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HOW TO DEVELOP CREATIVITY AND INNOVATIVE TEAMS IN 21ST CENTURY

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ABSTRACT

Creativity, innovation and teams concern the process of creating and applying new knowledge. As such they are at the very heart of knowledge management. Knowledge management, however, is an emerging discipline and creativity, innovation, technological innovation system, social innovation, economic innovation, organization and teams need to be thought about in this new context. This paper creates a framework in which to discuss these concepts. It goes on to explore how our creativity is 'blocked' in a variety ways, including deep-seated beliefs about the world. It is often thought, for example, that creativity is a serious analytical task limited to certain disciplines such as R&D. This could not be further from the truth. Finally this paper takes a brief look at two tools to support knowledge management and creativity - one in the human domain and the other in the technology domain. We are also needs to boost its capacity for continuous creativity and innovation for both technology, social, economic, and organization reasons.

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Introduction

Creative problem solving is the mental process of creating a solution to a problemⁱ. Richard Fobes (1993) noted, it is a special form of problem solving in which the solution is independently created rather than learned with assistance. Alex Osborn (2001) stated, the creative problem solving always involves creativityⁱⁱ. However, creativity often does not involve creative problem solving, especially in fields such as music, poetry, and art. Creativity requires newness or novelty as a characteristic of what is created, but creativity does not necessarily imply that what is created has value or is appreciated by other people.

Innovation is the introduction of new goods or services. The company must adapt to change on consumer demands and to new competitors. Innovation is a change in the thought process for doing something, or the useful application of new inventions or discoveries. Byrd and Jacqueline noted (2003, p.8) it may refer to an incremental emergent or radical and revolutionary changes in thinking, products, processes, or organizationsⁱⁱⁱ. In many fields, Cabral and Regis (2003, p.19) stated, such as the arts, economics and government policy, something new must be substantially different to be innovative^{iv}. In economics the change must increase value, customer value, or producer value. The goal of innovation is positive change, to make someone or something better. Innovation leading to increased productivity is the fundamental source of increasing wealth in an economy. When the internet allowed merchant to bypass traditional distribution channel and reach buyers directly, and Bellman states (2001, p.21) that traditional marketers had to learn how to innovate to remain competitive^v. **Technological Innovation System** is a concept developed within the scientific field of innovation studies which serves to explain the nature and rate of technological change.^{vi} A Technological Innovation System can be defined as "a dynamic network of agents interacting in a specific economic/industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilization of technology".^{vii} Gary Hamel, notes (2001, p.139) that the real competitive battle was never between the heralded new Internet economy and an old economy.^{viii} Lundvall states, the concept of the **innovation system** (1985) stresses that the flow of technology and information among people, enterprises and institutions is key to an innovative process^{ix}. Freeman (1988) notes, it contains the interaction between the actors who are needed in order to turn an idea into a process, product or service on the market. **Innovation economics**, Evangelista Rinaldo states (2000, p.183) is an economic doctrine that reformulates the traditional model of economic growth so that knowledge, technology, entrepreneurship, and innovation are positioned at the center of the model rather than seen as independent forces that are largely unaffected by policy. Innovation economics is based on two fundamental tenets: that

the central goal of economic policy should be to spur higher productivity and greater innovation, and that markets relying on price signals alone will not always be as effective as smart public-private partnerships in spurring higher productivity and greater innovation^x. **Social innovation**, Howaldt and Schwarz (2010) refers to new strategies, concepts, ideas and organizations that meet social needs of all kinds - from working conditions and education to community development and health - and that extend and strengthen civil society^y.

Discussion

Creative Problem Solving

To qualify as creative problem solving the solution must either have value, clearly solve the stated problem (Lau & Cheung, 2010, p.329), or be appreciated by someone for whom the situation improves.^{xii} The situation prior to the solution does not need to be labeled as a problem. Alternate labels include a challenge, an opportunity, or a situation in which there is room for improvement. Solving school-assigned homework problems does not usually involve creative problem solving because such problems typically have well-known solutions. If a created solution becomes widely used, the solution becomes an innovation and the word innovation also refers to the process of creating that innovation. A widespread and long-lived innovation typically becomes a new tradition. "All innovations begin as creative solutions, but not all creative solutions become innovations." Some innovations also qualify as inventions.^{xiii} Altshuller and Henry (1994) noted, that the inventing is a special kind of creative problem solving in which the created solution qualifies as an invention because it is a useful new object, substance, process, software, or other kind of marketable entity. Many of the techniques and tools for creating an effective solution to a problem are described in creativity techniques and problem solving.

Creative-problem-solving techniques as McFadzean (1997, p. 220) notes can be categorized as follows^{xiv}:

- Creativity techniques designed to shift a person's mental state into one that fosters creativity. These techniques are described in creativity techniques. One such popular technique is to take a break and relax or sleep after intensively trying to think of a solution.
- Creativity techniques designed to reframe the problem. For example, reconsidering one's goals by asking "What am I really trying to accomplish?" can lead to useful insights.
- Creativity techniques designed to increase the quantity of fresh ideas. This approach is based on the belief that a larger number of ideas increases the chances that one of them has value. Some of these techniques involve randomly selecting an idea (such as choosing a word from a list), thinking about similarities with the undesired situation, and hopefully inspiring a related idea that leads to a solution. Such techniques are described in creativity techniques.
- Creative-problem-solving techniques designed to efficiently lead to a fresh perspective that causes a solution to become obvious. This category is useful for solving especially challenging problems. Some of these techniques involve identifying independent dimensions that differentiate (or separate) closely associated concepts. Such techniques can overcome the mind's instinctive tendency to use "oversimplified associative thinking" in which two related concepts are so closely associated that their differences, and independence from one another, are overlooked.

The following formalized and well-known methods and processes combine various creativity and creative-problem-solving techniques:

- TRIZ, which is also known as Theory of Inventive Problem Solving (TIPS), was developed by Genrich Altshuller (1994) and his colleagues based on examining more than 200,000 patents. This method is designed to foster the creation and development of patentable inventions, but is also useful for creating non-product solutions.
- Mind mapping is a creativity technique that both reframes the situation and fosters creativity.

- Brainstorming is a group activity designed to increase the quantity of fresh ideas. Getting other people involved can help increase knowledge and understanding of the problem and help participants reframe the problem.
- Edward de Bono has published numerous books that promote an approach to creative problem solving and creative thinking called lateral thinking^{xv}.
- The Creative Problem Solving Process (CPS) is a six-step method developed by Alex Osborn and Sid Parnes (2001) that alternates convergent and divergent thinking phases.

Even if people knew how to systematically and routinely innovate beyond brainstorming, there are other challenges^{xvi}. They may resist trying for fear of failure (Lee, Edmondson & Worline, 2004). Status-conscious employees often keep their good ideas to themselves, afraid to test them in the workplace, fearing embarrassment and loss of status if their ideas fail^{xvii}.

Another barrier is that even when people generate novel ideas for the good of the organization, their colleagues may see these ideas as tainted. Menon & Pfeffer (2003) states, that acknowledging a superior idea from a colleague implies deference to their internal rival and devalues their own status and distinctiveness within the organization^{xviii}.

Employees may resist sharing their best ideas for fear of colleagues stealing or "free-riding" on that idea (Kerr & Bruun, 1983). People may harbor ideas waiting for the ideal time to reveal them in a way that limits their colleagues from taking credit^{xix}.

A frequent approach to teaching creative problem solving is to teach critical thinking in addition to creative thinking, but the effectiveness of this approach is not proven. As an alternative to separating critical and creative thinking, some creative-problem-solving techniques focus on either reducing an idea's disadvantages or extracting a flawed idea's significant advantages and incorporating those advantages into a different idea. Creative-problem-solving tools typically consist of software or manipulate objects (such as cards) that facilitate specific creative-problem-solving techniques^{xx}. Electronic meeting systems^{xxi} provide a range of interactive tools for creative-problem-solving by groups over the Internet.

Innovation

Innovation is an important topic in the study of economics, business, entrepreneurship, design, technology, sociology, and engineering. Colloquially, the word "innovation" is often synonymous with the output of the process. However, economists tend to focus on the process itself, from the origination of an idea to its transformation into something useful, to its implementation; and on the system within which the process of innovation unfolds. Since innovation is also considered a major driver of the economy, especially when it leads to new product categories or increasing productivity, the factors that lead to innovation are also considered to be critical to policy makers. In particular, followers of innovation economics stress using public policy to spur innovation and growth.

Those who are directly responsible for application of the innovation are often called pioneers in their field, whether they are individuals or organizations.

In the organizational context, innovation may be linked to performance and growth through improvements in efficiency, productivity, quality, competitive positioning, market share, etc. All organizations can innovate, including for example hospitals, universities, and local governments.

While innovation typically adds value, innovation may also have a negative or destructive effect as new developments clear away or change old organizational forms and practices. Organizations that do not innovate effectively may be destroyed by those that do. Hence innovation typically involves risk. A key challenge in innovation is maintaining a balance between process and product innovations where process innovations tend to involve a business model which may develop shareholder satisfaction through improved

efficiencies while product innovations develop customer support however at the risk of costly R&D that can erode shareholder return. Innovation can be described as the result of some amount of time and effort into researching an idea, plus some larger amount of time and effort into developing this idea, plus some very large amount of time and effort into commercializing this idea into a market place with customers.

Innovation has been studied in a variety of contexts, including in relation to technology, commerce, social systems, economic development, and policy construction. There are, therefore, naturally a wide range of approaches to conceptualizing innovation in the scholarly literature.

Distinguishing from invention. Invention is the embodiment of something new. While both invention and innovation have "uniqueness" implications, innovation also carries an undertone of profitability and market performance expectation.

An improvement on an existing form or embodiment, composition or processes might be an invention, an innovation, both or neither if it is not substantial enough. According to certain business literature, an idea, a change or an improvement is only an innovation when it is put to use and effectively causes a social or commercial reorganization.

In business, innovation can be easily distinguished from invention. Invention is the conversion of cash into ideas. Innovation is the conversion of ideas into cash. This is best described by comparing Thomas Edison with Nikola Tesla. Thomas Edison was an innovator because he made money from his ideas. Nikola Tesla was an inventor. Tesla spent money to create his inventions but was unable to monetize them. Innovators produce, market and profit from their innovations. Inventors may or may not profit from their work well having those is unsustainable.

In organizations. A convenient definition of innovation from an organizational perspective is given by Luecke and Katz (2003), who wrote:

"Innovation . . . is generally understood as the successful introduction of a new thing or method . . . Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services."

A content analysis on the term "innovation" carried out by Baregheh et al. (2009) within the organizational context, defines innovation as:

"Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace."

Innovation typically involves creativity, but is not identical to it: innovation involves acting on the creative ideas to make some specific and tangible difference in the domain in which the innovation occurs. For example, Amabile et al. (1996) propose:

"All innovation begins with creative ideas . . . We define innovation as the successful implementation of creative ideas within an organization. In this view, creativity by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second".

For innovation to occur, something more than the generation of a creative idea or insight is required: the insight must be put into action to make a genuine difference, resulting for example in new or altered business processes within the organization, or changes in the products and services provided.

"Innovation, like many business functions, is a management process that requires specific tools, rules, and discipline."

From this point of view emphasis is moved from the introduction of specific novel and useful ideas to the general organizational processes and procedures for generating, considering, and acting on such insights

leading to significant organizational improvements in terms of improved or new business products, services, or internal processes.

Through these varieties of viewpoints, creativity is typically seen as the basis for innovation, and innovation as the successful implementation of creative ideas within an organization.

It should be noted, however, that the term 'innovation' is used by many authors rather interchangeably with the term 'creativity' when discussing individual and organizational creative activity.

A **Collaborative Innovation Network**, or CoIN, is a social construct used to describe innovative teams. It has been defined by the originator of the term, **Peter Gloor** (a Research Scientist at MIT Sloan's Center for Collective Intelligence) as "a cyber team of self-motivated people with a collective vision, enabled by the Web to collaborate in achieving a common goal by sharing ideas, information, and work."^{xxii}

COINs feature internal transparency and direct communication. Members of a COIN collaborate and share knowledge directly with each other, rather than through hierarchies. They come together with a shared vision because they are intrinsically motivated to do so and seek to collaborate in some way to advance an idea.

The five essential elements of collaborative innovation networks (what Gloor calls their "genetic code") are as follows:^{xxiii}

1. Evolve from learning networks
2. Feature sound ethical principles
3. Based on trust and self-organization
4. Make knowledge accessible to everyone
5. Operate in internal honesty and transparency

COINs rely on modern technology such as the Internet, e-mail, and other communications vehicles for information sharing. Creativity, collaboration, and communication are their hallmarks. COINs existed well before modern communication technology enabled their creation and development^{xxiv}. The most valuable and complex technologies are increasingly innovated by networks that self-organize. Networks are those linked organizations (e.g., firms, universities, government agencies) that create, acquire, and integrate diverse knowledge and skills required to innovate complex technologies (e.g., aircraft, telecommunications equipment). In other words, innovation networks are organized around constant learning. Self-organization refers to the capacity these networks have for combining and recombining these learned capabilities without centralized, detailed managerial guidance. The proliferation of self-organizing innovation networks may be linked to many factors, but a key one seems to be increasing globalization. Indeed, globalization and self-organizing networks may be coevolving. Changes in the organization of the innovation process appear to have facilitated the broadening geographical linkages of products, processes, and markets^{xxv}. At the same time, globalization seems to induce cooperation among innovative teams in organizations.

Technological Innovation System

The Technological Innovation System is a concept developed within the scientific field of innovation studies which serves to explain the nature and rate of technological change.^{xxvi} A Technological Innovation System can be defined as 'a dynamic network of agents interacting in a specific economic/industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilization of technology'.^{xxvii}

The approach may be applied to at least three levels of analysis: to a technology in the sense of knowledge field, to a product or an artifact, or to a set of related products and artifacts aimed at satisfying a particular

societal function¹. With respect to the latter, the approach has especially proven itself in explaining why and how sustainable (energy) technologies have developed and diffused into a society, or have failed to do so.

The concept of a Technological Innovation System was introduced as part of a wider theoretical school, called the innovation system approach. The central idea behind this approach is that determinants of technological change are not (only) to be found in individual firms or in research institutes, but (also) in a broad societal structure in which firms, as well as knowledge institutes, are embedded.^{xxviii} Since the 1980s, innovation system studies have pointed out the influence of societal structures on technological change, and indirectly on long-term economic growth, within nations, sectors or technological fields.

The purpose of analyzing a Technological Innovation System is to analyze and evaluate the development of a particular technological field in terms of the structures and processes that support or hamper it. Besides its particular focus, there are two, more analytical, features that set the Technological Innovation System approach apart from other innovation system approaches^{xxx}.

Firstly, the Technological Innovation System concept emphasizes that stimulating knowledge flows is not sufficient to induce technological change and economic performance. There is a need to exploit this knowledge in order to create new business opportunities. This stresses the importance of individuals as sources of innovation, something which is sometimes overseen in the, more macro-oriented, nationally or local oriented innovation system approaches.

Secondly, the Technological Innovation System approach often focuses on system dynamics. The focus on entrepreneurial action has encouraged scholars to consider a Technological Innovation System as something to be built up over time.

Technological Innovation Systems are defined in terms of knowledge/competence flows rather than flows of ordinary goods and services. They consist of dynamic knowledge and competence networks. In the presence of an entrepreneur and sufficient critical mass, such networks can be transformed into development blocks, i.e. synergistic clusters of firms and technologies within an industry or a group of industries.^{xxx}

This means that a Technological Innovation System may be analyzed in terms of its system components and/or in terms of its dynamics. Both perspectives will be explained below.

Structures. *The system components of a Technological Innovation System are called structures. These represent the static aspect of the system, as they are relatively stable over time. Three basic categories are distinguished:*

- **Actors:** Actors involve organisations contributing to a technology, as a developer or adopter, or indirectly as a regulator, financier, etc. It is the actors of a Technological Innovation System that, through choices and actions, actually generate, diffuse and utilise technologies.
- **Institutions:** Institutional structures are at the core of the innovation system concept. It is common to consider institutions as ‘the rules of the game in a society, or, more formally, the humanly devised constraints that shape human interaction’.
- **Technological factors:** Technological structures consist of artefacts and the technological infrastructures in which they are integrated. They also involve the techno-economic workings of such artefacts, including costs, safety, reliability. These features are crucial for understanding the feedback mechanisms between technological change and institutional change. For example, if R&D subsidy schemes supporting technology development should result in improvements with regard to the safety and reliability of applications, this would pave the way for more elaborate support schemes, including practical demonstrations.

The structural factors are merely the elements that make up the system. In an actual system, these factors are all linked to each other. If they form dense configurations they are called networks. An example would be a coalition of firms jointly working on the application of a fuel cell, guided by a set of problem-solving routines and supported by a subsidy programmed. Likewise, industry associations, research communities, policy networks, user-supplier relations etc. are all examples of networks.

An analysis of structures typically yields insight into systemic features - complementarities and conflicts - that constitute drivers and barriers for technology diffusion at a certain moment or within a given period in time.

Dynamics of Technological Innovation Systems. *Structures involve elements that are relatively stable over time. Nevertheless, for many technologies, especially newly emerging ones, these structures are not yet (fully) in place. For this reason, mostly, the scholars have recently enriched the literature on Technological Innovation Systems with studies that focus on the build-up of structures over time. The central idea of this approach is to consider all activities that contribute to the development, diffusion, and use of innovations as system functions.^{xxx1} These system functions are to be understood as types of activities that influence the build-up of a Technological Innovation System. Each system function may be 'fulfilled' in a variety of ways. The premise is that, in order to properly develop, the system should positively fulfil all system functions. Various 'lists' of system functions have been constructed. Note that it is also possible that activities negatively contribute to a system function. These negative contributions imply a (partial) breakdown of the system. As an example, the seven system functions defined by Suurs are explained here^{xxx2}:*

- **F1. Entrepreneurial Activities:** The classic role of the entrepreneur is to translate knowledge into business opportunities, and eventually innovations. The entrepreneur does this by performing market-oriented experiments that establish change, both to the emerging technology and to the institutions that surround it.
- **F2. Knowledge Development:** The Knowledge Development function involves learning activities, mostly on the emerging technology, but also on markets, networks, users etc. There are various types of learning activities, the most important categories being learning-by-searching and learning-by-doing. The former concerns R&D activities in
- example in the form of laboratory experiments or adoption trials.
- **F3. Knowledge Diffusion / Knowledge Exchange:** The characteristic organisation structure of a Technological Innovation System is that of the network. The primary function of networks is to facilitate the exchange of knowledge between all the actors involved in it. Knowledge Diffusion activities involve partnerships between actors, for example technology developers, but also meetings like workshops and conferences.
- **F4. Guidance of the Search:** The Guidance of the Search function refers to activities that shape the needs, requirements and expectations of actors with respect to their (further) support of the emerging technology.
- **F5. Market Formation:** Emerging technologies cannot be expected to compete with incumbent technologies. In order to stimulate innovation, it is usually necessary to create artificial (niche) markets.
- **F6. Resource Mobilisation:** Resource Mobilisation refers to the allocation of financial, material and human capital. The access to such capital factors is necessary for all other developments.
- **F7. Support from Advocacy Coalitions:** The rise of an emerging technology often leads to resistance from actors with interests in the incumbent energy system. In order for a Technological Innovation System to develop, other actors must counteract this inertia. This can be done by urging authorities to reorganise the institutional configuration of the system. The Support from Advocacy Coalitions function involves political lobbies and advice activities on behalf of interest groups.

In this context, cumulative causation is the phenomenon that the build-up of a Technological Innovation System accelerates due to system functions interacting and reinforcing each other over time. For example, the successful realisation of a research project, contributing to Knowledge Development, may result in high expectations, contributing to Guidance of the Search, among policy makers, which may, subsequently, trigger the start-up of a subsidy programme, contributing to Resource Mobilisation, which

induces even more research activities: Knowledge Development, Guidance of the Search, etc. System functions may also reinforce each other 'downwards'. In that case interactions result in conflicting developments or a vicious circle! Recently scholars have increasingly paid attention to the question of how cumulative causation may be established, often with a particular focus on the development of sustainable energy technologies.

Social innovation

Over the years, the term has developed several overlapping meanings. It can be used to refer to social *processes* of innovation, such as open source methods and techniques. Alternatively it refers to innovations which have a social purpose - like microcredit or distance learning. The concept can also be related to social entrepreneurship (entrepreneurship isn't always or even usually innovative, but it can be a means of innovation) and it also overlaps with innovation in public policy and governance. Social innovation can take place within government, within companies, or within the nonprofit sector (also known as the third sector), but is increasingly seen to happen most effectively in the space between the three sectors. Recent research has focused on the different types of platforms needed to facilitate such cross-sector collaborative social innovation^{xxxiii}. Currently, social innovation is becoming increasingly important within the academic debate, also regarding its theoretical concepts.^{xxxiv}

The idea of social innovation has become much more prominent with ongoing research, blogs and websites (such as the social innovation exchange), and a proliferation of organisations working on the boundaries of research and practical action. Several currents have converged in this area, including:

- new thinking about innovation in public services, pioneered particularly in some of the Scandinavian and Asian countries. Governments are increasingly recognising that innovation isn't just about hardware: it is just as much about healthcare, schooling and democracy.
- growing interest in social entrepreneurship.
- business, which is increasingly interested in innovation in services.
- new methods of innovation inspired by the open source field.
- linking social innovation to theory and research in complex adaptive systems to understand its dynamics.^{xxxv}
- collaborative approaches to social innovation, particularly in the public sector.^{xxxvi}

A recent overview of the field highlighted the growing interest of public policy makers in supporting social innovation in these different sectors, notably in the UK, Australia, China and Denmark.^{xxxvii} A focus of much recent work has been on how innovations spread and on what makes some localities particularly innovative.^{xxxviii}

Innovation economics

Innovation economics is an economic doctrine that reformulates the traditional model of economic growth so that knowledge, technology, entrepreneurship, and innovation are positioned at the center of the model rather than seen as independent forces that are largely unaffected by policy. Innovation economics is based on two fundamental tenets: that the central goal of economic policy should be to spur higher productivity and greater innovation, and that markets relying on price signals alone will not always be as effective as smart public-private partnerships in spurring higher productivity and greater innovation. This is in contrast to the two other conventional economic doctrines, Neoclassical economics and Keynesian economics. Innovation economists believe that what primarily drives economic growth in today's knowledge-based economy is not capital accumulation, as claimed by neoclassic lists^{xxxix}, but innovation. The major changes in the U.S. economy of the last 15 years have occurred not because the economy accumulated more capital to invest in even bigger steel mills or car factories; rather they have occurred because of innovation. The U.S. economy developed a wide array of new technologies, particularly information technologies, and used them widely.

Although capital was needed for these technologies, capital was not the driver; nor was capital a commodity in short supply.

The major drivers of economic growth are productive efficiency and adaptive efficiency. If the focus in neoclassical economics is “the study of how societies use scarce resources to produce valuable commodities and distribute them among different people,” the focus in innovation economics is the study of how societies create new forms of production, products, and business models to expand wealth and quality of life.

In contrast to neoclassical economics, which is focused on getting the price signals right to maximize the efficient allocation of scarce resources, innovation economics is focused on spurring economic actors – from the individual, to the organization or firm, and to broader levels, such as industries, cities, and even an entire nation – to be more productive and innovative. From the standpoint of innovation economists, if government policies to encourage innovation “distort” price signals and result in some minor deadweight loss to the economy, so be it, because allocate efficiency is not the major factor in driving economic growth in the 21st century knowledge-based economy.

Spurring evolving and learning institutions is the key to growth. Neoclassical economics, which focuses principally on markets and individuals and firms acting in them as atomistic particles responding pretty much exclusively to price signals along supply and demand curves does explain a share of the economy. But innovation in the neoclassical economic model is an exogenous process – a black box, if you will, that works its magic solely in response to price signals. In this sense, the neoclassical model sees innovation as falling like “manna from heaven,” not something that can be induced by proactive economic policies.

In innovation economics, innovation is central. Innovation economists recognize that innovation and productivity growth take place in the context of institutions. Indeed, it is the “social technologies” of institutions, culture, norms, laws, and networks that are so central to growth, yet are so difficult for conventional economics to model or study. Innovation economists view innovation as an evolutionary process in a market where firms act on imperfect information and where market failures are common.

Organizational Innovation

Programs of organizational innovation are typically tightly linked to organizational goals and objectives, to the business plan, and to market competitive positioning. One driver for innovation programs in corporations is to achieve growth objectives. As Davila et al. (2006) note, “Companies cannot grow through cost reduction and reengineering alone... Innovation is the key element in providing aggressive top-line growth and for increasing bottom-line results” (p.6)⁴

In general, business organizations spend a significant amount of their turnover on innovation, such as making changes to their established products, processes and services. The amount of investment can vary from as low as a half a percent of turnover for organizations with a low rate of change to anything over twenty percent of turnover for organizations with a high rate of change.

The average investment across all types of organizations is four percent. For an organization with a turnover of one billion currency units, this would represent an investment of forty million units. This budget will typically be spread across various functions including marketing, product design, information systems, manufacturing systems and quality assurance. The investment may vary by industry and by market positioning.

One survey across a large number of manufacturing and services organizations found, ranked in decreasing order of popularity, which systematic programs of organizational innovation are most frequently driven by:

1. Improved quality
2. Creation of new markets
3. Extension of the product range
4. Reduced labour costs
5. Improved production processes
6. Reduced materials
7. Reduced environmental damage
8. Replacement of products/services
9. Reduced energy consumption
10. Conformance to regulations

These goals vary between improvements to products, processes and services and dispel a popular myth that innovation deals mainly with new product development. Most of the goals could apply to any organization be it a manufacturing facility, marketing firm, hospital or local government. Whether an innovation goal is successfully achieved or otherwise depends greatly on the environment prevailing in the firm^{xii}.

Research findings vary, ranging from fifty to ninety percent of innovation projects judged to have made little or no contribution to organizational goals. One survey regarding product innovation quotes that out of three thousand ideas for new products; only one becomes a success in the marketplace. Failure is an inevitable part of the innovation process, and most successful organizations factor in an appropriate level of risk. Perhaps it is because all organizations experience failure that many choose not to monitor the level of failure very closely. The impact of failure goes beyond the simple loss of investment. Failure can also lead to loss of morale among employees, an increase in cynicism and even higher resistance to change in the future.

Innovations that fail are often potentially good ideas but have been rejected or postponed due to budgetary constraints, lack of skills or poor fit with current goals. Failures should be identified and screened out as early in the process as possible. Early screening avoids unsuitable ideas devouring scarce resources that are needed to progress more beneficial ones. Organizations can learn how to avoid failure when it is openly discussed and debated. The lessons learned from failure often reside longer in the organizational consciousness than lessons learned from success. While learning is important, high failure rates throughout the innovation process are wasteful and a threat to the organization's future.

The causes of failure have been widely researched and can vary considerably. Some causes will be external to the organization and outside its influence of control. Others will be internal and ultimately within the control of the organization. Internal causes of failure can be divided into causes associated with the cultural infrastructure and causes associated with the innovation process itself. Failure in the cultural infrastructure varies between organizations but the following are common across all organizations at some stage in their life cycle (O'Sullivan, 2002).^{xiii}

1. Poor Leadership
2. Poor Organization
3. Poor Communication
4. Poor Empowerment
5. Poor Knowledge Management

Common causes of failure within the innovation process in most organizations can be distilled into five types:

1. Poor goal definition
2. Poor alignment of actions to goals
3. Poor participation in teams
4. Poor monitoring of results
5. Poor communication and access to information

Individuals and Teams Innovation

Effective goal definition requires that organizations state explicitly what their goals are in terms understandable to everyone involved in the innovation process. This often involves stating goals in a number of ways. Effective alignment of actions to goals should link explicit actions such as ideas and projects to specific goals. It also implies effective management of action portfolios. Participation in teams refers to the behavior of individuals in and of teams, and each individual should have an explicitly allocated responsibility regarding their role in goals and actions and the payment and rewards systems that link them to goal attainment. Effective communication and access to information are important for individual members and teams on daily activities in innovation process. Finally, effective monitoring of results requires the monitoring of all goals, actions and teams involved in the innovation process.

Innovation can fail if seen as an organizational process whose success stems from a mechanistic approach i.e. 'pull lever obtain result'. While 'driving' change has an emphasis on control, enforcement and structures it is only a partial truth in achieving innovation. Organizational gatekeepers frame the organizational environment that "enables" innovation, however innovation is "enacted" – recognized, developed, applied and adopted – through individuals and teams.

Individuals and teams are the 'atom' of the organization close to the minutiae of daily activities. Within individuals gritty appreciation of the small detail combines with a sense of desired organizational objectives to deliver (and innovate for) a product/service offer. With these constraints, it appears that people place a premium on getting the idea out of their head and over to their partner first rather than pre-judge the merits of the idea and the value to their personal status for having thought of it. Working in pairs seems to create a sense of accountability and transparency. Once the idea is out on the table, each partner gives some sense of oversight or verification that the idea has been shared with the larger group. A participant may think afterward that one of his or her ideas is brilliant and thus too good to share with the teams, but it is too late. The idea has been captured for the larger group to consider.

The systematic inventive thinking method produces several dozens to several hundreds of ideas depending on the amount of time dedicated to the activity. Skillful facilitation is required again to help overcome the problem of peer acceptance of those ideas.

First, the facilitators create an environment of non-attribution so that no one individual is associated with a specific idea. Because the idea was generated in a small team of two or three, and because the moment of truth was born out of a stepwise contribution of their insights and notions during the mini-exercises, it is often hard to distinguish who actually could be credited with generating one specific idea. Idea anonymity reduces the internal competitive threat among colleagues and makes ideas no longer tainted. Participants come to recognize idea contribution as process output.

Second, the facilitation process emphasizes only newly-created ideas rather than ideas participants had before coming to the workshop. This inhibits the problem of people selling their pet ideas to their peers, which are usually ideas that the peers have already rejected.

Third, the facilitators lead the larger team to develop a specific set of objective, weighted criteria to judge each of the new ideas generated in the workshop. Diverse teams bring the value of diverse thinking but also the added cost of having to converge on a set of guiding principles.

With these criteria in place in the form of a linear weighted model, ideas are allowed to rise to the top without the stigma of who generated them or who judged them. Internal competition among peer rivals is minimized allowing for a more objective evaluation of ideas. Thoughtful facilitation seems to bring about this alignment much more efficiently than what internal teams can do left on their own.

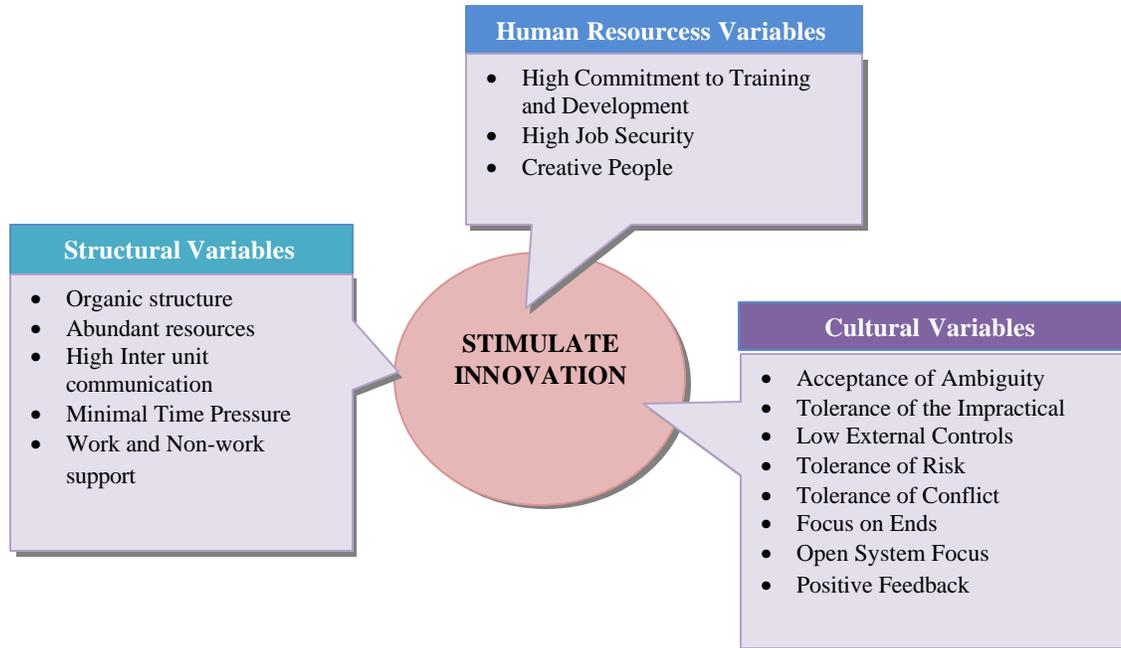
There are two fundamentally different types of measures for innovation: the organizational level and the political level.

- The measure of innovation at the organizational level relates to individuals, team-level assessments, and private companies from the smallest to the largest.
- Measure of innovation for organizations can be conducted by surveys, workshops, consultants or internal benchmarking.

There is today no established general way to measure organizational innovation.

How Organization more innovative

We've identified three set of variables that have been found to stimulate innovation; the organization structure, culture, and human resource practices, as figure below^{xliii};



Conclusions

- A widespread and long-lived innovation typically becomes a new tradition. All innovations begin as creative solutions, but not all creative solutions become innovations. Some innovations also qualify as inventions.
- If we find a better product and services, process or procedure to accomplish our task, we have an innovation. Two fundamental types of innovation are product and process innovation. Product or services innovation are changes in the actual outputs themselves. Process innovation are change in technology—a departure from previous ways of doing things.
- There are definable and predictable patterns in the way technologies emergence, develop, and are replaced. Critical forces convergence to create new technology, which then follow well-defined life cycle pattern. Programs of organizational innovation are typically tightly linked to organizational goals and objectives, to the business plan, and to market competitive positioning.
- There is science behind making new product or services. Understanding what is happening in the process helps you achieve the desired results. This is true for every domain in which we are see people working in the trenches of innovation. No matter what you are doing, there is a body of knowledge that precedes your efforts. If you don't have good access to this knowledge, you are destined to repeat the mistakes of the past and waste a lot of effort reinventing the wheel.
- Social innovation can take place within government, within companies, or within the nonprofit sector (also known as the third sector), but is increasingly seen to happen most effectively in the space between the three sectors. Recent research has focused on the different types of platforms needed to facilitate such cross-sector collaborative social innovation.
- In innovation economics, innovation is central. Innovation economists recognize that innovation and productivity growth take place in the context of institutions. Indeed, it is the “social technologies” of institutions, culture, norms, laws, and networks that are so central to growth, yet are so difficult for conventional economics to model or study. Innovation economists view innovation as an evolutionary process in a market where firms act on imperfect information and where market failures are common.
- Organizational gatekeepers frame the organizational environment that "enables" innovation, however innovation is "enacted" – recognized, developed, applied and adopted – through individuals and teams.

Suggestion

- R&D of organization must proactive to recognized, developed, applied and adopted – innovation through individuals members and teams.
- High performance innovation organizations understand the need to knowledge enable their innovation individuals members and teams by providing them with the best, purposeful knowledge research and delivery systems.
- In the organizational context, innovation may be linked to performance and growth through improvements in efficiency, productivity, quality, competitive positioning, market share, etc. All organizations can innovate, including for example hospitals, universities, and local governments.
- Participation in teams refers to the behavior of individuals in and of teams, and each individual should have an explicitly allocated responsibility regarding their role in goals and actions and the payment and rewards systems that link them to goal attainment.
- Effective communication and access to information are important for individual members and teams on daily activities in innovation process.

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