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A MODEL FOR INNOVATION CULTURE MANAGEMENT IN ORGANIZATIONS (IVALUE 7)

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ABSTRACT

Governments, companies, universities, institutes, and individuals all over the world have prioritized innovation on their agenda and some have declared innovation as a strategic goal, but for a few of them, innovation has been a way of life. Organizational development depends on human capabilities more than ever. Not just intellectual, emotional, executive, experiential, and physical quotients of human capacity, but also creative, spiritual, passionate, motivational, and social quotients now need to be considered. When an invention is valued, it becomes an innovation. Although, innovation began with human, it is hard to pinpoint the first inventor in history. Transformation from a learning organization to a thinking organization is needed to be able to sustain innovative culture. At this point, the hard question is how? A smart, creative and dynamic innovation culture will help organizations to see the value of invention. In this study, a brief review is first made on the historical backgrounds of universities, institutes, industrial revolutions, and management systems in order to understand the evolution of the concept of innovation. Then, IVALUE7, a management model for dynamic, smart innovation organizational culture, will be introduced and discussed.

Keywords: Innovation; Culture; Management; Technology; R&D; Quality; Quotient.

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MODELO PARA LA GESTION DE INNOVACION CULTURAL EN ORGANIZACIONES (IVALUE 7)

ABSTRACTO

El gobierno, las companias, universidades, e individuos alrededor del mundo han dado prioridad a la innovacion en sus agendas y algunos han declarado la innovacion como una meta estrategica, pero para algunos la innovacion ha sido una forma de vida. El desarrollo de una organizacion depende de las capacidades humanas mas que nunca. No solo capacidades humanas intelectuales, emocionales, ejecutivas, experimentales y fisicas, pero tambien las capacidades creativas, espirituales, pasionales, de motivacion y las sociales necesitan ser ahora consideradas. Cuando una invencion es valorada, se convierte en innovacion. Aunque la innovacion empezo con la raza humana, es dificil identificar el primer inventor de la historia. La transformacion de una organizacion de aprendizaje a una organizacion de pensamiento es necesaria para sostener una cultura innovadora. A estas alturas, la question es como? Una cultura de innovacion inteligente, creative y dinamica ayudara a las organizaiones a ver el valor de la invencion. En este estudio, por primera vez, se presenta una revision breve de los conocimientos historicos de universidades, instituciones, revoluciones industriales, y sistemas de gestion con la finalidad de entender la evolucion del concepto de innovacion. Con tal finalizad, se presenta y discute IVALUE7, un modelo de gestion para la innovacion dinamica e inteligente de la cultura de organizaciones.

Palabra Clave: Innovacion; Cultura; Administración; Tecnología; Investigación Y Desarrollo; Calidad; Cociente

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INTRODUCTION

Innovation has become a strategic goal for all organizations. Our journey to innovation is strongly related to the history of universities, institutes, industrial revolutions, and management.

Although, universities, laboratories, institutes, industrial, and civil organizations may have had different missions in the past, they currently have a shared mission: INNOVATION.

In any organization, in order to improve organizational effectiveness and improve the quality of products or processes, a number of systems should be managed effectively. To date, many management systems/models, tools, and practices have been developed (Shewart, 1986, p.1-10; Deming, 2013, p. 69-105; Juran & Gofrey, 1988, p.2.1-2.18 ; Feigenbaum, 1997, p. 45-47; Karuppusami & Gandhinatha, 2006, p.372-385; Bamford & Greatbanks, 2005, p. 376-392; Crosby, 1979, p. 119-127; Taguchi & Chowdhury, 2005, p.25-125 ; Monden, 2012, p. 1-6; Pyzdek &Keller, 2014, p.4-8; Altshuller, 2004, p.2-6; Govers, 1996, p. 575-585; Stamatis, 2003, p. 21-76; Montgomery, 2009, p. 1-22; Shingo, 1986, p. 99-106; Weckenmann, Akkasoglu & Werner, 2015; Emiliani, 2006; Manders, Vries & Blind, 2016) With the motivation of globalization, even though many standards for management systems have been made, innovation management standards are still in development (ISO 9001, n.d; "ISO/AWI 50501", n.d).

The integration of these systems is and will be a serious problem for many organizations. Furthermore, the future is bringing other questions, like, who will be responsible for innovation culture management, what kind of culture will be infused, and how will it be integrated into the existing culture?

This study is focused on the importance of innovation culture management rather than on innovation management. First, a brief review is made on the historical backgrounds of universities, institutes, industrial revolutions, and management systems in order to understand their roles in the evolution of innovation in society. Then, IVALUE7, a management model for a dynamic, smart innovation culture, will be introduced and discussed.

Learning from history

The first university in history was established by the philosopher Plato in 387 BC in Athens, Greece as the Platonic Academy. There are others sources that claim Taxila University, established in 600 BC, was the first university. The Guinness World Records recognizes Karueein University, which was founded in 859 AD by a woman, Fatima al-Fihri, in Fez, Morocco.

In Europe, the University of Bologna in Italy was founded in 1088. In the United States of America, Harvard is known to be the first university as it was founded in 1636 before the American Revolution commenced. In Turkish history, the Great Seljuk Empire founded Al-Nizamiyya in Baghdad in 1065.

They are considered to be the model for Madrasahs founded during the Ottoman Empire. Moving away from the religious centered approach, the Mühendishane-i Berri-i Hümayun (Imperial School of Naval Engineering), known today as Istanbul Technical University (ITU), was established in 1773 (see Fig. 1) ("Top 10 Oldest Universities", n.d., "Ancient Higher Learning", n.d.; Erdem, 2005).

The first institute was established in the 9th century in Baghdad as an observatory. In that era, most institutions were focused on astronomy. After the 9th century, many institutions were established and worked in different research areas (Al-Khalili, 2010).

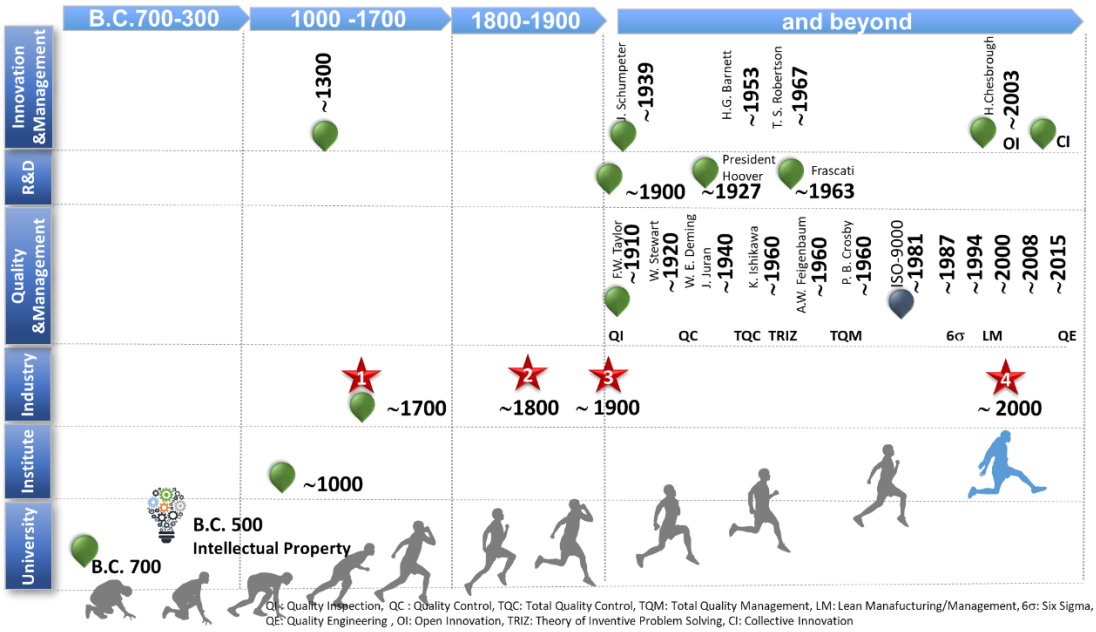

Fig 1. The evolution of IP (intellectual property), university, industry, quality, R&D and innovation.

The industrial revolution erupted in the late 18th century due to endless transformations in technology, sociology, and politics new business structures (Godin & Lane, n.d). Hence, founders and managers were faced with new challenges in know-how, organization, quality, R&D, and innovation management.

The first intellectual property (IP) protection was documented in Greece in 500 BC King Henry IV wrote a royal letter granting the first patent to John Kempe in 1331. The first IP protection system was formed in Venice, Italy in 1450. Regulations in IP protection in the Ottoman Empire started with the Trademark Regulation (Alamet-i Farika Nizamnamesi) in 1871 and the Patent Law in 1879 (Tolga, 2016; "History of Patent Law", n.d.; Turkish Patent Institute, n.d.; Ozkan, 2015). Godin & Lane (n.d.) note that R&D management gained importance when McKeen Cattell, an editor of "Science," published the biographies of around 4000 researchers in 1906 (although it is noteworthy that only university professors were included). In those days, the word 'research' was associated with basic research and industrialists maintained their entrepreneur, merchant, technician and engineer identities. This is demonstrated by the absence of R&D departments in industrial organizations. This perception changed in 1927 when American President Hoover promoted basic and applied research. Descriptions of development in industry in the second half of 19th century are actually descriptions of the evolution of industry accomplished through research. Experimental, technical, or product development departments started to be part of industrial organizations. In 1963, the first international definition of R&D was made by OECD members in Frascati, Italy. In order to label an activity as R&D, it has to be novel, creative, uncertain, systematic, transferable/reproducible, include basic research, and use applied research in experimental development (OECD, 2015). Today, due to increased competition it is vital to decrease the duration of product development by smart R&D models, Ebrahim, 2015 has proposed a model for Virtual R&D teams.

Management as a science and practice has continued to gain importance in the 19th century. The first known CEO, Alfred P. Sloan, and inventor of the modern corporation, Peter Drucker, have been acknowledged as the fathers of management. Quality management has greatly affected business with quality inspection (QI), total quality management (TQM) and lean manufacturing (LM) initiatives. Automotive companies have been the leaders of systems improvement tools, techniques, and

methodologies. Toyota in particular has played a significant role by introducing the Toyota Production System (TPS). TPS is built on lean manufacturing and uses Kaizen, 5S, Just In Time (JIT), Kanban, Value Stream Mapping, Quality Circles and Poka Yoke methods (Monden, 2012, p. 27, 35, 216, 257) Based on Deming's philosophy, Motorola developed an improvement model called 6Sigma in 1986. This methodology brought another perspective and new techniques such as Quality Function Deployment (QFD), Statistical Process Control (SPC), Design of Experiment (DoE), Project Management (PM) were introduced (Pyzdek&Keller, 2014, p. 4-8). Over the years, some of these tools and techniques have been included in international standards for managing quality, environment, information, and health & safety (ISO, n.d.). It is worthwhile to note that knowing these tools in innovation will help us to design effective innovation culture management models. The term innovation appeared for the first time in legal texts in the 13th century in reference to renewal of contracts (Godin&Lane, n.d.). The term, as it was used then, was more about change than creativity. In a survey, by Edison et.al. (2013) the most comprehensive definition for the term is ''the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". The definition shows that innovation is multidimensional and has several components.

Schumpeter, (1939) wrote a theory of invention. He clarified the difference between invention and innovation. Barnett (1953), Professor of Anthropology at Oregon University, used innovation in his book titled "The Basis of Cultural Change". He was the first to point out the role of innovation in cultural change. Robertson (1967) later defined innovation as "a process whereby a new thought, behavior, or thing is conceived of and brought into reality". The concept of Open Innovation was introduced by Chesbrough (2006) to accelarate internal innovation using inflow and ouflow knowledge.

The conceptual design

In history, there are many inventions that failed, but are still considered by many to be innovations. However, most people define innovations as technological innovations. In this paper, innovation is defined as valued invention. If an invention does not get any market value, it does not become an innovation. Therefore, having many tested and proven creative ideas or hypotheses does not make one innovative. When an invention is accepted by the market or society it is assumed to be sold, commercialized or embraced. If an idea provides a benefit to society and fits in Maslow's (1943) hierarchy of needs, then invention become innovation. Innovation refers to valuable inventions in both technological and social arenas. Valuable invention produces new products and services. Because we define the product as an entity which could be sensed or seen, a car is a product just as much as a management style or business plan. Therefore, an invention made to solve a social problem like refugee management is valuable and at some point more valuable than the invention of semiconductor technology.

The Detailed Design Dynamic and smart innovation culture management (IVALUE7)

The journey starts with human curiosity (see Fig. 2). Once, we have the urge we start looking around, seeing, feeling and dreaming to define deficiencies, problems or opportunities. Then, the hard part begins, thinking about how to reach our dreams. Giving meaning and shape to our dreams, requires decision making and signing; **de**(cision)**sign**(ature). Last, it is time to produce a product (innovative idea) and say eureka!

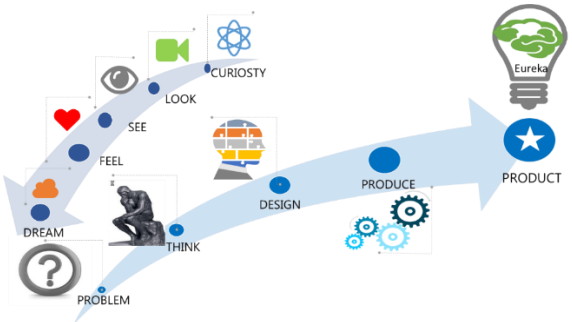

Fig. 2. Idea generation process.

Reaching the "eureka moment" requires smart people and smart systems. Organizations have been transforming from producing to thinking entities under the influence of social and technological developments (see Fig 3). Revolutions in particular have played a great role in this transformation. Today, some organizations are experiencing the fourth industrial revolution (World Economic Forum, 2016). To cope with this transformation, an innovation culture has to be formed. Organizations must harness energy and convert it to a valuable output called innovation. Therefore, to see and feel the big picture, it is important to know how much potential energy is available and what form it takes.

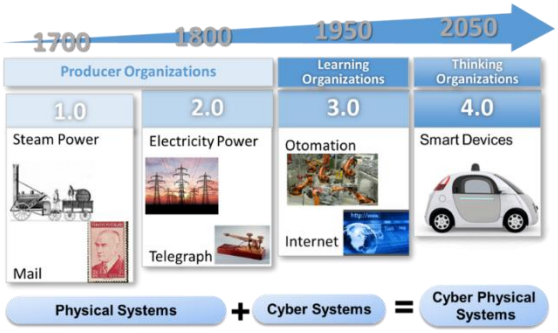

Fig 3. The relationship between organizations and industrial revolutions.

The energy potential is related to the physical, intellectual, technical, experiential, executive, practical, scientific, social, emotional, motivational, collective, patient, spiritual, learning, curiosity, passionate, and creative quotients of individuals and companies. The most commonly known quotients are intellectual and emotional quotients. However, one has to be aware of the other quotients to measure assets. For an individual, the physical quotient is the physical capacity to see, move hands, etc. For an organization, it is both the physical quotient of the employees and the physical capability of the organization's infrastructure. The experience quotient may be described as an inventory of know-how.

In Fig 4, the inventory of an organization quotient has been schematically shown. It is worth noting that having high creative and intellectual quotients do not make individuals and/or organizations innovative. Therefore, it is better for organizations to question and analyze their level of quotients before starting innovation management. To be innovative organizations, they must have high intellectual, experience, technical, practical, and physical quotients. When comparing two organizations, if one has a high executive quotient, it will be successful in competition. Having high emotional, social, spiritual, motivational, patience, learning, curiosity, creativity, and passion quotients will make the difference in innovation. Therefore, collective quotients have to be managed to build a dynamic and smart innovation culture.

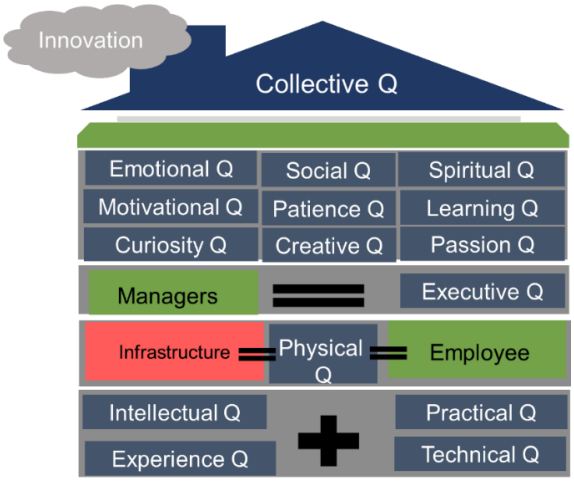

Fig 4. The quotient inventory of an innovative company.

Although there are a few surveys available to evaluate the innovative capabilities of companies, none are directly measuring these quotients (Amara, Landry, Becheikh, &Ouimet, 2008; Amara& Landry, 2005; Amara, 2006; Evangelista, Perani, Rapiti & Archibugi, 1997; Hashi, Stojci, 2013; Peter, 1993; "Harmonised Survey", 2012; "Innovation Survey", n.d.; "Bussiness R&D Innovation Survey", n.d.; "Testing Your Corparet IQ", n.d.; "Innovation Management Assesments", n.d.).

There are a lot of "most innovative" lists available ("The World's", n.d.; Forbes 2016, n.d.; The Most Forbes 2017, n.d.; Blomberg, 2017). In most of these lists, the criteria are based on financials. In one report, CEOs asserted that for success in innovation, the key ingredient is creating an organizational culture and that existing cultures are the largest barriers ("Unleashing the Power", n.d.)

For a dynamic and smart innovation culture, the key parameters are human and management systems. As seen in Fig. 5, without one, no valuable culture can be created. Higgins (1995) has had another approach, in his approach the sum of creativity and organizational culture is equal to innovation. Aichouche & Bousalem (2017) assert that organizational innovation in human management influences open innovation as well as organization performance.

Although there are many definitions on culture, culture in business can be defined as giving a philosophy soul and shape.

Therefore, before starting to manage innovation leaders have to think about the organization's philosophy.

Organizational values and statements of mission and vision are the starting point for giving soul to this philosophy. People in the company decide on the soul and then shape it by designing and using new and existing tools.

Fig 5. The equation for an innovative culture.

The essential components for IVALUE7 are shown in Fig 6 as human management, idea-design and technology management, infrastructure management, finance and fund management, innovative strategy management, intellectual property management, and collaboration management.

For success, integration of the above mentioned components is required. The philosophy behind IVALUE7 is valuing and integrating best practices. Therefore, creating and using Total Quality Management (TQM) or other tools is the liberty of organizations.

Fig 6. Seven pillars for a dynamic and smart innovation management culture (IVALUE7).

Innovative Strategic Management:

Innovation is a core strategic goal in almost every organization. However, innovative strategies will be needed to reach the goal. Therefore, smart and futuristic plans are needed. In order to make these plans, first historical, economic, sociological and cultural facts have to be thoroughly investigated. Then, the philosophy behind the innovation culture has to be defined. If necessary, revisions should be made to mission, vision, and values statements. To make smart plans, dreams and barriers should be scrutinized. By focusing on the futuristic customer requirements, a roadmap for dreams can be built

on using a nine step business model canvas (see Fig. 7) (Osterwalder & Pigneur, 2010, p. 15-18).

Human Management

Everyone is responsible from innovation. A dynamic and smart innovation culture needs smart minds. The mind is the regulator of energy produced in our brains. Healthy minds will shape organizations. In a human management system, simultaneous work management is needed under democratic authorizations and delegations. To build life-long thinking and learning organizations, professional development training programs will be needed. Nowadays, many organizations have already designed the curriculum of such programs. A database should be formed that includes instructors from inside and outside of the organization.

Structuring individual and organizational quotients will be a great challenge in this system. The quotient of each individual should be in a database. And, the training scores defined for individuals must be collected and analyzed. Finally, the whole quotient inventory of the organizations can be formed. Balanced Scorecards (Kaplan & Norton, 1993, p. 4) could be modified for easy and fast integration with existing systems.

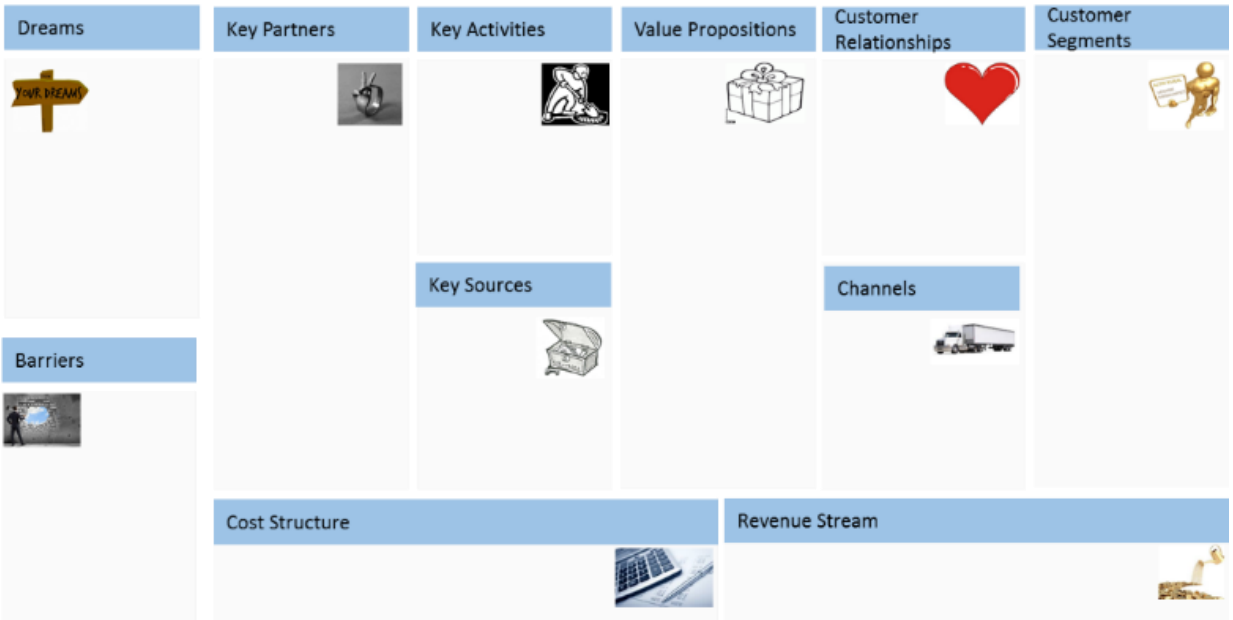

Fig 7. Modified smart and futuristic strategic plan tool.

Idea, Design and Technology Management

Innovation process starts with ideas and not all ideas generated will bring innovation. For each idea selected, a conceptual and detailed design must be studied in proposal and project management processes. Effective project management will produce a technology (product and process). In our model, NASA's TRL9 process is adopted for an innovative idea, design and technology assessment (Mankins, 1995) It is known that TRL9 is also adapted by the EU Committee in their Horizon 2020 work programme (EU, n.d.).

Using INO10 will provide a common language in technology management. This will help solve some conflicts among organizations. Fig. 8 shows the level of responsibilities for governments, universities, institutes, and industry by considering their missions. In universities and institutes, technological maturity usually stops at INO5 or INO7 and their innovative products (patents, paper, thesis, etc.) are transferred to the public.

However, industries are able to put their ideas to market by completing INO10. Governments, similar to industries, must complete all levels before they deliver any law or policy to society.

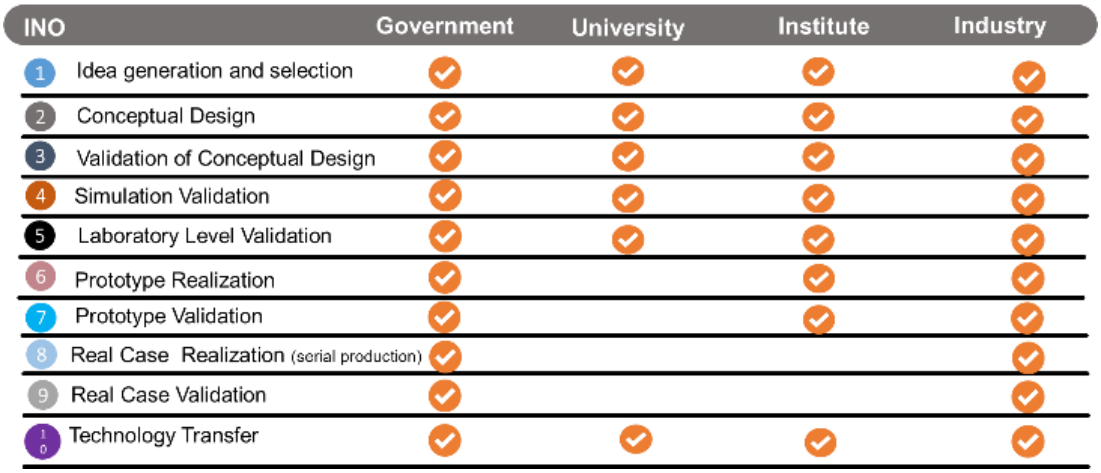

Fig 8. INO10: Idea, design and technology management road map.

Intellectual Property Management

Intellectual property is the treasury of an organization. Today, the management of technology and know-how plays a great role in competition (Frenz & Gillies, 2009; Vega-Jurado & Gutierrez-Gracia, Fernandez-de-Lucio & Manjarres-Henriquez, 2008). The first stage is to be aware of existing levels of know-how and technology. This is very important if the organizations are going to be pursuing a joint innovation.

Therefore, the existing memory of the organization should be checked in order to discover background IP. This memory refreshment will give organizations an opportunity to erase prejudices and find some forgotten knowledge. Second, is determining who will decide on the value of the new know-how produced and how.

The know-how should be collected, classified (background, foreground, and side-ground) and saved in an IP bank. This bank will require tools to classify, assure, protect, and transfer this know-how and technology. In a smart and dynamic innovation culture, every employee should have a know-how account that ultimately enriches the organizational know-how and technology treasury. This is very important for managing great minds and building strong collaborations.

Collaboration Management

Creating and powering sustainable collaborations are key to dynamic innovations (Nietoa & Santamaria, 2007; Tsai, 2009). A clear code of conduct, high quality communication plans, well prepared protocols and confidentiality agreements with suppliers, customers, employees and advisors will raise the collective quotient of organizations.

Infrastructure Management

Cooperative and effective infrastructure management will reduce the cost and time spent on innovation.

People will be able to work together using the utilities needed for experimentation, prototyping and real environment realization and validation. This is crucial for organizations that have distributed facilities at local, regional, and international levels. In these organizations a database should be structured for employees to access infrastructure, expertise, and support as needed.

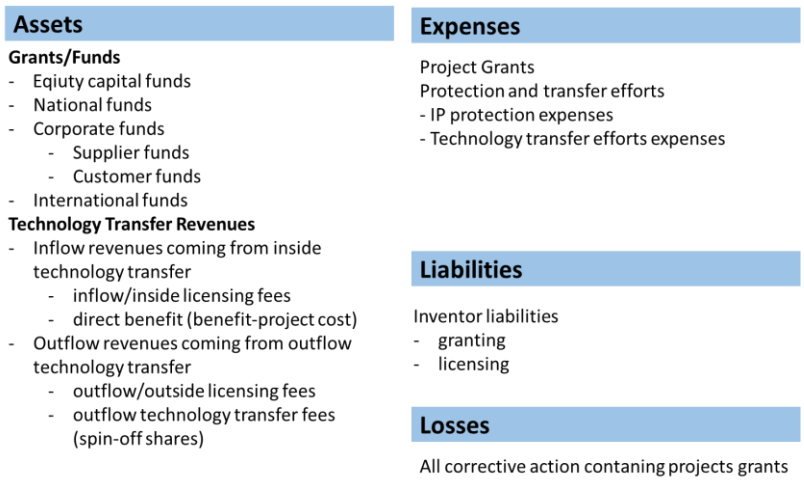

Fig 9. Assets and expenses in innovation bank for finance and fund management.

Finance and Fund Management

Cost Benefit Analysis or Cost-Value Analysis for innovation would be managed by an innovation bank (IB). The IB should be in strong communication with the IP bank. The assets of this bank could be grants/funds from the organizations equity capital, national, international funds and revenues coming from technology transfers as seen in Fig. 9. These technologies could be licensed in and out of the organizations. Inflow technology transfer includes using the IP inside organizations or affiliates. Outflow is transferring the technology to outside organizations. The expenses could be project grants, IP protection and technology transfer efforts, liabilities for personnel holding IPs granted and licensed. One of the important expense is the money spent for the projects aiming correcting the existing technologies (products/projects). This item should be specifically monitored to evaluate the innovation performance.

Conclusion

We have been experiencing the fourth industrial era of thinking organizations. The amount of new data generated in the last couple of years approximates to be larger than the data generated in the entire human history. This necessitates great amount of agility and universal consciousness to set the minds for a global innovation culture management. Considering time spent for the journey of total quality management, it is obvious that having a sound innovation culture management methodology sooner better than later is vital. To be an innovative partner of the world's future, organizations need a creative, dynamic and smart culture. For this culture; first the collective quotient of the organizations has to be evaluated. Then, a philosophy has to be created and shaped with the mission, vision, values and systems of the organizations. IVALUE7 is a management system featuring seven components to develop a creative, smart and dynamic innovation culture.

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