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Conceptual paper

Innovation for creating a smart future



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ABSTRACT

Today, we live in a dynamic and turbulent global community. The wave of mega-trends, including rapid change in globalization and technological advances, is creating new market forces. For any organization to survive and prosper in such an environment, innovation is imperative. However, innovation is no longer just for creating value to benefit individuals, organizations, or societies. The ultimate purpose of innovation should be much more far reaching, helping create a smart future where people can enjoy the best quality of life possible. Thus, innovation must search for intelligent solutions to tackle major social ills, seek more proactive approaches to predict the uncertain future, and pursue strategies to remove barriers to the smart future. This study explores the detailed requirements of a smart future, including both hardware types and soft social/cultural components.

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Introduction

Innovation has been the main task of humans throughout history (Lee, 2015). To survive and improve the quality of life, continuous innovation efforts have been imperative. All major revolutionary waves of human history – agricultural, industrial, information, and now convergence – are all about innovation for creating new and better value (Lee, Olson, & Trimi, 2012). Political leaders exhort the importance of innovation for social justice and a better quality living environment for the citizens. Global executives stress the importance of continuous innovation for new products/services and ventures for customers, yet 94 percent expressed dissatisfaction with their innovation performance (Christiansen, Hall, Dillon & Duncan, 2016). Managers of non-profit organizations pursue innovation to challenge the social ills of the economic divide, digital divide, and goal divide (Lee, 2015). The purpose of innovation is much more profound than just creating greater customer value, better competitive advantage of firms, and an environment for better quality of life. The ultimate goal of innovation should be the creation of a better future. The “small i” for innovation is for an individual, organization, society, or country. However, the “Large I” should be innovation for creating a smart future.

The benefits of innovation may accrue to individuals, groups of people, communities, industries, societies, nations, regions, and

the world. What is common to all these entities is that they all pursue innovation for better preparation of the future (Canton, 2015; Drucker, 1985). However, innovation should not be for passively being future smart by preparing to meet the uncertain future by being predictive, adaptive, and agile. Instead, innovation should be for more aggressively active in creating a smart future that provides more opportunities for a better quality of life.

The term “smart” has been used widely nowadays, for example, smartphones, smart cars, smart homes, smart infrastructure, smart cities, smart countries, and the like. The term “smart” represents the concept of hope and aspiration that depends on a person’s perspective. The smart state depends on the given condition, environment, culture, and the person’s value system. Nevertheless, the general concept of a smart future should mean a living environment which is much better than the current state of affairs.

The smart future should be where innovation would help develop intelligent solutions to complex problems to secure a humane environment (Streitz, 2015). In such a smart future, people can more freely pursue opportunities to learn and grow, be engaged in good relationships, be happy with the community and work place, and also have a comfortable and healthy life style with adequate financial resources (Gallup-Healthways, 2015). Creating such a smart future requires much more than just smart gadgets, advanced technologies, convergence strategies, and government support. It requires a fabric of soft innovations that can nurture an aspirational future such as social justice, rule of law, transparency, accountability, cohesive collective wisdom of people, and shared visions and goals (Kramer & Pfitzer, 2016; Porter & Kramer, 2011).

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In this paper, we will explore the definition of a smart future, requirements for creating an environment for the well-being of people, application of fast advancing science and technologies, and creative convergence strategies that support aspirational innovation efforts, ideas that can disrupt the barriers to a smart future, and the soft social requirements that are fundamental for developing shared visions for a smart future. This paper is organized as follows. In “Innovation for value creation” section, we discuss the purpose, classification, and organizational purpose of innovation. “Innovation life cycle” section presents innovation life cycle from idea generation to harvesting on the S-curve. The concept of a smart future is articulated in “What is smart future?” section, while the requirements for creating a smart future is presented in “Requirements of a smart future” section. “Innovations that disrupt barriers to the smart future” section discusses innovations that can disrupt barriers to a smart future. “Conclusion” section concludes the paper by proposing the soft social requirements for a smart future.

Innovation for value creation

Today, business executives, political leaders, educational administrators and even religious leaders all exclaim the innovation imperative. In a broad sense, innovation is synonymous with change (Tushman & O'Reilly, 1997). Change can be due to natural phenomena, the intentional design of human ingenuity, or collaborative efforts of individuals (Lee & Olson, 2010). Scientific breakthroughs, technological advances, inspiring ideas that motivate the masses, and the like are all changes that are often the outcomes of innovation. However, many innovations never see the light of the day. Many new scientific and scientific developments may contribute to the existing body of knowledge but they may not be economically feasible for actual implementation (Schumpeter, 1934).

In this paper, we define innovation as new ideas that are actually applied in fundamentally different ways to generate new and/or additional value (Lee & Olson, 2010). We further assume that innovation is for the benefit of all stakeholders, not just the idea generator or the organization. Recently, a number of countries have adopted innovation as their national agenda. For example, Singapore proclaimed “creating a smart country” as its national priority, with innovation at its building block (Sim, 2015).

With the fast changing market forces (e.g., globalization, digitization, changing demographics and industry mix, global urbanization trend, environmental issues, the new economic influence of emerging nations, etc.), the strategic focus of innovation has also evolved (Lee et al., 2012). Organizations used to emphasize innovation for finding new ways to *do things right*, focusing on quality management and improving the efficiency of the nuts-and-bolts work in the value chain (e.g., cost cutting, waste minimization, speed, etc.) (Schonberger, 2008). Then, the strategic emphasis shifted to how to *do right things*. In this phase, problem-solving, decision-making, and effectiveness of the value chain are emphasized (business process reengineering, decision support systems, enterprise systems, etc.). With the increasingly uncertain and volatile global market environment, today most organizations put their strategic emphasis on how to do new things, placing radical innovation as the strategic priority of the organization (March, 1991).

Innovation classification

Innovation has been classified in many different ways in the literature. However, many studies have suggested the following four broad classifications: incremental (exploitative), radical (explorative), ambidextrous and disruptive innovation (Benner &

Tushman, 2015; March, 1991). *Incremental innovation* involves continuous improvement of what is already known. Japanese firms have made great strides in expanding their global market presence by emphasizing Kaizen (e.g., Kawasaki, Sony, Toyota, etc.). This type of innovation usually takes relatively short periods of time. Studies have shown that a majority of innovations is of this type but such innovations contribute less than one-third of total profits. That means firms cannot sustain their competitiveness by focusing primarily on incremental innovations.

Radical innovation involves exploration of the unknown. Many new inventions, patents, or business models represent such innovations (e.g., parallel processing systems, digital cameras, 3-D technology, DNA sequencing, e-business, sharing economy, and the like). This type of innovation usually takes a long period of time for R&D, experiments, regulatory approvals or market acceptance. Explorative innovation may be initiated for the existing market. However, the ultimate purpose of such innovation is to become the first mover in a newly created blue ocean market which provides new values to the customer and generates new profits (Kim & Mauborgne, 2005). With the advent of the digital age, the locus of innovation has expanded beyond the boundaries of organizations to global open innovation communities for co-innovation (Adner, 2001; Afuah & Tucci, 2013; Benner & Tushman, 2015; Chesbrough, 2003; Lee & Olson, 2010).

Most organizations cannot focus only on one type of innovation, either exploitative or explorative. Many organizations possess certain core competencies that have been built over time. These competencies can be improved continuously to enhance productivity for generating additional financial returns (Benner & Tushman, 2015). However, they cannot simply dwell on improving their existing core competence in the fast changing and volatile market environment. Thus, explorative innovation is imperative. The critical strategic question is how organizations should balance exploitative and explorative innovation so that they can leverage their current core competencies while simultaneously striving to develop new competitive advantage through explorative innovation. An organization which can achieve a proper balance between the two types of innovation cannot only reduce the tensions between the two major streams of innovation (March, 1991; O'Reilly & Tushman, 2013) but also pursue synergistic effects of their strengths (Lee, 2015). Thus, *ambidextrous innovation* strives to develop dynamic capabilities so that organizational strategies are congruent with the fast changing market situations, such as global conditions, technological advances, changing demographics, global urbanization trends, environmental sustainability efforts, and the like (Raisch, Birkinshaw, Probst, & Tushman, 2009; Teece, 2014; Tushman & O'Reilly, 1997), while continuously improving its existing competitive advantage.

Disruptive innovation is a complex concept. However, the basic notion is that firms tend to overshoot their markets with new technological advances for the mainstream of customers, thus creating a market for newcomers that can even overthrow the incumbent market leaders (Adner, 2001; Christensen, Rayner, & McDonald, 2015). A good example would be Xiaomi which has introduced very cheap but excellent smartphones for economy minded customers and has become a market leader in China. Xiaomi's business model disrupted the existing market and the rules of competition. However, recently, other new Chinese smartphone producers, such as Vivo, Oppo, and OnePlus, are making significant inroads into Xiaomi's market share by using their own unique disruptive innovation strategies (Gilbert, 2016).

Evolution of innovation

Innovation has also been discussed based on its evolution (Lee & Olson, 2010). *Innovation 1.0* can be labeled as closed innovation.

In this phase, innovation is organization bound and thus most of the new ideas are the result of the organization's internal R&D for developing its own unique core competencies (Lee et al., 2012). Many first mover market leaders in the past relied on this type of innovation (e.g., Bell Lab, Proctor and Gamble (invented here), NASA (as only NASA can), and the like).

Innovation 2.0 represents collaborative innovation. In this phase, organizations collaborate with external sources or partners for value chain innovation (Tapscott, 2006). Many global firms, such as Apple, Dell, Mattel, Zara, Boeing, etc. all rely on such innovations.

Innovation 3.0 is for open innovation where organizations search for new sources of innovation from both internally and externally (Chesbrough, 2003). Some researchers suggest that open innovation is quite similar to crowdsourcing of innovation. However, we believe open innovation is much more purposeful and focused than broad collective intelligence or crowdsourcing (Afuah & Tucci, 2013). There are a very large number of open innovation intermediaries (we label them as “innomediaries”) in business. Some of the best known are NineSigma, InnoCentive, YourEncore, Yet2.com, etc. There obviously exists some degree of the seductiveness of open innovation, although challenges also exist (Lee et al., 2012).

Innovation 4.0, co-innovation, is where organizations develop an innovation ecosystem to evaluate and converge ideas that are generated through all useful sources such as internal R&D, collaboration, open sourcing, co-creation with customers and partner organizations, and the like to develop implementable innovation plans (Gobble, 2014; Govindarajan, 2016; Lee et al., 2012; Ramaswammy & Ozcan, 2014). The co-innovation platform is the hub of innovation web with numerous nodes and networks of smart innovation sensors.

The primary strengths of co-innovation can be summarized as follows:

- Generating a continuous flow of ideas across boundaries, space and time.
- Developing a large pool of knowledge by sharing IT-supported data analytics (Kim, Trimi, & Chung, 2014).
- Creating a new innovation culture through shared vision and goals (Kramer & Pfitzer, 2016; Porter & Kramer, 2011).
- Designing a tacit knowledge based convergence filter which is unique and difficult to imitate by other firms.

Samsung Electronics and Nike are perhaps the best-known organizations that have the most comprehensive co-innovation programs.

Organizational value creation

The main purpose of any organization is value creation. The value being sought may be financial, public welfare, social justice, or even psychological. Regardless the type of organization, whether it is a government agency, business enterprise, non-profit institution, or charitable entity, there exists a value chain architecture. Then there are basically five areas where value can be created through innovation, as follows (Gupta & Govindarajan, 2004; Lee & Olson, 2010):

- (1) New products, services or ventures (projects).
- (2) Redesigning the end-to-end value chain architecture for greater efficiency.
- (3) Reinventing the customer value, from utilitarian to hedonic to experience.
- (4) Redefining the customer base including e-market, global market, and blue ocean.

- (5) Reformulating business models using new ICTs such as Internet of Things (IoT) (Chui, Loffler, & Roberts, 2010; Kavadias, Ladas & Loch, 2016; Lenovo, 2015).

Every organization has missions, visions, goals, objectives, and strategic plans. The purpose of all organizational efforts is to make the above-described value creation areas more effective. Thus, organizations are concerned about how to prioritize and/or balance the five value creation areas so that their innovation efforts are properly focused on maximizing organizational performance (Govindarajan, 2016).

Among the five value creation areas, the last three have seen many new developments due to globalization, digitization, and convergenomics (Lee & Olson, 2010). Customer values usually include reasonable price, good quality, speed, and customization. However, these values are market entry requirements (order qualifiers) rather than sufficient conditions for sustainable competitive advantage (order winners). Today customers demand beyond utilitarian values, including hedonic (sense of safety, esthetics, excitement, flow, arousal, and the like), experience, participation in co-creation, sharing and opportunities to learn. Such new customer values have pushed organizations to new ways to develop products, services, and business models. For example, “do it yourself (DIY)” has become a new attraction to customers in food services, jewelry making, tourism and apparel business (Von Hippel, Ozawa, & De Long, 2011).

The customer base of the organization has also changed dramatically. Today organizations can have regular in-store customers, e-customers, global customers who do business only online. In addition, organizations may develop an entirely new blue ocean market where competition is irrelevant for newly developed products or services (Kim & Mauborgne, 2005). Organizations have also developed many new business models based on new technologies and convergence of ideas and technologies. Today, e-business is widespread globally; IT-enabled new sharing services are everywhere such as open source software development, crowdsourcing, Uber, Airbnb, and Zipcar (Sundararajan, 2016); and convergence-enabled products/services are opening up new business opportunities such as medical tourism, surgical robots, massive open online courses (MOOCs), Instagram, SoLoMo (social, location, and mobile services) (Heinemann & Gaiser, 2015) and the like.

Innovation life cycle

In the networked digital age, organizational core competencies have short life cycles. The first mover advantage may last few months to several years before new technologies or business models turn the market upside down, as we have witnessed the demise of Kodak, Wang Computer, Nokia, Blackberry, K-Mart, Sharp and many others. This indicates that innovation is not a one-shot activity but a process of never-ending efforts for developing sustainable competitive advantage.

The innovation life cycle resembles the technology S-curve, as suggested by Christensen (1992). At the beginning of the curve, a new innovation is planted and the required resources are committed. Many innovative ideas, inventions, patents, or business models may not even pass the feasibility phase and be discarded. Some may receive enough management support and required resources for implementation but with a short lifespan without reasonable returns. Some innovations may have a long life cycle with a steady marginal rate of return (cash cow), as shown by many consumer products such as detergents, sanitary products, and the like. The typical innovation S-curve has the planting phase at the beginning where the marginal rate of return begins to increase rapidly at an

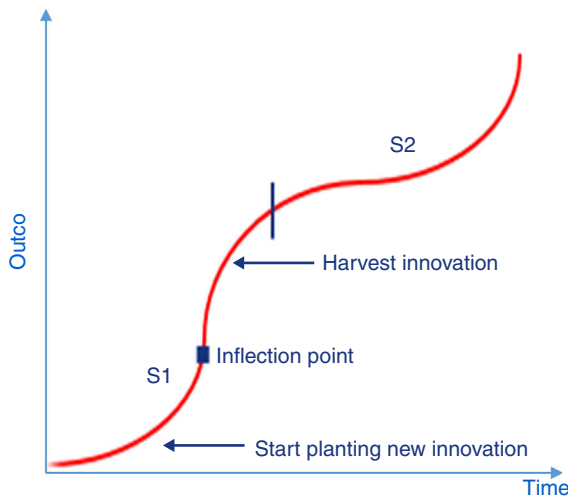


Fig. 1. Innovation life cycle S-curve.

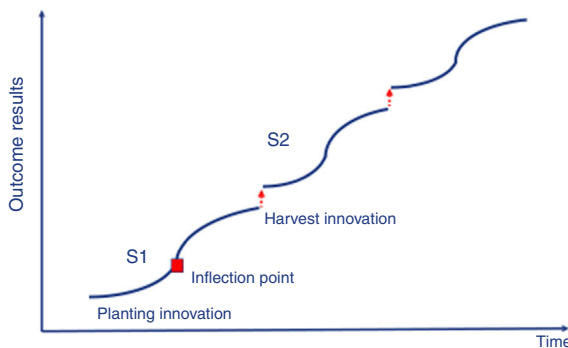


Fig. 2. Continuous innovation S-curves.

increasing rate until it reaches the inflection point. This is typically the beginning of the harvesting phase of innovation. Once the curve reaches the inflection point, the marginal rate of return begins to diminish. The S-curve may actually nose dive. The firm may discontinue its efforts to harvest the innovation or a creative firm might have started a new S-curve before the previous curve reaches the peak as shown in Fig. 1.

High-performance organizations are those that are resilient, agile, and ambidextrous (O'Reilly & Tushman, 2013). They strive to build dynamic capabilities in such a way that their innovation strategies are congruous with the rapidly changing market environment through maintaining an effective balance between continuous and radical innovations (Teece, 2014). Such organizations attempt to proactively strategize continuous innovation S-curves. Furthermore, these firms try to start new S-curves from above the peak of the previous S-curves by leveraging new technologies or convergence ideas as shown in Fig. 2. It is important for the firm to plan for continuously riding innovation S-curves.

What is smart future?

The concept of “smart” has many different perspectives. In this paper, our concept of smart is about being intelligent, proactive, purposeful, aspirational, and goal-oriented in applying innovative ideas to achieve a desired future (Smart Future Initiative, 2016). Creating a smart future is much more than just being future smart where people prepare for the possible scenarios of the future so that they can better face future challenges (Canton, 2015). The efforts to create a smart future require innovative ideas to leverage ubiquitous digital connectivity, smart sensors,

artificial intelligence, Internet of Things (IoT), access to all human knowledge, and entrepreneurship to capture opportunities for the best quality of life. Thus, a smart future is where people can freely pursue their well-being and be optimistic about their future. In the contemporary society, people face numerous complex problems and difficult decisions. A smart future is where people can search for and eventually find intelligent solutions to these issues in collaboration with others, in support of governments or other entities, or even alone by applying available technologies and knowledge.

Searching solutions to social problems

Today, the new normal is “increasing uncertainty and slowing economic growth globally.” There are numerous social challenges in every society, from conflicts due to ethnic, cultural, and political differences to decaying inner cities, increasing crime rates, deteriorating environmental conditions, global jobs shortage, and the like. These problems cannot be solved by the government alone. Many social goal minded corporations realize that it is not only their corporate citizenship responsibility to respond to diverse social needs but it also is an important contributor to their long-term sustainability in the market (Caroll & Buchholtz, 2011; Porter & Kramer, 2011). Many large organizations have undertaken numerous corporate social responsibility (CSR) projects to face environmental problems, inner city challenges, training the unemployed people for job skills, community development, and the like (Campbell, 2007). For example, many corporations have initiated reverse logistics projects to minimize waste, reduce carbon emission, and reuse disposed goods, often in partnership with local governments.

Another development to attack the mounting social problems is social entrepreneurship (SE). SE is a form of convergence innovation, converging the passion for social mission and entrepreneurship to create value for the society or common good (Martin & Osberg, 2007). SE projects are often based on personal funds of concerned individuals, crowdsourcing, donations, fees, or grants from governments, NGOs and/or governments. There are numerous SE examples. Some of the notable SE projects are (Martin & Osberg, 2007; Peredo & McLean, 2006):

- Grameen Bank, Bangladesh, founded by Dr. Muhammad Yunus: Provides small loans to people around the globe to improve their economic health.
- The Institute for One World Health (IOWH), USA, established by Dr. Victoria Hale: The first nonprofit pharmaceutical company that targets providing drugs to people in the developing world with infectious diseases who may not be able to pay for the drugs.
- Sekem, Egypt: Reducing pesticide use by 90% in cotton fields to protect the health of farmers, while creating educational institutions and hospitals for the poor.
- Revolution Foods, USA: A venture capital supported start-up that provides 60,000 healthy and nutritious meals to students daily.

Most of the world's ills today stem from three major divides: economic, digital, and goal (Lee, 2015). The economic divide, the ever widening gap among the have-nots, haves, and have-mores, has created all sorts of social problems such as the increasing public unrest, crimes, health issues, and the like. The public media has reported that the top one percent of wealthy people in the world has almost 49 percent of global wealth. It has also been reported that 40 richest people have the equivalent wealth of 3.5 billion low-income people in the world. The United Nations (UN) reported that the world has reduced the direst poverty group by 50 percent during 2000–2015, from 3.8 billion to 1.9 billion, primarily due to China's economic development (Gallup, 2016). UN's new goal is to cut the proportion of the remaining poverty level people in half again during the next 15 years. That means by 2030 there

will be only about 12 percent of world population (790 million) in the direst poverty group. The smart future needs to figure out how to redistribute wealth among people so that this effort can be sped up to achieve a better economic equity.

In the digital age, there is ubiquitous support of information and communication technologies (ICTs). Today, roughly 50 percent of world population has the Internet access and 2.5 billion people use smartphones daily. The digital divide is much more serious than just distinguishing those who have the information access through their ICT devices and those who do not. People who are digitally deprived do not have access to advanced technological devices, Internet of Things (IoT), 3-D technologies, artificial intelligence tools, big data analytics support, cloud computing and over 3 million apps for smartphones that can help open many opportunities to share knowledge with others. About one-half of the world population, 3.7 billion people, who do not have the digital technology access will left behind in the digital world as unskilled or unemployed. The digital divide is especially serious for people with mental or physical disabilities as digital support can help overcome some of their handicaps.

Perhaps the most damaging divide in modern society is goal divide. In many regions and countries of the world, people simply do not share same visions or goals. Indeed, many conflicts in the world today seem overwhelming and almost impossible to resolve. Thus, one of the most difficult tasks of innovation is how to co-create shared visions and goals among people so as to create a peaceful, harmonious future (Porter & Kramer, 2011; Ramaswammy & Ozcan, 2014).

The Global Well-being Index

The Gallup Organization and Healthways have collaborated to develop the Global Well-Being Index (Gallup-Healthways, 2015). In their report, five well-being criteria are proposed:

- (1) Purpose – Like what one does each day and is motivated to achieve goals.
- (2) Social – Have nurturing relationships, affection, trust, friendship.
- (3) Financial – Manage comfortable economic life, security for future.
- (4) Community – Enjoy the community, safety, and pride in the society.
- (5) Physical – Have good health, enough energy for daily activities.

The Global Well-Being Index is based on an evaluation of each criterion on three subjective measures: thriving, struggling, and suffering. We believe the measures should be weighed based on the perceived importance of each criterion as the environmental conditions are different for each individual in the given environment.

In addition to the above five criteria, we would like to add an intellectual aspiration as follows:

- (6) Opportunities to grow – learning, exploring, and experimenting.

In summary, a smart future is a state where each individual aspires to be in happiness, good health, doing interesting things that the person is good at and enjoys financial and physical security, nurturing and affectionate relationships, living in a nice community, and with opportunities to improve oneself intellectually.

Requirements of a smart future

While a smart future is the aspirational target of most individuals, organizations, governments, and even countries, it simply

does not just appear as wished. There are many requirements to pursue and realize a smart future. Here we propose the following seven essentials.

- (1) Smart people – In the dynamic global environment, with rapidly advancing technologies and knowledge, a smart future required well educated and trained people. Some scientists estimate that about 90 percent of the knowledge we have today has been created during the past 5–6 years. Also, 90 percent of data we have today has been created during the past 2 years (Kim et al., 2014). That means we need smart people who can contribute to creating new knowledge, are capable of using new innovations to improve what is important in the society, and extract important pieces of intelligence from the ever increasing volume of data through smart analytics. Recently, President Barack Obama of the U.S. announced the \$4.1 billion program, “Computer Science for All”, to equip all Americans to be capable citizens in the ubiquitous digital age (White House Blog, 2016).
- (2) Smart leadership – Today’s effective leaders are not just tough decision makers, charismatic personalities, and good communicators. They must be capable of co-creating shared vision and goals with others for collective wisdom and discipline (Kramer & Pfitzer, 2016; Ramaswammy & Ozcan, 2014). Smart leaders are those who can motivate and engage people in contributing to co-creation of a smart future. Advanced technologies do not always bring shared prosperity or harmony in the society (Schumpeter, 1934). In fact, application of technologies does not always create new jobs. Rather, automation of many tasks by machines, robots, and ICT have destroyed many jobs around the globe. A recent study by Oxford University faculty reported that about 47 percent of all job activities can be automated by technologies (Frey & Osborne, 2013). We no longer find telephone switchboard operators, road construction workers with picks and shovels, farmers planting seeds or harvesting by hand, and thousands of manual assembly line workers at automobile plants. Smart leaders must find ways to create new jobs with relatively long life cycles as many jobs disappear.
- (3) Smart governments – In the digital age, governments are not the institutions that govern and control citizens. Citizens are intelligent with all sorts of information through advanced ICTs. Smart governments must facilitate citizen participation in co-creating a safe country with accountability, transparency, rule of law, and social justice that are universally applied. The key for sustainable economic growth and political stability is the disciplined government which is trusted and connected (Lenovo, 2015).
- (4) Smart infrastructure – A smart future requires efficient systems of citizen safety and privacy, public transport management, electric grid, clean water, environment monitoring, waste management, security of ICT and the like. With the application of closed circuit TV, smart sensors, IoT, cloud systems, and advanced analytics, cities or communities can develop and manage smart infrastructure (Chui et al., 2010). Recently, the Smart City Forum, a global organization of CIOs or other leaders of major cities, was established as a resource to share best practices in developing and managing smart infrastructure in cities (Hamblen, 2016).
- (5) Smart industries – In the digital age, smart industries must be proactive about digital transformation to provide customers with customers with goods and services that they want or will need (Rogers, 2016). The gradual shift to the service-dominant logic in advanced economies is forcing business firms to create added value by bundling products with unique services. Also, the new economic model in the digital age allows many new ventures that can secure a very large number of customers with a handful of employees (e.g., Instagram, WhatsApp,

Airbnb, etc.), by focusing on access rather than ownership of physical capital, agility rather than scale, collaboration over independent operations, and no cost (e.g., digital goods) rather than cost minimization (Lee, 2015). They also take advantage of technology-empowered new business models such as SNS, social-commerce, mobile solutions, and self-managing enterprise systems.

- (6) Smart healthcare and education systems – The two areas that will likely see the most drastic changes in the future will be healthcare and education. Already there are many new breakthrough medical technologies that fight numerous diseases, such as genome editing to cut off undesirable cells, and many converged smart systems that will replace human resources (e.g., smart devices that read MRI and X-rays, e-healthcare, self-operating automobiles, etc.). Also, massive open online courses (MOOCs) have already revolutionized higher education around the world. These smart systems will have profound impact and implications socially, economically and also personally to people.
- (7) Smart homes and autos – Two of the aspirational needs of people are affordable, efficient, and comfortable home and car. In the digital age, with the support of smart people, leadership, governments, and infrastructure, homes should be equipped with advanced ICT, closed-circuit TV (CCTV), sensors, smart security systems, self-learning systems, and the like. The home security system can be controlled by a mobile device and an IoT system can manage the content of the refrigerator, control lighting and temperature, operate the smart toilet and the like (Lenovo, 2015). Already Google, Apple, and Tesla are working on smart self-driving cars. These innovations will greatly change the quality of life in a smart future.

Innovations that disrupt barriers to the smart future

Important innovations that we need are those that can disrupt many barriers to creating a smart future. Already we have a wide variety of new technologies and convergence practices that are available to remove many challenging barriers to a smart future. Some of those that we have already discussed are: big data and smart analytics, IoT and networked smart sensors, devices and robots that can learn and share information for decision support, smart biochips and gene editing to eliminate diseases, artificial intelligence and self-learning machines for pattern recognition to predict future states, and the like. However, such technological tools are not sufficient to disrupt many challenges ahead. We also need many social, psychological, and managerial research findings to handle complex and ambiguous soft challenges. Some of the innovations that can disrupt the barriers to the desired smart future are as follows.

- (1) Matching human talent and jobs – Organizations constantly strive to improve productivity through effective human resource management (HRM). Leadership, motivation, employee satisfaction, job design, communication, team management, and the like are all related to achieving the best outcome of human resources. Strengths-based HRM has been advocated during the past two decades (Harter, 2007; Rigoni & Asplund, 2016), in addition to motivation theories, positive psychology, and recently Psychological Capital (Luthans, Youssef-Morgan & Avolio, 2015). People are most productive when they use their talents on their jobs. Gallup estimates that matching human talent and jobs could be the biggest contributor to not only national GDP (several trillion dollars) but also the sense of accomplishment and happiness on the part of the worker (Harter, 2007). The smart future needs such innovation.

- (2) Creating jobs to do right things and new things – The conventional wisdom is to focus on incremental improvement of productivity by doing the old work more efficiently. Such innovation, while always necessary in organizations, is not sufficient to make a quantum leap through radical innovation. The smart future needs effective new solutions that focus on effectiveness rather than efficiency. Design thinking, 3D technology, and bio-artificial systems convergence (e.g., brain-wave-controlled wheelchair, Internet of Brains, IoB, etc.) are good examples of such innovations.
- (3) Creating new jobs with longer life cycles – There is a general belief that new technologies help create new jobs. Many countries struggle to create jobs by pouring huge amounts of the budget for R&D efforts, science and technology commons, support for new venture creation and the like. For creating a smart future, we need smart innovations that apply new advances in technologies to create new jobs that have relatively long life cycles, especially in small and medium enterprises (SMEs), the engine of job creation, to support the national economy (Brynjolfsson & McAfee, 2014; Clifton, 2016). Such new digital age jobs include many knowledge-intensive professional work that support smart systems (e.g., smart infrastructure, factories, public safety, transport, energy, water, waste treatment, healthcare and education, and the like) and personal service jobs for many professionals (e.g., child care, household care, physical and sport coaching, beauty and artistic interests, and the like).
- (4) Leveraging the aging population – Population in almost every country, with the exception of Middle East nations, is aging rapidly. This trend is due to several important factors: drastically decreasing birth rates, the increasing longevity of people due to advanced medical sciences and health care services, improved quality of life, and ICT-supported converged services for well-being. Japan already has about 25 percent of the population over 60 years of age. The proportion of working population simply cannot produce enough income and taxes to support retired senior citizens. The smart future must find ways to not only keep senior citizens healthy and engaged in the society but also leverage their accumulated wisdom in producing value. Many retired knowledge workers can be freelance temporary workers in many knowledge-intensive organizations (Drucker, 1985; Lee & Olson, 2010).
- (5) Sustainability and green management – One of the major threats to the smart future is the deteriorating environment. The global warming trend has caused numerous natural disasters, including the increasing sea level due to the fast melting permafrost and El Nino-induced droughts, wildfires, floods, hurricanes, etc. The world needs continuous and revolutionary innovations to clean up the already damaged environment and simultaneously take proactive measures to prevent further environmental disasters. The smart future needs incentives management. GE has already shown that “green is green” indicating that environmental protection projects can be profit generating business for organizations (Lee & Olson, 2010).
- (6) Design thinking – We have already discussed the merits of design thinking. The conventional decision-making process assumes that the problem under study is well defined and associated variables are known. Design thinking considers the fluid nature of the decision environment, including the objectives, variables, and relationships (Brown, 2008; Howkins, 2013). Also, the main purpose is often what is “good” for the society at large and humanity, rather than the typical financial outcome. Innovations that can support design thinking more easily and widely applied to deal with complex problems will help the process of creating a smart future.
- (7) Going beyond the current horizon of our imagination – A smart future needs the collective resolve and wisdom of

people to move from “the probable” to “what is imaginable.” There already are advanced technological tools available that can help predict many future states through smart analytics, artificial intelligence (e.g., Facebook’s Deep Face; Google’s Deep Mind; IBM Watson) and IoT applied devices. Soon, we should be able to see the sound and people’s mood or feelings. What a smart future needs is to develop the “common good” through co-creation of shared visions and goals (Lee, 2015; Porter & Kramer, 2011; Rigoni & Asplund, 2016).

Conclusion

Innovation is about the actual implementation of new ideas or technologies to create new value in fundamentally different ways than in the past. In the continuous efforts to confront complex challenges in the networked global market, innovation is imperative. Innovation is no longer about creating value for an individual or organization. Rather its ultimate goal is about creating a smart future which can provide new possibilities to the stakeholders of a society. A smart future is clearly something that people, organizations, governments, and countries want to create. As discussed earlier, the government of Singapore has the project “Building a Smart Nation” as its top priority. It certainly makes a sense to have such a national goal, as Singapore is one of the world leaders in personal GDP, yet her people have a very low level of happiness and optimism for the future (Sim, 2015). Israel and South Korea have similar national projects for building “A Creative Economy”.

Most governments that are engaged in creating a smart society tend to emphasize “hardware” requirements for making the project a success. Such requirements are preferred as they are visible, measurable and easy to celebrate for accomplishments. For example, the following represent the typical national project requirements for building a smart nation.

- Research infrastructure development for science, technology, engineering (ICT, biotech, materials, robotics, artificial intelligence, etc.).
- Development of R&D centers, research commons, and innovation campuses.
- Applied research centers for convergence innovation and venture creation.
- Support of technological small/medium enterprises (SMEs).
- Support of educational programs in science, engineering, and mathematics.
- Government structure, budgets and policies for job creation.

While the above programs are all worthy and positive elements for a forward-looking modern society, creating a smart future requires more fundamental cultural fabric where innovation can be nurtured and harvested for a smart future. More specifically, “software” type environmental conditions should be in place. Although not exclusive, some of the basic software type requirements are as follows:

- Social justice – rule of law, accountability, and transparency.
- Culture and environment where creativity is valued.
- Society that values entrepreneurship and risk taking.
- People supporting and participating in collaborative leadership and shared goals.
- Environment where integrity and collective discipline are virtues.
- The government is viewed as the facilitator rather than a ruler.
- A culture that advocates change over status quo.
- A society where job creation is more valued than job taking.

The smart future is an aspirational goal for most people and society. However, it is not an imaginary future but within the grasp

of our possibilities, especially in the digital age. To create a smart future, people must set stretch goals, think beyond the obvious, and work collectively for the good of the entire society.

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