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The goal of the *ASEAN Journal of Management & Innovation* (AJMI) is to publish insightful, original and timely research that describes or potentially impacts management and/or innovation that has the potential to be applied in the ASEAN context. Topics that are either distinctly ASEAN-related, or are regional or international in scope are encouraged. AJMI is multidisciplinary in scope and interdisciplinary in research methodology and content. AJMI accepts papers that initiate or redirect a line of inquiry as well as papers that provide new insights into previous work.

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Editorial

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I hope that this issue provides stimulation, sparks ideas, and gives you new insights on topics that are important for you and your community and for ASEAN in general. We look forward to your feedback on this issue and suggestions and submissions for future issues.

Best regards,

Dolly Samson
Stamford International University
Editor in Chief

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Message From a Senior Consulting Editor

Asia/ASEAN Rising and the Role of the *ASEAN Journal of Management and Innovation*

Asia rising is not a fiction. More than half of the population of the world is in Asia. China, India, Indonesia, Vietnam are rapidly expanding their economies. ASEAN with over 600,000 million people is a critical component of the rise of Asia in all domains. There are scores of UNESCO sites in ASEAN nations, evidencing the contributions to the human heritage in the region and globally. At the centre of all developments in Asia and ASEAN is education. There rise of Asia and ASEAN is the rise of Education. Just as Asian and ASEAN civilizations had contributed to the funded knowledge of Mankind, the reemergence of knowledge leadership in the region will mean once again the significant contributions of scholars from the region to the cumulative and mature knowledge in all disciplinary and transdisciplinary domains.

In every ASEAN nation and in all its institutions of knowledge, small and large strides are being made in educating the young and old to be responsible local, national, regional, and global citizens. ASEAN scholars, knowledge leaders and leaders in all other fields are determined to be part of the global march of progress in the midst of the realities of wars, civil conflicts, diseases, poverty, extremisms, terrorism, and the threats of other kinds of social and political anarchy. Scholars endeavour to focus on the knowledge advances and share findings, wisdom of received and inherited wisdom, current knowledge, policies, practices and leading edge breakthroughs, and, make connections with other scholars throughout the world.

It is necessary and timely that an ASEAN Journal of Management and Innovation (AJMI) be established to contribute to the significant and focused efforts of knowledge generation, knowledge evolution, knowledge dissemination, and knowledge management from the region, on the region and on the universal aspects of all dimensions of human existence. AJMI creates opportunities for the nurturing of a critical mass of researchers from the region and on the region and who will share their research studies and findings on the particulars and universals of management and innovation phenomena.

Imitation, Innovation and Invention are interrelation creative endeavours. Administration, management, leadership, and entrepreneurship are interrelated dimension of acts which make things happen and acts which sustain excellence and letting go of obsolete modes of thoughts and norms. Knowledge management is about understanding knowledge creation processes and understating the nature of knowledge obsolescence in each discipline. The ancient wonders of the world were about the powers of knowledge, management, language and mathematics, imagination, arts and design, and of course, the creative minds of architects, engineers, and others who understood the experimental nature of trial and error, imagination, and action. Leaders with will and resolve marshal natural resources, renewable and nonrenewable resources to develop societies, sometimes steadfastly working for decades to complete one project, a pyramid, dam, canal or religious site. The modern wonders of the world, in the kitchen, in hospitals, battlefields, entertainment worlds, on land, in the oceans in

outer space are made possible because of the cumulative research knowledge gathered from researchers in all fields and from everywhere in the world.

The arts and sciences of creation are recorded in the thousands of years of recorded human history evidenced by artefacts, sociofacts of social order and psychofacts of individual imaginations. Quantitative and qualitative methodologies of all sciences, physical, social, metaphysical have modes of thoughts, intuition, and inspiration, believe and adventure that drive the passion for innovation. No imitation, innovation, and invention have taken place without administration and management of ideas, plans, designs, and resources. Foundational to all acts of resource mobilization and value adding is the development and honing of human resources. Human resources are about basic and advanced literacies, the mastery of competencies, the development of talents, and the nurturing of the culture of research, imagination, and creation. Formal, non-formal and informal education builds and transmits the contents of mature knowledge which constitute and shape the gestalt and weltanschauung of contemporary civilization.

The culture of research and the various traditions of enquiry will reinforce existing funded wisdom and mature knowledge and provide new insights on previous work and redirect enquiries in new directions and on novel phenomena of the relationships of matter, energy, environment, human social order, and behaviours. AJMI aims to create opportunities for researchers to make tipping and turning points contributions to the knowledge corpus of management and innovation from disciplinary, intradisciplinary, interdisciplinary, and multidisciplinary and transdisciplinary perspectives. The digital era, initiatives such as MOOCC, the increasing numbers of researchers and their global collaboration, the knowledge revolution, the increase in the numbers of universities, the mobility or researchers as well as the instantaneous sharing of their research questions, methodologies and insights create a an exciting dimension to "quantum leap" knowledge generation and sharing, and, strategic addition to the mature knowledge corpus in the fields.

It is expected that AJMI will shape research policy in the region and provide significant data to the community of policy makers in the region. The insights, findings, and concerns of researchers would contribute to the general intelligences of the ASEAN citizenry, as well as globally, and enhance policy making decisions for the improvements of societies. It is expected that in the immediate future/in time AJMI will be able to drive major initiatives and establish Policy and Advocacy Chapters in collaboration with partners in the region and elsewhere. Such initiatives must, however be founded on mature knowledge and evidence of debated concerns, elegant solutions to problems, best practices and inspiring management and innovation initiatives for development.

As ASEAN is ready for great and strategic transformations, the community of scholars must rise to generate dynamic ideas for development by the Small Medium Industries and Small medium enterprises as well as by multinational companies and other conglomerates for mega projects. Researchers must likewise be ready to define and formulate relevant and significant research questions and generate research-based findings and evidence and formulate relevant

recommendations for all the organizations which require data to make informed policies for investments and problem-solving.

There are exciting challenges ahead, as the institutions of governments, the non-governmental organizations, the institutions of civil societies individually and collectively interrogate and make recommendations for development. Educational institutions and research institutions must themselves be credible institutions which generate, share and consult and get others to use and apply mature knowledge in the various initiatives of development. Researchers must themselves resolve the debates of basic and applied research qualitative and quantitative research at the conceptual and academic level so that presentations made to decision-makers are not distracted by sometimes unnecessary abstract academic distractions. While going through the rigorous protocols of academic research, researchers should also develop the art of science of preparations of advocacy and position papers for policy and advocacy research. The collections of the contributions of AJMI will enable the cumulative insights for use by academician in their teachers, the use by other researches in the review of literature, and the use by decision-makers for their decisions on practical projects. To be able to contribute impact fully and effectively, there must be the corpus of mature knowledge which could stand interrogation I terms of methodologies of findings, acquisitions, interpretations, formulations of elegant, relevant and feasible solutions.

The Southeast Asian Ministers of Education Organization (SEAMEO) established in 1965 before the establishment of the Association of Southeast Asian Nations (ASEAN) had a number of institutions focusing on different areas of specializations, such as Mathematics and English Language Educational innovation and Arts, Agriculture and Vocational and Technical Education. Among its institutions is the Regional Institute for Higher Education Development (RIHED) founded in Singapore in 1959 [before SEAMEO], later reorganized, and established in Thailand in 1993 as the SEAMEO Regional Centre for Higher Education. Both the Association of Southeast Institutions of Higher Learning (ASAIHL) founded in 1956 which is a non-governmental association, and, the ASEAN University Network [AUN] founded in 1995, which is linked to ASEAN focus on the capacity building of higher education in the region. These various organizations, specifically, SEAMEO institutions, AUN, ASAIHL conduct seminars, workshops symposiums and publish technical reports and handbooks.

There are hundreds of universities in ASEAN, old and new, large and small, public and private. These universities have different patterns of national, regional, and global contacts and connections in their niche areas of research. ASEAN Universities have individually published many important Journals related to the general areas of Teaching and Learning and to their niche areas of specializations. These numerous journals in various ASEAN languages are published by various faculties and departments, and there are also Journals published as university –wide publications. AJMI is positioned to be a partner to the research publication endeavours of these various organizations to make a positive and strategic difference in the management and innovation knowledge. AJMI provides opportunities for renowned researchers from renowned universities as well as young researchers from newer universities to contribute and share. The selection of research works for publications rest not on the ranking of universities but on the relevance, impact, and robustness of the research problem

and the use that the findings can be for the region. Together these institutions in ASEAN and their various knowledge management mechanisms are contributing towards realizing the ASEAN Higher Education Area [ASEA] within the overarching agenda of the ASEAN Community.

AJMI is now another academic journal which will contribute to the knowledge corpus in ASEAN and globally. Researchers from all disciplines studying many different kinds of phenomena continue to ensure robust methodologies are used in their various enquiry traditions. The fields of management and innovation continue to attract researchers from all disciplines of knowledge who conduct enquiries on natural phenomena and social creativity, change and related obstacles as well as possible futures. Evolution, change, transformation, tipping and turning points, reform, reengineering, restructuring, reconceptualization are all part of the language register of dynamic management and innovation. AJMI provides opportunities to further clarify epistemological, ontological, and axiological perspectives of management and innovation and the power of the visions of the future and change in the region.

AJMI is a peer-reviewed scholarly journal which is entirely electronic from submission to publication. AJMI promotes studies that aim towards the integration of theoretical, empirical, and applied research works which create synergies across knowledge disciplines. The collective vision is that AJMI is committed to rethinking on what constitutes knowledge, its production and transmission, rigour and quality. To this end, we value excellence in inquiry, independence in analysis and strategic innovation in the research endeavours. We hope to link the findings, insights, and interrogation of the researchers with the policy deliberation processes. We look forward to receive and be motivated by cutting edge research and encourage manuscripts from various genres of research. As we move forward, we shall revisit significant aspects of the ethics of human subjects research as well as the overall ethics pertaining to the research enterprise and together raise our consciousness of responsibility and accountability of the community of researchers in the region.

AJMI promises to be a journal that shall contribute to nurture academic and intellectual culture and the maturation of generations of researchers in ASEAN and on ASEAN. In time, AJMI will generate a Directory of Research Works and research expertise, in every ASEAN State and from ASEAN communities on the various fields of research. Students, scholars, researchers, and intellectuals are invited to contribute their best works to AJMI and to nurture a culture which leads to knowledge based civilization building. With the establishment of AJMI, in continuity of the *Stamford Journal* listed in the Thailand Citation Index (TCI) we can chart out new mature research contents and directions and build a knowledge based society in ASEAN while contributing to the global community.

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Measuring Corporate Innovation Capacity: Experience and Implications from i2Metrix Implementation in Vietnam

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Abstract
This paper discusses the issue of measuring corporate innovation capacity, and proposes a method for implementing such measurement program (i2Metrix). The actual survey on 19 Vietnamese leading businesses suggests that the i2Metrix design is working and can be further improved for future use. Responses by firms' executives show not only their awareness of innovation but also interest in management tools and methods to make use of this crucially important but elusive concept and resource. Insights from the survey highlight a disciplined process of innovation, adoption, and diffusion.

Keywords: Creativity / Innovation, Technology management, Corporate culture, Core competency, Strategic management
J.E.L. classifications: C42; M13; O31; P27

1. Introduction

The Vietnamese economy has, since the launch of extensive economic reforms, called '*Doi Moi*', been in transition, transforming from an old-fashioned Soviet-styled command economy to a more modern market-oriented emerging economy. From a low base of production, as little as US$10 billion annual output in early 1990s (using the official exchange rate), the country's output (measured by gross domestic product; or GDP) has increased to approximately US$150 billion for the fiscal year of 2013, due largely to higher growth periods such as 6.9% per annum (1996-2000), 7.5% p.a. (2001-05) (Vuong, 2012). It currently has a 'golden population structure' with 65% of people of working age, and a high literacy of over 90%. The agriculture-based economy produces sufficient food for its own safety and exports. Currently the country is the world's second largest exporter of rice and coffee (and largest exporter of robusta variety), and a major exporter of aqua-products, furniture, garments/textile, along with several other products. In 2013, Vietnam exported goods and commodities worth $120 billion, a staggering increasing in both ratio exports to GDP and in absolute values compared to those of the turn of the millennium.

The corporate sector, nowadays comprising three major subsectors state-run, foreign-invested (FDI) and privately run firms, has emerged as the country's most important economic force, enjoying benefits that *Doi Moi* has brought about to the economy. From a few thousand firms established in the early 1990s when the Law on Private Enterprises was introduced, official statistics shows that in total some 700,000 firms have been established since the start of *Doi Moi*. Roughly, 14,000 FDI firms of all types have committed over $220 billion to the domestic economy. Investments in the national

infrastructure have been increasing quickly over the years, helping to improve the conditions for economic activities and operations of commercial firms, with large supports from such multi-donor institutions as the World Bank, ADB, and bilateral ODA partners like Japan, France, England, Australia, etc. An example is within the 2001-05 alone, nearly $15 billion in ODA was committed by various donors to support Vietnam's economic transition, of which half was disbursed (Vuong, 2012).

Almost all factors seemed right for Vietnam to take off. But economic realities have turned out very differently from what was expected and hoped for. The Vietnamese economy has gone through a tumultuous transition period from 2007 till 2014, with no clear sign of bottoming out, including several crashes of its stock markets in the past 7 years, and then a free fall of the real estate market. Vietnam's GDP growth has declined to an average of around 5.6% p.a. on the 2010-13 period (Nguyen, 2013).

These major problems reflect the economy's vulnerability to both external shocks (such as the global financial meltdown 2008-09) and internal shocks (like recurring problems of high inflation and home-made liquidity crunch). But deep down, observers with economic acumen have noted other other deeper reasons, in particular the absence of innovation-led value added in various corners of the economy.

Vuong & Napier (2014) examined empirical data on Vietnam's corporate sector to explore the problem of 'resource curse' as counterexample of local firms' determination of pursuit for innovation and creative performance. Abundance of resources, both physical and financial, has become a curse on corporate performance when a clear strategic goal for pursuing innovation is absent. In other words, as firms become addicted to over-reliance on resources, they face a downward spiral of productivity and economic efficiency. In fact, firms that rely on amassing capital/physical assets tend to downplay the value and potential contribution of creative performance and innovation in their strategic pursuits. Such a pattern of commercial pursuits without a clear strategy for making innovations soon becomes the so-called 'destructive creation' (a play on Schumpeter's famous term 'creative destruction').

In reality, the Vietnamese culture-reflecting legacy of the Confucian value system appears to reduce the willingness for risk and radical changes, whether in business or socio-political settings, and thus hinders innovation process (Vuong & Tran, 2009). Simply put, firms are unfamiliar with the idea of tapping creative performance and innovation as an emerging and valuable resource. Many (including successful) entrepreneurs regard innovation as unknown and thus painful and thus transform themselves to into 'capitalists' in a risk-adverse fashion (Vuong, Tran & Nguyen, 2010), avoiding the two part 'tango' of entrepreneurship-creativity (Napier, Dang & Vuong, 2012). Being capitalist almost means shifting from resource-less entrepreneurial undertakings to capital-intensive business operations, which by nature demands more financial resources. Nevertheless, innovation is both possible and needed in emerging market economies, especially when it comes to notions creating and implementing organizational change in a disciplined way.

Given the value of innovation and creativity in emerging markets along with the lack of understanding of it, this paper seeks to offer a research based way to help organizational leaders assess their own capacity for innovation and evaluate its contribution for performance. This set of metrics, called Inclusive Innovation Metrics (or "i2Metrix") helps measure corporate innovation capacity, actual and potential, and as they become better known, enhance public knowledge about the purpose and value of innovation for organizations. The paper, therefore, includes several sections to explain and analyze this concept. First, the paper reviews literature that examines which aspect or dimensions to evaluate, proposes a practical approach to measuring those dimensions in the field, and a report on important insights and implications gained from a pilot test of the survey in the early 2014.

2. A literature review on possible metrics of innovation/creativity

In this section, we focus on selected theoretical and empirical discussions about measurement of creativity and innovation within organizations. In particular, this section covers ten key areas that come into play and support the notion of metrics for assessing creativity and innovation capacity. They include (1) the outcome of the innovation process; (2) the innovator factor; (3) financial resources available for innovation; (4) institutional supports; (5) process and product differentiation; (6) ability to set or catch up with emerging trends; (7) information process toward innovation; (8) core

values and mindsponge; (9) efficiency of the implementation process; and (10) readiness for market competition.

2.1. Outcome of innovation process

When it comes to the innovation process, two key questions for practitioners and academics have been what is the process and is what the outcome of the process of innovation (Runco & Richards (1997), and Napier & Nilsson (2008). Despite such a demand, until the late 1980s, it was difficult to find appropriate metrics even for economic activities like manufacturing. Schroeder, Scudder & Elm (1989) acknowledge "further understanding is needed, especially in the definition and measurement of innovation in manufacturing" because they are often confused (process and outcome).

Despite such interest, the range of options for measuring the outcome of innovation is limited. Acs, Anselin & Varga (2002) show that the major indicators of outcome of innovation process are patents, as in inventions and process; further, 'direct innovative output' refers to economic value (new innovative product/process/service and turnover). However, despite the shortcoming, the widespread practice is still to measure patent count data as innovative output appears to be more difficult for collecting data.

According to Ling (2003), impacts of innovation adoption (which might be a reflection of 'perceived outcome') may be felt by organization members by such factors as level of interest of project team members, working environment, formation of task groups, and the capabilities of the people involved in the innovation.

2.2. The innovator factor

The innovator factor deals with human resources that work in unit(s) charged with creating new products, processes and ideas in business organizations. The central concept of this 'innovator factor' is knowledge creation, which, given rising uncertainty in today's business world, makes this this the most lasting competitive advantage (Nonaka, 1991). Chiu & Kwan (2010), echoing Nonaka, also suggest that culture has profound impact on real-world knowledge creations.

Innovation ranges from new products, services, and methods in the workplace as well as innovative behaviors, evident in leaders, individuals and groups in terms of how problem-solving efficiency and work group relations (Scott & Bruce, 1994). Griffith, Huergo, Mairesse & Peters (2006) present econometric evidence suggesting that across systems, innovators' efficiency and payoffs affect organizations' innovation outcome in general and productivity in particular. However, an innovator's capacity changes over time. Peters (2009) reports that only 51% of the innovators are still involved in innovation after three years. That appears due to the relationship between entrepreneurship and innovation, according to Day (1995). In a similar view, Lumpkin and Dess (1996) establish a connection between the entrepreneurial orientation (EO) and firm performance, while Greenfield & Strickon (1981) argue that a typical entrepreneur by nature possesses qualities of an innovator. The fact that entrepreneurs must work hard, following strict disciplines to hope for any success makes the innovation style of an entrepreneur more of a disciplined one, the view that is advocated by Unsworth & Clegg (2010), (Barczak, Lassk & Mulki, 2010), and McAdam & Keogh (2004). In addition, because an innovator is hard to find, he or she becomes a scarce resource (Egan, 2005).

2.3. Financial resource available for innovation

Economic activities demand financial resources, and innovative activity is no exception. Griffith *et al*. (2006) also show that for developed economies in the European Union, higher per employee R&D investment improves the chance for a firm to become innovator. The fact that large and international firms tend to be more active and engaged in R&D activities also suggests that availability of finance has significance on firms' determination of becoming innovators in a broad sense.

In addition, part of the financial issue with innovation is caused by team and organization's failure to realize potential value of innovation, according to Klein and Knight (2005). As innovation is never an easy job to do, once top management decides to adopt it, they have to devote resources to its implementation.

2.4. Institutional supports

Creativity and innovation are complex tasks as described by Udwadia (1990:76), and thus require various institutional supports. In Udwadia's structure for the innovation process, there is a cascade of connected creative processes, including interdisciplinary, marketing, manufacturing, design and R&D. Although this is only one of many models, it shows the complexity of the task of implementation, which gives rise to the need for organized institutional support.

Ettlie, Bridges & O'keefe (1984) show that process adoption and innovation require appropriate strategy and structure of an organization. Strategy and structure then need an aggressive technology policy and concentration of technical experts, especially for obtaining achievement of radical innovation. The authors suggest, "a greater support of top managers in the innovation process is necessary to initiate and sustain radical departures from the past for that organization."

Successful adoption of innovation is related to firm's culture, market orientation and especially organizational learning (Hurley & Hult, 1998). Participative decision making also contributes to higher levels of innovativeness at firms, which represents institutional supports to innovation regarding the decision of adoption and implementation.

Hurley & Hult (1998) reflect an important insight from Eisenberger, Fasolo & Davis-LaMastro (1990) that perceived organizational support is assumed by team members to improve effectiveness and commitment to complex tasks. In such an environment, team players tend to believe that "greater efforts toward meeting the organizational goals will be rewarded," and this would normally include innovation as well.

2.5. Product and process differentiation

In this regard, Damanpour (1991) provides evidence that radical innovations usually take place in units that are created for this task, and that there is a significant relationship between specialization, differentiation, technical knowledge and innovation. Gupta & Loulou (1998) find that "process innovation accentuates the profit difference between integrated and decentralized channels."

In addition, Hull & Rothenberg (2008) show that "innovation drives firm innovation and the level of differentiation in the industry." They also indicate that financial performance from successful differentiation using innovation would benefit the firm innovation strategy, bearing in mind an additional advantage that innovations usually challenge and improve firm learning capabilities.

Dougherty (2001) finds that in firms with innovative capabilities people understand value creation as a long-term working relationship with the market, leading to a differentiation driver to learn how to solve customers' need and a reshaping of the notion of 'integration of work.'

2.6. Ability to set or catch up with emerging trends

Rombach & Achatz (2007) confirm, "the most comfortable position is the position of a trendsetter." A trendsetter drives innovation, self developed or acquired, and has the market power to successfully define the rules of the game in the market…" In light of this, part of Dell'Era & Verganti's (2010) study addresses the question: "Does the capability to propose new product trends allow companies to be recognized as innovators?" using empirical data from Italian furniture makers in the 1996-2005 period. Its findings confirm that trend-setters can attain the best performance when consumers take part in the early phase of diffusion.

Rahaman & Muhamad (2004) show that the trend-setting comes after micro- and macro-environment analyses are performed, with the former (micro) examining the organization's internal resource strength/weakness, and the later (macro) giving clues about how external factors may affect a firm's well being. These analyses are critical for a 'the new product development' plan as a step toward new product innovation. Their findings also confirm that only a small percentage of successful innovators rely purely on technology as a driver; the majority adopt a 'dual strategy,' accommodating both technology and market drivers.

2.7. Information, information processing and innovation

Information and information processing play a central role in making innovation, which appears in several ways in the literature. Bradford & Florin (2003) advocate the central role of enterprise resource planning (ERP) systems in coordinating various functional strategies of a business, with presence of profound impact of innovation diffusion factors. Napier and Nilsson (2008) argue

that the more organizations seek new products and processes, including emergent business models, innovation requires improved information quality and information processing. Improving information flows and better processing information as input for producing innovation result in Aha! moments (Napier, Bahnson, Glen, Maille, Smith & White, 2009), serendipity (Napier & Vuong, 2013) or a disciplined approach to creativity and innovation (Napier & Nilsson, 2008).

2.8. Core values and 'mindsponge'

As an early recognition of core entrepreneurial value for innovation, Greenfield and Strickon (1981) argue that entrepreneurial values include characteristics of risk appetite and alertness to new opportunities, which boost creativity/innovation capacity to turn them into lucrative commercialization.

Entrepreneurial orientation and a core value of innovation may enhance firm-level performance (Lumpkin & Dess 1996; Shane 1993). Shane (1993) found that "rates of innovation are most closely associated with the cultural value of uncertainty acceptance, but that lack of power distance and individualism also are related to high rates of innovation." The author also suggests that "nations may differ in their rates of innovation because of the cultural values of their citizens." According to Shane (1993), capita income appears to be more economically important than industrial structure, as 'innovation-demanding' has become a culture in wealthier societies for the sake of labor-saving and differentiated goods. From another angle, Leonard-Barton (1995) suggests that clarity of a goal must be part of the core value if an organization is to innovate and, further, knowledge building has to be related to innovation.

Hurley & Hult (1998) conclude that creating a culture that supports innovation requires a system of value and beliefs that supports participative decision-making, learning and development. To reach toward innovation, Ulijn, Nagel & Tan (2001) indicate that the transition from an innovator to entrepreneur requires a change in mindset on the part of the innovation agent, giving rise to a new core cultural value. National context and cultures tend to have profound impact on this transition. Further, Tidd & Bessant (2011) and Unsworth & Clegg (2010) emphasize that leaders' shared vision and will to innovate must be part of the value system. We also notice that Barczak, Lassk & Mulki (2010), in a survey of student teams at a large American university, suggest that team emotional intelligence promotes team trust, which in turn, fosters a collaborative culture, which enhances the creativity of the team.

More recently, Vuong & Napier (2013) provide the notion of 'mindsponge' as a mechanism for introducing and rejecting a core value that is relevant to the determination of cultural systems that constitute an ecosystem for innovation/creativity at organizational level. As an individual (or ultimately a collection of individuals within an organization) considers what values to hold or reject, they build to become a mindset or way of operating. If that includes becoming more creative and innovative, then the values that may need to be rejected and absorbed (via the 'mindsponge') could become critical for changing a culture as well.

2.9. Efficiency of the implementation process

Leonard-Barton (1995) show conditions for successful implementation of innovations from initial creative ideas, namely: Characteristics of task, knowledge and skill diversity, external demands, integrating group processes and intra-group safety. In West's (2002) study, although diversity of knowledge and skills is a powerful predictor of innovation, processes employed by groups and core competency are factors that determine the success of innovation.

For efficient implementation to occur, Hurley & Hult (1998) argue that "receptivity to innovation, which is at the core of adaptiveness and change, is related systematically to other dimensions of culture. Leaders cannot simply select an organization's culture; they must shape it. Organizations may want innovation, but when their implicit norms and values reinforce the status quo, it is not forthcoming." The role of a leader is critical here. Success depends on the leader's vision of what the firm can accomplish toward a strategic goal. Leaders of innovation firms, then, must consciously manage the value systems, culture and atmosphere that support innovation (or risk having it devolve to a culture that they cannot control or does not support key values). Klein & Knight (2005) show that although innovation at work is imperative, many fail to realize its expected value because of implementation failure, not necessarily innovation failure. They suggest the organizational

characteristics that together improve the chance of implementation success include a strong, positive climate for implementation; management support for innovation implementation; financial resource availability; and a learning orientation.

Naturally, trust has a great role to play in cementing team efforts toward the implementation success of innovation (Barczak, Lassk & Mulki, 2010). Bissola & Imperatori (2011) show that creativity is not only about creative genius. Enhancing creativity requires, obviously, creative skills, and also team dynamics and organizational solutions. An organization's collective performance that produces innovations should be an interaction between the above key elements, which should be combined in a well coordinated innovation implementation process. In addition, Unsworth & Clegg (2010) examine the motivation for people to undertake creative actions at work: "… General work motivation, creativity requirements, cultural support for creativity, time resources, and autonomy were all used as cues in deciding whether undertaking creative action would be worthwhile via judgmental processes of expectancy and instrumentality." Clearly, the shift to market orientation, and product commercialization, is of primary concern for such an implementation, in line with suggestion by Tidd & Bessant (2011).

We learn from Rothaermel & Hess (2007) that "antecedents to innovation can be found at the individual, firm, and network levels." This knowledge is important, as in line with this, an efficient implementation process will have to avoid the risk of concentrating efforts and resources on some 'specific factors' without fully appreciating the value of the systemic coordination. Also, there is evidence that radical-innovation plans must be implemented and managed differently from incremental-innovation ones, as radical innovations are subject to 'abundance of uncertainties and discontinuities' (Leifer, O'Connor & Rice, 2001).

2.10. Readiness for market competition

Greenfield & Strickon (1981) indicate that readiness for market competition represents another critical success factor for entrepreneurial orientation and innovation capability to tap a firms' opportunity for profitable commercialization of products. The degree of commercial readiness is partly defined by perceived organizational support, diligence, and commitment by employees, according to Eisenberger, Fasolo & Davis-LaMastro (1990).

Li & Calantone (1998) show that each of the processes that generate and integrate market knowledge has significant impact on firms' new product advantage, using data from the software industry, leading to positively correlated product market performance. More importantly, top managers' perception of importance of market knowledge has the largest impact on the processes of market competence.

According to Miller & Friesen (1982), both 'conservative' and 'entrepreneurial' models of strategic momentum reflect the value of innovation in the process of marketization of a new product. In the conservative model, innovation is performed reluctantly, in response to serious challenges. Thus, innovation will correlate positively with environmental, information processing, structural and decision-making variables that represent, or help to recognize and cope with these challenges. In contrast, the entrepreneurial model suggests that innovation is always proactively pursued leading to negative correlations between innovation and the variables that can provide such warning 'to slow down' with evidence from 52 Canadian firms.

As for SMEs in developing economies, Keskin (2006) provides survey results showing that firm innovativeness positively affects firm performance. But the more important insights also include a positive influence of market-orientation on firm learning orientation, with learning orientation serving as 'mediator' between market orientation and innovativeness. Consequently, the research concludes, "firm market-orientation indirectly impacts firm performance via firm innovativeness and learning." Tidd & Bessant's (2011) paper on aspects of commercializing an innovation (i.e., developing business plan; forecasting outcome of innovation; assessing risk / uncertainty; anticipating resources; estimating adoption of innovation) is compatible to Keskin's (2006) results.

Weerawardena (2003) seeks to discuss more deeply the issue of relationship between marketing capability with firm innovation toward a well founded competitive strategy. The research points out that the role of marketing capabilities in competitive strategy has been inadequate. There have been inadequacies in the conceptualization and operationalization of innovation and sustained competitive advantage constructs. The author suggests that marketing capabilities influence both firm

innovation intensity and competitive advantage, and that measures of entrepreneurship, marketing capabilities, and organizational innovation are very useful for sustaining firm competitive advantages.

3. The design of i2Metrix and the surveying process

The long established need for and value of innovation in the workplace calls for some approach to measure the capacity of innovation within firms and determine the impact on performance of various measures of innovation. The i2Metrix is designed to provide measurements of corporate capability of creativity and innovation. Initially, ten proposed dimensions - each consisting of 4-6 facets - form the foundation (see Table 1). Before conducting the survey, the dimensions, facets and survey method were presented to owners and top managers from Vietnam's Leading Businesses Club (LBC) - whose members are the most popular brands in Vietnam as voted by consumers – for calibrating questionnaires and examining availability of data.

An initial pilot surveyed 19 of the 30 Club members, most in multiple hour-long interviews as well as written surveys, who agreed to an ongoing longitudinal relationship. The full survey and questions used in the semi-structured interviews appear in Table 1

Table 1. i2Metrix: Dimensions and Facets

1	**Output: Values added/created by corporate creativity and innovation**
1.1	Contribution of innovation and creativity to sales growth
1.2	Sales of new products and services
1.3	Number of proposed ideas and solutions
1.4	Number of registered patents
1.5	Efficiency of innovation-related decisions
2	**Innovators: Quality of the human resources for carrying out creativity and innovation**
2.1	Number of staff in the R&D Department
2.2	Quality of R&D team
2.3	Sources of ideas and solutions: internal and external
2.4	Levels of entrepreneurial spirit of corporate leader(s): risk appetite, determination of pursuing innovation and economic independence.
2.5	Usage of external experts
2.6	Level of readiness to change of staff members
3	**Financial resources for creativity and innovation**
3.1	Ratio of R&D budget to operating expenses
3.2	Level of readiness to reallocate financial resources for innovation
3.3	Capital structure of R&D investment
3.4	Expectation of returns on investment in R&D and innovation
4	**Institutional Support for innovation and creativity**
4.1	Level of importance and strategic role of R&D and innovation defined by corporate leader(s)
4.2	Level of importance and strategic role of R&D and innovation defined by corporate managers
4.3	Level of availability of management policies that encourage and facilitate innovation
4.4	Level of engagement of corporate members to innovation
4.5	Level of readiness to change of business plan, corporate strategy in order to adapt to early results of innovation
5	**Differentiation: Levels of difference of corporate products/services/management in comparison to industry rivals and the economy's average**
5.1	Level of differentiation of products and serviced made by innovation
5.2	Level of differentiation of production and management in comparison to industry rivals
5.3	Level of differentiation of allocating resources to innovation in comparison to industry rivals
5.4	Level of differentiation of finding new ideas and solutions
5.5	Level of differentiation of implementing innovation
6	**Trend-setting: Levels of adaption to market trends, product cycles, or creating of new**

	market demand
6.1	Usefulness of innovation (Innovation results help extend business cycle and/or add more value to existing products and services.)
6.2	Novelty of innovation (Innovation results are new products and services that create new market demand)
6.3	Impacts of innovative performance on internal changes
6.4	Impacts of innovative performance on firm's position in the supply/value chain.
6.5	Impacts of innovative performance on firm's core values and strategy
7	**Multi-filtering: Ability to process/digest information for primitive insights which are prerequisites of disciplined process of innovation**
7.1	Appropriateness and efficiency of procedures for proposing new ideas and solutions
7.2	Level of connections to top experts in different fields related to firm's business
7.3	Level of usage and exploitation of available information sources (newspaper, published academic and scientific works, market feedbacks, expert opinions)
7.4	Level of efficiency of management information system
8	**Mindsponge: Ability to absorb and integrate new cultural values into corporate mindset toward innovative change and creative performance**
8.1	Level of readiness to accept a new idea, new solution, new cultural value
8.2	Level of clear explanation, with concrete evidence, for firm's core values
8.3	Level of trust of corporate leaders in team's capability of proposing new ideas and solutions
8.4	Level of trust of team in corporate leaders' capability of evaluating new ideas and solution and making right decisions (accept or reject)
8.5	Level of appropriateness of process/procedure for evaluating then accepting or rejecting a new idea or new solution by corporate leaders
9	**Implementation: Ability to coordinate and implement the innovation process to final outcomes- i.e., new products, services, method of management**
9.1	Level of corporate consensus on implementation of innovation
9.2	Level of effective coordination among different functional departments in order to transform an innovative idea into actual result.
9.3	Ability and skill of corporate team in implementation of innovation
9.4	Level of corporate leader(s)'s commitment to implementation of innovation
9.5	Level of appropriateness of innovation implementation and strategy implementation
10	**Competition Readiness: Ability to observe and forecast threats/risks as well as estimate future costs and benefits of pursuing innovation – for instance, cutting loss and moving to other directions**
10.1	Ability to foresee market trends and science/technology achievements that generate new demand for innovation by corporate leader(s)
10.2	Ability to foresee challenges and problems that occur in the implementation of innovation by corporate leader(s)
10.3	Ability to connect with communication systems (the media) to facilitate innovation process
10.4	Level of usage and mobilization of communication systems (the media) in receiving primitive insights as well as implementing innovation and introducing new products/services
10.5	Impacts of success and failure lessons on firm's interest and implementation of innovation

The value of a dimension was determined as the average of the results on the dimension's multiple facets. The value of each facet is the average of assessments by (i) research/survey team, (ii) surveyed enterprises, (iii) the media, (iv) experts, and (v) public consumers. In the first survey on 19 members of LBC, only the first three sources of assessment are available.

Executives were interviewed by two researchers. While going through the questionnaires, the interviewers provided firm's representatives with explanation, illustration, and guidance for making their own assessment on innovative performance of the firms. The two interviewers also had their assessments noted separately. It is important to note that although the interviewers and the

interviewees were mentioning about the same activity and/or answering the same question, their assessments are independent from the others.

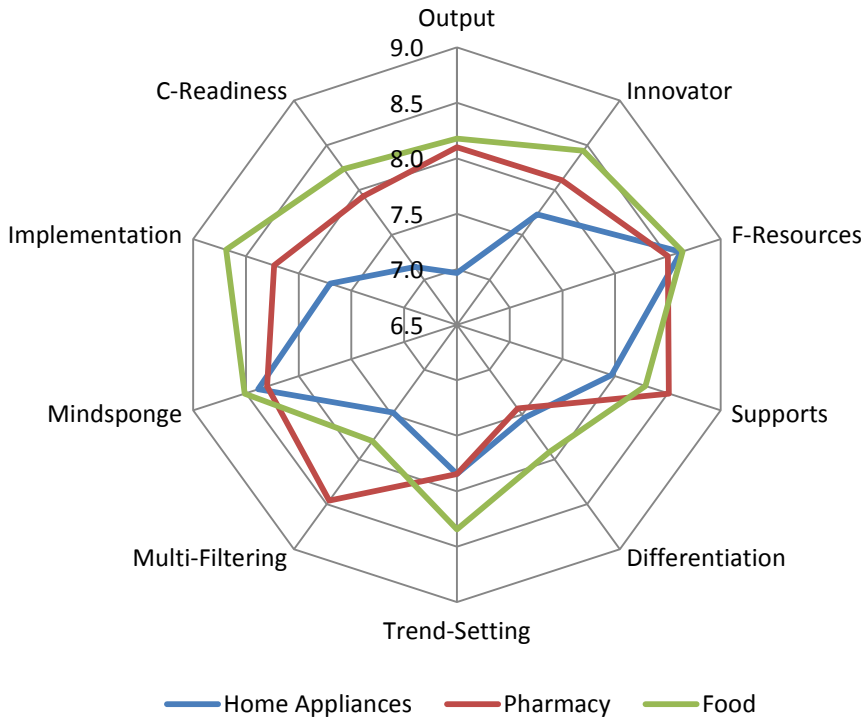
Business reporters did not join the interview. i2Metrix researchers helped them understand the questionnaires, then they gave assessments based on their own information sources and experience of the firms.

Assessments are quantified from 1 (one) to 10 (ten) where the higher the point is the closer the actual performance to assessor's expectation.

4. Insights and implications from the i2Metrix survey

The first survey sample consists of 19 LBC members in eight manufacturing industries, including home appliances, food, pharmacy, ceramic and porcelain, tire, plastics, agriculture machinery, and paper. Those firms have had total assets of approximately US$1.14 billion, provided 28,000 jobs, and generated US$1.67 billion revenue in 2013.

Figure 1: i2Metrix by Industry



Home appliances, pharmaceutical and food are three industries that have at least three firms joining the first i2Metrix survey. Innovation capabilities of the industries are illustrated in Figure 3. The fact that the radars of pharmacy and food industries cover that of home appliances is reasonable. Products of the first two industries directly affect clients' health thus have to meet much higher quality requirements and standards.

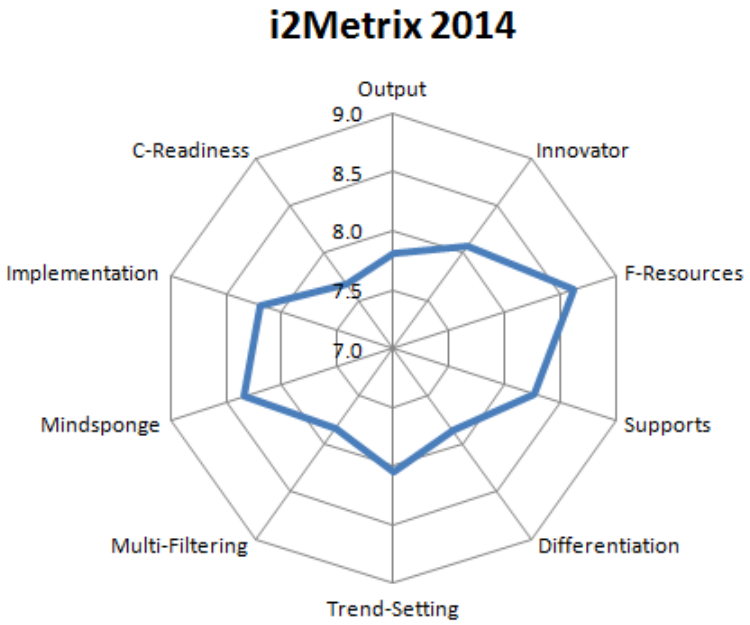
Grouping of dimensions

i2Metrix considers innovation a process. The ten dimensions, therefore, are divided into three groups as follows:

- Input Group consists of two dimensions: Innovator and F-resources
- Output Group consists of three dimensions: Output, Differentiation, and Trend-setting
- Support Group consists of five dimensions: C-readiness, Multi-filtering, Implementation, Support, and Mindsponge

The averages of dimensional values vary between 7.5 and 8.5 (see Figure 2), tentatively suggesting firm's innovation capability and their market positions.

Figure 2: i2Metrix of 19 LBC members



On the Output Group. Survey results reveal that while contributions of innovation (i.e., new product, service and process) to sales, profits, and cost saving are modest, business leaders appreciate the pivotal role of innovation in making a difference. Sales growth from improved and/or new products is less important than perceiving and setting a new trend of consumption as well as making the firm different from its rivals.

On the Input Group. Inputs for innovation process are abundant with assessments of Innovator and F-resource at 8.1 and 8.6 respectively.

Firm leaders' determination to pursuit innovation is decisive and not the firm's stage of development. Mr. Co Gia Tho – President and CEO of Thien Long Group (HOSE: TLG), stationary business – believes that "*One must not say 'because my company is still poor I will not invest in R&D' if one wants one's company to keep going and growing*." In fact, leverage ratios – measured by percentage of total debts over total assets) are less than 5% at surveyed firms. Innovation efforts are mostly financed by retained earnings and/or almost riskless finances.

The roles of the firm's leaders are crucially important in family businesses, which accounted for more than one third of the sample. Most of them are in a transition process where parents are training the next generation in various functions of the business before handing over the family fortune. It is also noteworthy that a higher average score of the 'mindsponge' dimension likely indicates that the business leaders have institutionalized some working mechanism for inducting emerging cultural values that may support their longer-term pursuit while effectively safeguarding those values at the heart of the cultural systems. In addition, most business owners sent their sons and daughters abroad to study management theories, techniques and global best practices. As a consequence, the new generations tend to be significantly different from their parents who have built the business out of private experiences and successful adaptation to the emerging market economy modus operandi. For instance, at Minh Long I, the father – currently the ultimate decision maker – who regards the ceramic and porcelain business as a game of life and very much appreciates personal abilities of his lifetime and loyal partners – accepts his Canada-educated son's proposal for documenting manuals of all machines, equipment, and tools in factories. When completed, this multi-million-dollar effort will create a standardized production system that puts the institutional sustainability first, instead of private experience and skills.

On the Support Group. Support dimensions reflect the state of the ecosystem for innovation in the businesses, describing how firm put tangible inputs of Innovator and F-resources in use. The

metrics define internal corporate capability of making the best use of limited physical inputs. For example, executives of Phu Nhuan Jewelry (HOSE: PNJ) and SG Food managed to find ideas for new products and solutions by getting more primitive insights from their staff members, not spending more on market survey and R&D activities. They often visit workshops and talk directly to the workers in order to grasp information for the multi-filtering process of creativity, similar to the model described in Vuong and Napier (2012).

Removing the 'entrepreneurial curse of innovation'

While understanding the pivotal role of innovation, firms see the risk of abusing innovation, too. If reliance on physical resources – such as, capital and business privileges – may create 'destructive creation' (Vuong & Napier, 2014) then scrambling for innovation may cause an entrepreneurial curse of innovation to firms (Maddock, 2013). They understand Maddock's argument that finding innovative ideas is challenging but still much easier than transforming it into commercial products and services that are accepted by consumers and clients. The commercialization process of innovation is often costly, requiring a huge effort in innovative solutions to marketing, cost optimization, effective distribution and the likes. Entrepreneurs who trust in the power of innovation may fall into the 'innovation trap' – a potential failure of business. That is, instead of being innovators who first find the largest unmet demand then innovate products, services, solutions to market's problems, many are inventors who start with their innovative thinking then try to convince market to buy what they offer.

Mc Donald's and Coco-Cola provide researchers and managers with famous case studies on successfully selling the same products in tens, even hundreds, of years. Coca-Cola, moreover, faced serious sales drop when introducing Coke with new formula in 1985. Although the two cases are often employed as counter-example of innovation, it is worthwhile to question how the firms maintain their global leading brands. It is expected that innovation is valuable somewhere inside the giants, for instance, in management of a multi-cultural workforce. The history of Coca-Cola reveals that the firm had activated its mindsponge to find out proper solution to acculturation problems (Gupta & Govindarajan, 2002). In order to secure its global soft drink empire, Coca-Cola's board of directors appointed Douglas N. Daft, who was born in Australia and spent most of his career outside America prior to the appointment, as President and CEO. This was the first time Coca-Cola had a non-native American in such positions. Daft led Coca-Cola by the motto, "think locally, act locally."

The i2Metrix 2014 survey finds that surveyed firms' managers have been able to strike a balance between emphasizing innovation capability and converting it to real-world results. On the one hand, they are devoted to motivating their teams to engage in innovation practices and institutionalize 'the innovation disciplines' in line with Napier and Nillson (2008). On the other hand, they refrain from introducing too many (incremental) innovations that may confuse the management and the market.

Mr. Nguyen Lam Vien – who founded Vinamit, a leading dried jackfruit and frozen tropical fruits brand, in 1991 – helps us confirm that innovation is an on-going and never-ending process, but executives must plan well when, where and how to introduce innovative products to market.

In NaMiLux (a mini gas stove manufacturer) and Traphaco (pharmaceuticals manufacturer), innovations have to be in line with corporate responsibilities to secure sustainable supply and employment. Japanese buyers offer NaMiLux a long-term partnership largely because of the firm's engineering team's ability to design production plans for manufacturing complicated and high-quality gas cookers at comparatively competitive production costs. However, CEO Nguyen Manh Dung insists that any innovative solution, even the smallest one, must be tested and consulted with Japanese partners before introducing it to production lines. "A minor mistake can create big damage in mass production," he remarks, "and we have to be the most reliable manufacturer supplying sufficiently and continuously." As for Chairwoman Vu Thi Thuan of Traphaco, replacing hundreds of workers with automatic production lines is not an innovation. Her firm has to not only secure jobs for loyal workers but also provide a stable income source to their families. Traphaco's innovation efforts, therefore, focus on smarter and friendlier marketing and distribution as the firm is serving special clients – the patients.

Innovation in a hierarchical environment

Hierachical systems – where the junior has to obey the senior – are common in the Confucianist cultural environment of Vietnam private firms (Vuong & Tran, 2009). Does this reality prevent surveyed firms from being innovative? Napier and Nilsson (2008) suggest that the answer should be "No" because common features of innovative firms are (i) out of discipline thinking, (ii) within discipline expertise, and (iii) a discipline process of implementation. The question is whether these apply in a Confucianist cultural environment as well.

The first discipline is to seek new ideas out of the firm and the industry, even dream about solutions or future products. Innovators who are able to think out-of-the-discipline collect primitive insights from related and unrelated fields then try to apply these insights in solving their issues. The second is to employ the best expertise in different professional functions. When the best experts work in a team, they not only share their knowledge, but also learn from others. The results of such a learning and self-improving process are innovative outcomes. The third discipline is a process of putting together creativity methods and inputs in a consistent manner to strive for innovations. Such a process releases innovators from administrative disturbance and makes them highly focused on generating innovations. Responses from the i2Metrix survey unveil that although the firms' executives may have not learnt about the three disciplines, they naturally follow the three.

Executives often quickly accept the first two disciplines – keep finding new ideas from any where, and making themselves the best experts. Some, however, may feel it difficult to practice the third. Developing a systematic process of generating innovation seems to be more challenging and costly than just trial-and-error. Many are afraid of missing an opportunity but not worried about failure of making a new idea into opportunity.

Christensen and Overdoft (2000) argue that well-established corporations face an innovation dilemma. High-quality teams, working in a comfortable environment, are not able to propose new ideas and solutions as unacceptance if failure puts extremely high pressure on them. What a corporation can do or cannot do depends on (i) resources – what the corporation possesses, (ii) process – how the corporation operates, and (iii) core values that the corporation's members trust in then defines their priority. The larger the corporation, the more important a role that a team's consistent understanding of core values plays. The only way to solve the innovation dilemma is to build the corporate core value of pursuing innovation and creation of new market values.

Schumpeter (1994[1942]) stresses the critical importance of entrepreneurship, in relation to innovation, in economic development. In his creative destruction, the boom-bust cycles of an economy are driven by advanced creativity. In the expansion stage, innovations and inventions increase productivity and encourage investment. In the mature stage, investors are getting harder to find a place to put their money, and the law of diminishing returns appears. As a result, businesses face stagnation and some dissolve. A depression comes. A new cycle will not start until new innovations and inventions destroy backward methods of production, lower inputs for the same amount of outputs, and require new inputs for producing new products. A wealthy economy has to build a comfortable socio-economic setting for the process of creative destruction to continue.

Agreeing with Napier & Nilsson (2008), MacDonald (2008) argues that innovation is possible in the most bureaucratic of institutions. MacDonald considers a corporate team's desire for creating new market values a prerequisite for innovation while emphasizing the corporate leaders' entrepreneurial determination to pursue innovation.

The survey on 19 LBC members affirms that firms' leaders play decisive roles of making innovation happened. On the one hand, this reality raises concerns over sustainability of corporate innovation, especially where leadership is transferred to the next generation. On the other hand, the fact that those executives are trying to build a disciplined process of creativity sends a reliable signal for a bright future of Vietnamese corporate innovation. Such insights are in line with Vuong, Napier, Tran & Nguyen's (2013) suggestion – that is, the association between business approach (i.e., rent-seeking vs. creativity making) and corporate orientation (i.e., tapping out resources or seeking prospective market) is the best-fit predictor for financial collapse. The examination of 256 cases in 2007-2013 period points out that the cause of Vietnamese financial collapse is not asymmetric information (Pressman, 1998) but "the lack of cost-benefit consideration and multi-layer filtered information."

The story about Minh Long Ceramic and Porcelain is typical of the success of a disciplined process of creativity. At the beginning of the i2Metrix interview, the head of the family – Mr. Ly Ngoc Minh – affirms, "No innovation effort of Minh Long is not a success." It is because he understands that innovation is a never-ending process and patience is necessary. Accidentally, Minh Long employs all three disciplines by Napier & Nilsson (2008).

Minh Long first participated Abiente Frankfurt 15 years ago. But until Abiente The Show 2014, the leader of Vietnamese ceramic and porcelain producers gains the first achievement. Spending a lot of money on participating in the most expensive international trade fairs that is always organized during Lunar New Year holidays while receiving no orders really challenges Ly. "Several sales managers left Minh Long because I insisted on bringing our products to Frankfurt," he says. Ly's determination is rooted in his careful study about the Fair, which strongly affirms that Abiente Frankfurt is the eldest and most famous Trade Fair where the best ceramic and porcelain wares have been bought by the most respected buyers in the world. In short, this is the place of the bests.

In addition, Minh Long does not go to Frankfurt to sell their products. "I want to see what are the best ceramics and porcelains, try to learn how they were made, explore how the producers sell their best products, and investigate what the buyers look for," Ly says. "In the first years, I knew the quality of our products were low and that we could not sell any thing at the fair," he smiles. Ly's thought is really out of the box.

Explaining his patience with costly Frankfurt, Mr. Ly outlines five principles that key members at Minh Long have to learn by heart and constantly practice at work: 1) Simple and effective (ideas and solutions); 2) Double check (at least); 3) Never give up; 4) Open and optimistic; 5) Honesty. "The first three are for internal operation, and the last two are for external relations," Ly adds.

Hidden power of innovation

Firms' executives, who joined the i2Metrix survey, highly appreciate the contribution of innovation to their business successes. However, half of them do not think that their innovation capabilities are good enough. 9 out of 19 executives rate themselves lower than the average i2Metrix which is compiled by assessments of respondents, i2Metrix researchers, and reporters.

Strong entrepreneurial spirit of the firms' leaders is not only a powerful motivator but also a destroyer of self-satisfaction. The Chairwoman and CEO of Phu Nhuan Jewelry (HOSE:PNJ) repeatedly quotes Voltaire's "the best is the enemy of the good."

Entrepreneurship is most important force that created economic achievements of the Vietnamese economy in the last three decades of *Doi Moi* (Vuong, Dam, Van Houtte & Tran, 2011). Entrepreneurial process, however, is just only able to release the labor force from the centrally planned economy and to introduce commercial incentives to the economy. In a fast-changing competitive environment, the Vietnamese corporate sector has to build both innovative business methods and mindsets.

Corporate innovation capability is getting more important than traditional inputs of production, namely land, capital and labor, especially when the economic turbulence reaffirms the law of disminishing returns. When Vuong, Napier & Tran (2013) examine relationships between culture, creativity and business stage of 115 business success stories in Vietnam, they find that cultural values and methods of creativity are critical to business performance in the entrepreneurial phase. Their roles diminish as the business grows. Therefore, it is noteworthy that ability to nurture strong entrepreneurial leadership is a reliable signal for predicting the future performance of a business. For those respondent executives who are still unhappy with their corporate innovative performance, it is safe to conclude that their firms possess hidden powers of innovation.

5. Limitations of this research

Although the design of i2Metrix is a joint-product of international proficient research teams and veteran business executives, the following limitations well acknowledged.

Small sample size. 19 respondents are not able to provide a statistically confident conclusion. It is expected that the sample will be larger in the next years as more businesses are registering to join i2Metrix survey.

Survey sample is not typical of the Vietnamese corporate sector. The 19 LBC members are upper stratum corporations. Most, if not all, of them are leaders in their industries. As a result, their i2Metrix composites are skewed as varying from 7.1 to 8.9. Such skewness, however, is necessary and allows people to hope for a bright future of the Vietnamese economy.

Subjectivity in assessments. Although innovations are concrete outputs – i.e., new production, new solution, new management – the process of innovation is intangible and vague. Subjectivity in assessments, therefore, is unavoidable, especially when data is collected by in-depth interviews with numerous qualitative questions. In order to minimize human errors and personal opinions, the three sources of assessments – including firm's executive, survey teams, and reporters – are unweighted.

Large difference between assessments. There are possibly large differences between assessments by different sources. Since the final measures of facets are an unweighted average it is expected such measures will be maximum likelihood when the number of evaluators increases.

Unclear instructions on how to assess. i2Metrix introduces just only principles for evaluators to assess the difference between personal expectation/target and actual performance. On the one hand, the absence of a standardized benchmark prevents the survey from getting homogenous results. On the other hand, the quality of assessment largely depends on professional capability and understanding of business culture and environment of evaluators as well as their learning and inductive attitudes.

6. Closing remarks

The fact that i2Metrix is welcome by the business community (with executives spending their valuable time on in-depth interviews), local government (Deputy Chairman of An Giang asked enterprises located in the southern province to join the survey), and policy makers (Minister of Science and Technology employed the i2Metrix scores when giving awards to 17 typical innovative enterprises), it unveils an improving awareness of innovation and a rising demand for a quantitative approach to innovation management and strategy. Examining the elusive innovation by ten distinctive dimensions and concrete facets helps business executives intuitively review innovation practices of their firms and improve their confidence in managing the intangible innovation resource. Such visualized understanding of corporate innovation capability, perhaps provides firms – which are seeking non-traditional ways of developing competitive capability - with primitive insights for designing and implementing innovation strategies.

Open design and theoretical foundation, which are based on globally grounded theories of creativity and innovation, allow the i2Metrix survey and analytical framework to be imitated in other economies, especially the ASEAN neighbors. Enlarged samples and cross-country comparisons are expected to offer better insights for business managers and policy makers in the context that innovation is "wanted dead or alive."

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A Qualitative Examination of Information Systems (ISs) and Management in Organizations: An Integrative Literature

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Abstract
Employers at all levels, in all settings, are continually in search of information to develop decisions that can be supportive when facing complex, and unpredictable scenarios in the global market. Hence, information and information systems have become strategic tools in the hands of decision makers in today's businesses. This paper is a presentation of the contemporary reality of information systems, and their influence in enhancing organizational performance. Further, the author identifies the types and levels of information systems available, and their fundamental purposes and roles, alongside the challenges and risks involved. Ultimately, practical implications for business leaders, and recommendations for further studies are provided.

Keywords: information, system, use, business, data, decision

1. Information Systems Concepts

An information system (IS) can be described as a group of individuals, data, and technology that operate or function collectively to find, store, and distribute particular information that enhances decision-making processes. Hence, developing ISs should not be regarded as a separate function from business process management. Concisely, an IS is the use of information technology (IT) to gather, systematize, and allocate information for developing apposite decisions in today's modern organizations. Oz (2009) clarified that, with an understanding of the two concepts '*information*' and '*system*', the definition of IS is instinctive: It embraces all elements that function together to process data and generate information. The IS can also be defined as a planned, systematic mechanism for providing managers with information necessary for making wise decisions in organizations.

Additionally, ISs involve several subsystems with sub-goals, all linked to the organization's central goals. Therefore, decision-makers should optimize each subsystem, in order to make the whole system function effectively. Another comprehensive definition involves ISs as systems for acquiring, organizing, storing, manipulating, and transmitting information, and they can be thought of as involving inputs, transformations, and outputs (Bartol & Martin, 1991; Jones & George, 2011; Schermerhorn, 2011). Nevertheless, Norton (2006) considered that ISs perform more than storing and retrieving data; they can also assist individuals in how they can use this information effectively. For example, "When a company desires a particular type of employee, job specifications and requirements are fed into the computer, where they are matched against the resume data stored there. The output is a set of resumes for individuals who meet the requirements" (Miner & Crane, 1995, p.333). Another conjecture is that an IS might be tailored to enhance business processes or to take advantage of a business opportunity, and if so, the design will comprise attributes that would include various IS types (Thompson & Cats-Baril, 2003).

Moreover, IS have become synonymous with a computer-based information system (CBIS), which collects and processes information according to an individual's order to a computer. A (CBIS) is a distinct set of hardware, software, databases, individuals and processes that are put together to collect, store, control, and transform data into information (Stair & Reynolds, 2008). Developing CBISs can be complex and costly, predominantly when the applications are vast and multifarious. "Today, however, when business people think about information systems, they are most likely thinking about computer-based information systems. These systems rely on computer and related technologies to store information electronically in an organized, accessible manner" (Boone & Kurtz, 2010, p.499). Prominently, organizations should develop policies, and procedures regarding the ethical

use of computers and the Internet in the workplace. These policies involve: ethical computer use policy, information privacy policy, e-mail privacy policy, Internet use policy, anti-spam policy, and acceptable use policy (Baltzan & Phillips, 2009). More importantly, these policies must be communicated to each individual in the organization, and their signatures must be obtained on consent forms. Mathis and Jackson (2000) also recommended rigorously implementing every segment of each policy and monitoring usage for business uses. According to Stair and Reynolds:

> Some IS professionals believe that their field offers many opportunities for unethical behavior. They also believe that unethical behavior can be reduced by top-level managers developing, discussing, and enforcing codes of ethics. Various IS-related organizations and associations promote ethically responsible use of information systems and have developed useful codes of ethics. (2008, p.415).

According to Odlyzko (1999), we will continue to live on the rim of intolerable frustration and always be exasperated with computers, as long as technology proposes alluring products and services. Therefore, the best path for an employer planning to be involved in employee monitoring, and enforcing codes of ethics, is open communication surrounding the issue. In a similar vein, Heeks (1998) declared that the efficiency of the technology is a regular frustration. Yet we endure in conceiving that productivity and success are effortlessly reachable if only: (a) we buy the most recent software; (b) we have better computers; (c) we have access to a new communication network; or (d) we apply a new management paradigm to develop and execute our ISs. Therefore, it is important to realize that businesses differ in the technologies used to deliver their outcome because: (a) some businesses are very labour-intensive, requiring a great deal of labour to produce goods and services; (b) other businesses are very capital-intensive, requiring large investments in tools and equipment to support their production processes; (c) some businesses have access to identical technologies and consequently have similar cost structures; and (d) other businesses can access a technology that is not accessible to others (Baye, 2009).

As noted earlier, an IS, is a formal system for supplying management with required and helpful information for making critical decisions, and enhancing the different business functions and activities. However, successful ISs in organizations necessitate managerial control because of the rapid expansion of the field of ISs, and the unlimited information that can be generated from such systems. Following this line of thought, managers need appropriate and timely information to perform tasks as planned or desired. Certo and Certo (2009) reported that information appropriateness, information quality, information timeliness, and information quantity are crucial factors that portray the significance of such information. Moreover, to optimize the whole system, several practices must be taken into account (e.g., systems investigation, systems analysis, systems design, systems implementation, and systems maintenance and security). Accordingly, awareness of the present state of the system and its mechanisms is the initial phase to develop influential policies, and effective ways of management to optimize the whole system. Another important issue for an effective IS is to distinguish between data and information, as well as to examine the ontology of information processing. Computer professionals interpreted data, as the unexamined facts, reports or charts; whereas, information implies data that has been scrutinized and ready for decision makers, and information processing encompasses the different types of data manipulation and inquiries, such as sorting, summarizing or classifying that convert data into information. The efficiency of information processing and flat organizational structures are consequences of strategically implemented IT, which facilitate access to information (Gong & Greenwood, 2012). Information is the result of the process of transforming data into a valuable and practical form for a particular objective (Bartol & Martin, 1991; Goodman, et al, 2007). However, enabling data and applying systems analysis effectively calls for an environment where employees realize that knowledge is power and behave accordingly to assist the organization generating the required knowledge promptly to produce the right decisions at the right time (Johnson, 2012). Generally, system analysis involves a spotlight on the goals and actions that users undertake; what users identify about their duties and responsibilities; and the psychological factors such as perceptions, objects, entities, and attributes and how they are interconnected (Smith-Atakan, 2006).

Comprehensively, O'Brien and Marakas (2006) noted that the IS function embodies the following:

- A fundamental business area the same as other business functions (e.g., HR, marketing, finance, and accounting);
- A significant tool that enhances employee productivity, operational efficiency, and customer satisfaction;
- A large amount of information required to assist decision makers and business leaders; an important component to reserve a competitive advantage or first-mover advantage in the global marketplace;
- A challenging occupation for many individuals around the globe; and
- An important part of the assets of today's networked business corporations.

Consequently, it is vital for business leaders to become fully aware of the different ingredients of information systems that they encounter, and be able to recognize all hardware, software, data, and networks they use in everyday operations. Thus, "in thinking about the relationship between redesigning business processes and developing information systems, it is always helpful to remember the saying: before paving the cow path, straighten it" (Thompson & Cats-Baril, 2003, p.354). For example, operating an influential IS requires prior consideration of the following: (a) specify what information is required within the organizational system; (b) determine a prompt time to obtain this information; (c) decide in what structure the information must be delivered; (d) draw decision areas in which management makes decisions; and (e) develop alternative decisions that must be well scrutinized to make critical decisions. In addition, the fast development of information technologies has modified many business structures and hierarchies, and enabled ISs to contribute positively. Developing high-quality ISs requires a process called '*systems analysis and design*'. This process entails systems investigation, analysis, design, implementation, security, and maintenance (Goodman, et al, 2007). In addition, they stated that if all stages in the design of an IS have been successful, the ensuing system will have two critical aspects: (a) *feasibility*: an evaluation of the IS feasibility emphasizes the assessment of alternative systems that are likely to comply with the business needs and workers. In addition, feasibility has many features (e.g., organizational feasibility, economic feasibility, technical feasibility, and operational feasibility); and (b) *ability to meet needs of diverse users*: the system should eventually fulfill the users' needs and expectations to accomplish their goals. ISs create learner organizations, operations that are more flexible, enhanced collaboration among different quarters, greater diversification of operations, management processes that are more developed, and they change employee manners or behavior (Griffin, 2008).

In this sense, organizations or every business must have modern ISs, and continually up-dated communication systems (Moss, 2006). Another school of thought revealed that an IS does not call for the use of a computer, and various organizations manage their information without being computerized (Goodman, et al, 2007). Perhaps the hypothesis behind this trend is that systems of managing information were present many years before the existence of computers. However, the partnership between people and computers is now everlasting and rooted in our business and domestic culture (Maddix, 1990). Aside from this, computers can be used to manage a significant amount of information in a short period, diminish the per-unit cost of information processing, deliver information that is advanced and promptly available, and monitor activities as they arise by classifying real-time information (Miner & Crane, 1995).

2. Types and Levels of Information Systems

Information systems comprise two expansive categories: (1) operational support systems are tailored to generate a variety of information on the organization's processes, and activities for internal and external stakeholders; and (2) management support systems are ISs that are structured to offer support for strategic decision-making needs of the upper-level of management (Boone & Kurtz, 2010; Daft & Marcic, 2007). Further, businesses often set up ISs from the bottom up, level by organizational level, and many different levels of management support systems are practical in today's businesses

(e.g., a transactional-processing system (TPS), a management information system (MIS), a decision support system (DSS), an executive support system (ESS), enterprise resource planning (ERP) systems, customer relationship management (CRM) system, business intelligence (BI) systems, geographic information systems (GISs), information management systems (IMSs), and an expert system (ES)). Dessler (2011) noted that TPS provides an organization's management, particularly accountants' comprehensive information about everyday activities. The following are the most widely used information systems. Robbins and Coulter (1999) noted that MIS assist managers and professionals in making effective decisions by regularly developing uniform, consistent, and precise reports. Boone and Kurtz (2010) articulated that DSS provide direct support to business managers, while making decisions: one more level up is ESS, which supplies the upper-level of management with vital information necessary for making decisions, such as for developing a multi-year strategic plan (Gitman & McDaniel, 2006). Thompson and Cats-Baril (2003) mentioned that ERP systems are also known as supply chain management (SCM) systems, which provide information that enhances the planning process of shipping resources (e.g., raw materials or funds); however, they support managers in tracking and altering processes as they arise, and are not only for planning. They are a set of integrated software packages, which support core business activities. CRM systems, administer an organization's connections with customers and refer to a variety of ISs from simple ones to sophisticated systems that examine important aspects and predict future prospects. As Oz (2009) noted, BI systems are ISs that can help businesses find competitive advantages over others in the marketplace. GISs can be helpful when managers link information to physical settings. According to Orilia (1986), IMS are designed for the distribution of data through a system, access to a database, and data communications' activities, and their major function is to manage the flow of information to individuals. Finally, according to Bartol and Martin (1991), ESs sometimes called '*knowledge-intensive systems*', are computer-based systems that apply considerable expert information to assist in solving critical dilemmas. Aside from this, ESs can be used for a plethora of purposes (e.g., monitoring, tracking, and anticipate prospective dilemmas in the workplace).

Hence, there are numerous types of computerized ISs, which serve the different managerial levels in organizations, and the common element to all ISs is that they support decision-making within the organization. Dichter (1987) described three managerial styles of rational decision-making. Speculative managers are managers who must be risk takers, since a great deal of information required for evaluation will not be accessible to them and speculative behavior is desired when facing uncertainties. This approach is known as '*belief in growth or positive thinking*' rather than taking chances. Timid managers are those who take actions when all risks involved have been removed, and there is very little of a backfire because of their fear of making inappropriate decisions. Straddler managers are managers who venture a decision, when positive and negative results are equal. They consider themselves astute and they will be accountable for any damages or losses. There are several successful examples of decision-making patterns; however, perplexity and intricacy occur when managers superimpose their own managerial philosophies that might not be compatible with others.

One proposition to discern the different types of ISs is to examine the functions they execute, and the individuals they serve in an organization (Daft & Marcic, 2007). Recently, the trend has been shifted toward the unification, and the amalgamation of the capabilities of more than one system, and it is less likely to find a separate system in one particular organization. One IS cannot contain an array of information requirements; therefore, the IS is a complex of many ISs that allocate information while supporting different organizational levels, departments, and operations (Griffin, 2008). However, linking or integrating systems is difficult to develop and implement, as well as being costly. Loraas and Diaz (2011) discovered that when technology is easy to use, potential users count on their situational learning temperament, and when it is difficult, a larger risk of malfunction is expected, situational goal orientations are less powerful, and users count on dispositional goal orientations more. Either way, an organization's technology is an important variable in shaping its structure; however, clarifying the rapport between technology and structure is convoluted, because different businesses may apply different technologies (Nelson & Quick, 2006). It is commonly considered best to create an impermanent structure, and promote resilience and employee freedom for creating and innovating constructive ideas (Daft & Marcic, 2007).

In all cases, technology in organizations must be managed (e.g., planning for the expansion of technological capacities, recognizing key technology, specifying what technology to purchase, and developing some tools to lead and harmonize the development of bureaucratic standards and policies to control it). With that said, technology is not the sole source of achieving a competitive advantage; however, it is becoming a fundamental stipulation for many businesses. A competitive advantage arises from positioning IT effectively in redesigning processes, maintaining smart connections with diverse quarters, and drawing the organization's design.

Dessler (1998) argued that there is a hierarchy of ISs, because of information prerequisites at every organizational level. A hierarchical MIS structure elongates its resources through an organization according to management needs. For example, MISs and DSSs offer information for middle-level managers regarding issues related to present versus past equipment and facilities required for the production process or operations. Moreover, ESSs provide information for strategic planners and decision-makers concerning issues related to the operating plans in the future. Further, different types of ISs support different business functions and serve different managerial levels. For example, ISs in organizations can be designed and started at the basic TPS, which records a variety of events, to a more advanced system, such as an ES that enhances individuals' efforts, and minimizes costs required. This leads us to question what types of information are available in today's businesses, in order to select and scrutinize the most applicable and effective system that can assist or enhance policy makers, and decision makers. Nickels, McHugh, and McHugh (2008) expounded upon the types of information that are accessible in today's businesses, as follows:

1. *Business process information* involves all data and information accumulated during an organization's operations.
2. *Physical-world observations* are caused by the use of radio frequency identification (RFID) devices, tiny cameras, wireless access, and global positioning systems (GPS). All of these devices can identify people's locations and what they do within an organization.
3. *Biological data* are types of recognition including fingerprinting, and biometric devices that can scan and recognize faces and voices, which may be used to modify products or services in organizations.
4. *Public data* involve electronic devices that individuals use, such as sending e-mails or using instant messages, and public data being shared, stored, or purchased.
5. *Data that indicate personal preferences or intentions*: on the Internet can divulge individuals' priorities, what they like and dislike, and this valuable information can be sold to different quarters.

In short, critical information comes in and goes out of an organization through countless sources or directions. Thus, it can be dangerous to allow this sea of information to flow without having the ability to manage it and control it to obtain the utmost benefits for an organization. Managers and business professionals encounter the following factors that primarily emphasize the quality of support services business users may require: (a) performance; (b) system improvement; (c) maintenance; (d) training; (e) backing; (f) ease of access; (g) business reputation; (h) hardware; and (i) software. Other types of IS services required by an organization can be outsourced (e.g., '*system integrators*') (O'Brien & Marakas, 2006). They also added that IS maintenance is essential in all business operations because the system maintenance involves monitoring, assessing, and adapting operational business systems to accomplish desired improvements.

3. Fundamental Purposes and Roles of Information Systems

Individuals in organizations need information for a plethora of reasons (e.g., to develop solutions to problems, promote particular strategies or policies, and make appropriate decisions) and the dynamics of the system govern what information should be disseminated to whom and in what standard. In addition to solving problems and making decisions, organizations need ISs to support daily operations and activities. In other words, ISs serve diverse purposes intended to improve organizational performance, such as maintaining records, creating reports, promoting products and services, organizing budgets and finance issues, analyzing documents, and evaluating performance of individuals. According to Oz (2009), the use of ISs has become significant in organizations for a

plethora of reasons, some of which include: the rapid development of computers and their low prices, the fast-growing capacity of electronic devices with cheap prices, the array and creativity of computer programs are greater than before, the ease of access with which the Internet and Web pages become worldwide, the overwhelming majority of the global workforce can manage computers, and perhaps more importantly, organizations may be uncompetitive if they do not use ISs to accomplish their goals. Furthermore, ISs provide support to, control, and enhance all business functional areas (e.g., marketing, finance, HR, and accounting). However, technological factors, legal issues, languages, cultural factors, and economic and political paradigms remain critical challenges to all businesses that use ISs to support processes, strategies, and decision makers. In other words, effective management of ISs delivers fundamental challenges to business leaders.

The main purposes of any IS, regardless of the type of information that is applied, involve the ease to deliver relevant information to users, which enable them to recognize critical issues and allow them to add or create value to the information that already exists in the organization's system. Moreover, Thompson and Cats-Baril (2003) noted that a long-term IS plan typically answers vital matters, such as: Where does the organization stand? What does the organization want to achieve? What facilities are needed to obtain the desired output? What resources are needed to implement such systems? How long does it take to obtain results? Does the organization have the human capital required for executing an effective system? Thus, the concept of IS planning implies converting strategic and organizational efforts into systems development initiatives (Stair & Reynolds, 2008). Above and beyond, individuals in organizations should undertake particular roles with regard to ISs, such as trainers, facilitators, system developers, and records specialists. However, verifying whether organizational and IS goals are aligned is an enormous gap in IS literature that remains unidentified.

In business, the most valuable asset is not technology but, rather, an individual's mind (Haag & Cummings, 2010). Managers and business professionals may rely heavily on ISs, but they can rarely replace them because difficult problems call for human interference or judgment. With that said, the fast development of the Internet, intranets, extranets, and other global networks, limits our abilities to predict IS capabilities in organizations, and to what extent ISs could enhance business processes, and activities. Nonetheless, the fundamental roles of ISs were generally interpreted as follows: they support the organization's processes and operations; support decision-makers; and support an organization's strategies for sustainable growth, and development (O'Brien & Marakas, 2006). Most importantly, an IS should provide the right information to the right person in the right format at the right time. DuBrin (2006, 2009) thoroughly reported and synthesized the most indispensable factors and capacities of ISs in organizations as follows:

- Provide detailed accounts concerning the organization's sales.
- Enhance inventory management.
- Deliver a comprehensive report on employee turnover rates, absenteeism, and employee stress levels.
- Provide precise information about each departmental budget, manager, or region.
- Accumulate financial proportions periodically, and compare them to organizational standards.
- Synthesize production and operation control indices, and compare them from setting to another.
- Print out a synopsis of delayed or unpaid accounts related to goods or services obtained.
- Measure the return-on-investment (ROI) of cash excess by subsidiary.
- Make price comparisons for goods and services purchased in organizations.

Likewise, ISs are structured to fulfill one or more goals: (a) *infrastructure systems* offer services that are shared across the organization and its stakeholders. Some businesses are very modest in their infrastructures, while others make significant investments in infrastructure systems; (b) *transactional ISs* are developed to enhance operational efficiency and are often considered for containing costs and downsizing; (c) *informational ISs* are dedicated to informational and decision support and their purpose is to improve managerial effectiveness by allowing them to create better decisions; (d) *strategic ISs* are described as systems that are aligned to the organization's competitive strategy and for managing the structural changes of improvement systems (Thompson & Cats-Baril, 2003). To sum up briefly, an IS covers the following serviceable aspects that relate to a business and its environment:

- *Perception* is data entry whether captured or produced into the organization.
- *Recording* is physical capture of data.
- *Processing* is transformation depending on particular objectives of the organization.
- *Transmission* is the flow of information that takes place in an information system.
- *Storage* assumes anticipated future use.
- *Retrieval* is the search for stored data.
- *Presentation* is reporting, documenting, and communicating.
- *Decision making* is when the information system is connected to making decisions (Adeoti-Adekeye, 1997).

In a general view, ISs are considered necessary to make decisions and this can be made through the description or explanation of particular phenomena or events, recommend solutions, and ultimately assess current activities performed.

4. Challenges and Risks to Information Systems

Organizations encounter several serious challenges to information systems (e.g., technological aspects, economic and political trends, language differences when dealing with other nations, and employees' competencies in IT). Additionally, it is necessary to realize that ISs may not be easy to develop and be executed effectively because they are not all relevant for all processes or quandaries. Another major challenge is that managers may not be competent enough to identify what ISs can and cannot do, alongside with the difficulty to predict new technologies that may occur in the future. However, strategic information should be provided for all concerned managerial levels, which presents another challenge for most organizations in the current global economy. Perhaps the largest challenge is that ISs are susceptible to sabotage and viruses. Likewise, risks to hardware, data, and applications are considered large threats to organizations that do not plan for worst-case scenarios or create contingency plans. Employers should operate efficiently to thwart violations and threats to information systems, and repeatedly assess perils to information, and ISs. Finally, a lack of control over data security and integrity can lead to the invasion of individual rights to privacy. Therefore, Cunningham (2012) urged five 'generally accepted recordkeeping principles (GARPs) of integrity as follows: the employers' policies and procedures need to be accurate and complied with; inclusive training must be offered to those who interact with the system; the reliability of the data within the system must be taken into account; an audit trail for the system is required to test different documents effectively, and the algorithms, processes, and the computing milieu that act upon the data must be reliable.

5. Practical Implications for Leaders

Managers or business leaders should devote considerable time in particular issues associated with behavioral and managerial aspects and roles of ISs. Aside from this, it is crucial to develop some tactics that can align the IS and departmental goals to organizational strategies, goals, and vision. Business leaders should regularly manage, monitor, and control the development efforts of IS specialists to ensure that they can offer or develop novel applications of IT for the organization. Several questions need to be answered to ensure the positive contribution of ISs that achieve the objectives of an organization. These are: (1) What are the results of general control of IS auditing in enhancing the quality of information delivered by the system? (2) What is the role of general control of IS auditing in facilitating the adaptation of systems with the latest changes? (3) What are the effects of general control of IS auditing in containing the economic cost of such systems? By reviewing, and auditing all phases of the system, and validating appropriate control, the economic cost of the system can be reduced, and the quality of information provided by the system can be improved, thus, enhancing the system's capability to adapt to the latest changes, which lead to achieving the organization's objectives. As a word of caution, it is important to determine the present grade of the different parts of the technology applied and its level, and perhaps more importantly, the recognition of the entire business network because any hidden aspect might negatively affect the quality of such decisions. Another significant issue is that vendors and suppliers of hardware and software products provide various IS services to organizations. Therefore, business managers are required to fully

recognize their staff capabilities, network resources they use, and the types of information products they produce to make the best choice when purchasing such services.

Significantly, it is essential never to underrate or fail to recognize the significance of change management strategies and interventions necessary to accomplish particular goals. Above all, any scientific investigation concerning what adds to successful information technology execution and any endeavors at explanatory theory building need to begin with a rigorous analysis of the environmental aspects, as portrayed in the four actions:

1. Analysis of the business environment: What are the most dominant environmental factors?
2. Analysis of the IT plan: How can these environmental factors influence the particular IT plans?
3. Theory building: Why do the recognized factors affect the particular IT plans in this form?
4. Promising generalization of the theory: Who may benefit from these conclusions and where and when? (Roztocki & Weistroffer, 2011).

It was also recommended that a system could be effective in an organization if there is continuity between the legacy environments and proposed future activities (Wagner, Galliers & Scott, 2004). Another practical issue is that IS professionals should critically analyze the organizing vision and evolving configurations, to maximize their benefits from such a system (Aanestad, Henriksen & Pors, 2004). In conclusion, practitioners should realize that the IS field is affected by multiple disciplines (e.g., management and organizational studies, social sciences, computer sciences, and behavioral sciences). Korpela et al. (2004) noted that information, technology, system, communication, organization, and the individual are all important elements, but remain only elements without interpreting sufficiently which IS should take place. Consequently, several human factors should be taken into account, and efforts should be made to assess the fit between an individual and the used technology in the workplace.

6. Recommendations for Future Research

Organizations vary considerably in their level of IT focus; therefore, this offers great opportunities for researchers to investigate a plethora of critical issues related to the field. Another area of study could be related to drawbacks and new risks of IT programmes for best practices in organizations. Little research has been done in the area of IT investment behavior of corporations and the constituents that influence such behavior. Shark and Brady (2012) noted that almost no Chief Information Officer (CIO) or manager would argue that the most challenging issue of adopting new technologies is employee consent. Thus, employee acceptance of the use of new technologies and employee interaction with a new system can be investigated. The term IS in North America implies a system offering technology-based information and communication services in organizations; whereas in Europe, IS scholars rely more heavily on interpretive, and descriptive studies, and social and organizational topics regarding IS, to obtain in-depth understanding of the IS discipline (Mursu, 2002). Hence, comparative case studies regarding the field of IS, what it means, and how it can be applied in different socio-economic and cultural contexts would be another interesting research area. We also need to expand our level of understanding of the IS subject by including legal and economic factors involved in a system. Another intriguing area of research could be related to the level and the capacity of ISs in facing crises.

7. Contributions of the Paper

The contributions of this study are related to the IS field portrayed and interpreted here. Pozzebon (2004) mentioned that critical interpretive research is an emerging and valuable perspective on IS research. The main contribution of this paper is focused on knowledge sharing about ISs in organizations because of the misperception of the connotation and significance of ISs. Some users mistakenly conceive that ISs are only converting documents and paperwork in-to a digital dossier. The paradigm or the school of thought that was empowered in this paper is, thus, constructivism because of the fact that critical interpretive research is fundamentally constructivist. Academics can use the knowledge in this paper to compare or reflect their own research to other research. For practitioners, the author hopes that this paper can inspire them to improve their work tasks and provide practical notions that can be used to reflect on the output of their own work activities. However, Bell and Adam

(2004) acknowledged that IS is often described as a young field concerned with reflexivity between theory and practice.

Moreover, Lee (2004) argued: (a) ISs research is a product of ISs researchers; (b) ISs research itself is an objective reality; and (c) an IS researcher is a product of IS research. Following these arguments, this paper can serve individuals who attempt to comprehend, and analyze critical issues in IS. The author also believes that an extensive review of literature and discussions of the existing trends in IS can lead to better practices in organizations that employ such systems and stipulate those in doubt about IT investments. As a caveat, IS studies are indefinitely of great importance, whether exploring novel and creative trends or revising, integrating, and replicating other studies. Novel and creative ideas may add value to organizations that place great emphasis on technological matters and have the human capital required to interact with new systems, particularly in Western societies. Alternatively, integrative or revised literature might be useful to individuals who are skeptical about the use of technology in their work activities because it provides a large body of evidence about the value of implementing or investing in technology. Evidently, integrative theory development is a feasible strategy to construct truly exportable IS theory, despite being difficult and time-consuming (Rose, Lindgren, & Henfridsson, 2004). Briefly, the author argues that all types of IS research are needed, as they serve different purposes and individuals in different settings around the globe.

8. Conclusion

Every business needs a system perspective that reflects all ingredients of input and output and conversion process through control apparatus and feedback tools, an integration of decision-making processes, and consideration of the effects of every decision concerning discrete or unconnected areas. Apparently, the use of proper IS methods reflects the effectiveness and the efficiency of an organization's functions and affects its strategic direction. As discussed earlier, effective ISs contribute to organizational financial performance, increase the efficiency of operations, integrate related technologies across all organizational units, and enhance the overall performance of an organization. Nevertheless, development that arises continually in the IT field has led to the investigation of the controlling function and the value of the auditing system to ensure valuable and supportive information is delivered. Thus, auditors should excel in knowledge of computer informational systems for planning, consulting, controlling, and examining organizational performance. To this end, systems exist in private, public, small, large, economic, social, administrative, military, and commercial institutions; therefore, the author of this paper decided to explore the present reality of ISs and their effects on management performance.

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A Case Study on Kaizen as a Learning Tool for a Management Team

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Abstract
Management teams are often faced with the challenges of administrating kaizen due to the complex working system that is technical and social in its own respective role. These types of team have to defy the way of aligning kaizen with the organizational characteristic structure and the operational practice so that it serves the interests and benefits for all involved instead of being viewed as a burden of workload. Therefore, in order to maintain the discipline of having kaizen carried out as 'a continuous improvement in standard way of operation' there needs to be an actual purpose on utilizing its idea. A case study was applied on a management team practicing kaizen. The results were used as the outline for management teams to make the most of kaizen as a learning tool for better decision making, determining the distance for accomplishing objectives, and discerning the course of direction for the organization.

Keywords: Assessment, Change, Decision, Innovation, Improvement, Kaizen, Learning, Management Team, Problem Solving, System

1. Introduction

Kaizen is an event that captures the ongoing process for sustaining continuous improvement while at the same time producing viable information for management teams in learning how to assist their company or organization to become competitive in the long run (Glover et al., 2013). Management teams are interdependent of their fellow colleagues who have to set and execute the kaizen practical methods so that a better way is discovered, tested, and accepted; thus helping teams to know where there's a problem, to begin searching for solutions, preventing mistakes to be repeated, as well as capturing and retaining knowledge and expertise (May, 2006). However, in managing kaizen, teams are often faced with the challenges of administrating its complex system that is technical and social in its own respective role. Teams have to defy the way of aligning kaizen with the organizational characteristic structure and the operational practice so that it serves the interests and benefits for all involved (Magnier-Watanabe, 2011) instead of being viewed as a burden of workload. In addition, management teams have to be aware of the workplace dynamics to ensure that there is a collective morale otherwise there will be a systematic breakdown in collaboration and communication which could derail the objectives of establishing kaizen (Farris et al., 2008). To uphold the idea in practice, the team itself has to consider both the process and results so that the actions to achieve effects are evident. As a model for solving problems effectively and efficiently, relevant hard data must be gathered and made available for analysis – not just hunches and feelings so that the team can provide clear evidence for leading a culture of change and initiate constant changes for improvement (Al Smadi, 2009). They also have to see the whole process in order to avoid creating problems elsewhere and allow the re-examination of the assumptions that resulted in the current working process (Saleeshya, Raghuram, and Vamsi, 2012).

In this paper, the author asserts that in order for management teams to maintain the discipline of having kaizen carried out as 'a working system within a whole system' then there needs to be an actual purpose on the utilization of this tool. As a tool for teams to learn, the information that kaizen provides can best be employed for making decisions, assessing the resources for attaining the goal, and providing the rational for whether to support a particular idea or not (Van Aken et al., 2010). Previous studies have often discussed about the implications for making the procedures of kaizen lean towards maintaining an effective outcome standard (Oki, 2012). This brings about a tunnel vision in

managing kaizen instead of developing the paradigm of team members to become more innovative in utilizing kaizen for a long-term gain (Marin-Garcia, Garcia-Sabater and Bonavia ,2009). The aim of this study is to provide a framework for management teams to utilize kaizen as a learning tool for making decisions, assessing events, and determining the resolution for moving forward. Such a framework would enable a management team to come up with an ideal scheme to support their claim for a decisive action that had been based on the results of the kaizen events. In addition, it would help members of the management team to holistically reflect and set the next course for kaizen activities in becoming much more effective and efficient in attaining the stated objectives as well as helping to reach the goal.

2. Research Objective & Questions

The objective of this study is to provide a outline for management teams to make the most of kaizen activities by framing the results for better decision making, determining the distance for accomplishing objectives, and discerning the course of direction for the organization. The author of this work attempts to achieve this aim by first providing a case study of a management team already engaged in a company that supports the practice of kaizen and then offering a theoretical analysis for kaizen as a learning tool. To obtain the analysis the following questions have been raised.

1. *How can the results from the kaizen activities be employed for making decisions?*
2. *How can the results from the kaizen activities be employed for determining the distance for accomplishing objectives?*
3. *How can the results from the kaizen activities be employed for discerning the course of direction?*

3. Kaizen as a Learning Tool for a Management Team

Kaizen is a concept for continuously improving the standard way of operation in the workplace (Topuz and Arazan, 2013). The philosophy of kaizen is equivalent to the principles of quality control management, six sigma, and lean thinking where the practice is focused on eliminating problems and seeking for the best solution possible (Folinas and Ngosa, 2013; Ortiz, 2010). However, the strength of kaizen is the teaching on how to divide the processes and analyze them instead of solely concentrating on improving the process of production and marketing (quality control), or focusing on quality by rebuilding the processes in order to avoid reworking (six sigma), or converging on speed by cutting down on complexity, redundancy, and non-value added steps (Gil-Marques, and Moreno-Luzon, 2013; Ford, 2006). The uniqueness of kaizen is that it stimulates learning in the working process so that the staff can thoroughly examine and critically question the activities for performance (Emiliani, 2005), thus enabling the management team to gather information from the staff for doing a method analysis in improving production and reducing cost through the form of making decisions, measuring the distance towards goal achievement, and pondering for a new direction (Al-Tahat and Eteir, 2010).

3.1 Learning for making decisions

It's critical that decisions are made through the analysis of team who is assigned to seek out the problems in the system. For a management team it has to decide whether the system is effective enough for measuring the performance for finding areas of opportunity for improvement (Sua´rez-Barraza and Ramis-Pujol, 2010), otherwise the system needs to be redesigned so that the process ensures the support for performance and improvement. As a tool for continuous improvement, the team has to keep to the fact that kaizen will support the improvement of existing activities, but it will not provide the giant step forward (Strategic Direction, 2004). Therefore, decisions should remain on targeted objectives and determine the appropriate resources that will catalyze the process for an efficient and effective outcome. Nevertheless, even a management team anticipates on the collective effort of other staff members to make kaizen an ideal working model to support the organizational goal and objectives. Individuals that are part of a management team have to take the human element into consideration because a positive attitude towards problem-solving and being committed to improvement is highly critical in coordinating the practice of kaizen (Marksberry et al., 2010). But to keep these workers encouraged in probing for improvements and making suggestions the management

team has to decide how to manage the skills and talents of its organization's human resources so that kaizen becomes a discipline in itself instead of a fad (Titu, Oprean, and Grucel, 2010).

3.2 Learning for measuring the distance towards achieving a goal

According to Doolen (Doolen et al., 2008), *"positive attitudes at the conclusion of a successful event do not automatically translate to sustained performance improvement or employee enthusiasm"*. Doolen asserts that appropriate action should be taken to help bolster support for follow-on activity, particularly in the months following the event, when fellow kaizen team members may be struggling to engage the rest of their peers. Shang and Pheng (2013) view the challenges in the area of work scheduling and professional understanding in executing kaizen for a project. Based on their study, work scheduling can sometimes become compressed due to enormous pressure for delivering the results. Such a tight timeframe compromises the control in accurate practice of kaizen as workers take drastic measures to deliberately shorten the schedule while being deviant from seeking for improvement. Shang and Pheng believes that time should not overwhelm the drive towards quality. On the issue of professional understanding, the authors attest that a resolute behavior and mindset is significant in sustaining the morale for utilizing kaizen. Shang and Pheng highlight the need for team members to make kaizen a philosophical approach to develop one's capacity and capabilities so that they can set the aura for other colleagues to follow and learn. Farris (et al., 2008) believes that certain boundary conditions (e.g., cost, etc.) should be arranged and then giving the team a high degree of autonomy in deciding what solutions to implement, as long as those boundary conditions are met. This idea is for the purpose of being prevented from being hindered in taking the necessary actions to complete a task and not having to become overly stressful with the amount of available resources to be used for problem solving.

3.3 Learning for contemplating on a new direction

The idea of kaizen is to ensure that people of all levels in the organization are participating instead of leaving it to the management team to be held accountable for humanizing the workplace, eliminating hard work (both mental and physical), teaching people how to do rapid experiments using the scientific method, and learning how to see and eliminate waste in business processes (Lareau, 2003). The team has to steer the course for kaizen to make others embrace the culture to change and seek for changes in developing the production system, experimenting, and finding other innovative methods for continuous improvement (Glover et al., 2011). Efforts should be made to galvanize the benefits of implementing kaizen when participants are expressing appreciation in being given the opportunity to learn, attempting new techniques for working, and developing oneself through the activities without any feeling of an overload of work (Sandoval-Arzaga & Sua´rez-Barraza, 2010). In managing the kaizen process, the management team has to see whether there are values being received and that other workers have bought into the system. Khan (2011) points out that *one of the main vehicles for involving all employees in Kaizen is through the use of the suggestion system*. In his work, *the suggestion system does not always provide immediate economic payback, but is looked at as more of a morale booster*. Khan states that *morale can be improved through Kaizen activities because it gets everyone involved in solving problems*. The number of suggestions made by each worker is looked at as a reflection of the Kaizen efforts. Therefore, it is the goal of the team to come up with ways to help generate more suggestions by the workers (Khan, 2011).

4. Research Methodology

4.1 A Case Study of President Food's Management Team Supporting Kaizen

The work investigated the background of a management team being in charge of managing quality assurance by employing kaizen at President Food. The team was bestowed by the President Food Company to manage the kaizen events and was requested to meet the following seven objectives for continuous improvement:

- Reducing the cost of production.
- Decreasing the amount of materials being used.

- Increasing the rate of production.
- Improving safety at work.
- Saving energy.
- Limiting the procedures for work performance.
- Improving quality.

This management team is composed of a team leader and four supporting staff members who are individually assigned to look after the issues of production, operation, warehouse, quality control, and safety. The management team has implemented kaizen as a form of a suggestion system. The idea is to encourage employees of all level to take an initiative in applying their judgments and working performance as a tool for seeking continuous improvement in quality that would provide benefit for the company. The frame of the kaizen suggestion system is a bottom-up approach that triggers a sense of duty for all workers that are taking part in the continuous improvement activities. Also, the belief is that the system will lead the way to higher productivity. The management team has set the number at a minimum of 555 kaizen cases reported on an annual basis for the purpose of upholding standards and beyond excellence.

Interviews were made with team members to inquire about the administration of the kaizen activities. Observation was made on how kaizen was applied as a system to detect for any operational errors or mistakes so that problems don't become out of control. Documentation was done to assess the recorded kaizen events and then asked to the managers on the next step for action to take with the results at hand. The conceptual approach for obtaining the analysis of this study is depicted below.

Figure 1. Making decisions, measuring the distance, and contemplating the direction through kaizen events.

According to the figure above, the study uses the idea of how decisions are made, how the distance is measured, and how the direction can be contemplated through the activities of kaizen. Each of the ideas examines the case and addresses its own issues for providing in-depth information towards the concept of this work.

4.2 Making Decisions through Kaizen

With the results provided on a yearly format from the kaizen activities, the management team frames the problem to decide how the issue should be handled. When members of the team identify the impact of the problem they would dispatch it to the right personnel for solving it. Based on the interview with the production manager he proclaimed that "*problems occurring at the critical level are sent to staff with a high level of expertise to handle all matters*. *Problems taking place at the fundamental level would require a group of workers to make a diverse analysis to solve the situation. Problems that are happening at the simple level call for workers to be self-empowered to handle the case. The management team has to decide whether the problem pertains to the subject of waste in production*". The production manager also stated that *"the team has to be mindful of eliminating or reducing the amount of waste in operation capacity so that the company's production can run its full course in an efficient and effective manner*".

For every result from the kaizen events the team has to create a report that elaborates the problems discovered in waste production. The management team has to determine whether the problem was due to an error in manufacturing, excessive production, lack of efficiency in assembling parts, overstocking the warehouse, delivering below the target the number, unnecessary maintenance, or idleness during working operation. In following up the report they have to make an assessment of the working environment and decide if the working system or operational framework needs to be revamped. If the working system needs to be changed then they have to ensure that the alterations will be aimed towards making waste production scant while also ensuring that the kaizen activities don't become interrupted. There was a case example provided by the quality control manager on deciding what is best for quality assurance through experimentation. According to his statement from the interview he said that "*in this situation, the management team had to decide what to do on increasing the production of dried noodles through a series of testing*". Furthermore, he said that "*while procuring the resources for making dried noodles, the production staff had noticed that some of the finished product was not qualified for packaging. Upon examination, some parts of the dried noodles were not fully cooked and had to be discarded thus making the volume of these goods to be reproduced with the right size for wrapping. The production staff identified the issue as amplifying the rate of operation and reducing the cost of materials used. The staff suggested on bringing the under qualified samples for thorough investigation to see what are the correct resources, temperature, and operation time so that all of the outcome will be highly qualified for packaging. The management team decided to comply with the suggestion since it was a concept towards reducing waste by fixing the error in production and meeting the target number*". In the quality manager's view with the decision to let the production staff perform the experiment, "*the management team experienced a fortunate outcome by seeing the manufacturing rate and quality of dried noodles to be at a top level*". At times, the management team had been given many suggestions from other staffs such as dealing with the issue of quality control. However, not all suggestions have been given the confirmation to do some testing due to time and resources. With regards to the team leader he alleged that in order "*to keep the morale of the staff in carrying out the kaizen events, the management team does provide absolute interest and attention to ensure that the company as a whole appreciates the effort in maintaining the discipline*".

4.3 Measuring the Distance through Kaizen

The management team has to keep abreast with the activities of kaizen to ensure that it is actually supporting the intended outcome; otherwise it could become an extra burden of work that is micromanaging the staff's skills and abilities to perform. From the interview with the team leader, he has to "*keep asking his team members on a monthly basis on whether or not the cost of operation is below the desired status*". The team leader stated that "*if the expense figures aren't quite impressive then the management team has to ask the staff to re-evaluate the method of applying kaizen*". In addition, he proclaimed that "*the staff is also inquired to review the approach to see if it is really producing any positive gains for the purpose of making some adjustments*". In his view, "*the management team needs something that can be measured so that kaizen is truly demonstrating the philosophy of continuous improvement and not just empty promises*". There was an illustrated case by the operation manager where "*a staff of the maintenance had noticed a leak in a water tank that serves as part of the equipment for the production facility*".

Figure 2. Reducing cost of operation by recycling water.

According to figure 2, the worker identified this as an issue for reducing the cost of production. With regards to the operation manager's knowledge he said that "*while making an inspection round the production facility, the individual noticed that there was so much water dripping from the water tank and onto the balcony on a daily basis. In his mind, he thought that it would be a good idea to see that water reused for other purpose rather than being left to waste. So he took an initiative to do a study on how to use this recycled water. His process of implementation began with collecting data and conducting a test. This was done by measuring the amount of water that's equal to 100 liters; collection was done on an hourly basis which produced up to 1,600 liters per day. He discovered a high dosage of condensation in the water and that the experiment provided some valuable information. Upon bringing the water for laboratory analysis to see if there are any germs or parasites the results were negative, thus allowing him to bring the sample to the production site for application*". The operation manager also stated that *the water was used for washing the utensils, tanks, trays, baskets and cleaning equipment of the production line. It was also used for steaming and cooling dried goods. The cleaners used the water for cleaning the glass, office corridors, floors, and bathroom. While the results of the application were astonishing, most importantly, the management team was pleased to learn that the recycled water helped managed to cut down the cost of using fresh water on the day to day cleaning operation*".

4.4 Contemplating the Direction through Kaizen

The management team has to assure that kaizen activities are aimed towards the benefits for the staff involved. The team needs to see that kaizen is a positive way to work and that it is encouraging people to take on an innovative approach when dealing with problems. Also, from the perception of the team leader he believed that "*it's essential that the team sees the staff embracing the philosophy due to the gains being witnessed from implementing the concept*". The management team evaluates the following criteria to make sure kaizen provides a spontaneous growth for improvement:

- There is an efficient use of time to increase the rate of production.
- Staff and individual workers are constantly finding innovative ways of using resources for other purpose.
- Working conditions have been created to maintain the well-being, health, and safety of all employees.
- The working system supports the workers to complete their tasks with credible results.
- Assignments have become much more convenient and quicker to perform.
- Awareness has been developed that the workplace and the working environment is committed to safety.
- Equipments and materials are properly organized and easy to access.
- Waste in production and material costs are properly managed for positive results.

Under the notion that the working system is only as efficient as the behaviors that are applied, the management team encourages individual workers to come up with new ideas that will make their tasks much more manageable. From an interview with the safety manager he provided a case example at the oil packaging station where "*workers were required to find solutions that would make their assignments expedient towards their role and duties so that their physical capacity does not become quickly depleted over time*". He affirmed that "*there had been an ongoing case where workers often struggled to make their rounds of delivering crates of oil to be packaged*".

Figure 3. Redesigning the pushcart for convenience.

In the figure above, workers had to use a lot of raw force in pushing the cart of crates full of oil to be delivered for packaging. The safety manager said that "*while they are making an effort to keep up with the schedule it exposed the workers into a wear and tear of the muscle, thus rendering the physical capability of the workers to continue on carrying out the task*". He claimed that "*with kaizen creating the conditions for seeking improvement, workers and staff analyzed the way on how the tasks were being performed with the pushcart and to see what can be done to ease the burden*". Upon assessment, the safety manager contended that the "*workers and staff decided to revamp the working procedures to become more ergonomic friendly. The original pushcart was replaced with a four wheeled cart to make the process of delivering the crates much more easily*". According to the safety manager, "*this innovative attitude enabled the workers to be in much more control of their assignments and highly confident in their performance*". Moreover, from his point of view, "*workers at the oil packaging station praised the change as an idea that prevents them from being injured at work and without getting into an accident*". With regards to this event, the team leader was pleased to learn that "*the morale of workers was boosted as they became further productive in arranging the crates of oil to be ready for packaging on schedule*". What's more, the team leader asserted that "*with the positive results the workers and staff continued to work in tandem as the eyes and ears for kaizen activities*".

5. Discussion

Kaizen should be utilized as the means toward assisting the company or organization to reach its goal and objectives by dealing with the facts and analyzing them for appropriate action. For example, in a case study done by Miller, Pawloski, and Standridge (2010) on a small furniture company trying to eliminate waste kaizen was applied as a learning event to find the cause of the overflow of trash. This led the operations manager to mandate that *all solid waste be collected in a*

central location prior to disposal each morning. The operations manager and several other system managers began a process of sifting and sorting through up to eight-0.88 cubic yard hoppers each morning after their daily start-up meeting for approximately twenty working days. A brief analysis led to the development of a process map for the development of a robust recycling program. The managers *identified that approximately 1.75 dumpsters per day (1.54 cubic yards) could be diverted from the company's solid waste stream to recycling*. The event led on to establish a recycling project within the company (Miller, Pawloski, and Standridge, 2010). For kaizen activities to bring about positive results the alignment of a structure, strategy, system as well as with the shared values of staff members must be in place, otherwise it will be seen as an extra burden that could be viewed as complicated and stressful for employees to carry out. According to an experimental study done by Dickson and his colleagues (2009) at a hospital, they explained that *few people in the health care industry are trained and experienced in process improvement methodologies*; unlike in manufacturing *the process improvement techniques are considered core competencies*. The authors of this work also asserted that there was *a lack of goal congruence between physicians and hospitals due to the separation between hospital and physician payment*. Lastly, *despite the advances made in patient-driven health care delivery, hospitals fear that shifting the focus to the patient experience will be perceived as shifting the focus away from the physicians and lead to a swing in admissions to "physician-centered" hospitals* (Dickson, et. al, 2009). Therefore, the implementation of kaizen must be flexible and reasonable enough in that cultural working environment to make the role and duties of staff and workers coordinated to achieve the outcome. Otherwise the good intentions of implementing kaizen can cause an affliction and resentment among personnel.

With the aim of configuring kaizen as a learning tool, members have to demonstrate the self-discipline upon each other and as an example for fellow colleagues to follow in order to make kaizen inevitable in the long term (Aoki, 2008). The practices on part of the management team have to be reassessed in order to confirm that everyone is taking a moral initiative in making kaizen activities indispensable; this would create the conditions for constantly acquiring information from its staff for making sound decision to alleviate costs, measuring to see if results are supporting the objectives, and determining whether the outcome has contributed to the well-being of the entire people in the company. The practices applied should provide a great deal of benefit towards the vision and mission of the organization while being mindful of employees' health and spirit as they take part in the collaborative process. All staff and workers are to be considered as partners in making a collaborative effort with the management team. This was a case at the Virginia Mason Medical Center in Seattle, WA, USA trying to execute continuous improvement in patient care as a long-term mission by implementing the concept of the Toyota Production System model. With the idea that patients should receive the utmost quality in treatment the medical center's planning team worked in tandem with the architect, patients, and staffing representative staffers to design a workflow that was ideal and convenient. However, even the final layout brought about more inquiries on structural procedure and effective performance towards providing quality care. While it was clear that the Virginia Mason Production System is all about reducing waste and minimizing any unnecessary burdens on patients some unpopular changes as well as sacrifices had to be made if the medical center truly intends to raise its standard (Weber, 2006). Although there may be compromises along the process, the management team must create the perception to win the hearts and minds of the people taking part in the kaizen activities. Therefore, those who preach the importance of kaizen should also be receptive in being taught by others who seek for greater improvement. This conviction has to exhibit the facts and have colleagues engaged in a dialogue to determine the extent of value in conducting the kaizen events. Otherwise, according to Shang and Peng (2013), "*if people do not look at problems as opportunities for building a better problem solving system, then they will simply take the shortest path to removing the symptom. Regardless of how much professional know-how and skills they might possess, such wrong behavior can prevent all progress*". As a learning tool for a management team, even kaizen and the results from its activities are never the absolute truth for team members to make that critical decision, measuring the distance, or determining the next direction. What is seen at the instant will always be different in the next moment in time. While

there are experts in certain areas to provide analysis on problems that are foreseen it is vital that communication among the departmental staff is interacted upon. A case study on Boeing by Modarress and his associates (2005) points out that "*the key to success in the implementation depends on close cooperation between work cell team members and management*". The work indicated that the metrics were developed as the guidelines for targets to be achieved, as well as meeting the groups' expectations. In such a business culture where the outcome of a project has to be standardized because the peoples' lives are at stake, the metrics established are for "*holding workers accountable*". Furthermore, *"all elements related to these metrics and processes must be understood and accepted by all parties involved, otherwise none of it will be of any use as people will not follow them, trust them, or use them*" (Modarress, et. al., 2005). Everyone needs to know what the other person has distinguished so that a framework can be quickly drawn to obtain solutions in a problem. Nevertheless, the fact remains is that change will always occur and the team has to make the necessary changes in order to sustain the organization's competitiveness in the near future. While the staff and employees are requested to be disciplined in the matter, it is the management team that has to maintain a very strict demeanor for kaizen activities to keep on flourishing (Yokozawa and Steenhuis, 2013). The management team has to be innovative in what they're learning so that they don't get caught up in managing kaizen events as a form of bureaucracy. Things have to be done and thought about differently with experimentation and reflection serving as the catalysts for preserving the kaizen discipline. To keep getting closer to the truth of the matter each member of the team has to install their inner kaizen conscience to make the kaizen activities a benefit for all in the organization.

6. Conclusion

This study used a case study of a management team at a company that had already incorporated kaizen at the workplace. The activities and events of kaizen were configured as a learning tool for a management team. As a form of a learning tool, the work presented as a way for the outcome to be employed for making decisions, determining the distance for accomplishing objectives, and discerning the course of direction. However, in order for an ideal system such as kaizen to work within a system the practical side must be lead with a proper support for innovation, change, experimentation, communication and learning for continuous improvement. The facts can only be presented if human behavior and performance are committed in making kaizen as a way of working and organizational development. From the researcher's perspective, kaizen is a theory chosen to assist individuals who are working as a collaborative or cooperative group to reach the stated objectives. With this view, although kaizen will not help managerial teams to become 100% perfect in reaching their aim it does prevent team members from developing hubris and enables them to become more innovative and challenging in searching for better ways of working while working together with others. Because that is the only way a managerial team can help its organization, institution, or even an establishment to strive in the long-term.

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Predicting Student College Completion Intention: A Discriminant Analysis

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Abstract
Many universities are dealing with problems concerning the graduation of their students. Using discriminant analysis, a model was developed to predict students' college completion intention. The constructs of perceived institutional support, academic self-efficacy, classroom learning environment, and social support are examined as predictors that discriminate between students with low, moderate, and high levels of intention to complete college. Results indicate that students with low, moderate, or high intention to complete college can be discriminated from each other based on their perception of institutional support and their perception of their academic self-efficacy. Implications for universities are discussed.

Keywords: college completion intention, discriminant analysis

1. Introduction

In many parts of the world graduation rates are poor. The Organization for Economic Co-Operation and Development (OECD) conducted a survey amongst its 27 member countries and found that only 39% of women and 25% of men who choose to attend college are able to complete their bachelor's degree before age 30 (OECD, 2011). Results such as these raise questions as to what is contributing to so many people not completing college. One element in the problem with graduating from college could be the student's intention to finish college as intention is a powerful predictor of behavior (Ajzen, 1991). Prior studies have examined the intention of students to drop out of college (Bean, 1983; Cabrera, Nora, & Castaneda, 1992; Tinto 1975). For educational administrators, the drop out intentions of students has significant implications in regards to the success of tertiary institutions of higher learning.

The challenges administrators are facing in regard to students dropping out of college are often connected to such problems as school quality and student quality (Bound, Lovenheim, & Turner, 2010; Spradlin, Rutkowski, Burroughs, & Lang, 2010). Another common contributor to dropping out of college is a mismatch in the ability of the student in comparison to the college they attend (Light & Strayer, 2000). In the context of ASEAN, universities are facing such challenges as high gender disparities and a lack of preparation for the study of the sciences (Sittichai, Tongkumchum, & McNeil, 2009; UNESCO, 2014). There are still questions left unanswered about students and their intention to complete college.

Little attention has been given to examining factors that influences a student's intention to complete college. Despite the problems, students are still completing school. What is contributing to the success of students? How are the perceptions of completing college different between those who have a high intention to complete versus those with a lower intention? Understanding the differences between students with low, moderate, and high levels of intention to complete college can serve as information for making necessary reforms for low intention students as well as helping to understand why some students have high intention to complete college. Such knowledge as this can serve to help schools to identify students who are at-risk of discontinuing their studies before finishing.

The Philippines is facing the unique challenge of shifting from a K-10 educational system to K-12 (Flores, 2013). This is leading to major changes in higher education as curriculum that was once taught at the collegiate level is being brought down into high school. There is a great deal of controversy over the pros and cons of adding an addition two years to the time young people spend as students (Philippine Institute of Development Studies, 2012). With this shakeup, there may be shifts in the students' perception of college and completing their studies. Understanding current trends in perception of completing college could be of value to leadership as the country faces this significant transition.

This study investigates undergraduate student's perception of the following: classroom learning environment, academic self-efficacy, institutional support, and social support and there viability in predicting a student's low, moderate, or high intention and to complete college. The purpose of this study is to explain the characteristics of each level of intention, to determine which variables are appropriate discriminate variables for college completion intention. An understanding of this could help students to complete college by comprehending in a fuller way their intention.

The research questions for this study are as follows.

Research Question 1: Can the level of a student's college completion intention (high, moderate, and low) by differentiated based on variables that have been associated with influencing college completion intention?

Research Question 2: How do the perceptions of the member of each group differ in regard to their responses to the questions pertaining to each construct?

Developing answers to these questions will help educational administrators to be able to identify students with low intention to complete college and to intervene through providing services that these students indicate they need from their responses to the instrument of this study. Failure to complete college leads to a large host of social, financial, and psychological ramifications (Higon & Stoneman, 2011; Hughes, 2007; Newman & Newman, 2012). As such, investigating the perceptions of the respondents will provide indicators of some of the impediments to completing college as well as what is working to help students.

Aim of the Study

The aim of this study is to differentiate amongst student with low, moderate, and high levels of college completion intention by the following discriminate variables classroom learning environment, perceived institutional support, social support, and academic self-efficacy. The proposed model will be tested using discriminant analysis.

2. Theoretical framework

Intention is closely related to motivation (Schunk, 2012). As such a decision needed to be made interm of using intention or motivation for this study. One of the many advantages of the theory of planned behavior, which explains intention, over theories invloving motivation is the inclusion of social influences in the model of the former. Within the theory of planned behavior the constructs of subjective norms and normative beliefs are included in the model (Ajzen, 1991). This is in contrast to the expectancy-value theory of achievement motivation, which has no direct inclusion of constructs that deal with social influences (Schunk, 2012).

Another difference is that the theory of planned behavior includes perceived behavioral control while theories of motivation often include self-efficacy. Perceived behavioral control is considered a broader construct, which includes self-efficacy within it as well as perceptions of controllability (Ajzen, 2002). Self-efficacy on the other hand, addresses only the individual perception of their capability to perform actions (Schunk, 2012). Therefore, the theory of planned behavior provides a different framework in which to assess the phenomena of college completion intention.

Theory of planned behavior

Intention is defined as the motivators that lead to a behavior or action (Ajzen, 1991). Ajzen (1991) identified seven factors that contribute to intention: attitude towards the behavior, perceived behavioral control, subjective norms, control beliefs, normative beliefs, behavioral beliefs, and actual behavioral control. Several studies have confirmed that these factors influence intention and effect behavior (Latimer & Ginis, 2005; Kargar, Tarmizia, & Bayata, 2010). This theory explains intention in general and can be used to explain specific intentions such as the completion of college.

Attitude towards the behavior is defined as what an individual thinks about a behavior (Ajzen, 1991). Individuals who associate positive feelings with an action are more likely to commit to performing the behavior (Al-Rafee & Cronan, 2006). Perceived behavioral control is the ease or challenge of performing a certain action (Ajzen, 1991). If the task of completing college is too difficult students will have a lower intention. In contrast, if students think graduating from college is too easy it will also lower their intention to complete. However, if the student considers the challenge of completing college as moderately difficult their intention to complete will be strongest (Schunk, 2012). Subjective norms are the social pressures applied to a person to perform a behavior (Ajzen, 1991). This pressure can come from any person an individual knows. Control beliefs are the factors that could encourage or discourage a behavior as perceived by the individual (Ajzen & Driver, 1991).

Normative beliefs are a person's perception of the beliefs of the members of their social network (Davis, Ajzen, Saunders, & Williams, 2002). If the students believes that their social network does not value higher education this could lower their intention to complete university. Behavioral beliefs are the subjective conviction that a certain course of action will lead to some sort of consequence (Ajzen, 1991). If the consequence is unpleasant intention is low but if the consequence brings pleasure then intention should be higher. Often it is the perception of the reward and not the reward itself that raises intentions (Schunk, 2012). If a student just believes that graduating college is wonderful it may raise their intention. Actual behavioral control is the skills an individual has to perform a behavior (Ajzen, 1991). Some of the skills needed for completing college included the ability to process information and self-regulate (Schunk, 2012).

College completion intention

College completion intention is defined as the likelihood that a student will make the choice to complete their degree (Mallinckrodt, 1988). There is little extant literature on college completion intention. Therefore, there is a pressing need to further analyze the success of students rather than their failure. This may give schools clues as to how to help students complete college and may help to support them in their mission of not only retaining students but also helping them achieve college completion. In addition, understanding what forms of instructional methods enhance the environment of learning can be useful in helping teachers in other contexts to know what may work for them in order to improve their own learning environment and perhaps increase the intention of their students to complete college.

In order to understand this construct, literature from dropout intention was used as this is a related but different construct. Groundbreaking studies on college dropout intention have been conducted by Tinto (1975) and Bean (1980, 1983). Tinto (1975) found that there is relationship between a student's commitment to their goals and the institutions commitment to the student. This relationship between the student and school may influence a student's dropout intention. Bean (1980, 1983) concluded that commitment from the student in combination with their campus-wide experiences influences dropout intention. Cabrera et al. (1992) combined Tinto (1975) and Bean's (1980, 1983) models into one. Cabrera et al. (1992) found that these two models of drop out had a great deal in common. Both models are providing a macro-level perspective of the student's dropout intention without examining the micro-level perspective of the experience of the classroom. This study provides students with a chance to voice their perceptions of not only the larger school but also their experience with their teachers inside the classroom.

Academic self-efficacy

Academic self-efficacy is defined as the measurable belief that a person has that they have the ability to accomplish various tasks related to school (Bandura, 1986). Bandura (1977) identified four components of self-efficacy, vicarious experience, emotional state, mastery experience, and social persuasion. People are able to develop self-efficacy through observing others or vicariously (Sigelman & Rider, 2012) and this ability to learn and develop confidence through seeing others performing a task is consistent with social cognitive behavior (Bandura, 1989). The emotions of a person also can influence their confidence to carry out different task. Cartoni, Minganti, and Zelli (2005) concluded that anxiety impacts self-efficacy adversely. Another study found that students who received verbal encouragement from peers had a higher sense of academic self-efficacy in comparison to students who did not receive such positive verbal support from fellow students (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996).

In education, few studies have examined the direct relationship between self-efficacy and college completion intention. Typically, self-efficacy is studied through its affect on academic achievement (Lane et al., 2004). Bandura (1993) states that a student's perception of their self-efficacy influences their academic success. Academic performance is often a precursor to college completion (Tinto, 1975). Therefore, academic self-efficacy may be an appropriate discriminating variable of college completion intention.

Social support

Social support is defined as the positive relationships that individuals have with one another through which they help each other (Dressler, 1991; Kim, 2010). Students who received encouragement from peers will often have a corresponding change in their GPA (Jacobson & Burdal, 2012; Witkow & Fuligni, 2011). Providing student with the resources they need for their academic success, such as feedback on assignments, is a form of practical social support (Roberts & Lunds, 2007). Students often need advice and counsel about various aspects of the university experience and this information that is provided by friends and teachers in the educational setting is a form of informational social support (Palloff & Pratt, 2003; Robert & Lunds, 2007).

Based on the studies of the preceding paragraph, a student's belief about the social support they receive could provide insights into predicting their level of college completion intention. Understanding the significance of this variable will help to explain what is happening at tertiary schools in a way that is beneficial to administrators and students. Indeed, one unique challenge of colleges in ASEAN is developing ways to strengthen social support through developing a stronger relationship between universities and the home of students (UNESCO, 2014).

Classroom learning environment

The classroom learning environment is characterized as the physical, social, intellectual, and instructional setting of a students learning (Liou, 2010). Fraser, McRobbie, and Fisher (1996) state that there are seven characteristics of the classroom environment investigation, cooperation, teacher support, equity, task orientation, involvement and social cohesiveness In addition, students who received support from the teacher often see a corresponding change in their academic achievement (Elias & Haynes, 2008). Another component is equity, which means equal treatment for all students. Alvarez and Mehan (2006) found in their study that students who are treated fairly have a higher likelihood to go to college and perhaps a higher intention to complete college.

Studies indicate that the classroom environment has an influence on intention to complete college. Bean (2005) states that an instructional approach that maintains the interest of the students is important in establishing a positive classroom environment. Relevant, student-centered learning is also important in shaping the environment of the classroom, which impacts college completion (Karp et. al, 2012). One component of the classroom environment is social cohesiveness, which relates to Tinto's (1975) idea of social integration, which is a part of his model of student retention. In ASEAN, some countries struggle with overcrowding in the classroom, which as a negative influence on the classroom environment as the teacher is unable to provide adequate academic support to all of the students (Maligalig, Caoli-Rodriguez, Martinez, & Cuevas, 2010).

Fraser et. al's (1996) contribution has significance in assessing classroom experience. However, this construct may have never been applied to understanding the intentions of students concerning completing graduation. Administrators can use this knowledge in understanding what kind of classroom experiences they need to provide their students. An experience of engagement with supporting teachers through the influence of leadership is highly likely to improve students intentions to complete college.

Perceived institutional support

Perceived institutional support is defined as the perception a student has that his institution of study cares about him (Eisenberger, Huntington, Hutchison, & Sowa, 1986). The construct of institutional support is based on organizational support theory and organizational support theory is derived from the norm of reciprocity and social exchange theory (Eisenberger et al., 1986; Gouldner, 1960; Homans, 1961). Organizational support theory states that a person will give human-like characteristics to an organization and that a person will reciprocate the treatment it receives from an organization (Aselage & Eisenberger, 2003; Eisenberger et al., 1986).

Studies indicate that educational institutions need to offer support for the social and emotional needs of their students and this may influence a student's desire to complete college (Lan Rong & Preissle, 2009; Walsh, Larsen, & Perry, 2009). In other words, schools need to have concerns for their students beyond the classroom and the experiences that happen in them. Since the inclusion of social and emotional components are important. The construct of institutional support may provide appropriate discrimination of student's college completion intention.

Institutional efforts to improve college completion include mentoring/advising and the use of learning communities (Spradlin, Rutkowski, Burroughs, & Lang, 2010). In addition, schools that make a commitment to integrating students academically were able to improve retention rates and thus completion of college (Gansemer-Topf & Schuh, 2006). Such strategies have made a difference in helping students. However, the overall success of such approaches is substandard. The reason for this assessment is due to the low overall graduation rate of universities. Something more needs to be done to help students.

Figure 1 shows the conceptual framework of this study and depicts the relationships amongst the constructs. Social support, perceived institutional support, academic self-efficacy, and classroom learning environment are the discriminating variables that may predict high, medium, and low levels of college completion intention in this study.

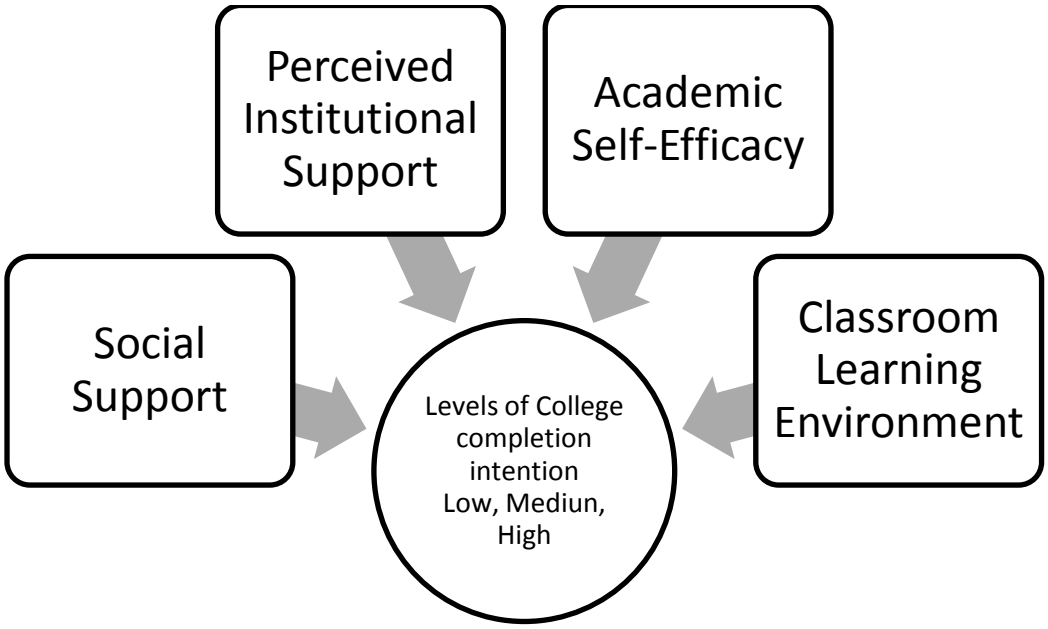

Figure 1
Conceptual Framework

3. Method

Research Design

This quantitative study utilized a discriminate analysis to determine the level of college completion intention of the sample population. A cross-sectional survey design was chosen in order to develop an understanding of a population's perceptions about a concept at a given moment in time (Jacobsen, 2008). In addition, in this study, simple random sampling was used for data collection. The Lickert question were measured on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).The five variables employed in this study were college completion intention, academic self-efficacy, perceived institutional support, classroom learning environment, and social support.

Participants and procedures

In this study, 262 undergraduate students from four universities, all located within the Philippines, completed the questionnaire. The original size of the sample was 285. However, 23 respondents were identified as outliers through the analysis of box plots and were removed from the study. Table 1 provides the number of participants by school.

Table 1
Participants by School

School	Frequency	Percent
A	91	35%
B	95	36%
C	54	21%
D	22	8%
Total	262	100%

Among the participants, 67% were female compared to 33% for men. The results for gender are imbalanced but are consistent for the region of study. For example, in the Philippines, 61% of college students are women and 39% are men (Quismundo, 2012). Table 2 provides a breakdown of gender by academic standing. The academic standing of the participants showed better proportions. However, there was a decline in the number of representatives at the academic level of senior with only 11% of the sample coming from this class. This is typical of four-year graduation rates as there is normally a declined in the number of seniors as students transfer and or dropout of their studies (Radford, Berkner, Wheeless, & Shepherd, 2010).

Table 2
Academic Standing and Gender

Academic standing	Male	Female	Total
Freshman	9%	22%	31%
Sophomore	12%	19%	31%
Junior	7%	20%	27%
Senior	5%	6%	11%
Total	33%	67%	100%

A survey that consisted of questions pertaining to the five variables of this study was administered and collected from the respondents. Students were informed of the purpose of this study and invited to participate in it. They were instructed to read the directions on the first page of the instrument and to select the answer they most agree with for each questions. Once they had completed the scale students left the survey with the data collection agent.

Research Instrument

The Lickert questions pertaining to institutional support were adapted from Eisenberger et al.'s (1986) scale on organizational support. Sample questions for this scale include "My college respects my choices" and "I feel I am a part of the college community." The exploratory factor analysis of the pilot study reduced the number of question to 12 and this single factor was able to explain 67% of the variance. The Cronbach Alpha for the modified scale was 0.95.

The Likert questions addressing academic self-efficacy were adapted from Owen and Froman's (1988) academic self-efficacy scale. Examples from the scale include "I understand most ideas presented to me in class" and "I can participate in small discussion." The number of questions was reduced to 11 during the exploratory factor analysis. This one factor was able to account for 69% of the variance. The Cronbach Alpha for the modified 11-item scale was 0.95.

The scale that assesses social support in this study was developed by the researcher based on extant literature. The scale has eight items. Two sample questions from this scale are "When I have a problem in college I can talk to my friends about what to do" and "The relationships I have with my college friends are good." The factor analysis of the pilot study revealed one factor that explained 57% of the variance. The Cronbach Alpha for this scale was 0.88.

The scale used to assess the classroom learning environment was adapted from Fraser et al.'s (1996) scale. Sample questions of this scale were "I know how much work I have to do" and "The teacher's questions help me to understand." The factor analysis of the pilot study indicated a 13-item factor was able to account for 50% of the variance. The Cronbach Alpha for the modified scale was 0.91.

The college completion scale used in this study was also developed by the researcher. This scale has eight items. Sample questions from the instrument include "Completing college is a positive experience for me" and "The college I study at is encouraging me to graduate." The pilot study revealed an eight question factor that explained 57% of the variance. The Cronbach Alpha for this scale was 0.93.

Data Analysis

This study uses discriminant analysis. This method is used to determine whether or not a set of variables discriminates between two or more groups. This analysis produces a discriminant function coefficient for each of the predicting variables that are included in this study. This function also indicates the importance of each variable. In addition, the coefficients are standardized in order to remove the effects of differing means and standard deviations. The signs of the coefficients in a discriminant analysis have no special meaning. This is because the dependent variable, college completion intention, is treated as a nominal variable, and positive or negative associations have no meaning in such circumstances.

4. Results

In this study, discriminant analysis was used to determine whether undergraduate students college completion intention could be distinguished and classified based on the independent variables that are known to relate to college completion intention. The three categories of college completion intention constituting the criterion measure were based on the average of the students' responses to the statements pertaining to college completion intention on the questionnaire. The groups, as determined by their averages, were low (0 < 4.5), moderate (4.51 < 4.87), and high (4.88 < 5). In this sample, 26% of the respondents were assigned to the low group, 32% to the moderate group, and 42% to the high group. Table 3 provides a summary of the classification results.

The step-wise discriminant procedure indicated one significant canonical discriminant function (eigenvalue = 0.321; canonical correlation = 0.493; Wilk's lambda = 0.798), $x^2(4, N = 262) = 75.23$, $p = .000$. This indicates that the three levels of college completion intention are significantly different on only one of the two possible dimensions represented in the discriminating variables. The correct classification percentage for this discriminant function was 55%. This classification percentage is higher in comparison to the classification percentage if the participants had been randomly assigned (35%). The higher classification percentage of the discriminant function is a 30% reduction in the error proportion. The correct classification percentage by group was as follows 49% for the low group, 25% for the moderate group and 80% for the high group. The results for the moderate group are low and indicate that there was difficulty in discriminating this group from the others with the current set of variables. The linear function represented by the variables in the stepwise procedure including their standardized canonical discriminate function coefficients, indicated two discriminating variables, institutional support (.84) and academic self-efficacy (.47).

Table 3
Classification Results

	College Completion Intention Level	Predicted Group Membership			Total
Count		Low	Medium	High	
	Low	33*	12	22	67
	Medium	13	21*	49	83
	High	13	10	89*	112
Percentage		Low	Medium	High	Total
	Low	49.3*	17.9	32.8	100.0
	Medium	15.7	25.3*	59.0	100.0
	High	11.6	8.9	79.5*	100.0

*Classified correctly

The linear function develop in this study revealed the following centroids for each group low group centroid = -.81, moderate group = -.04, and the high group = .54. These results indicate that the function was moderately well at separating the three groups based on the discriminating variables. The low group represented undergraduate students with a lower intention to complete college in comparison to the moderate and high group. Members of the low group had a statistically significant lower overall perception of institutional support in comparison to both the moderate and high group (low, *M* = 3.5, *SD* = .70; moderate, *M* = 4.02, *SD* = .55; high, *M* = 4.24, *SD* = .53). In regard to academic self-efficacy there was no statistical difference between the low group and the moderate group. However, academic self-efficacy was an appropriate discriminating variable in separating the high group from the moderate and low group (high, *M* = 4.03, *SD* = .70; moderate, *M* = 3.66, *SD* = .77; low, *M* = 3.48, *SD* = .67).

For questions that assessed institutional support the low group had the least positive perception that the school respect them as individuals in comparison to the moderate and high groups (low, *M* = 3.70, *SD* = .95; moderate, *M* = 4.33, *SD* = .75; high, *M* = 4.58 *SD* = .69). Respondents of the low group also did not agree as strong as the moderate and high groups in regards to the school they attend consistently applies the rules (low, *M* = 3.49, *SD* = .85; moderate, *M* = 3.98, *SD* = .79; high, *M* = 4.20 *SD* = .84). The low group also had a lower perception of the respect they believe that the school they attend gives them in regards to the choices they make (low, *M* = 3.39, *SD* = .97; moderate, *M* = 4.07, *SD* = .79; high, *M* = 4.23 *SD* = .86). Lastly, there was no difference between the low and moderate group in relation to their response that problems are settled fairly at their school but there was a difference between the low and high group for this statement (low, *M* = 3.30, *SD* = .76; vs. high, *M* = 3.88 *SD* = .70).

The moderate group responses were consistently higher than the low group and consistently lower that than the high group for the questions related to institutional support. In addition to the questions mentioned in the previous paragraph, the moderate group had a more positive perception that the colleges tries hard to be fair to the students when compared to the low group but their perceptions was of lesser value than the high group (low, *M* = 3.49, *SD* = .91; moderate, *M* = 3.88, *SD* = .90; high, *M* = 4.58, *SD* = .69). However, for all the remaining questions that address institutional support, there was no difference between the moderate group and the high group which may explain why 59% of the moderate group was misclassified as belonging to the high group. The high group

consistently had a much stronger agreement with the statements of the questionnaire in comparison to the low and moderate groups. In all statements, the high group was the highest and was significantly different from the low group but not always different from the moderate group.

For questions that addressed academic self-efficacy the low group consistently had a less positive response than the high group in their response to the statements on the questionnaire but there was never a difference between the low group and the moderate group for this construct. Respondents from the low group express they had less confidence in participating in class discussion (low, *M* = 3.46, *SD* = .86; vs. high, *M* = 3.89 *SD* = .95), listening carefully to a lecture (low, *M* = 3.63, *SD* = .98; vs. high, *M* = 4.29 *SD* = .90), and asking a professor to explain a concept they did not understand (low, *M* = 3.30, *SD* = 1.01; vs. high, *M* = 3.90 *SD* = .96). In addition, respondents from the low group indicated that they had less confidence in earning good grades (low, *M* = 3.30, *SD* = .87; vs. high, *M* = 4.04 *SD* = .81) and understanding what they read (low, *M* = 3.58, *SD* = .86; vs. high, *M* = 4.04 *SD* = .85) when compared to the high group.

The responses of the moderate group indicated no difference between themselves and the low group but consistently the moderate group had a less positive perception of academic self-efficacy in comparison to the high group. The moderate group express less confidence in answering questions in small classes (moderate, *M* = 3.69, *SD* = .88; vs. high, *M* = 4.03 *SD* = .81), making professors respect them (moderate, *M* = 3.92, *SD* = 1.00; vs. high, *M* = 4.28 *SD* = .84), and planning their studies rather than cramming (moderate, *M* = 3.39, *SD* = .96; vs. high, *M* = 3.73 *SD* = .98). The high group consistently had a much higher level of confidence in their responses to the questions on the survey in comparison to the low and moderate groups. In all statements the high group was the highest and was significantly different from the low group but not always different from the moderate group.

5. Discussion

The data analyses indicated that student college completion intention can be differentiated into the three groups of this study (low, moderate, high). The discriminating variables were institutional support and academic self-efficacy. The high group always had the strongest agreement with statements on the questionnaire pertaining to academic self-efficacy and institutional support. The moderate group was inconsistent often being the same as the high group or as the low group. The low group always had the least agreement with the statements of the questionnaire in comparison to the high group but there was not always a difference between them and the moderate group.

Prior studies state that self-efficacy influences intention to drop out of college (Lotkowski et al., 2004; Robbins et al., 2004). This study confirms that academic self-efficacy has an effect not only on drop out intention but also on a student's intention to complete college. Furthermore, other studies have stated that institutional support influences a student's desire to drop out of college (Melese & Fenta, 2009; Tinto, 1975, 1999). This study also provides evidence that institutional support can influence the college completion intention of students.

Other variables were originally included in the study but were removed in the stepwise procedure of the discriminant analysis. Social support was considered a factor that could impact student's college completion intention as it has already been confirmed as a factor in dropping out (see Lagana, 2004; Nicpon et al., 2007). However, social support was not a factor in the discriminant analysis of this study. In addition, the classroom learning environment was a confirmed factor in drop out intention (Bean, 2005; Karp et al., 2012). Despite this, this variable does not have an influence on differentiating amongst the respondents of this study.

6. Implications

The present study reveals the importance of institutional support and academic self-efficacy of student. A student's level of college completion intention can be predicted by these two variables. The

findings of this research have significant implications for universities and teachers. Universities must be aware of the support they are providing students. This support can be providing students with leadership opportunities and developing a sense of community (Howard et al., 2004; Lan Rong & Preissle, 2009). Leadership opportunities provide students with the voice that they need in decision-making, which is a component of institutional support. Developing a sense of community is also important in providing students with an understanding that the school is there to help them.

Administrators must also bear the importance of maintaining a fair and equitable environment. Procedural justice or fairness is highly relevant in collectivist cultures (Aselage & Eisenberger, 2003). Since this study was conducted in Southeast Asia, it is imperative that administrators maintain a fair environment for students. Failure to do so will result in a lower perception of the support of the school and could damper a student's intention to complete college. School leaders have a responsibility to help students to succeed and this can be done through provide equal treatment to all students regardless of background.

These suggestions for schools must happen willingly. One study indicates that if an organization chooses to help there people freely this is viewed positively by the people but if the organization is forced to help the people there will be no change in the people's perception (Eisenberger, Cummings, Armeli, & Lynch, 1997). Change that helps students must be made by the choice of the school leaders and faculty in order to potentially influence the students in a positive manner. Educational leaders within ASEAN must make changes not due to external pressure from accreditation or government influence but from an internal drive to willingly help students.

The teacher also plays a role in a student's college completion intention. An excellent classroom experience provided by the teacher could influence how a student perceives the school and this is consistent with organizational support theory (Eisenbeger et al., 1986). The teacher needs to develop an instructional design that is engaging and provides opportunities for interaction between students and with the teacher (Fraser et al., 1996). Teacher need to provide opportunities for inquiry based learning and cooperative learning as these experiences give students a positive perception of what is happening in the classroom and thus the school (Jollife, 2007; Robinson, Shore, & Enersen, 2007).

Many classrooms within ASEAN region, not just the Philippines, focus heavily on lecture style teaching (Park, 2000). This focuses on knowledge transmission does not help the students to be active and engaged. A transactional or transformational orientation within the curriculum and instruction of the teachers will help with involving students with their learning (Ornstein & Hunkins, 2009). Empowered students are students who develop deeper thinking and improved academic performance (Schunk, 2012). The improvement in academic performance will encourage students that they can complete college and will raise their intention to do so.

Academic self-efficacy can also be improved by the strategies mentioned already for institutional support. Universities need to be aware of the role of academic self-efficacy among students. Ignoring this could lead to students who may not finish school. Institutions can help with academic self-efficacy by insuring they make a commitment to help the students to attain their educational goals (Tinto, 1975). With empowerment from the school, students will have the confidence they need to accomplish various academic task that they need to do in order to finish school.

Teachers also need to understand their students' academic self-efficacy. Since the teacher has so much contact with students they can serve as an agent against attrition. Teachers need to provide mastery experiences for the students. This can be done through a simple to complex approach to curriculum design. As the students master the simple task, they are developing confidence to deal with greater challenges. Demonstration by the teacher or peers provides vicarious experiences that students

also need to enhance their self-efficacy. Verbal encouragement in the form of feedback and praise may also help students to have the self-efficacy needed to have a higher level of college completion intention.

This study only reflects the perception of undergraduate students. It would be informational to conduct a similar study at the graduate or K-12 level to compare the results of this study with these other contexts. A study that looks at college completion intention through examining differences in socioeconomic standing may also be helpful in understanding this phenomenon.

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Knowledge Management Measurement Models: The lack thereof

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Abstract

This paper reviews performance metrics that are commonly used in knowledge management. Since knowledge is the root of all sustainable advantage in the knowledge-based economy, the area of knowledge management performance measurement has become a hot topic. Unfortunately, the measurement of knowledge assets is difficult and few models have been developed specifically for the purpose. This paper critically reviews the most common measurements and concludes with a list of criteria that should be used in the development of future metrics.

Keywords: Knowledge Management, knowledge management performance

1. Introduction

Knowledge management is a relatively new management science having begun in the early 1990's, though several key concepts have been derived from Peter Drucker's work in the 1960's and 1970's. While still a new edition to management science, knowledge management has thus far captured and held the attention of academics and practitioners. The field has begun to reach a level of academic maturity and has survived the litmus test of academic scrutiny. If it is to sustain the interest of academics and practitioners concrete evidence of its benefit to firm performance is needed. However, there is currently a lack of empirical evidence to substantiate a causal relationship between knowledge management and firm performance, this is especially true of firm financial performance. This paper will critically review metrics commonly associated with knowledge management and offers an opinion regarding the type of metrics that still need to be developed.

2. The need for measurement

In business, the old adage "you can't manage what you don't measure" is typically given as the reason why performance and valuation measurement is important to the firm. Simmons (Simmons, 1990) observes that performance measurement means tracking the implementation of business strategy by comparing actual results against strategic goals and objectives. As it applies to knowledge management, the purpose of managing and leveraging a company's knowledge is to maximize the returns to the firm. This means it is necessary to be able to measure the principal investment a firm makes to acquire knowledge, the costs to maintain that knowledge, and the yield the firm receives from that investment at regular intervals. However, traditional accounting practice does not provide for the identification and measurement of intangibles in organizations, especially knowledge-based organizations (Petty & Guthrie, 2000). Lev (2004) states, "Managers often fly blind when deciding how much they should invest in intangibles or which ones offer the best rewards." Some researchers believe that established reporting systems have lost their relevance because they are unable to provide management with information essential for the management of knowledge-based processes and knowledge assets (Tan, Plowman, & Hancock, 2007). For example, Generally Accepted Accounting Principles (GAAP) treats practically all internally generated intangibles- knowledge included- not as investments but as costs that must be immediately expensed, thereby distorting enterprise profitability, efficiency, and value.

Knowledge management can be thought of as having been successful if, through its efforts, it has increased the performance of the firm. Therefore, the measurement of Knowledge management's contribution to corporate performance is extremely important, but is impaired by several inherent difficulties as knowledge assets are intangible, dynamic, and difficult to quantify. Understanding the economic value of a knowledge asset allows for decisions to be made regarding whether to invest further, hold onto the asset, or dispose of it. Without a well-developed measurement model firms will lack a way to clearly identify how knowledge assets impact their value chain. Furthermore, as a management science, it is essential to measure the link between knowledge management and corporate performance in order to justify itself. This need is further exacerbated as at present there is little conclusive research on the relationship between knowledge management strategy and firm performance (López-Nicolás & Meroño-Cerdán, 2011).

Knowledge management systems (KMS) performance measurement, which should be thought of as a sub-division of overall knowledge management performance, is also of importance and could be measured separately from other knowledge management activities. KMS may involve tangible assets which could appear on traditional accounting reports, e.g., balance sheets and income statements. Tseng (2008) suggests that it is also important to measure KMS performance separately in order to better understand the dynamic between KMS performance and knowledge management performance in general.

Additionally, there has been a recent surge of interest in the development of intellectual capital (IC) statements. This is particularly true of Danish and Scandinavian countries, as evidenced by a series of examples found in Mouritsen et al. (2002) and Mouritsen, Bukh, and Marr (Mouritsen, Bukh, & Marr, 2004). An IC statement has the goal of showing how IC and knowledge resources affect corporate performance. Currently, the majority of IC statements report on firms' knowledge management activities, but do not place a dollar value on knowledge, the amount of knowledge held, nor which departments are involved in knowledge creation (Mouritsen, Bukh, Larsen, & Johansen, 2002). Instead, they provide a report on how organization-wide knowledge resources allow the firm to do something for the benefit of the firm. Measurement models have the ability to enhance IC statements by providing a means for indicating how knowledge resources are used to create or enhance products/services/processes in order to create value for the customer or user. The implementation of these reports currently seems to be limited to a small number of companies. For example, in the extremely knowledge intensive banking industry, there is very little documentation released on knowledge management activities. In the Portuguese banking industry, Curado (Curado, 2008) found that no banks produced periodic reports on their knowledge management activities, even though all banks in the sample attributed some of their success due to knowledge management.

The above section was meant to provide information regarding the need for knowledge management measurement. The majority of literature reviews written on knowledge management do not include knowledge management measurement as being under the main purview of the field. This perhaps explains the dearth of literature regarding measurement models developed specifically for knowledge management and the lack of a clear model that measures the direct impact of knowledge management on performance (López-Nicolás & Meroño-Cerdán, 2011). The following section presents an overview of knowledge management measurement models in general and a review of several of the most prominent models.

3. Measurement Models

Knowledge asset measurement has been a topic of interest for both researchers and practitioners since the 1990s, or much earlier than the 1990s if one considers the parallel field of human resource accounting (Flamholtz, Bullen, & Hua, 2002; Toulson & Dewe, 2006). Both practitioners and academics have made efforts to measure and evaluate the impact and usage of knowledge management. The development of a knowledge management measurement is of particular importance because its impact is largely invisible with respect to current accounting methods. Current

accounting practices were developed for an era in which tangible assets were the predominant resource in creating value for a firm. In the new knowledge based economy, these methods are unable to convey the significance of intangible assets in the market valuation of a firm (Green & Ryan, 2005). As knowledge management is mainly concerned with intangible assets- with the possible exception of KMS that may have tangible components- it too is largely invisible with regards to corporate financial reports.

Another reason for the growing interest in measurement is due to the growing impact that intangibles are having on firm performance. Many executives now feel the need to factor intangibles into their decision making processes or risk losing confidence in their abilities. Bontis (2001) feels that the effect of intangibles may be growing to the point to which it has caused a paradigm shift in the way in which business is conducted. This is evidenced by the results of many studies that conclude that intangible assets are a major if not the largest reason that a firm may be able to achieve above average financial returns to its shareholders (Steenkamp & Kashyap, 2010; Whitwell, Lukas, & Hill, 2007).

In a broad sense, knowledge management and other intangible asset measurements are categorized as “dollar valuation” and “non-dollar valuation” (Tan, Plowman, & Hancock, 2008). However, Sveiby (2010) provides four specific categories:

- Direct IC (DIC) method: Measurements in this category attempt to apply a dollar value to intangible assets. This may be accomplished by either valuing the entire firm or individual components of the firm.
- Market capitalization methods (MCM): These models compare market to book value of shareholders equity to derive a value of intangible assets.
- Return on asset (ROA) method: The measurements in this category use a ratio comprising of income divided by assets to indicate efficiency of assets utilization. The method by which ROA is calculated varies from model to model, but typically involves a firm comparison to industry averages.
- Scorecard methods (SCM): SCM identifies and monitors firm specific intangible assets that are then reported via a scorecard. Typically, no dollar value is assigned to intangible assets and external comparison is not possible due to the firm specific nature of the method.

The purpose of this next section is to review in detail the methodology of several of the most popular knowledge management measurements. Measurements are presented in alphabetical order and include: Balanced Score Card, Economic Value Added, Intangible Asset Monitor, Knowledge Management Performance Index, Skandia Navigator, and Tobin’s Q Ratio. These measurements have been chosen due to the popularity of their use by practitioners and for being frequently mentioned in academic articles.

3.1 Balanced Score Card

Developed by Kaplan and Norton (1996a), the Balanced Score Card (BSC) is a measurement tool that links IC with organization outcomes. It is arguably the most popular IC measurement tool and has been adopted by the majority of knowledge management practitioners (Tiwana, 2002). The BSC monitors an organization through four different lenses (Kaplan & Norton, 1996a):

- Financial - "How can we add value to our shareholders?"
- Customers - "What do our customers value from us? Are we meeting their needs and expectations?"
- Internal Processes - "What do we need to do well in order to succeed?"
- Learning and Growth - "How can we continue to add value (in the future)?"

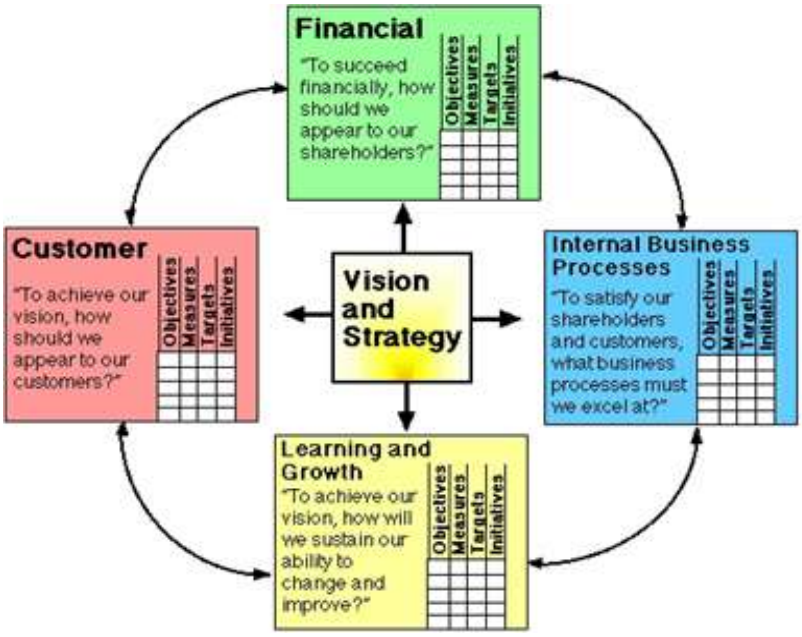

Figure 1: Balanced Scorecard (Kaplan & Norton, 1996b)

The BSC (Figure 7) typically uses both leading and lagging indicators and measurements focusing on internal and external impacts. This means the financial perspective usually includes traditional accounting measures that may be contextualized to fit the organization as a whole or customized for individual strategic business units. The customer perspective includes those measurements which are directly relatable to customer outcomes, e.g., customer satisfaction, retention, etc. Internal process perspective is similar to the concept of a value chain (Bontis, Dragonetti, Jacobsen, & Roos, 1999) and includes measurements relating to the realization of products and services. Lastly, the learning and growth perspective encompasses measures relating to employees and organizational learning. By linking the four perspectives together, managers are provided with a tool to monitor and assess progress towards their unique corporate vision and strategy.

BSC is a highly adaptable tool that is commonly customized to fit the context of the organization using it. If a firm changes its focus or strategy, the BSC is able to be recalibrated to match. BSC is frequently described as a measurement tool or valuation system by most academics (Bontis et al., 1999; Petty & Guthrie, 2000; Tayles, Pike, & Sofian, 2007). However, David Norton, the co-author of BSC, states something to the contrary: "The BSC is definitely not a measuring system. It is a technique for describing strategy" (Daum, 2002). With this sentiment in mind, one should conclude that BSC is an incredibly useful tool, but not one that should be a primary means of evaluating the value or utilization of knowledge assets.

3.2 Economic Value Added

Economic Value Added (EVA) was developed as a comprehensive performance measure that acts as a proxy for ways in which corporate value can be added or lost (Stewart, 1991; Worthington & West, 2001). EVA has been described as providing a common language for managers to discuss value-creation and can increase a firm's legitimacy in the eyes of financial markets (Bontis et al., 1999).

EVA is the difference between net sales and the sum of operating expenses, taxes, and capital charges. Capital charges are calculated as the weighted average cost of capital multiplied by the total capital invested.

$$Net\ Sales - Operating\ Expenses - Taxes - Capital\ Charges = EVA$$

However, when used as a measurement of IC or knowledge management, it is implied that no specific measure of intangible assets are needed (Bontis et al., 1999). Also, EVA is a very complex measurement in that it contains 164 performance adjustments to account for intangible assets and other areas that have a degree of uncertainty (Bontis, 2001). The high number of potential adjustments has a limiting effect on the potential for EVA to be used in firm comparisons. Another common criticism of EVA is that it assumes that companies should operate exclusively for the benefit of shareholders, which would ignore stakeholder theory (Tan et al., 2008). If used as an indicator of knowledge management, managers would lack an understanding of the extent to which knowledge management contributed to firm value-creation. Therefore, a firm using EVA would not have a means with which to monitor its knowledge management efforts nor would it be able to quantify the impact of those efforts. Moreover, as EVA focuses on the efficiency of capital employed, and it is not appropriate to equate the calculation with either knowledge or intellectual capital employed.

3.3 Intangible Asset Monitor

The Intangible Asset Monitor (Figure 8) was developed by the well-known knowledge management researcher Karl Sveiby. His measurement model is based upon a conceptual framework which includes three types of intangible assets: external, internal, and individual competence. External intangible assets are mainly composed of extra-firm relationships. Internal intangible assets are represented by resources such as a firm's culture, explicit knowledge-base, patents, and legal structure. Individual competence may be thought of as the intangible assets employees carry home with them at the end of the work day such as education, experience, and tacit knowledge (Sveiby, 1997).

Sveiby believes that shareholder value is best represented by a combination of financial measures to determine tangible resources and non-financial measures to determine intangible resources. Sveiby also postulates that current accounting methods do not clearly represent a company to its external stakeholders because those methods poorly represent intangible assets. As a result, Sveiby recommends giving information to external stakeholders that includes key indicators and clear explanations, as opposed to attempting to compile a full balance sheet listing and monetary valuation of every intangible asset. In addition to providing information to external stakeholders, he also believes that internal stakeholders need a method with which to monitor progress and take corrective action when needed. He strongly emphasizes the need for a tool to monitor flow, trends, and change.

In his measurement model, Sveiby identifies three broad measurement indicators: growth and renewal, efficiency, and stability; the choice of which variables to use as proxies for each indicator is dependent upon a company's strategy. Furthermore, Sveiby recommends three sub-aspects of each indicator be explored: external structure, internal structure, and competence of people. Organizations are recommended to develop at least one indicator for each intangible asset under each of the three sub-aspects.

The Intangible Asset Monitor was not developed solely for the purpose of measuring knowledge management's impact, however it does provide a means with which to monitor a firm's knowledge assets. The biggest downside to using the Intangible Asset Monitor as a knowledge management measure is that it becomes difficult to separate knowledge management performance from the broader intangible asset performance.

Celemi						
Intangible Assets Monitor 1994 - 1995						
Our Customers (External Structure)		**Our Organization** (Internal Structure)		**Our People** (Competence)		
Growth/Renewal		**Growth/Renewal**		**Growth/Renewal**		
Revenue growth	44%	IT investment % Value add. (15)	11%	Aver. Professional experience (7),years	7.8	- 25%
Image enhancing customers (2)	40%	Organization enhancing customers (2)	44%	Competence enhancing customers (2)		43%
		Product R&D % value added	18%	Total competence experts (4,7), years	298	43%
		Total investment in org %VA	33%	Average education level (3)	2.3	0%
Efficiency		**Efficiency**		**Efficiency**		
Change Sales/customer (12)	4%	Change Proportion of Admin staff.(1,8)	4%	Value Added per Expert (4,15), TSEK	867	- 13%
		Sales per admin. staff. growth (11)	- 20%	Value Added per employee (15), TSEK	665	- 13%
Stability		**Stability**		**Stability**		
Repeat orders (9)	66%	Admin. staff turnover (1,14)	0%	Expert turnover (4,14)		10%
5 largest customers % (5)	41%	Admin staff seniority, years (1,13)	3	Expert seniority (4,13), years	2.3	79%
		Rookie ratio (10)	64%	Median age all employees, years	34.0	- 12%

Figure 2 Intangible Asset Monitor (Sveiby, 1997)

3.4 Knowledge Management Performance Index

The Knowledge Management Performance Index (KMPI) was developed by a team of South Korean researchers (Chang Lee, Lee, & Kang, 2005) and is one of the only metrics created directly for knowledge management. The authors' main assumption is that the efficiency of knowledge circulation processes (creation, accumulation, sharing, utilization, and internalization of knowledge) directly relates to overall knowledge management efficiency. The authors contend that KMPI is able to indicate whether or not a firm is a knowledge-intensive business. In order to compute KMPI, a series of complicated calculations must be completed.

Knowledge Creation Processes (KCP) is a function of the relative weight of the given value of each knowledge circulation component multiplied by the average factor value of the same knowledge circulation component. The values representing knowledge creation, knowledge accumulation, knowledge sharing, knowledge utilization, and knowledge internalization are then added together to create a composite score for overall KCP.

Once KCP has been calculated it is next possible to describe KMPI over time (*t)*. The equation is an S-shaped logistic model where 1 is the upper bound on the KMPI from the KCP application. It is assumed that the constant (a) is equal to zero at the beginning of an organization, as a new organization is thought to start with very small KMPI.

$$KMPI_{t=\frac{1}{1+e^{a+KCPt}}}$$

These measurements are all predicated on the use of questionnaire-based items on a Likert scale. Chang Lee, Lee, and Kang (2005) recommend the use of 33 items and a Likert scale ranging from 1 (strongly disagree) to 4 (neutral) to 7 (strongly agree). However, the authors don't clearly state who within a company should be responsible for filling out the questionnaire nor how often it should be re-taken. Without having a clear understanding of how the measurement should be applied, KMPI is of limited use to practitioners.

An addendum to KMPI was developed by Tseng (S.-M. Tseng, 2008) to specifically measure the impact of KMS. The additional measurement model is titled Knowledge Management Systems Performance Index (KMSPI), and was developed as a continuation of KMPI.

$$KMS = RWE_S\, AVE_S + RWE_P\, AVE_P + RWE_T\, AVE_T$$

S is the knowledge management Strategy, *P* is the plan of knowledge management, and *T* is the implementation of knowledge management. The three components of the formula are based upon questionnaire items recommended by Tseng (2008). Similar to KMPI, the author suggests that the questionnaire be completed by senior management. However, the author does not state who in senior management should complete the survey or how often it should be re-taken.

KMPI provides a conceptually interesting method for measuring knowledge management performance, however it is not very useful from a practical perspective. Firms using this metric would only be measuring performance subjectively as the results are based upon an individual's or (at best) a group of individuals' perceptions of how well various knowledge management processes have performed. Also, it would be impossible for one firm to be able to compare their results to a competitor. This severely limits management's ability to interpret results in a meaningful way. Furthermore, KMPI's correlation to meaningful financial measures has not been found to be at a 95% confidence interval.

3.5 Skandia Navigator

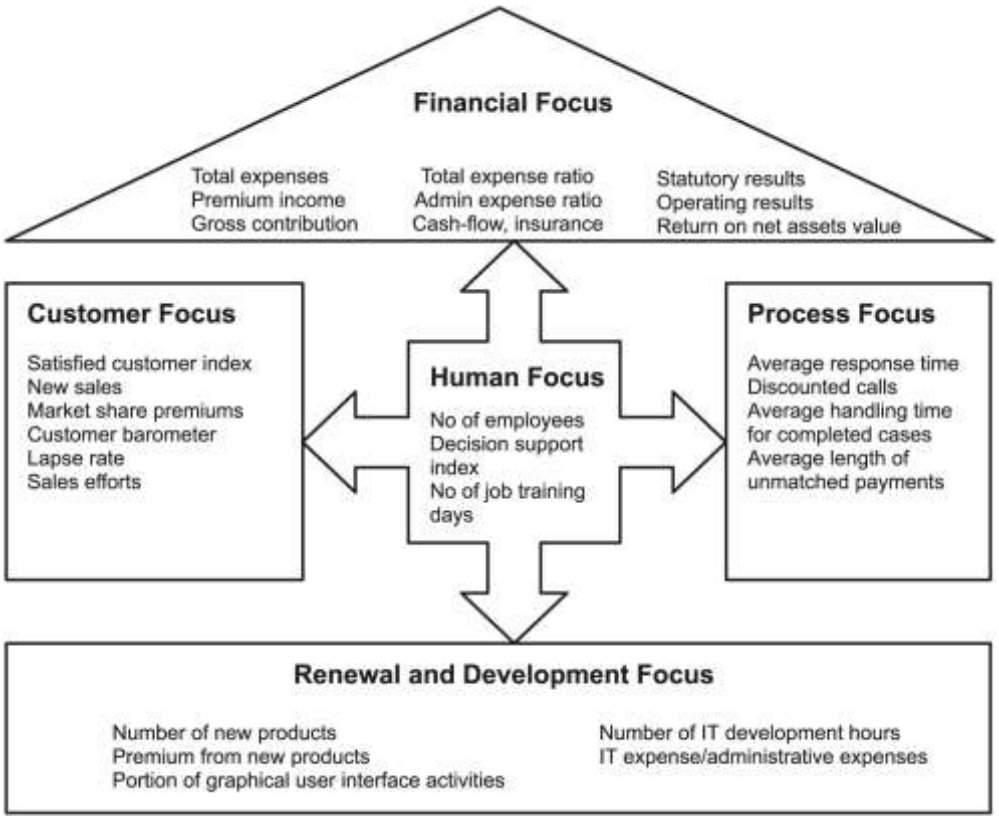

Figure 3 Skandia Navigator (Edvinsson and Malone; 1997)

The Skandia Navigator (Figure 9) is considered to be the first comprehensive system for measuring knowledge assets (Bontis, 1996). It was developed by Skandia, a Scandinavian finance and insurance company, as an internal intellectual capital report in 1985. Skandia is also known for being the first company to issue an intellectual capital addendum along with its traditional financial reports. Since its creation by Skandia's CKO Leif Edvinsson, the Skandia Navigator has become a popular measuring system for both IC and knowledge management.

The measurement model has five main areas of focus: financial, customer, process, renewal and development, and human capital. The model assumes that intellectual capital is primarily a combination of human and structural capital. Financial and non-financial measures are used to attempt to reflect the company's core competencies. This is done in an attempt to better represent the firm's knowledge-sharing technology and knowledge assets, and goes beyond only placing a value on intellectual property such as copyrights, patents, or trademarks (Edvinsson & Malone, 1997).

The Skandia Navigator represents the first truly comprehensive IC measurement model. It has provided researchers with a general taxonomy to measure the value and impact of firm knowledge and IC. It offers a method to analyze a firm’s intangible characteristics that were, and in most cases still are, lacking from traditional financial reports. However, the model itself is overly complicated and requires access to an extensive amount of data in order to be operationalized. Moreover, several of the metrics have had their underlying assumptions called into question (Bontis, 2001; Marr, Schiuma, & Neely, 2004; Ragab & Arisha, 2013; Roos, Roos, Dragonetti, & Edvinsson, 1997). One such criticism is that the equation which sums IC and financial capital to calculate the market value of an organization is incorrect, based on the variables being inseparable in this manner due to their inherent interaction with one another (Marr et al., 2004). Furthermore, the model does not act as a specific

measure of knowledge management's value or efficiency, and thus would be difficult for knowledge management practitioners to use to justify their existence.

3.6 Tobin's Q Ratio

Tobin's Q Ratio (or simply Tobin's Q) was developed in 1968 by the famed economists James Tobin, a Nobel Laureate, and William Brainard. At its inception, it was developed to compare a firm's market value to the replacement cost of its assets. From a macro-economic perspective, Tobin and Brainard originally hypothesized that the total market-capitalization of all listed companies should be equal to their replacement costs (Brainard & Tobin, 1968).

$$Tobin's\ Q = \frac{Market\ Value\ of\ Installed\ Capital}{Replacement\ Cost\ of\ Capital}$$

Though not its original purpose, Tobin's Q has been adopted as a tool to value a firm's intangible assets. Tobin's Q is a popular proxy for the value of intangible assets due to the way intangibles are treated by traditional accounting practices. Traditionally, tangible assets are capitalized and captured on a firm's balance sheet, while intangible assets are expensed and shown on a firm's income statement. As a result, many researchers feel that book value does not capture intangible value, and that market value does (Baskerville & Dulipovici, 2006; C. Y. Tseng & James Goo, 2005; Villalonga, 2004).

As a measurement for intangible assets, Tobin's Q has received several criticisms. One of the primary arguments against Tobin's Q is that it was developed for tangible assets and cannot be used for intangible assets without making major conceptual re-adjustments (Baskerville & Dulipovici, 2006). Marr and Spender (Marr & Spender, 2004) suggest the calculation is nearly impossible to apply to knowledge assets because the replacement cost of knowledge assets is inherently difficult to calculate. Furthermore, measuring intangible assets against market value would result in the value of a firm's IC rising and falling constantly due to the sentiments of financial markets. At best, Tobin's Q can act as a crude measurement model for knowledge management. However, stakeholders would have trouble separating market movements from knowledge asset growth/depreciation. Furthermore, managers would not be able to pinpoint which areas of knowledge management need to be improved upon nor in what manner knowledge management has contributed to firm value.

4. Conclusion

The majority of the measures discussed were developed to measure IC in general and not knowledge management specifically. However, as knowledge is an intangible asset, these measures are commonly used by knowledge management practitioners. The primary objective of knowledge management is to maximize a firm's returns through the management and leveraging of a company's knowledge. Generally, the previously developed measures lack a method to show a direct link between knowledge management and firm financial performance. This severely limits knowledge management's ability to prove its contribution to firm profitability and valuation. The available measurements do highlight various aspects of knowledge management, but there is a clear gap in their ability to measure the financial impact of knowledge management.

If no measure of its financial impact is developed, then enthusiasm and support for knowledge management will begin to wane in the coming years. Stakeholders must be provided with tools to measure the investment made in knowledge management and the yield gained/lost from that investment. In the knowledge based economy, knowledge workers are a firm's most valuable asset. However, the majority of economic and financial models treat employees as a cost and not as a resource (Pulic, 2004). Unfortunately, measurement is the least developed aspect of knowledge management, and best practice transfers are suffering as a result (Bose, 2004). If knowledge

management is to be considered a legitimate business practice, it must be able to justify its existence by providing solid proof that its role in the knowledge-based economy is deserved. A quote from Lord Kelvin (Thomson, 1883; p. 73) expresses this sentiment succinctly:

> *"When you can measure what you are speaking about and express it in numbers, you know something about it; but when you cannot measure, when you cannot express in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginnings of knowledge, but you have scarcely, in your thoughts, advanced to the stage of a science."*

Another major drawback of the current measurements is that they require insider-information to be used. Most of the methods of knowledge measurement that have been developed are concentrated on measuring the knowledge within the organization. In competitive business environments, knowledge management performance measurements usefulness are seriously limited without being able to compare performance with major rivals (Chen, Huang, & Cheng, 2009). This being the case, one critical outcome of performance measurement is not available to knowledge management practitioners: the ability to ascertain what is required to attain a competitive advantage over rival firms. Benchmarking would also allow firms to enhance knowledge management performance by establishing standards against which comparisons may be made; this would also allow for improvement plans to be created.

As seen in Table 1, the majority of measurements do not allow for benchmarking or for the financial impact of knowledge assets to be expressed. While Tobin's Q and EVA do allow for both benchmarking and financial impact, they only do so crudely and if firms weighted average cost of capital (WACC) is available. Furthermore, VAIC, which also allows for benchmarking and financial impact analysis, has been criticized for being more a measure of labor efficiency than of intellectual capital efficiency. Obviously, the usefulness of the currently available measures is severely limited.

Table 1: Measurement Model Comparison

	Benchmarkable	Financial	Direct link to KM
Balanced Score Card			✓
EVA	✓ *	✓	
Intangible Asset Monitor			
KMPI			✓
Skandia Navigator			
Tobin's Q	✓ *	✓	
VAIC	✓	✓	

*Only if cost of capital is known

There is currently a gap in the academic literature regarding knowledge measurement. The vast majority of measurement models in use were originally developed for other purposes. Many of the models which purport to measure the impact of knowledge management do not do so directly, but rather measure the impact of intellectual capital as a whole. There is a great need for researchers to develop a knowledge management specific measurement system in order to empirically justify the benefits of knowledge management. It is of great importance that knowledge management measurement models have the ability to specifically measure the financial effects of knowledge management. This will allow for firms to convince their shareholders that investment into knowledge management is worthy of consideration. Researchers developing a model should consider the following guidelines in order to gain academic and practitioner acceptance:

- The measure should utilize publicly available financial information in order to increase data availability and measurement reliability.
- The measure should be able to be consistently applied regardless of firm structure or strategy.
- The measure should provide a clear link between knowledge management, its outcomes, and firm performance.
- The measure should be straightforward and easy to calculate.
- The measure should be useable by internal and external stakeholders, i.e. investors, employees, managers, bond holders.

5. Suggestions for Future Research

It is recommended that further research be conducted in the area of knowledge measurement. There is currently a lack of literature regarding how to measure the impact that knowledge management has on firm performance. In particular, knowledge management lacks a measurement model that can be used to measure the impact knowledge management has on firm financial performance. This may be a difficult task as knowledge management is by its nature integrated into every aspect of the firm. Due to this, future researchers may have difficulties in isolating the effect of knowledge management, and thus the direct impact of knowledge management.

It is further suggested that when developing a knowledge management measurement model, that researchers explicitly state which knowledge management process or outcome they are measuring. The three key outcomes of innovation, collaboration, and leverage may all have an impact on firm financial performance. It is suggested that a future measurement model be able to identify through which outcome knowledge management is making an impact on firm performance i.e., to test whether knowledge management is making a larger impact through collaboration than innovation. If this approach is taking than it is suggested that researchers also seek to understand the mediating effect that knowledge management has on innovation, collaboration, and leverage.

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Choosing a Mobile Application Development Approach

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Abstract
With over a billion mobile devices in use worldwide and nearly half a billion mobile applications on offer, software developers must make choices between developing one or more versions of native, hybrid or mobile web applications. This paper compares development approaches across these three options and compiles a set of criteria on platforms and devices that can be used in critical development decisions. Key issues for each application development approach are discussed, and a comparative analysis highlights the advantages and disadvantages of each approach.

Keywords: App, mobile application, native mobile app, hybrid mobile app, web mobile app, mobile application development

1. Introduction

Smartphones are a handheld device integrated with an operating system capable of performing a range of different features including common mobile phone capabilities, video camera, multimedia player, web browsing, advanced computing capability and a multi-touch screen. These features support the proliferation of mobile applications often referred to as "apps."

Smartphone operating systems offer the same features, but the underlying operating systems differ significantly in terms of organization and architecture. According to a market report on smartphone sales (Vasanth, 2014), Android dominates with 52.1% of the market, and Apple iOS has a 41% market share. Windows Phone market share has surpassed Blackberry and currently stands at 3.9% (Long, 2014). As these three mobile operating systems differ significantly from each other, mobile apps developers that want to reach a large numbers of users must develop their apps for each platform. Considering that in the first quarter of 2014, there are over 1.3 billion smartphones in use with over 450,000 installed mobile applications (Khalaf, 2014), an organization's platform development strategy will have significant consequences.

We separate mobile apps development for those platforms into three categories: native, hybrid and web mobile applications. We provide an overview and comparison of the most significant advantages and disadvantages of these three development approaches.

2. Mobile Apps Development Challenges

There are five common challenges to mobile application development.

1. *Multiple Standards*: The existence of multiple standards for mobile platforms is a challenge for developing mobile apps rather than an opportunity for technology advances that drive innovation. Even with the same platform, various smartphones have different hardware specifications such as RAM, CPU, Screen Size and storage capacity. Moreover, there are different standards at the operating system level, such as fragmentation on Android devices with different screen resolutions.

Android	iOS	Windows Phone
Smartphones		
240 × 320 240 × 400 240 × 432 320 × 480 480 × 640 480 × 800 480 × 854 640 × 960	320 × 480 640 × 960	480 × 800
Tablets		
1024 × 600 1024 × 768 1280 × 768 1280 × 800	1024 × 768	1024 × 768

Table 1: A Comparison of available screen resolutions

2. *Lack of Analysis Tool*: In mobile App development, there is very lack of testing and only a few app developers dedicated testing teams. But it is changing currently and they start to concentrate quality control and testing. There is very limited supporting on Automated testing for native mobile apps. Current existence emulators cannot perform important features of mobile devices such as sensors, location services or multi-gestures touch. Mobile app developers need better analysis tools for measuring, monitoring, and visualizing the various metrics of their apps and testing. [2]

3. *Development Platforms Divide*: Android is an open source OS. However, there is fragmentation across the various versions of Android, and some manufactures modify the OS source code according their hardware specifications. The resulting multiple standards result in limited portability from one version to another, introducing more complexity for application development. In contrast, iOS and Windows are closed source, so fragmentation isn't an issue. Application development for iOS requires technical skills in Objective-C, Xcode IDE and the iOS SDK, Windows requires .Net skills.[3]

	Android	iOS	Windows Phone
Language	Java	Objective-C	C#, VB.Net and more
Tools	Android SDK	Xcode	Visual Studio
Packaging format	.apk	.app	.xap

Table 2: A comparison of development platforms

4. *Frequent Version Releases:* The frequency of version releases of mobile operating system is a challenge. Developers must learn different programming languages and APIs for those fragmented platforms and keep up to date with software development kit (SDK) updates. Each version may provide a platform is different than the previous one, in terms of tools and user interface design necessitating the challenge of learning new development techniques. Some mobile OS versions lack the support of an integrated development environment.

Released Year	Android	iOS	Windows Phone
2007		- iOS 1.0 - iOS 1.1	
2008	- Apple Pie	- iOS 2.0 - iOS 2.1 - iOS 2.2	
2009	- Banana Bread - Cupcake - Donut - Éclair	- iOS 3.0 - iOS 3.1	
2010	- Froyo - Gingerbread	- iOS 3.2 - iOS 4.0	- Windows Phone 7
2011	- Honeycomb - Ice Cream Sandwich	- iOS 4.3 - iOS 5.0	- Windows Phone 7.5
2012	- Jelly Bean	- iOS 6.0	
2013	- Kitkat	- iOS 7.0	- Windows Phone 7.8 - Windows Phone 8

Table 3: A comparison of released major version of mobile operating systems [4][5][6]

5. Lack of Storage Capacity: Many smartphone devices still have very limited data storage capacity. Using a network connection to store data in the backend is also a challenge. Some mobile apps need to store large amounts of data that is not well supported by offline caching.

3. Native Mobile Applications Development

Native mobile applications are executable binary files designed for a specific mobile OS and its particular devices. These apps are installed into the mobile OS directly and users can launch the apps without any container or intermediary tool. Native apps can freely access all of the APIs and built-in device functionalities such as the dialer, camera, SMS and location services. While native mobile application development requires deep knowledge of the specific platform, this strategy delivers a higher quality user experience than other mobile application development methods. Native apps are written in Java, Objective-C, and other programming languages. [7]

Advantages: The performance of native mobile applications can be predicated easily as they are supported by the native API and UI and receive frequent library updates. They have ability to leverage device specific software and hardware. Therefore they can take advantage of the latest technology available on mobile devices and can integrate with built-in apps such as the contact list, media player and photo gallery. Native apps are best distributed through an app store.

Disadvantages: While mobile technology is growing rapidly, it is also highly fragmented and constantly changing. One of the most critical disadvantages of native applications development is that the source code written for one mobile platform cannot be used on another. Native mobile application development suffers from time and cost inefficiencies, due to duplicate efforts for development and maintenance of native apps for each mobile platform. They also require a platform-specific SDK because each mobile OS comes with its own unique tools.

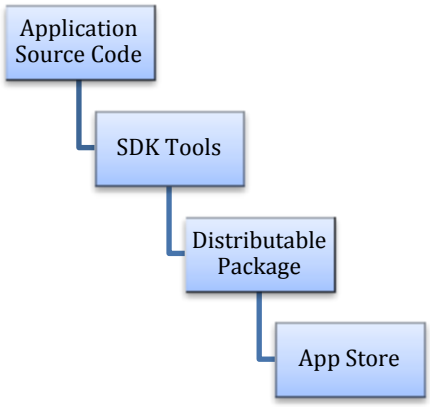

Figure 1: Native Mobile App

4. Hybrid Mobile Application Development

Hybrid mobile app development combines both native development and web technology, but hybrid apps look and behave much more like web apps than mobile apps. Using this approach, developers code their own framework, taking advantage of ready-made development tools such as "PhoneGap," an open source library that provides a JavaScript programming interface giving access to underlying operating system features.

Advantages: Hybrid application development saves development and maintenance cost and time since it produces a single code base for multiple platforms and hardware. This approach is typically less challenging native apps, as programmers don't face barriers of proprietary and closed systems.

Disadvantages: The hybrid app cannot be developed independently of the OS, and it needs to provide a native container. Although a native container gives access to native features, full API accessibility, faster performance and the latest UI technologies might not be fully supported. If a better user experience or device specific features are required, native app development is still a better choice.

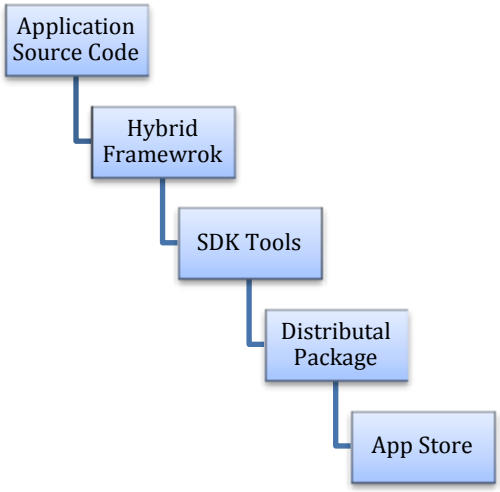

Figure 2: Hybrid Mobile App

5. Web Mobile Application Development

The web mobile application can be either a web page that resides on a server or a set of HTML,

CSS, JavaScript and other related files saved on the device. The web pages are formatted for smartphones and tablets, and are accessed through the mobile devices' web browser. Such a system is designed to host the application source code on a web server for flexibility, yet cache them locally on the mobile device for performance. [8]

Advantages: The web app development approach is less complex, inexpensive, fast to build and easier to maintain. Application source code hosted on a server enables developers to make minor updates to the app without going through the process of submission and approval that app stores typically require. Most web apps are completely platform independent and capable of launching on any kind of devices and platforms with an installed browser.

Disadvantages: This development approach disregards any offline functionalities, as the content is not accessible when the device is not online. Web mobile apps perform wholly in the mobile browser and are unable to access native features of the devices. Some web technologies such as Microsoft Silverlight or Adobe Flash are currently not completely platform independent.

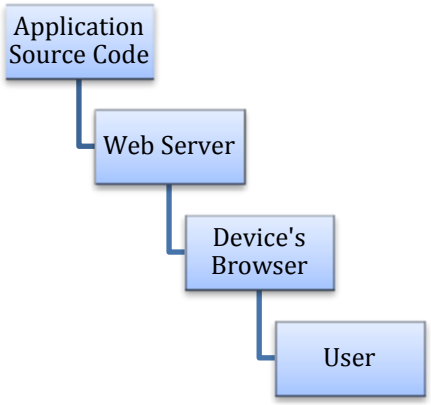

Figure 3: Web Mobile App

Features	Native App	Hybrid App	Web App
Development Language	Native Only	Native and Web or Web Only	Web Only
Device Access	Full	Full	Partial
Speed	Very Fast	Native Speed	Fast
Development Cost	Expensive	Reasonable	Reasonable
App Store	Yes	Yes	No
Advanced Graphic	High	Moderate	Moderate
Upgrade Flexibility	Low	Moderate	High
Some Example Apps	Angry Birds, Instagram	Ebay, PayPal	http://m.facebook.com, http://m.bbc.com/

Table 4: Mobile App Development Approach Comparison [9]

6. Conclusion

In summary, the native app development approach is the best choice for excellent performance, but the development cost is expensive. The web app development approach is inexpensive but limited in functionality and cannot offer exceptional user experience. The hybrid approach is a middle way for many situations, especially if the developers want to create a single app that targets various platforms. Choosing the optimal approach depends on the needs of the organization and can be driven by many criteria including finances, project timeline, resources, target users, application features, and IT infrastructure. Android, iOS and Windows Phone are not the only OS in the marketplace. Others like Blackberry, Ubuntu, Firefox OS, and upstarts Jolla and Tizen are also competing for the lucrative and growing smartphone market. Thus, mobile apps developers must carefully consider their platform options when developing mobile apps for the smartphone market.

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