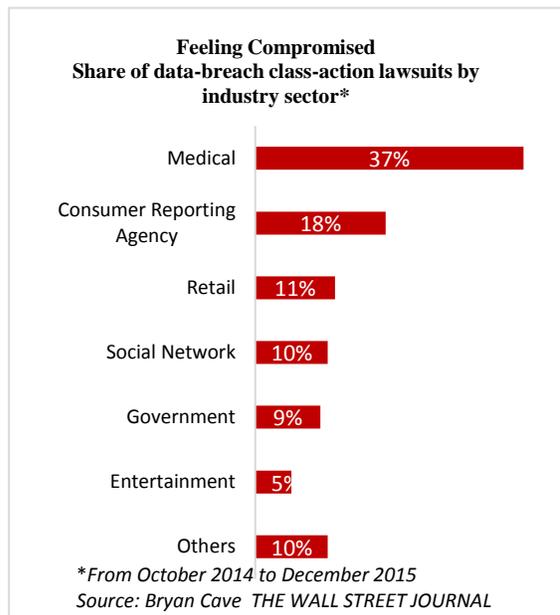
email addresses, hoping that someone will click on the link. High-skill, low-focus attacks such as the ones on Target, Home Depot Chase and other commercial networks in the past year are more serious. They are sophisticated attacks using newly discovered "zero-day" vulnerabilities in software, systems and networks. The following tables show some of the top 10 data breaches in 2014, and the total data breaches in 2014 listed by Identity Theft Resource Center.

Top 10 business data breaches (Source: Identity Theft Resource Center)

Company	State	Number of accounts affected
Home Depot	GA	56 million
Michaels	TX	2.6 million
Neiman Marcus	TX	1.1 million
Goodwill	MD	868,000
Variable Annuity Life	TX	775,000
Spec’s	TX	550,000

Total data breaches in 2014 (Source: Identity Theft Resource Center)	Number of breaches	Number of records
Banking/ Financial	43	1,198,492
Business	258	68,237,914
Education	57	1,247,812
Government	92	6,649,319
Healthcare	333	8,277,991
Total	783	85,611,528

Cyber breaches can cause widespread damage to companies, and harm to customers. About 5% of data breaches in the U.S. have led to lawsuits so far, but high profile cyber breaches can spawn more than 100 lawsuits according to a study by law firm Bryan Cave LLP. None of these cases has yet gone to trial because the parties have either settled out of court, or the



courts have dismissed them. Target and Home Depot both ended up settling customers' claims, while Neiman Marcus, PF Chang's, and others are contesting. When judges allow class-action lawsuits to progress beyond their earliest stages, the businesses have to bear millions of dollars for expenses incurred to gather large volumes of data and documentation demanded by the plaintiffs, in addition to loss of business and reputational damage.

4. Cybersecurity Management Execution Flow

Cyber security management is a combination of both technology management as well as adequate employee training on secure handling of IT resources. In this section, we present an implementation process for cyber security management that includes both technology and employees who use the technology. Figure 1 depicts an execution flow of security management for small businesses. Even though this approach is equally applicable to businesses of all sizes, we emphasize that security of organization can be improved to a large extent by (1) training the employees and (2) appropriately hardening the computer and communication settings. More importantly, the investments required to implement these two steps would be affordable for small businesses.

4.1 Human Resources Management: A well-known weak link in secu-

4.2 Technology and Systems Management: Most of the cybersecurity attacks on businesses are low key and low focused. They often exploit the weakness in security settings of computer and communication devices. For example, it is more often the case that default settings of routers, firewalls, user privileges and credentials remain unchanged until such vulnerabilities are exposed by the attacker.

Hardening Security Settings: Configure firewalls, both computer and network level, to have up-to-date blacklisted websites. Enable the security features of all communication networks like Wi-Fi, Bluetooth, LAN etc. Configure the computer and mobile devices to run in lowest privilege mode as much as possible.

Explore the possibilities: Explore the possibilities of using pen source security tools for penetration testing, port scanning and anti-virus protections.

4.3 Real life practices: The corresponding author of this paper practiced the above flow while managing the operations area of a major financial services where employees had regular training on cybersecurity awareness. Annual simulation exercises were conducted involving cross functional teams to test the cyber resilience of the entire organization. The results of the simulation were analyzed and security practices were strengthened as needed. The organization's technology personnel used penetration testing using internal personnel and skilled outside testers to harden security settings as required. Anti-virus protection updates were installed

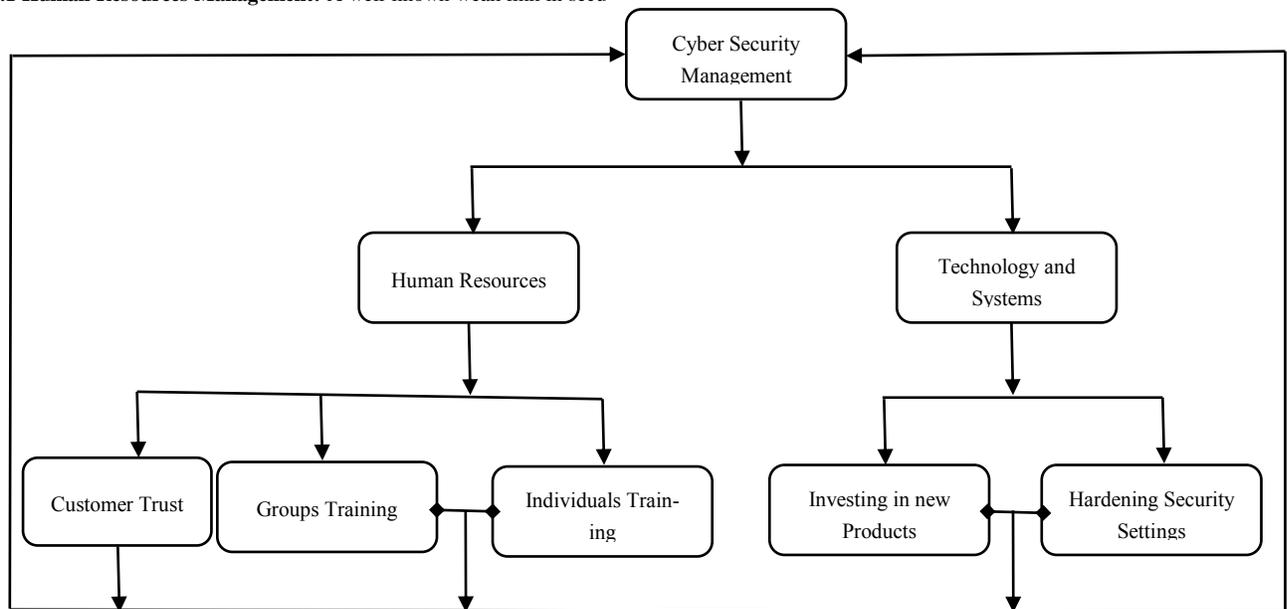


Figure 1: Cyber Security Management Execution Flow

rity protection chain is human beings who handle the resources. Security of organizations largely depends on safe handling of data storage and computer resources.

Individual Training: Regularly assessing the individual's security awareness through routine short courses and quizzes. Such assessments would help the security trainer opt the materials and illustrations specialized for the individual employees. This would help in the improving the overall security protection organizations.

Group Training: Security training on recently discovered attacks on the products (both hardware and software) that are used by the organization's business solutions. Establishing cross functional security teams to identify the business consequences of potential attacks and develop resilience.

Customer Trust: Demonstrable security practices of people handling information system within an organization would improve customer trust.

promptly, and tested periodically by the IT auditors. Such preventive measures were critical for building customer trust and for preserving regulatory approvals.

The second author of this paper worked in the electronics and defense industry for over 15 years, and had first-hand experience of going through security training. During his employment and working on the government projects, he and his colleagues had to go through continuous training regarding data handling and level of sensitivity of the data for their assigned projects. Anytime they had a need to use new data, the employees were briefed by the HR professional and the training about the technical part of handling the data was managed by the project manager. The key highlight of the training was the emphasis on the ethical responsibility of employee in handling data. The employees were formally informed about what data they could access and how they needed to be modified and stored. They were assigned specific segments of data that they could either read only or read and edit, and provided training on using the applications they were not familiar with. They were required to refresh their familiarity with the

policy of how they could handle the data. Any data access by the employees was recorded in a log with information about the type of data, the reason for access, the reason for modifying and using data, and employee had to enter his or her employee id and the date to allow for monitoring by management. The policies for data handling and protocols were the same for governmental and non-governmental projects. Any employee working on government projects had to get security clearance which was paid for by the corporation, and the employees who left the company voluntarily or involuntarily were debriefed about their responsibility regarding maintaining the security and content of the data. They were also informed about the possible legal action that can be taken by the company in case of any breach of security and privacy of the data. Both of the above real-life examples in different sectors show the data security management execution flow in practice today.

Besides the training and education, the right set of incentives would motivate the employees to keep them up-to-date on best security practices. A study on relationship between leadership style and cyber security in small businesses by Bhattacharya in 2008 showed that there is a significant relationship between transactional and transformational style leaderships and cyber security concerns within the organization. We suggest that the cyber security management activities such as planning the training and assessments, designing a right set of incentives and setting overall security goals be explicitly integrated into the adopted leadership style of the organization to implement an effective cyber security protection.

The National Institute of Standards and Technology (NIST) provided a detailed guidelines for securing small business. Table 1 provides a brief summary of recommendations made in the NIST report.

Table 1: NIST recommendations (Source: Kissel 2009)

Absolutely necessary actions	
1.	Keep regularly updated anti-virus and anti-spyware software both in office and home computers as employees may access from home computers.
2.	Install hardware firewalls between office/home computers and Internet. Change the default admin names and passwords of the firewalls. Secure Wi-Fi access points and networks.
3.	Install and enable software firewalls in each computers.
4.	Regularly patch OSs and applications; Make backup copies of important business documents.
5.	Control physical access to computer and network components.
6.	Require individual user account for each employee on business computers and business applications.
7.	Limit the access to data and information, authority to install software.

Highly recommended practices	
1.	Do not open attachments, web links, social media messages that comes in email unless you are expecting them and you trust the sender.
2.	Do not respond to popup windows by clicking Ok.
3.	Use secure browser connections while doing online business or banking.
4.	Do not surf the web using an administrative privilege.
5.	Do not download software from any unknown web page.
6.	While disposing computers remove the hard disk and destroy them.

Usage of mobile devices in small business is increasing rapidly as they are economically more viable than desktop and laptop computers. These de-

vices often handle and carry sensitive business information. Device-oriented, user-oriented and management-oriented recommendations for usage of mobile devices in small business is listed in (Harris et al. 2014).

5. Preventive steps and recommendations: Model framework

Security is a combination of prevention (protection), detection and correction (response). Prevention can defend against low-focus attacks and make targeted attacks harder, and detection can spot the attackers. Having a planned response strategy will minimize the damage and manage the fallout. In todays inter-connected, global marketplace individuals have to entrust businesses with intimate life details on email, Facebook, text messages etc., and entrust retailers with financial details. Increasingly, businesses and individuals use cloud services for storage and transactions (Green et al, 2014). Awareness about the risks and data vulnerability will prompt users to strengthen data security and response plans. Creating a culture of cybersecurity, having current security software, and creating an emergency response plan for a data breach are good first steps toward protecting the business in the long term. Broadband and information technology are powerful factors in small businesses reaching new markets and increasing productivity and efficiency making it critical for businesses to develop a cybersecurity framework to protect their own business, their customers, and their data from growing cybersecurity threats. Some specific steps to take are outlined in Exhibit 1.

Internal controls can strengthen companies' resilience against game-changing risks. Many businesses do not have formal processes in place to assess and prepare for game-changing circumstances that could have reputational, competitive, legal, or operational implications. Many cyber breaches result as much from weak spots in the technology as weak decision making processes that fail to account for the full range of potential business consequences of technology-related problems. The long term viability and reliability of a business depend on timely access to vital information and IT resources at all times. Effective internal controls can help a business maintain and test both the IT contingency and disaster recovery plans. Adopting a consequences-based approach to dealing with risk brings more focus on resilience and less on prediction. By establishing and testing scenarios, managers can determine if the businesses can be resilient at the times of greatest need. These scenario plans look beyond the individual business to include all players in the value chain including key vendors. More businesses are beginning to establish systems that monitor and alert when the probability of a particular scenario increases, setting up cross- functional crisis management teams, and identify processes to quickly react to risks when they occur. Ultimately the most successful risk strategies embed risk awareness through the company's entire culture.

Exhibit 1: Implementation steps

Action step	Method	Rationale
Set the tone at the top	Delegate responsibilities at various levels of management, assign security team, and develop metrics & measures of risks	To monitor cybersecurity threats and corresponding protective measures, to focus on holes in the technology infrastructure, metrics will allow to measure and take actions for any abnormal risk levels.

Raise employee awareness	Allocate funds to train employees in using technology	To enable employees to understand the importance of setting up various levels of passwords access to critical information on the servers.
Establish security policies, practices about Internet security practices, security policies for third-party security providers, and establish policies about physical access to computers and network hardware	Communicate them to employees on a regular basis along with the penalties for violating the business policies. Use of USB, social media, and personal devices on the workplace needs to be supervised. Establish the standards up front, spell out the desired security level, ensure that it is included in the provider's performance contract, and test them periodically.	To protect sensitive business data and practices rules for handling and protecting sensitive customer information and other vital data. When using third-party security it is important that a legal corporate contract is in place due to the liability issue Physical security of hardware components is inevitable for any business
Establish cross functional security teams	Include leaders from IT, HR, Finance, Risk and legal departments to meet on a regular basis to discuss and coordinate information security issues, run simulation exercises	To help them to take appropriate actions during and after security breaches. Communication between departments is integral to a successful security strategy. Companies that do not perform such scenario planning exercises for crises may end up looking like amateurs, making a bad situation worse.
Establish backup and recovery processes	Regularly backup data on all equipment used in the business.	To make sure that the business can recover by using the backup data from disasters
Setup firewalls between internal and external networks and implement barriers to limit the employees' irresponsible online actions	Teach employee to think about their irresponsible behavior	To prevent employees from unintentionally exposing the internal information to outside world
Automate software updates	Software such as Systems, application, antivirus, anti-spam, antispysware	To ensure prompt update of software

Secure and manage the Wi-Fi networks	Provide restrictive password access and assign the access to networks with careful investigation of individual who can access Wi-Fi network	To ensure that the access to Wi-Fi network is secured so that no unauthorized individual can access
Use encryption	Categorize the information sensitivity levels and accordingly provide encryption key so that only authorized individuals can have access to information	To secure trans-border dataflow in the global business environment
Instill trust in customers about the seriousness of security breaches	Via CRM the trust can be achieved	To promote customer confidence in the organization's commitment to privacy.
Be alert to new and affordable technologies and cybersecurity innovations that can deter attackers by detecting intruders sooner	Proactive management style of the security official is necessary to keep up with the state of the art security technology	To stay ahead of the intruder and minimize the risk of getting security breach

The suggestions outlined in the above table are preventive or avoidance mechanisms. Since cyber security threats evolve over time, it is not practical to implement a fool-proof security protection at an organizational scale. We suggest deploying intrusion detection systems at various levels within the business to identify potential ongoing attacks. Effectiveness and applicability of various types of intrusion detection systems are measured in terms their detection methods, metrics used and their deployment models (Milenkoski et al. 2015). Table 2 provides an overview of common trends and business practices of Intrusion Detection Systems (IDSs) necessary and feasible for small organizations

Table 2: IDS trends and business practices (Source: Milenkoski et al, 2015).

IDS property	Types	Recommendations
Attack detection and accuracy, coverage	All	Use workloads that contain current attacks
Attack detection and reporting	Distributed IDSs	Measure time to notify all or designated nodes
Resource consumption	IDSs in resource constrained environments	Measure power consumption based on all nodes
Performance overhead	Host based IDSs	Evaluate workloads in executable form generated by workload drivers
Workload processing	Network	Monitor high rate workloads

We recommend that the small businesses employ a combination of host and network based intrusion detection systems to identify ongoing attacks. This would help them to reduce the business risk from the security breaches that could circumvent the implemented preventive measures.

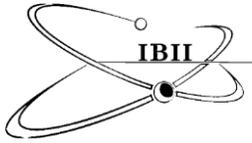
6. Conclusion

Many small businesses are realizing that in the increasingly sophisticated and inter-connected global marketplace, investing in information security helps for more than just protecting the business. Strong cybersecurity can position the businesses for competitive advantage with their business partners and customers, as well as to allow them to take advantage of newer technologies to help their growth. New, affordable technologies are offering stronger protections to detect intruders sooner and help businesses to implement preventive and corrective measures. Progressive small businesses understand that volatility will stay for years to come, and are re-thinking their approach to risk management so that shocks to the system will not disrupt their strategy and future growth. A culture of risk awareness throughout the business is a necessary platform for effective risk management.

By adopting some of the recommended steps, small businesses can be resilient and be able to take calculated risks to pursue growth in the global marketplace. With the exponential increase in internet fraud, security of personal data transmissions is vital to e-commerce operations. A survey by AICPA in March 2015 found that 82% of the respondents said their fear of cybersecurity breaches has changed their shopping habits on internet, and 56% mentioned that they used cash and checks more often. The increased level of internet data theft has caused potential customers to become skeptical and scared, and want more assurance of the protection of their information. Investment in technology to protect customers and earn their trust is minimal compared to the overall cost of doing business and by the potential upside. Enhancing e-commerce site security with technological tools like SSL, and working with a reputable security vendor are essential choices for small businesses to be successful and earn customer trust.

References

- Anonymous. 2016. Current Developments, *Computer and Internet Lawyer*, 33 (5): 20-25.
- Bidgoli, Hossein. 2016. Integrating Real Life Cases into A Security System: Seven Checklists For Managers, *American Journal of Management*, 16 (4) :9-25.
- Bosworth, Seymour, Michael E. Kabay, and Eric Whyne. 2014. *The computer security handbook*, 6th Ed., New York, Wiley.
- CBS. *60 minutes show*, 6 September 2015
- Clapper, Danial, and W. Richmond. 2016. Small business compliance with PCI DSS, *Journal of Management Information and Decision Sciences*, 19 (1):54-67.
- Eyden, Terri. 2013. "NSBA Survey: cyber-attacks concern small business owners", Available at: <http://www.accountingweb.com>, October 10.
- Fallon, Nicole. 2014. "A Culture of Cybersecurity' Is Best Small Business Defense". *Business News Daily*, November 10.
- Federal Communication Commission. 2004. Ten cybersecurity strategies for small businesses. Available at: www.fcc.gov/cyberforsmallbiz/
- Grant, Gerry H., and C Terry Grant. 2014. "SEC cybersecurity disclosure guidance is quickly becoming a requirement", *The CPA Journal*, 84 (5): 69-71.
- Green, Kelly Brian, and Brian P. Green. 2014. "Reining in the risks of cloud computing". *Internal Auditing*, 29 (5): 29-35.
- Hagel, Jack. 2014. "Not for profits delve into risk management". *Journal of Accountancy*, 218(5): 24-25.
- Lanz, Joel. 2014. "Cybersecurity governance: the role of the audit committee and the CPA". *The CPA Journal*, November: 6-10.
- Martin, William W. 2001. "Honey Pots and Honey Nets - Security through Deception". Available at [25http://www.sans.org/reading-room/whitepapers/attacking/honey-pots-honey-nets-security-deception-41](http://www.sans.org/reading-room/whitepapers/attacking/honey-pots-honey-nets-security-deception-41) SANS Institute InfoSec Reading Room, CISSP May - Accessed on September 7, 2015
- Milenkoski, Aleksandar Marco Vieira, Samuel Kounev.,Alberto Avritzer, and Bryan D. Payne. 2015. "Evaluating Computer Intrusion Detection Systems: A Survey of Common Practices", *ACM Computing Surveys (CSUR) Surveys*, 48 (1), September.
- PwC. 2012. Cyber Security: Why you can't afford to ignore it, *Growing Your Business PwC*.
- Schneier, Bruce. 2014. "Hackers Could Expose Any of Us --- A focused, expert attacker will always get past security", *Wall Street Journal*, 20 Dec: C.3.
- Schumpster, Joseph. Aug 2015. "Manage like a Spymaster" (<http://www.economist.com/news/business/21662540-counter-intelligence-techniques-may-help-firms-protect-themselves-against-cyber-attacks-manage>) – Accessed on Sept 7, 2015
- US Chamber of Commerce. 2004. *Commonsense guide to cyber security for small businesses*, Feb 2004, <http://www.uschamber.com>
- Wyatt, Christy. 2014. "Is it safe? Be open about cyber threats", *Wall Street Journal*, Oct 20: R4



(IT)Technology-driven New Role of 21st Century Pharmacists: Recommendations for Pharmacy Management

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Abstract

The main impetus for this study comes from the continued growth of information technology (IT) and its subsequent impact on business processes within various sectors of industry. Implications of changes in business processes are reflected on the individuals' job functions within businesses. IT is causing a major shift in pharmaceutical business paradigm. This shift can be observed in the changes in the traditional job functions of pharmacists. In this new paradigm, the Pharmacists are no longer perceived as just the "pill dispensers" but are viewed as the health consultants to the patients. This study uses secondary data and informal anecdotal evidences to understand and present the new emerging role of current and next-generation pharmacists. Specifically, the authors of this study explore the impact of IT on pharmacy professionals' job functions, work load and processes and its impact on services rendered to the customers. In response to the new paradigm of pharmacy professionals, we present recommendations to the pharmacy management to optimize patient care.

Keywords: Pharmacists, EMR, ASHP, CPOE, Health Professionals, Information Technology

1 Introduction

The continued growth of information technology (IT) and its subsequent impact on business processes within various sectors of industry is a known fact. It is also apparent that the changes in the business processes generally result in changes in job functions of individuals who are part of the business process. In this study, the authors' focus is to outline how IT is causing a major shift in pharmaceutical business paradigm and its impact on the traditional job functions of pharmacists. In this new paradigm, the Pharmacists are no longer perceived as just the "pill dispensers", but are viewed as the health consultants to the patients.

In a recent "The Next-Generation Pharmacist® Awards" several pharmacists were recognized for their contributions to their professions ("2015 Next-Generation Pharmacist Awards, Meet the Winners!" Pharmacy Times Editorial Staff). The comments made by the award recipients showed that they view the job functions of the current and the next generation pharmacists extending beyond the traditional functions of just dispensing the prescriptions.

This study uses secondary data and anecdotal evidences to understand and present the emerging role of current and next-generation pharmacists. Specifically, the authors of this study explore the impact of IT on pharmacy professionals' job functions, their work load and processes,

and its impact on services rendered to the customers. In response to the new paradigm of pharmacy professionals, we present recommendations to the pharmacy management. This paper is organized into several sections. The first section provides a literature review on how the pharmacy profession has evolved from its conventional and traditional drug focused basis to patient focused basis. The second section defines the role of information technology in the context of pharmacy business followed by methodology used in this study. The fourth section lists key factors that have significantly influence on the changing role of pharmacists. The recommendations to the pharmacy management are discussed in the fifth section. The last sections cover the limitations and future directions of the study followed by the conclusions.

2 Literature Review

In the past century, the pharmacist role focused more on the compounding and production of medicines. (Toklu and Hussain 2013). However, in the 21st century the focus of the pharmacists more towards teaming up with health care professional rather than spending majority of their time on compounding and dispensing medicines. Tokly and Hussain (2013) suggest pharmacy schools to prepare a program that has competence with the changing role of the pharmacists. They further suggest that the pharmacy students should be provided the skills neces-

sary to fulfill the new role. Lada and Delgado (2007) study analyzed pharmacist interventions and resuscitation experiences, including pharmacist's participation in a hospital emergency department (ED), and the potential cost avoidance associated with the interventions made by the pharmacists. The study found that the pharmacists played a supporting role of health professionals by providing drug information, dosage adjustment recommendations, responses to questions from nursing staff, formulary interchanges, and suggestions regarding initiation of drug therapy. The study concluded that such a role played by the pharmacists resulted in a cost savings of over one million dollars.

3 Role of Information Technology

In the context of this study Information Technology (IT) is any computer-based hardware and/or software application used in the management of any discipline and used as a tool for any function or carrying out any task. IT is a tool that provides information and used in any process that helps medical professional, including pharmacists to perform their job. For example, the electronic transfer of prescriptions from doctors' office directly to the pharmacy and between pharmacies facilitates receipt of patient data for the pharmacist to accurately provide necessary consulting service to the patient, ordering the medicines to manage the inventory efficiently, and many more. There are various forms of technology that influence the pharmacy education and profession resulting in changes in the traditional role of the pharmacist.

Pharmacy colleges and schools use a variety of technologies in their teaching methods, which have evolved to meet the needs of the current generation of tech-savvy students. While students are satisfied with the appropriateness of technology, many exhibit preferences for even greater use of technology in the classroom (DiVall et al. 2013). Educators are trying to balance the potentially positive aspects of technology (e.g. Twitter) which leads to increased interaction among students with potentially negative aspects such as the interruptive nature of Twitter use and the large volume of tweets generated by a class assignment (Fox and Varadarajan 2011). As the information technology permeates pharmacy education and the range of information technology in use increases, it could collide with considerable challenges due to the complexity and capability of diverse technology array (Fox 2011). The pharmacy faculty will have to be well versed in the role of information technology in the pharmacy education courses, so they can prepare the students for present-day pharmacy operations. In summary, IT facilitates and improves the efficiency of the pharmaceutical processes enabling the pharmacist to have more time to focus on patient counseling and other activities beyond just dispensing prescription. The rest of the paper discusses how the information technology is changing the job functions of the pharmacy professionals today

4 Methodology

This is a conceptual study and the authors have taken an exploratory approach to study the emerging role of pharmacist. They have conducted the literature review of the current and the past research studies and identified the key factors influencing the role of pharmacists. This paper will review a topic that has not been studied much in the past, as evidenced by the lack of existing literature. In addition, the authors have conducted one-on-one interview with the pharmacists, and used anecdotal evidences to substantiate their findings from the past research and developed a list of key constructs which has made a significant impact in transforming the traditional pharmacists' role.

The authors contacted the pharmacy professionals by visiting the local pharmacies in the area. The pharmacy selections were random based on the convenience and accessibility of the pharmacy professionals working in the specific pharmacy. The authors interviewed approximately a dozen pharmacies. In some pharmacies, multiple pharmacy employees were interviewed. The set of questions were general asking them about their education and the university they graduated from, and how long have they been working in the field, what are their responsibilities and if there were any changes in their job function while working the present pharmacy or in their previous jobs. Although the questions about their age was not asked, authors believe that the pharmacists they interviewed varied in age from late 20s to about 50. The gender distribution was about 65% female and 35% male. The authors' intent was not to compare the results based on any demographics, because the pharmacy employees were busy and the questions had to be specific to the details about their job. The respondents did cover the key aspects of their job functions so that the authors could understand the evolving trends in their jobs. In addition to their job functions most of them mentioned the increase in the regular training due to the changes in the technology and the growing pressure from the pharmacy management about their performance metrics and scores. Each pharmacy manager has to report the pharmacists' performance score card with certain metrics defined by the corporate office. The pharmacists are then rated based on their scores. In many chain pharmacies, the pharmacists have to also perform cashiering functions for customers who are at the pharmacy counter, thereby spending valuable time on non-pharmacy functions. In today's time and cost driven evaluation metrics, pharmacists are having to perform functions far beyond their traditional role. The authors got the impression that the overall work environment in the pharmacy was very stressful. The next sections discuss these constructs and the relationships between them to develop a model to explain the new emerging role of pharmacist.

5 Key Factors Driving the New Emerging Role of Pharmacist

This section discusses key factors driving the emerging role of pharmacist: Computerization of the Hospitals and Medical Entities (e.g. Electronic Health Records, automated dispensing cabinets), Cost related to Health Care, Mindset of the Health Professionals (all levels), National Surveys providing details about the trends in the various areas of medical profession), and Health Insurance.

5.1 Computerization of the Hospitals and Medical Entities

Advances in health care technology - Computerized Physician Order Entry (CPOE) and Electronic Medical Records (EMRs) -- free up pharmacists' time by automating certain tasks so they can dedicate more time to patients. These advances also increase accuracy and readability of prescriptions and improve efficiency. The technology enhancements help better documentation of pharmacy activities that improve patient care across the health system, while also challenging pharmacists to revise traditional roles and embrace change simultaneously which can be risky endeavors. Technology can bring the medical professionals and pharmacists closer together by creating opportunities to increase communication during hand-offs of care. The EMR would allow inpatient, outpatient, and community pharmacists to document and share their activities and information. Use of Electronic Health Records (EHR) plays a significant part in defining the role of the pharmacist in the 21st century (Klimek, Drug Topics – August, 2009). Traditionally, pharmacists have had very

little data to assess a particular disease state that a physician is treating. The advent of big data and data and data analytics combined with technology has enabled pharmacists to expand their role in improving the prescription of medications in both the hospital and outpatient settings and be aware of the patient's total prescription profile. The adoption of EHRs and medication-use technologies has contributed to this growth, according to the results of the 2013 ASHP national survey of pharmacy practice in U.S. hospital settings (Pedersen et al. 2014). EHRs have been implemented partially or completely in most hospitals (92.6%). Computer prescriber-order-entry systems with clinical decision support were used in 65.2% of hospitals, 80% had barcode-assisted medication administration systems, 80.8% had smart infusion pumps, and 93.9% had electronic medication administration records (Pedersen et al. 2014).

EHRs were used in 60.7% of outpatient clinics, with electronic prescribing to outpatient pharmacies used in 59.6% of hospitals. Pharmacists practiced in 27.1% of hospital ambulatory or primary care clinics, which is an increase from 18.1% compared with 2010 (Pedersen et al. 2014). The growing use of EHRs and the exchange of electronic data generally will give both physicians and pharmacists a unified view of the complete patient profile and enable pharmacists to provide greater assistance to physicians and patients in all care settings. (Klimek, Drug Topics – August, 2009)

In studying what IT is available on the market for prescribers and pharmacists, Goundrey-Smith (2014) found that there is a variety of systems and technologies available to support the medicines supply and use processes. The technologies identified by Goundrey-Smith (2014) are mobile technology, technologies to support approaches to adherence monitoring, automated dispensing, electronic prescribing (EP) systems, barcode medicine identification technology, and Telecare. However, pharmacists will need to ensure that they connect IT in a way that will support their professional objectives and that they are not circumvented in the IT initiatives of the new National Healthcare System (NHS). IT can improve patient safety, allowing professionals to provide high quality care and help patients make the most of their medications.

5.2 Cost related to Health Care

As third-party reimbursements continue to decline, physicians have been forced to increase the number of their daily patient encounters, shortening the amount of time they can spend educating their chronic care patients. A pharmacist becomes the most accessible healthcare professional who is highly skilled in disease management and chronic care education (Pope, Drug Topics – Oct. 15, 2010) and many pharmacists in retail practices across the country are beginning to specialize and act as health coaches, most notably in diabetes management, blood pressure, cholesterol

Whether teaching classes for large groups, managing intensive therapy programs, or initiating patients in the use of insulin pumps, pharmacists are serving a much-needed role in improving outcomes and, in turn, are lowering overall healthcare costs (Pope, Drug Topics – Oct. 15, 2010).

5.3 Mindset of the Health Professionals (all levels)

In the past, a few pharmacists have expressed concern that pharmacy was moving away from a product-based profession to a service-based model. As this evolution continues pharmacists must embrace both mindsets, knowing that provision of clinical services in the retail setting leads to increased prescription volumes (Pope, Drug Topics – Oct. 15, 2010). Once a critical mass of historical data is accumulated, data analyt-

ics can bring significant benefits to patients and health care professions alike in the future.

5.4 Health Insurance

With the new partnership between the National Community Pharmacists Association (NCPA) and the American Association of Diabetes Educators (AADE), more pharmacies are expected to begin billing insurances for cognitive diabetes educational services. Even industries and insurance companies are beginning to make use of the power of pharmacists to improve patient adherence and outcomes through clinical services in the retail setting. (Pope, Drug Topics – Oct. 15, 2010). The next section provides details on the ASHP survey background and its implications for pharmacists' job functions and pharmacy management. In addition, it discusses the growth of technology and its influence on the general business processes within pharmacy business.

5.5 American Society of Health System Pharmacists (ASHP) survey

ASHP's National Survey of Health-System Pharmacy Practice has evolved into a powerful tool to track pharmacy developments. The results of the survey, which monitors both micro- and macro-trends, help highlight changes that are critical to the profession's future (<http://www.ashpintersections.org/2011/03/use-of-technology-growing-pharmacists-roles-changing/>). The results of the ASHP survey are published regularly and it serves as a vehicle for communicating the present trend in the field of pharmacy practices. The results are also circulated via publication of survey results in pharmacy journals which are subscribed and read by the pharmacy professionals and the academic professionals. Typically, the survey consists of the data collected from various sources such as pharmacy professionals, hospitals, and industry. The results of the survey are then analyzed and organized to see the dynamics of factors such as technology, the demographic distribution of the pharmacy professionals, the use of various drugs and developments in the drugs and so on. Pharmacy management use the latest data to understand the emerging trends in the pharmacy disciplines and help define the job functions of the pharmacists. It further helps the management to align the pharmacists' job functions and the other operations of the pharmacy with the current developments. Thus, the ASHP survey has an indirect influence on the role of the pharmacists. The following discussion will help readers understand the purpose of the ASHP survey and its implications for the pharmacy management and the evolving role of the pharmacists.

5.5.1 ASHP Survey Background

The survey, which has its roots in the Mirror to Hospital Pharmacy (published in 1964), was first fielded by ASHP in 1975. What initially began as an occasional survey, occurring once every few years, has become an annual effort at data collection. ([ashpintersections.org](http://www.ashpintersections.org) March 2011). Since 1990, the survey has documented three important trends in health-system pharmacy: the influence of The Joint Commission (TJC's) on national safety standards, the growth of technology in pharmacy practice, and the evolution of roles for pharmacists and pharmacy technicians. ASHP's national survey has captured another pronounced trend: the growth of technology. In 2010, 34.5 percent of hospitals had adopted bar code medication administration, compared with just 1.5 percent in 2002. In 2010, 18.9 percent of hospitals had adopted computerized prescriber order entry with clinical decision support, compared with 2.7

percent in 2003. The growth of technology has positively affected how pharmacists and pharmacy technicians go about their work, according to the survey. Although seven- and eight-year trends demonstrate growth, longer trends illustrate just how far the use of technology in pharmacy has come. For example, in 1982, only 17.6 percent of hospital pharmacies were computerized. Now, virtually all are. (Douglas Scheckelhoff, M.S., FASHP, ASHP’s vice president of professional development). The near universal use of automated dispensing cabinets reflects the shift toward unit-dose drug distribution. All of these technologies improve efficiency and safety, and the information the survey provides about their use in forming practice models, to ensure these technologies are used to maximum effect.

6 Examples of New Role of Pharmacist

Some of the services provided by today’s pharmacists are: Vaccination influenza, Finger stick blood draws, Screen for hyperlipidemia or diabetes, Bone density screening for Osteoporosis (Roberts 2008), Comprehensive health care coordinators – Patient-centric Medication Therapy Management Service, Vaccination, Patient Counseling, Prevention and Wellness Program (Biotech Business Week, February 1, 2010, <http://www.highbeam.com>), symptomatic treatments of cough and cold, simple dermatological and minor trauma (Mabee 2014), help increase immunization rate and reduce vaccine preventable diseases (e.g. Walgreens has immunization intelligence application and Smart Recommendation tool which identifies CDC recommended immunization that are personalized), Informal medical advisor to customer (Kisa et al. 2007), Social Media – pharmacist are making their voice heard all over the world, #pharmacist tweet-a-thon – to highlight the positive impact that pharmacists have on patients, their communities and healthcare industry.

Exhibit 1: Key factors and changes in roles of pharmacists

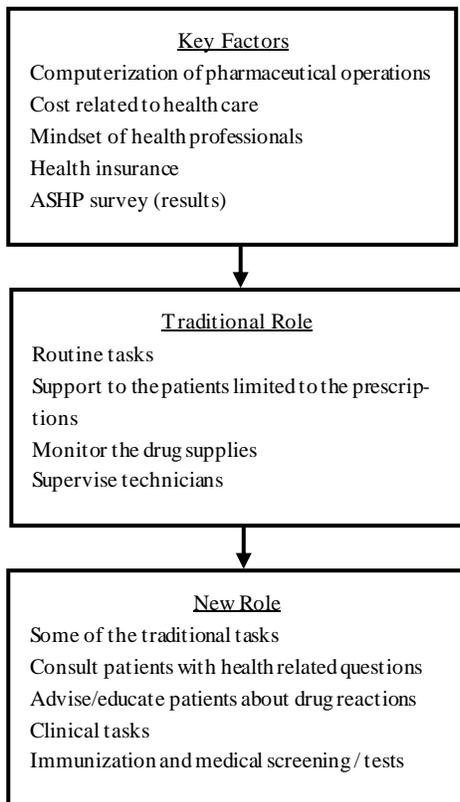


Exhibit 1 above shows the influence of the key factors driving the changes in the role of pharmacists. In the next section the authors provide the guidelines for pharmacy management that will help respond to the influence of technology on the emerging role of pharmacist.

7 Recommendations for Pharmacy Management

Table 1 displays the basic framework the pharmacy management can use as a guide to manage the ongoing changes in the pharmacy operations and their pharmacy professionals’ role.

Table 1: Pharmacy Management Framework

Key Factor	Pharmacy Management Action
Computerization of pharmaceutical operations	Update the pharmacy operations efficiency and develop and/or update the training of their pharmacists and pharmacy technicians.
Cost related to health care	Pharmacy management should update their information regarding the overall health care costs so that they can train their pharmacists to work with the doctors within the guidelines set by the FDA
Mindset of health professionals	Pharmacy management needs to understand the mindset of their pharmacy staff and introduce any changes in the processes gradually so that the staff accepts the change without any grievance
Health insurance	Changes in the health insurance of their customers need to be monitored and updated as necessary and also understand its impact on their relationship with their customers.
ASHP survey (results)	Review the findings of the ASHP survey in order to understand the overall pharmaceutical business environment so that they can make necessary changes in the pharmacist’s job functions
Other	Pharmacy management needs to be proactive in understanding any other unanticipated changes in the pharmaceutical business that can adversely affect the pharmacists’ responsibilities. Develop and update the performance metrics to match any changes in the pharmacists’ job function.

Based on the analysis of the factors influencing the job functions of the pharmacists it is important that the pharmacy management and specifically the corporate management of the large pharmaceutical firms assess their pharmacy processes to redefine the processes and prioritize

resources used in the pharmacy operations. Once the assessment of the pharmacy operations is completed, the management will need to evaluate the skill set of their pharmacists to determine the gap that may exist between their current skills and the revised skill set needed. The gap analysis will guide the pharmacy management to develop the training necessary for the pharmacists to align their skills with the revised pharmacy processes. For example, a senior pharmacist who has been working in a pharmacy for a long time may be required to go through the training of using the automated applications for processing the prescription. In some cases, the pharmacists may be required to take a continuing education course and pass an exam to update their skills and renew their state license. In short, the pharmacy management need to regularly monitor their pharmacy professionals and be proactive in updating their skill sets.

One of the challenges the management may face is their ability to manage the mindset of the pharmacists who have in their positions for a long time and resist changes to known processes. It may be necessary to hire change management consultants to educate the older pharmacists so that they can embrace the change in their job functions with clear understanding. Use of change management consultants by the corporations is normal practice in many industries, and the pharmacy management can use it successfully.

The pharmacy management will have to clearly understand the interaction between the health insurance of their customers and the impact on their business relations with the pharmacies. For example, in the previous section it was mentioned that the rise in the health insurance cost is pushing the doctors and hospitals to shift some of their functions in the hands of the pharmacists. In such cases the pharmacy manager will have to intervene and clearly understand the extent to which their pharmacy professionals have to play a "doctor's" role so that there are no legal implications because of the shifting of some of the tasks. Pharmacists may be motivated to perform some of the job functions that were performed by the doctors to help their customers, but they may not realize any type of legal implications. In such situations, it is the responsibility of the pharmacy management to make such decisions.

It is important for pharmacy management to understand the overall business environment of the pharmacies and the changes that are taking place so that they can proactively adjust their operations. One of the factors that was identified in the previous section was the routine survey of the pharmacy operations that is conducted by American Society of Health System Pharmacists (ASHP). The pharmacy management can critically review the results of these surveys and get the "pulse" of the changes taking place in the pharmacy operations. The data will give the pharmacy management some type of direction to make necessary changes within their pharmacy operations to be competitive in the market place. The management can share the results of the survey with their pharmacy staff so that they can understand the reason about any changes made in their job functions.

One of the aspects of the pharmacists' change in the job functions that is often overlooked by management is redefining or updating the performance metrics to match with the new role. Management cannot continue to use the outdated performance metrics, since it does not reflect the true performance of the pharmacists. The main challenge faced by management is the adjustment of the compensations of their pharmacy staff to align with the new and changed responsibilities.

The recommendations for Pharmacy managers are summarized as below:

- Understand the growth of technology and emerging applications that pharmacists can use.
- Assess the work environment and capabilities before deploying the technology.
- Reevaluate the job functions of pharmacists and pharmacy technicians.
- Assess the performance metrics -- pharmacists and pharmacy technicians.
- Continually evaluate customer satisfaction metrics and identify measures to improve them.
- Define clear boundary between the role of pharmacists, pharmacy technicians, doctors, and patients.
- Provide adequate resources for training and align with the technology deployment.
- Define clear boundaries between the role of pharmacists and the duties of retail counter personnel in chain pharmaceutical companies, to minimize drain on pharmacists' valuable time.
- Work with the pharmacy educators to ensure that the new graduates acquire the technology and technical skills needed to be successful in their future careers.
- Ensure that adequate training opportunities are provided to the pharmacy professional to keep their skills up to date.

8 Limitations of study and future directions

This study was based on the authors' interviews with the area pharmacy professionals and their responses, followed by analysis of the responses by comparison to the findings from the previous research studies. The results of the analysis were then used to draw the conclusions based on the authors' interpretations and perspectives of the responses of the pharmacists they interviewed and the literature study. The study did not include any form of statistical analysis other than the conclusions drawn based on the secondary data they used from the survey conducted by the ASHP survey. Thus, the study has a certain level of hidden bias in their report regarding the new role of the 21st century pharmacists. In order to eliminate the effect of such hidden bias it is necessary to gather larger volume of data by conducting a survey of pharmacy professionals across wide geographic region. Increased amount of data will allow the authors to be able to perform detailed statistical analysis so that more accurate results can be obtained. In a future survey, demographic data will be gathered so that the results can be compared across different demographic parameters such as, age, experience, education, gender of pharmacists. In addition to the pharmacies, it would be beneficial to conduct a survey of pharmacy schools and the curricula used in their degree programs to determine if they reflect the ongoing changes in the pharmacy operations.

One of the key areas that can potentially contribute to the factors discussed in this paper is exploring the curricula offered by the academic institutions in response to the new developments in the pharmaceutical industries. For example, over the past several decades the development in the information technology and growth of data have caused the businesses across US and overseas to redefine their business processes, and resulting in the need for new skill sets of their employees and graduates. The corporate managers are advising the education board to evaluate their degree programs and prepare the new graduates to meet the challenges created by the new technology. Several schools across North America have individuals working in the corporations serve on their

curriculum board to offer regular advice regarding making any changes necessary to meet the current skills demanded by the corporations. Likewise, it is expected of the pharmacy schools to assess their curriculum and make changes to meet the new skills demanded of their graduates.

Another area of research is needed in how the online pharmacies are influencing the brick and mortar pharmacies. It is also helpful to investigate if such online market has any type of influence on the pharmacy operations and on the role of the pharmacists. The results from such investigations may offer some necessary information to the pharmacy management to take needed action to avoid business declines. In addition, research in the area of ethics and legal implications of the technological developments' impact on the pharmacy operations will be useful to prevent any adverse effect on the patient care. In summary, wide areas of research landscapes are open and can offer additional knowledge to the pharmacy management.

9 Conclusion

The role of pharmacists continues to evolve as the technology enables automating their "routine" and traditional job functions, and empowering them to utilize their knowledge in more challenging medical activities than in the past. As technology implementation continues to evolve, pharmacists are at the forefront of capitalizing on new models for patient care and overcoming potential threats. Pharmacists can use technology to not only improve patient care, but to document their contributions toward meaningful use and reimbursement. In this paper the focus was on how the pharmacy management should respond to the hectic and changing job functions of the pharmacists and stay competitive in the health care market. The key factors were discussed and a pharmacy management framework was presented in this paper with suggestions for future directions.

References

- DiVall, Margarita V., et al. (2013). "Perceptions of Pharmacy Students, Faculty Members, and Administrators on the Use of Technology in the Classroom" *American Journal of Pharmacy Education*, 77(4): 75.
- Fox, Brent I. and Ranjani Varadarajan (2011). "TECHNOLOGY IN PHARMACY EDUCATION: Use of Twitter to Encourage Interaction in a Multi-Campus Pharmacy Management Course", *American Journal of Pharmaceutical Education* 75 (5): Article 88.
- Fox, Brent I. (2011) "Information Technology and Pharmacy Education" *American Journal of Pharmaceutical Education*, 75(5): Jun 10
- Goundrey-Smith, Stephen. (2014). "Examining the role of new technology in pharmacy: now and in the future" *Supplements*, Feb 11. (<http://www.pharmaceutical-journal.com/publications/supplements/focus-community-pharmacy/examining-the-role-of-new-technology-in-pharmacy-now-and-in-the-future/11134174.article>) Accessed on March 8, 2016
- Klimek, John. (2009). "The changing role of the pharmacist in health care", *Drug Topics* 153 (8): 60.
<http://www.ashpintersections.org/2011/03/use-of-technology-growing-pharmacists-roles-changing/> March 28 (accessed on September 27, 2015)
- Kisa, Sezer; Kisa, Adnan; Younis, Mustafa Z., (2007) "Changing Role of Pharmacist – A lesson from Turkey" *Drug Topics*. 12 (3).
- Lada, Pamela and George Delgado, Jr. (2007) "Documentation of pharmacists' interventions in an emergency department and associated cost avoidance", *Am J Health-Syst Pharm*, 64: 63-68
- Mabee, Robert L (2014). "The Pharmacist's role in changing health care landscape" *Drug Topics*. 158 (10).
- "NACDS' Rosato (2010). "Pharmacy is Embarking on Revolutionary Times" - Role of Pharmacists as Medication Experts Topic of Presentation at Massachusetts Health Council Forum. "Biotech Week. NewsRX. High Beam Research. <<http://www.highbeam.com>>. (Accessed on October 2, 2015)
- Pedersen, Craig A., Philip J. Schneider and Douglas J. Scheckelhoff (2014) "ASHP national survey of pharmacy practice in hospital settings: Prescribing and transcribing—2013", *American Journal of Health System Pharmacy*, 71 (11): 924-942
- Pope, David. (2010). "The pharmacist's role in the 21st century", *Drug Topics Hospital/Health-System Pharmacy –Voice of the Pharmacist*.
- Roberts, Simone. (2008). *Pharmacists' changing role*. Pharmacy News.
- Toklu, Hale Zerin and Azhar Hussain, (2013) "The changing face of pharmacy practice and the need for a new model of pharmacy education", *Journal of Young Pharmacists*, 5 (2): 38-40

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