The Necessity of Physics' Quantum Skills Strategies, Intellectual Capital and the Study of Knowledge Management in the Crisis Era

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Abstract: Knowledge, competence, and related intangibles have emerged as the key drivers of competitive advantage in developed nations. This is not just because of the importance of knowledge itself, but because of the rapid expansion of goods and factor markets, leaving intangible assets as the main basis of competitive differentiation in many sectors. There is implicit recognition of this in both management theory and practice with the growing emphasis being placed on the importance of intangible assets, reputation, customer loyalty, and technological know-how. By using physics quantum skills in the era of management managers uses from basic science in the area of managerial issues well and they can look widely for the contemporary issues. This paper aims to review the Intellectual capital notion and learning organizations. Also a new perspective to create LOs by implementing competitive strategies like Quantum strategies comes as well.

Keywords: Intellectual Capital; Quantum Skills; Learning Organization; Management

Jel Classification: O34; J24

Introduction

Organizations function as organic entities that evolve and adapt in response to their internal and external environments. Organizational responses to their environments emerge in the course of executive interpretation of organizational strategic needs. In recent decades theorists have identified intellectual capital (IC) as an organizational asset that enhances organizational survival in the 21st century (Carrel, 2010).

History by definition reflects past events. These past events lay the foundation and indeed mandate the design and structure for the organizations of the future. From organizational history, we are able to track patterns and forecast trends of organizational behavior. This historical reserve communicates tools and resources that have been successful and also identifies those management attempts that were

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not successful. The wise recognize the value of these lessons learned and benefit from the understanding of the classical management theorists' dialogue. Oliver Wendell Homes (1809-1894) stated "When I want to understand what is happening today, I try to decide what will happen tomorrow; I look back; a page of history is worth a volume of logic." To renew our understanding of organizational behavior a brief overview of the evolution of management theorists, applicable to both organizational theory and human resource utilization, is illustrated in this section. An understanding of why organizations think and behave as they do in the 21st century sets the stage for an appreciation of the environment intellectual capital is seeded. Understanding where we came from enriches our understanding of who we are and aid in predicting where we are going as well as contributing to the success of the trip (Sussland, 2001; Weick, 1999; Carrel, 2010).

As the 1990's ended, the business environment became one of virtual offices using complex networks and sophisticated technology for communication and aggregating data. The desirable employees for this millennium were knowledge-workers who knew and understood the organizational strategy and were able to aggregate information, synthesize and analyze data, make decisions instantaneously, and implement them independently (Carrel, 2010)

 In the end, wealth creation in a world of heightened competition comes down to developing and owning difficult to replicate (intangible) assets, and orchestrating them astutely. The latter capability is what I have referred to elsewhere as dynamic capabilities (Teece, 2002). It is estimated that; intellectual capital research has primarily evolved from the desires of practitioners (Bassi and Van Buren 1998; Bontis 1996a; Darling 1996; Edvinsson and Sullivan 1996; Saint- Onge 1996). Consequently, recent developments have come largely in the form of popular press articles in business magazines and national newspapers (Davis, 2009, p.18).

At first this paper has a literature review on intellectual capital and benefits of Intellectual Capital in management and organization. Then the notion of Learning Organizations and Characteristics of a Learning Organization and Associated Best Practices and benefits of learning organizations comes. Finally the quantum organization and Quantum skills for learning organizations and the relationship of the quantum skills to key workplace challenges and the most important factors in quantum strategy in Intellectual Capital practical strategies to creating Intellectual Capital learning system come in details.

Intellectual Capital

The Delphi Group White Paper (2001), drawing upon the work of Edvinsson offers a useful definition, paraphrased as follows. IC can be segmented into three sub-categories: Human Capital, Structural Capital and Customer Capital. Each of these can be considered as valuable assets of an organization in a rather similar way to that of 'goodwill' on that organization's balance sheet. Human Capital is the organization's 'know-how', Structural Capital may be considered as the organizations systems or work processes, and Customer Capital as its relationship with its customers (Thompson, 2010).

Organizations do not invent, it is the people within organizations who do that and so it is important for those engaged in managing intellectual capital to take notice of the human factors. This section considers the considerable influence of human behaviors on intellectual capital management.

There are many reasons why people invent or innovate. One of the more powerful drivers amongst these reasons might include an individual's need to invent, rather as a writer must write or a painter must paint. The difference between the purely functional engineering design and the elegant one can be seen, be it of an aircraft or a bridge. Good design, like good style, is easy to recognize but difficult to describe. Apart from competency in design and innovation, the difference may be that of passion for the outcome. This passion, like that of an artist, manifests itself in the outcome of the design. Thus as the inventor develops an idea he may become as passionate about it as a painter would of his painting, and that passion may well rub off onto those with whom he shares it (Thompson, 2010).

Facilitating the Development of intellectual Capital

Those involved with the development and management of intellectual capital need to be aware of specific dynamics and aim not only to avoid stifling ideas offered from individual knowledge workers, but also to nurture them. As Tapscott and Williams (2007) put it: "The production of knowledge, goods, and services is becoming a collaborative activity in which growing numbers of people can participate. This threatens to displace entrenched interests that have prospered under the protection of barriers to entry, including the high costs of obtaining the financial, physical, and human capital necessary to compete"(Thompson, 2010).
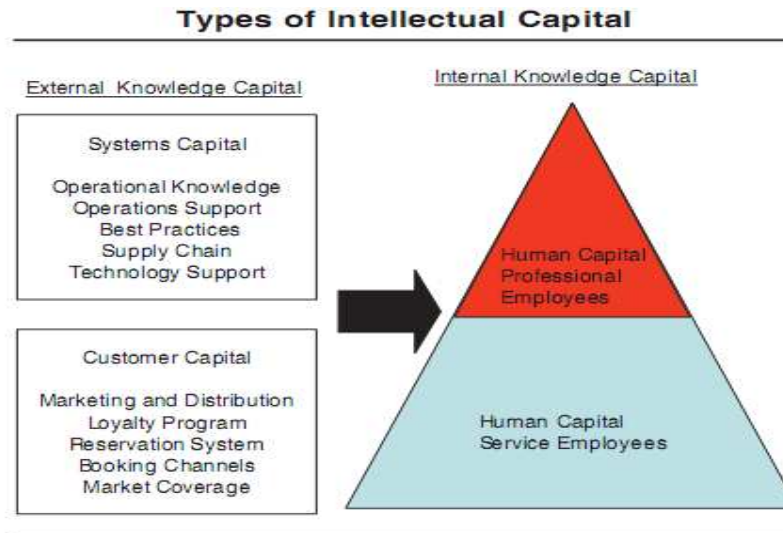
Types of Intellectual Capital

External Knowledge Capital

Internal Knowledge Capital

Systems Capital

Operational Knowledge
Operations Support
Best Practices
Supply Chain
Technology Support

Customer Capital

Marketing and Distribution
Loyalty Program
Reservation System
Booking Channels
Market Coverage

Human Capital
Professional
Employees

Human Capital
Service Employees

Figure 1. Types of Intellectual Capital

Source: (Walsh et al, 2008, p.302).

Benefits of Intellectual Capital in Management and Organization

Knowledge, competence, and related intangibles have emerged as the key drivers of competitive advantage in developed nations. This is not just because of the importance of knowledge itself, but because of the rapid expansion of goods and factor markets, leaving intangible assets as the main basis of competitive differentiation in many sectors. There is implicit recognition of this in both management theory and practice with the growing emphasis being placed on the importance of intangible assets, reputation, customer loyalty, and technological know-how. By using a good structure like learning organization we will have organizational structure that have the ability to support the Intellectual capital in today's market. So today's organizations should try to use this paradigm (learning organizations) to be competitive. Also because our contemporary organizations may differ from the traditional organizations and so we should implement new skills to be learning organization so that our staff can adjust themselves with new technologies. Also can sense the weak signals in the environment and can reply the prosper answer to them. In this situation our managers and executives and CEOs can effectively manage the Intellectual Capital in the organization.

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IC Measurement

Plenty of convincing arguments have been forwarded in support of the need to better understand

IC via measurement and reporting As discussed, these range from an intuitive understanding that it 'matters' (Stewart, 1997) to evidence that reporting IC has the potential to improve the efficiency of both capital and labor markets Few authors1, however, have traced the sequence of events involved in the development of IC. A historical perspective is important in understanding the context in which IC started appearing in company annual reports. A general timeline of major IC practice and research milestones appears in Table 1(Cuganesan, 2010).

Period	Progress
Early 1980s	• Continuing general notion of intangible value (often generically, labeled as 'goodwill') held over from the earliest days of doing business.
Mid 1980s	• The 'information age' takes hold and the gap between book value and market value widens noticeably for many companies.
Late 1980s	• Early attempts by practitioner consultants to construct statements/accounts that measure IC (Sveiby, 1988).
Early 1990s	• Initiatives by certain companies (e.g. Celemi and Skandia) to systematically measure and report on company stocks of IC to external parties. In 1990, Skandia AFS appoints Leif Edvinsson 'Director of IC'. This is the first time that the role of managing IC is elevated to a position with formal status and given an air of corporate legitimacy. • Kaplan and Norton introduce the concept of a Balanced Scorecard (1992). The Scorecard evolved around the premise that 'what you measure is what you get'
Mid 1990s	• Nonaka and Takeuchi (1995) present their highly influential work on 'the knowledge creating company'. Although the book concentrates on 'knowledge' the distinction between knowledge and IC is sufficiently fine as to make the book relevant to those with a pure focus on IC. • Celemi's *Tango* simulation tool is launched in 1994. *Tango* is the first widely marketed product to enable executive education on the importance of intangibles. • Also in 1994, a supplement to Skandia's annual report is produced which focuses on presenting an evaluation of the company's stock of IC. 'Visualizing IC' generates a great deal of interest from other companies seeking to follow Skandia's lead (Edvinsson and Sullivan, 1996). • Another sensation is caused in 1995 when Celemi uses a 'knowledge audit' to offer a detailed assessment of the state of its IC. • Pioneers of the IC movement publish bestselling books on the topic (Kaplan and Norton, 1996; Edvinsson and Malone, 1997; Sveiby 1997).
Late 1990s	• IC becomes a popular topic with researchers and academic conferences, working papers, and other publications find an increasingly diverse audience. • In 1999, the OECD convenes an international symposium in Amsterdam on IC.
Years 2000- 2004	• The Meritum project (2001-2003) involves six European countries working together to deliver guidelines for the development of an IC report. • The 'new' Danish guidelines are developed (Danish Agency for Trade and Industry, 2003). The guidelines relied upon input from 17 Danish organizations. The aim was to guide companies in the development of their own IC statements.
Years 2005 onwards	• Other countries develop or consider develop guidelines for intellectual capital or extended performance reporting while leading global companies continue to produce IC statements.

Source: Cuganesan, 2010, Intellectual Capital Measurement and Reporting: Issues and Challenges for Multinational Organizations, p.79

Learning Organizations

Apparently, learning as the core value of a company is hard to disagree (Senge, 1990; Redding, 1997)Nevertheless, we may oversimplify the key elements of organization accomplishment and think learning as an omnipotent dose dealing every problem in an organization. Although Seng's conceptual works provide ideal scenery for the management, putting concepts into action is not so easy. Senge believes that all companies should possess the characteristic of a learning organization in order to achieve continuous success. According to Senge, a learning organization can be achieved by practicing five disciplines: a shared vision, personal mastery, strong mental models, group learning, and system thinking(Senge, 1990; 1991). The assumption is quite rational and inexpugnable, but we can soon realize that there is a knowing-doing gap. The job of changing one's mental model and behavior is such big challenge, not even talking about changing the organization as a whole (Lee, 2007).

Another complication is the generalization of management theories proposed in Western culture to other cultures. The five disciplines working well in the West might lead to destruction in the East. For example, Chinese culture respects highly the patriarchal system. Anyone who disagrees with an authority is considered ingratitude. Transplanting different cultural values to another culture without any modification is questionable. Table 1 summarizes the characteristics of IC-knowledge based organizations (Lee, 2007).

Table 1. Characteristics of IC- knowledge based organizations *

Characteristic	Definition	Associated Best Practices	Positive Byproducts
Self mastery-individual	The ability to honestly and openly see reality as it exists; to clarify one's personal vision	1. Positive reinforcement from role models/managers 2. Sharing experiences 3. More interaction time between supervisory levels 4. Emphasis on feedback 5. Balance work/non-work life	Greater commitment to the organization and to work; less rationalization of negative events; ability to face limitations and areas for improvement; ability to deal with change

Mental models - individual	The ability to compare reality or personal vision with perceptions; reconciling both into a coherent understanding	1. Time for learning 2. Reflective openness 3. Habit of inquiry 4. Forgiveness of oneself 5. Flexibility/ adaptability	Less use of defensive routines in work; less reflexivity that leads to dysfunctional patterns of behavior; less avoidance of difficult situations
Shared vision - group	The ability of a group of individuals to hold a shared picture of a mutually desirable future	1. Participative openness 2. Trust 3. Empathy towards others 4. Habit of dissemination 5. Emphasis on cooperation 6. A common language	Commitment over compliance, faster change, greater within group trust; less time spent on aligning interests; more effective communication flows
Team learning - group	The ability of a group of individuals to suspend personal assumptions about each other and engage in "dialogue" rather than "discussion"	1. Participative openness 2. Consensus building 3. Top-down and bottom-up communication flows; 4. Support over blame; 5. Creative thinking	Group self-awareness; heightened collective learning; learning "up and down" the hierarchy; greater cohesiveness; enhanced creativity
Systems thinking - group	The ability to see interrelationships rather than linear cause-effect; the ability to think in context and appreciate the consequences of actions on other parts of the system	1. Practicing self mastery 2. Possessing consistent mental models 3. Possessing a shared vision 4. Emphasis on team learning	Long-term improvement or change; decreased organizational conflict; continuous learning among group members; Revolutionary over evolutionary change

Adapted from the work of Senge (1990), Argyris and Schon (1996), Argyris (1991)

Benefits of being a Learning Organization

Twenty first century is the century of knowledge and there are many benefits to improving learning capacity and knowledge sharing within an organization. The main benefits are;

• Adapting better than your competitors to external pressures

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• Systemizing innovation and new ideas
• having the knowledge to better link resources to customer needs
• Improving quality of outputs at all levels
• Increasing the pace of change within the organization
• Improving company image by becoming more people-orientated

Characteristics of a Learning Organization and Associated Best Practices *

Characteristic	Definition	Associated Best Practices	Positive Byproducts
Self mastery- individual	The ability to honestly and openly see reality as it exists; to clarify one's personal vision	1. Positive reinforcement from role models/managers 2.Sharing experiences 3.More interaction time between supervisory levels 4.Emphasis on feedback 5.Balance work/non-work life	Greater commitment to the organization and to work; less rationalization of negative events; ability to face limitations and areas for improvement; ability to deal with change
Mental models - individual	The ability to compare reality or personal vision with perceptions; reconciling both into a coherent understanding	1.Time for learning 2.Reflective openness 3.Habit of inquiry 4.Forgiveness of oneself 5.Flexibility/adaptability	Less use of defensive routines in work; less reflexivity that leads to dysfunctional patterns of behavior; less avoidance of difficult situations
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	about each other and engage in "dialogue" rather than "discussion"	up communication flows; 4.Support over blame; 5.Creative thinking	and down" the hierarchy; greater cohesiveness; enhanced creativity
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Adapted from the work of Senge (1990), Argyris and Schon (1996), Argyris (1991)

Becoming a Learning Organization

According to Peter Senge the 5 dimensions that distinguishes learning from more traditional organizations is the mastery of certain basic disciplines or 'component technologies' are:

Systems Thinking

Systems Thinking represents the ability to see the big picture and identify patterns and themes instead of individual events. Senge argues we tend to apply overly simplistic frameworks to complex systems; focusing on the parts instead of the whole. Classically we look to actions that produce improvements in a relatively short time span. However, when viewed in systems terms short-term improvements often involve very significant long-term costs. We may learn from experience but a simplistic short term view may mean we never learn. The argument runs, a better appreciation of systems will lead to more appropriate action (Learning Organization, 2005).

Personal mastery

Organizations only learn when individuals learn but individual learning does not guarantee organizational learning. People with personal mastery are continual learners and are aware of their short comings, development needs and ignorance yet they have the self confidence to be active learners.

Mental Models

This is about understanding that our assumptions and generalizations profoundly influence how we see the world and the decisions and actions we make. The process here is to uncover those assumptions or mental models and test them. It is also about balancing advocacy and inquiry and avoiding non-productive corporate games and politics. It is also about more distributed and local team ownership In other words it is about fostering a mental flexibility and openness (Learning Organization, 2005).

Building Shared Vision.

The emphasis is on a "shared vision" which means collaborative development to foster genuine engagement and commitment rather than just compliance. This is the exact opposite of a CEO selling a vision. Visions spread because of a reinforcing process. Increased clarity, enthusiasm and commitment rub off on others in the organization. 'As people talk, the vision grows clearer. As it gets clearer, enthusiasm for its benefits grow. Shared visioning build commitment for the future(Learning Organization, 2005).

Team Learning

This is about discussion and team alignment; it is about creating the results that the team desires. It builds on vision and personal mastery but these are not enough. Teams have to learn to work and learn together. It is about team disciplines and the quality of the team's discussions and insights. When teams learn together, Peter Senge suggests, not only can there be good results for the organization; members will grow more rapidly than could have occurred otherwise (Learning Organization, 2005).

Intangible Assets Era

As the 1990's ended, the business environment became one of virtual offices using complex networks and sophisticated technology for communication and aggregating data. The desirable employees for this millennium were knowledge-workers who knew and understood the organizational strategy and were able to aggregate information, synthesize and analyze data, make decisions instantaneously, and implement them independently (Chiavenato, 2001; Daft, 2004). In the virtual corporate environment employee judgment has to be trusted and depended on to be representative of the organization without the luxury of

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drawing consensus, accessing team input, and without supervision and mentoring of a manager down the hall or two floors above (Smallwood, 2004). This environment mandates that organizations optimize their employee corporate awareness, knowledge, and interconnectivity: their intellectual capital. Employee skills and core competencies are expected to be present while it is the employee's sought (Ulrich, 1997; Roos et al., 1998; Guthrie, 2001). Organizations need to look at their human resources and identify the intellectual capital necessary to provide sustainable momentum for the organization's competitive advantage (Edivsson et al., 1997; Roos et al., 1998; Carrel 2010).
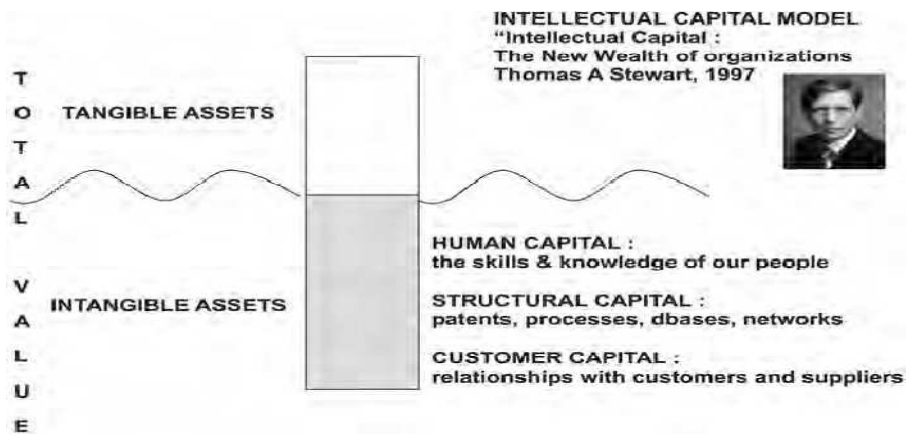
Source: (Laycock, 2005, p.523)

The Quantum Skills of Physics

At about the same time that Taylor and Fayol were developing management theories congruent with the Newtonian worldview, Einstein was conducting experiments that eventually turned this worldview upside down. Einstein discovered that in the realms of the very small (subatomic) and the very large (cosmic), Newton's laws are null and void. By the 1920s, this discovery launched a new branch of physics called quantum mechanics. The word quantum literally means "a quantity of something"; mechanics refers to "the study of motion". Quantum mechanics is, therefore, the study of subatomic particles in motion (Shelton, 1999, pp. 1-2). According to quantum theory, the universe is basically a set of signals or a field of information. It is much more like a great thought than the

great machine metaphor of the Newtonian paradigm (Shelton & Darling, 2003, pp.358-359).

The Quantum- Physics Organizations and Quantum Skills for Learning Organizations

As leaders use these quantum skills, they create what Shelton (1999) refers to as quantum organizations – organizations where all stakeholders know how to access the infinite potential of the quantum field. Quantum organizations are, therefore, learning organizations – places where continuous improvement and constant learning are cultural norms. Table I shows the relationship of each quantum skill to seven contemporary workplace challenges: quality, innovation, motivation, empowerment, social responsibility, change, and diversity. As leaders adapt new mental models that are congruent with the quantum worldview, they will discover highly innovative ways of dealing with these organizational challenges (Shelton & Darling, 2003, pp.358-359). According to quantum theory of Physics, the universe is basically a set of signals or a field of information. It is much more like a great thought than the great machine metaphor of the Newtonian paradigm. The quantum worldview, which characterizes the universe as a dynamic, unpredictable, subjective, self-organizing system, provides the conceptual foundation for seven quantum skills – skills that enable leaders to surface and test their mental models and thus improve their capacity to learn. The quantum skills are defined as follows:

(1) Quantum seeing: the ability to see intentionally.
(2) Quantum thinking: the ability to think paradoxically.
(3) Quantum feeling: the ability to feel vitally alive.
(4) Quantum knowing: the ability to know intuitively.
(5) Quantum acting: the ability to act responsibly.
(6) Quantum trusting: the ability to trust life's process.
(7) Quantum being: the ability to be in relationship (Shelton, 1999, p. 4; Shelton & Darling, 2003, pp.354-355).
The summary of quantum theory is summarized below in table II:

Table 2. The relationship of the Physics quantum skills to key workplace challenges

Challenge	Quantum skill	Definition	Behavior
Quality	Quantum seeing	The ability to see intentionally	Focused
Innovation	Quantum thinking	The ability to think paradoxically	Creative
Motivation	Quantum feeling	The ability to feel vitally alive	Energetic
Empowerment	Quantum knowing	The ability to know intuitively	Confident
Social responsibility	Quantum acting	The ability to act responsibly	Ethical
Change/chaos	Quantum trusting	The ability to trust life	Flexible
Teamwork/diversity	Quantum being	The ability to be in relationship	Compassionate

Source: Shelton & Darling, 2003, p. 359

The Most Important Factors in Physics Quantum Strategy in Intellectual Capital Management Practical Strategies to Creating Intellectual capital learning system

(1) Individual learning is an emergent process that seems to arise through interaction and seems to depend on a number of factors, of which the most important are:

- Who an agent met;
- How often an agent met a certain other agent;
- Which characteristics the agents respectively had;
- The characteristics of the agents, i.e. how much does an agent trust other agents, how motivated is an agent, how orderly, etc.

(2) Whether collective learning takes place depends on the composition of the team and their characteristics. That will eventually determine whether a group of agents will reach their group threshold.

(3) How quick an agent learns, depends on his characteristics and the characteristics of the agent he meets.

(4) An agent can learn, but he can also "unlearn" if his motivation and trust drop.

(5) Agents that represent R&D people and marketing managers seem to learn faster.

(6) The extent to which a senior manager slackens his control is determined by the degree of trust he has in the project manager, which in turn depends on the degree of trust a project manager has in other agents.

(7) A run of the model wherein senior managers were left out of the hierarchy showed that learning took place faster than in prior cases which hinted at the existence of self-organization (Harkema, 2003, pp.344-345).

Conclusions

It has long been recognized that 'economic prosperity rests upon knowledge and its useful application' (Teece 1981). Indeed, 'the increase in the stock of useful knowledge and the extension of its application are the essence of modern economic growth' (Kuznets 1966). Enlightened economic historians have long emphasized the role of technology and organization in economic development. Most organizations have adapted or transformed their management styles and business models to manage intellectual capital (IC) and respond to the IC-enabled dynamics of the knowledge economy. Many of these organizations have done it without even realizing that they are adopting an intellectual capital management (ICM) approach. A top executive of a leading consumer products company, whose name is withheld, commented that his company is not interested in ICM. "Show me the money," he said. "All I see are the circles and pyramids that ICM people draw in conferences." What this executive did not realize is that he was already managing IC in one way or another on a daily basis to make money. If it weren't for this executive's daily reliance on his gut feeling and tacit knowledge to manage his employees' innovation, the company he works for wouldn't be a market leader. If the company's employees did not care about the management of customer and structural capital, it wouldn't invest millions of dollars in its interactive Web site to solicit consumers' feedback 24 hours a day, seven days a week (ICM, 2009).

By using a good structure like learning organization we will have organizational structure that have the ability to support the Intellectual capital in today's market. So today's organizations should try to use this paradigm (learning organizations) to be competitive. Also because our contemporary organizations may differ from the traditional organizations and so we should implement new skills to be learning organization so that our staff can adjust themselves with new technologies. Also can sense the weak signals in the environment and can reply the prosper answer to

them. In this situation our managers and executives and CEOs can effectively manage the Intellectual Capital in the organization.

Successful managers and businesses have been managing intellectual capital one way or another all along, whether consciously or intuitively. This however, does not mean that they have an ICM program or strategy. Managing IC as a matter of common business sense is not sufficient for the development of ICM as an organizational competency. It is only when a management style moves from being intuitively applied to a planned and systemized process that it can be perfected. Only then can it be substantially transformed from being an art to becoming a science. Once it transitions into a science, it becomes testable, measurable, more predictable, and, most importantly, repeatable. Though organizations that apply ICM advance this goal, there is still a long road of experimentation and applied research ahead for the emerging field of ICM to become more of a "science." (ICM, 2009) One of the established precepts of ICM to date, however, is dividing IC into human, customer, and structural capital-what. Also doing a successful strategy and transferring a traditional organization to a knowledge-based one, and keeping and accumulating the IC and intangible resources in the organization more efficient, organizations should use from LO and knowledge accumulate strategies and professional team building strategies in their organizations to survive and growth and dynamical capability in today's' competitive era (Hung et al, 2005; Groves, 2002; Levet & Guenor, 2000). Formalization, the sharing of personal knowledge, and the development of structural approaches as a mechanism to transfer learning throughout the firm may on the other hand sap creativity and impede learning. Ideally, one would like to develop approaches or models which have a common essential logic, but which enable customization of particular features. This is but one of the many challenges to service firms in the new economy where knowledge sharing itself can often be the basis of competitive advantage (Teece, 2002).

In the modern knowledge intensive business environment, most organizations stand to gain a substantial prize in terms of innovative ideas, but these need to be coaxed out to win that prize. Part of that coaxing is likely to include an imperative of innovation as an ongoing activity to gain competitive position, and in turn managers will need to heed the foregoing points on organization (Thompson, 2010).

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