PALGRAVE STUDIES IN DEMOCRACY, INNOVATION, AND ENTREPRENEURSHIP FOR GROWTH

KNOWLEDGE-BASED SOCIAL ENTREPRENEURSHIP

Understanding Knowledge Economy, Innovation, and the Future of Social Entrepreneurship

Mitt Nowshade Kabir

Palgrave Studies in Democracy, Innovation, and Entrepreneurship for Growth

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The central theme of this series is to explore why some areas grow and others stagnate, and to measure the effects and implications in a trans-disciplinary context that takes both historical evolution and geographical location into account. In other words, when, how and why does the nature and dynamics of a political regime inform and shape the drivers of growth and especially innovation and entrepreneurship? In this socio-economic and socio-technical context, how could we best achieve growth, financially and environmentally?

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This conceptualization lies at the heart of the series, and offers to explore the correlation between democracy, innovation and growth.

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This book is dedicated to Levan Levanovich Chekhaidze, teacher and mentor who ignited my life-long interest in advanced technologies.

Preface

The world is standing at the crossroad of new technology and knowledge-based epoch. It is dubbed by many as new knowledge era, fourth Industrial Revolution, post-industrial society, or simply knowledge economy. Drivers of growth in this new economy are advances in technology, the proliferation of knowledge, and continuous innovation by corporations and entrepreneurs. Entrepreneurs, in particular, are fueling the growth by propelling innovation, instigating new industries, and creating jobs. New technologies and explosion of information have created a fertile ground for entrepreneurship in the knowledge economy. Knowledge has already become the primary means of production and a substantial portion of end products in many industries. This impact of knowledge as a critical factor in innovation and production process and its importance as a product component have prompted the emergence of a new entrepreneurship domain—knowledge-based entrepreneurship.

Despite the fact that this rise of entrepreneurship and the impact of the technology on the economy are generating tremendous new wealth, the increasing prosperity did not eliminate many of the pressing social problems the world is still facing. However, in recent years, the rising awareness of the social challenges, better-educated population and easier access to knowledge, and the desire to make a difference have given a surge to the social entrepreneurship. The mission of social entrepreneurs is to address social issues through entrepreneurial activities. Along with the expansion of the knowledge economy, social entrepreneurship armed with new possibilities owing to new technologies is also advancing gradually toward knowledge-based social entrepreneurship.

Knowledge-based social entrepreneurship is still in its early stage of growth, but signs are appearing that show that the process is speeding up. While interest in it is growing, its nature, constituting elements, and determinants causing its germination and evolution are still scantly studied and require better understanding. Both researchers and practitioners are curious to learn about this new phenomenon and ponder what makes it different from other types of social entrepreneurship, what should be the main focus areas to define its success, how entrepreneurs can take advantage of it, and how technology facilitates and at the same time necessitating its proliferation. These are not the only questions that are critical for grasping the rationale behind its value in solving some of the crucial and persisting social challenges. Apart from its immediate surrounding features, catalysts, processes, and factors, it is beneficial to learn what are the forces behind the growth of knowledge-based entrepreneurship, in which conditions it sprawls and why it is so invaluable for both the matured and developing economies.

This book is an effort to shed light on the present understanding of the knowledge economy, its components, and factors that drive this economy, advances in technology that is shaping the future, and knowledge and innovation as vital elements in entrepreneurship and business. It also illustrates and explains why and how entrepreneurs are one of the main forces behind the present economic growth, and why processes and strategies are key ingredients in knowledge-based social entrepreneurship.

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CHAPTER 1

Introduction

We are witnessing a significant transition of the world economy to a newer phase of development where knowledge is an instrumental force. Knowledge is the main ingredient in innovation, entrepreneurship is a variation of innovation, and both of these are engines of economic growth are not novel concepts. What is unique in the present knowledge economy is the massive explosion of knowledge, its increasing transformation to a main factor of production, its growing role in enhancing productivity and competitiveness, and the extraordinary surge of its importance as the essential resource for the social and financial prosperity of nations.

For centuries, knowledge has been known and perceived as a driving force behind technological and scientific progress. It also has always been deemed as an enabler to the increasingly sophisticated production systems. The first Industrial Revolution provided a significant boost to the burgeoning position of knowledge in the production value chain. Its role has altered again with the emergence of information and telecommunication technologies (ICT) which ushered the Information Age. In the next decades, the importance of knowledge in the trade, business, and manufacturing has thrived and evolved into one of the primary factors of production in many industries. The rapid development of science and technology since the early 1990s strengthened the status of knowledge even more not just as the primary resource in all technology-related

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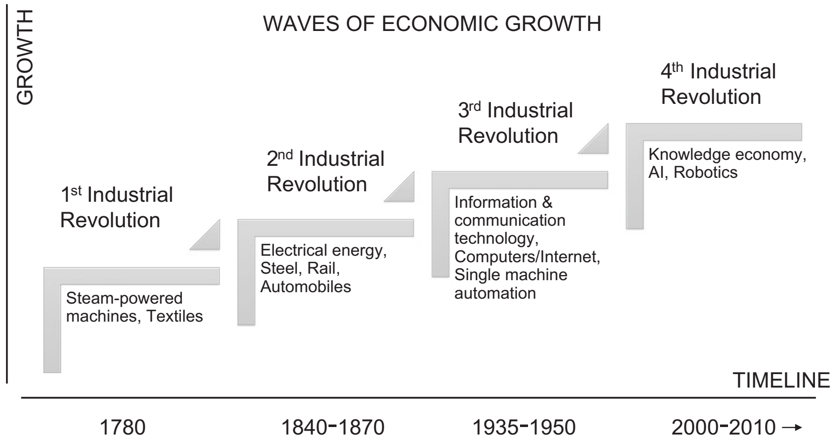

Fig. 1.1 Four major waves of economic growth

sectors of the economy but also as the most valuable facilitator of economic improvement and social transformation (Fig. 1.1).

Technological advancements and innovation supported by the human talents and new knowledge have initiated the elevation of living standards, the evolution of tools in productivity gain, streamlining of manufacturing processes through automation, and the emergence of new frontiers in the areas from quantum particles to space exploration.

Knowledge Economy

Knowledge has firmly established as the primary factor of production in today's knowledge economy where humans and ICT are the two central mediums of knowledge activities necessary for innovation and technological progress to occur. The knowledge economy is an economic system based on intellectual capital and knowledge production, consumption, and dissemination (OECD 1996). In this new economy, technological advancement, new knowledge, and human capital work as the basis of growth. As of today, most developed nations have shifted to knowledge economy while many others are in transition. High technology presence in the production systems, high demand of niche knowledge, availability of a sophisticated innovation system, existence of a large pool of workforce with higher education, particularly, in science and technology sectors, a thriving entrepreneurial sector supported by institutional regime, and advanced ICT infrastructure are indicators that demonstrate an economy dominated by knowledge.

In post-industrial realm, ICT, knowledge-related activities, intangible assets, and human ingenuity are the key components that further new knowledge. The engine of the economic expansion in this new reality is the high technology-dependent sectors that utilize knowledge extensively. However, lately, the other industries are also displaying a substantial reliance on knowledge for their growth. The saliency of knowledge and tasks related to it are steadily surging in every sector whether it is farming, trading, construction, or manufacturing.

Knowledge Economy Definition In knowledge economy, ideas, information, and knowledge are input resources; the research and development processes are highly knowledge-intensive; and the products, services, and commodities are new information, intellectual properties, and technological innovations. The fluidity of knowledge flow throughout the production process and the industries shift from labor-intensive production to automated processes managed by skilled knowledge workers or robots characterize the knowledge economy. The observable factors this economy demonstrates are the active commercialization of knowledge, proliferation of knowledge-intensive jobs, granular segmentation of skills, adoption of advances of technology by consumers and by industrial processes, and educated human capital (Jessop 2000; Castells 1997).

The knowledge economy is where knowledge is the main production factor for manufacturing goods and services, and the growth of the economy is maintained by knowledge-intensive activities that expedite the advancement of technologies and science, boost wider technology adoption in the society, and prompt frequent obsolescence of older technologies (Powell and Snellman 2004). The dynamics that contribute to and sustain knowledge economy include intellectual properties, knowledge workers and technologies and technology-related infrastructure, government policies, governmental and non-governmental institutes, and innovation system conducive to creativity and entrepreneurship. World bank has identified the following four different pillars that support a knowledge economy (Chen and Dahlman 2005).

- Market-oriented institutes and economic environment—Developed economic institutes and sound economic policies supportive of the free market in resource allocation and utilization that foster creativity, innovation, and knowledge flow.
- Skilled and educated workforce—The education level and absorptive capacity of the employees conform with the increasing need for new skills and knowledge.
- High-level innovation capabilities—Organizations such as educational systems or firms engaged in R&D are capable of extracting, integrating, applying, and sharing knowledge at a level adequate to create new knowledge.
- Advanced ICT infrastructure—For smoother information flow, seamless interaction between knowledge holders and practical knowledge exchange modern telecommunications and information systems are necessary and must be available.

The prominence of knowledge-related activities such as knowledge acquisition, integration, and creation of new knowledge and its effective dissemination throughout all economic activities are aspects that illustrate the knowledge economy. These knowledge-related activities influence improved production processes, efficient use of resources, better delivery network, and innovation in every aspect of the economic value chain. Social development, improvement of living standard, and distributed wealth creation are possible to attain in a knowledge-based economy at a level which far outpaces the capability of natural resource-based economic development. Many advanced and transitory economies have experienced remarkable growth since the ushering of knowledge economy thanks to their market supportive policies, meticulous planning, targeted investment in skills and vocational development, upgraded educational system, the creation of effective public institutions, and the establishment of knowledge and technology-based industry sectors. In last three decades, several middle-income countries owing to their pragmatic and focused policies, enhanced technology-related educational base, and concerted efforts in developing knowledge-based sectors have succeeded to transfer their economies to the developed country level. Notable among them are Taiwan, Korea, Singapore, Ireland, Israel, and Estonia. A couple of other countries that are not lagging far behind in their practices and capacity building in the quest for the creation of a knowledge society are Chile and Malaysia (KEI 2012).

Knowledge economy demonstrates three unique characteristics that differentiate it from previous stages of economic development: A higher percentage of jobs in the economy is knowledge-intensive, knowledge outweighs other production inputs, and intangible capital demonstrates more weight than tangible. These unique traits of the knowledge economy not just boost the significance of knowledge, but they also accelerate R&D, innovation, and the growth of entrepreneurship in knowledge-intensive areas (Houghton and Sheehan 2000).

Human curiosity, creativity, and needs drive inventions and innovation. Innovation, on the other hand, can't take place without such activities as knowledge assimilation, creation, and application in finding solutions to existing social, engineering, technological, and scientific problems. Entrepreneurs' intention, desire, and zeal help discovering opportunities and market imperfections. Together these two aspects prompt new combinations and recombination of production factors to ensue. Exploitation of innovation and commercialization of products and services resulting from this development are the underlying power behind the creation of economic value and societal prosperity. Entrepreneurs are one of the leading groups of people who with their vision and actions, and by taking advantage of market opportunities engage in innovation, work on making profits and generating wealth. Therefore, it is not surprising that countries and regions which are more prosperous demonstrate advanced knowledge economy, matured knowledge sectors, and speedier expansion of entrepreneurial endeavors in knowledge-related fields.

Entrepreneurship—A Renaissance

Conglomerations and incremental growth of firms were the trends in business expansion in the developed world much of the twentieth century until the early 1970s. Factors that supported this method of growth in business activities and subsequently economic progress included the refinement and elimination of operational and production methods, a surge in productivity thanks to the deployment of new technologies, and continuous increase of market positions by large and established companies. As a result, large corporations have dominated the economy by occupying and growing their share steadily.

As far as the small and midsize enterprises (SMEs) and entrepreneurship were concerned in the post-Second World War era till the 1970s, both general public and academics hold a disapproving view of them even in the developed world. The apparent reasons for holding this perception include SMEs were found to be less efficient compared to large companies, the salaries were lower in SMEs for the same kind of jobs, and their expenditure on innovation and R&D was marginal. The period consequently observed the diminishing importance of SMEs with their falling role in the economy (Audretsch 2004).

This systematic and predictive economic growth through the expansion of large companies came to a sudden halt right after the energy crisis of 1973 which brought lingering stagflation (Kilian 2009). The time coincided with the strong thrust in the ICT innovation when a slew of new products and services along with personal computers and programs related to their use started to make inroads into the market. As an entirely new industry, the personal computer and software segments generated many new opportunities which had minimum barriers to entry spurring an explosion of entrepreneurial ventures. These waves of reforms have begun a new economic trend reversing the prior trajectory that was illustrated in the surging importance of SME and renewed interest in entrepreneurship from the ordinary people of the society. During this period, another remarkable thing happened—a paradigm shift took place in people's perception of entrepreneurship. People earlier mostly associated the concept of entrepreneurship and business with chicanery, avarice, manipulation, and deception. These negative views gradually underwent a radical transformation to such positive connotation as innovativeness, hard work, perseverance, job creation, and power (Vesper and Gartner 1997). Better education, technological breakthroughs, more awareness of the possibilities that entrepreneurship can bring, the steady growth of knowledge, and much-publicized stories of successful entrepreneurs are believed to be the factors that swayed the global economy and people's opinion toward embracing entrepreneurship.

These were not the only factors spurring the revival of the entrepreneurship. There were many other reasons for this critical turn in the global economic course to transpire. The effects of globalization which created new market conditions thanks to deregulations and the elimination of trade barriers that simplified processes for foreign entrants to penetrate markets are one of them. The shift in the demographical structure of the labor market with the inclusion of more women, minorities, and immigrants also played a significant role. Changing consumer preference toward more tailored products and services that smaller firms are more willing and capable of producing rather than mass-market products that larger firms are comfortable to work, and liberalization of markets that allowed new smaller companies to participate in previously protected industries also bolstered the rise of SME. Importantly, smaller companies started to generate innovative ideas and approaches which facilitated them to manufacture products compatible with what larger firms had to offer (Brock and Evans 1989; Audretsch and Thurik 2001). The revitalization of the entrepreneurship in those years as the locomotive of economic growth was not an event transpired in the USA only, it was a global phenomenon noticeable in other developed and newly industrial countries (NICs) as well.

The conversion of the economy to knowledge-based one owing to the technological advancement and rising importance of knowledge in the production system has facilitated the proliferation of entrepreneurship (Fig. 1.2).

The globalization which helped the creation of many multinational super corporations, paradoxically, also lifted the number of SME and entrepreneurship. Big companies started to deploy automation and technologies to streamline processes, retain market position, and compete with manufacturing hubs with low-cost labor and production facilities in the developing countries. Along with the ushering of high-tech industries, it unleashed a spree of innovation that allowed SMEs and entrepreneurs to take advantage of new technologies and productions methods in their endeavors, particularly in the knowledge-based sectors (Audretsch and Thurik 2001).

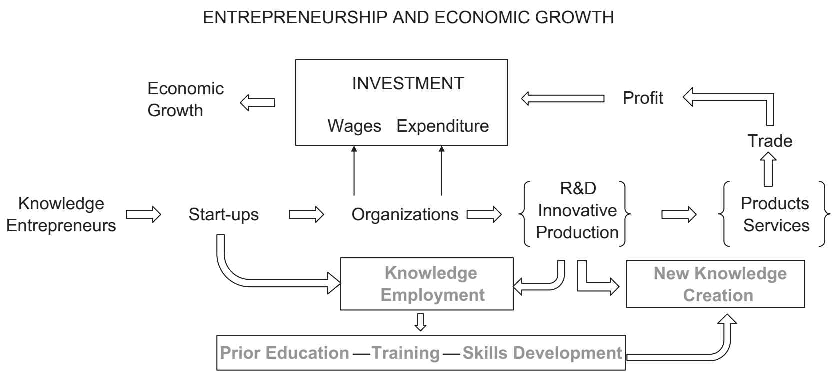

Fig. 1.2 Knowledge entrepreneurship and economic growth

Entrepreneurship and Entrepreneurs

An entrepreneur is a person who finds a gap between market demand and supply, uses that gap to create an enterprise, manages it, and takes risk-related responsibility of the enterprise. An entrepreneur acts as a change catalyst in the economy. According to Shane (2003), an entrepreneurial opportunity occurs when a person sees a possibility of recombining resources to generate products or services which can make a profit. Entrepreneurship literature often focuses on the individual as an entrepreneur, and the person's traits and activities while defining entrepreneurship (Venkataraman 1997). It created the mainstream understanding of an entrepreneur as a person who discovers a market opportunity and starts a venture to exploit it. The market opportunity derives from information asymmetry and innovation. An entrepreneur introduces innovation in the form of a novel combination from existing resources that creates new economic opportunities (Schumpeter 1934). The new combination can take various forms including a new product or a refinement of an existing product, a new production method, new market, new supply source of production materials, and a new business model. Peter Drucker (2014), the renowned management guru, also stressed on innovation as a lynchpin of the entrepreneurship and described entrepreneurship as "an act of innovation involving endowing existing resources with wealth-producing capacity."

A different approach emphasizes the information gap that occurs in the marketplace as the point of reference. Not everybody can see and identify an information gap that appears in the market. Only alert people can detect such gap and exploit the arbitrage opportunity in the supply and demand that it produces. From this perspective, alertness is the most important quality an entrepreneur must possess (Kirzner 2015). Whether the focus is more on innovation, information asymmetry, or both the generally accepted understanding is that entrepreneurs devise ideas, modify them, and turn them into exploitable opportunities, organize resources, and engage in activities to make a profit by exploiting those opportunities (Shane and Venkataraman 2000; Gartner 2001; Low 2001).

The world looks at entrepreneurs as a unique individual with specific traits that most people do not possess (Venkataraman 1997). Personality traits are the embodied characteristics of individuals that inclined them to demonstrate similar responses in diverse situations (Caprana and

Cervone 2000). These inherent qualities reflect our thought pattern, behavior, emotion, and temperament. Whether there exist specific personality traits that are must-have attributes for entrepreneurs or if we can distinguish entrepreneurs from others observing their traits are contentious issues. Some consider personal traits as essential determinants of entrepreneur's actions and expected behavior (Rauch and Frese 2000). Others disagree with this view and claim that we cannot create a profile of a generic entrepreneur by some specific traits alone (Aldrich 1999; Gartner 1988). While it is true that we cannot distinguish entrepreneurs just by personality traits because as a class they represent every single segment of the society with extensive heterogeneity in their characters, they still demonstrate some common qualities germane to entrepreneurial behavior (Zhao and Seibert 2006). From early days of entrepreneurship studies, as we notice, entrepreneurs were deemed as risk takers, disruptors, resource coordinator, opportunity identifiers, and venture founders (Cantillon 1755; Schumpeter 1936; Say 1816; Shane and Venkataraman 2000; Gartner 1989). Moreover, in entrepreneurship what counts is agility, responsiveness, and innovativeness rather than permanence and keeping the status quo, which are preferred choice for many people including numerous business owners.

Entrepreneurs discover opportunities, develop products, services, and business models to exploit identified opportunities, set up businesses, and engage in activities to commercialize their offerings. The tasks and actions taken by entrepreneurs to pursue their goal of making profits from products and services they have created or acquired are referred to as entrepreneurship process. Entrepreneurship is a dynamic, complex, and uncertain phenomenon which depends on many factors such as financial, social, and cultural contexts, entrepreneur's traits, zeal, and various other conditions. Economic level of the society, geographical location, educational level, personal traits, and base knowledge, all these elements play a critical role in the nature of entrepreneurship, its success potential, and social relevance (Atamer and Torres 2008).

Some routines, methods, activities, and procedures are universal for any entrepreneurship process, and others are dependent on context and various additional elements. For example, the contextual issues related to the location of an entrepreneurial initiative, whether it is in a factor-driven country or an innovation-driven country, influence on its required resources, strategies, industry structure, and many other aspects. We categorize countries depending on their economic development level into three different groups: factor-driven, efficiency-driven, and innovation-driven. In factor-driven economies, the competitive advantage of the country relies on natural resources or labor. In the efficiency-driven countries, the ability to produce and market standard goods is the source of competitive advantage. For innovation-driven countries, knowledge-based products and services which are innovative and technology-intense are the basis of competitiveness (Acs et al. 2017).

New venture creation is a common theme which receives much attention in entrepreneurship studies (Gartner 1989). A new venture does not have to be a creation of an entrepreneur—a start-up, entrepreneur can purchase a business in their quest of pursuing economic profit. The new venture must not be a for-profit organization either. It can be a subsidiary or a division of an established company, a nonprofit or even a state-owned company. As long as the enterprise adopts a strategic approach of quick and substantial growth by introducing innovative products, services, or business models, it is indeed an entrepreneurial project.

Technology Entrepreneurship In the knowledge economy, the production, application, and dissemination of knowledge are activities that flow through the entire complex network of economic processes, procedures, relationships, and structures. These activities and interrelations when observed from the market perspective reveal many opportunities that alert entrepreneurs can pursue. With the continuous advent of new technologies and knowledge production, the spheres where entrepreneurial opportunities are bourgeoning have been expanding in a solid pace since the birth of personal computer industry rekindled the interest in wealth creation, self-employment, and social contribution through entrepreneurship. Entrepreneurship since then also has transformed into an essential element in the invention and emergence of a large number of technologies. The rise of the entrepreneurship and its impact on innovation and the overall economy attracted attention from large companies and government agencies as well. Most corporations and governments today deem that entrepreneurship is a crucial source of new technology development, productive growth, job creation, improved living standards, and social progress.

As the new impetus in the rise of entrepreneurship coincided with the advent of the knowledge economy and a series of technological breakthroughs that instigated a wide variety of new industries, technology-based entrepreneurship found itself at the forefront of the entrepreneurship proliferation. It is not surprising that, today, technology companies though many of them even did not exist 30 years ago dominate over 25% of S&P 500. Technology entrepreneurs apply ICT in solving problems, exploit opportunities derived from emerging technologies, instigate technology change through innovation, conceptualize technology-based processes and business models to take advantage of market-induced information asymmetry, and establish technology enterprises (Garud and Karnoe 2003; Liu et al. 2005; Jones-Evans 1995). Technology entrepreneurship is a highly collaborative process where human talents using knowledge and technology resources create products or services that bring economic or social value. Because of its collaborative and interdependent nature, it also creates spillover and spin-off effects producing innovative ideas from the interrelation of human capital and new knowledge stemming from the entrepreneurial endeavors. Organizational R&D and innovation along with their operational processes and manufacturing method optimization and refinement efforts produce new knowledge, develop technological and human capitals which eventually other market players exploit, and create new enterprises. The spillovers effect implies a transfer of knowledge that creates new opportunities and used by others without paying any compensation to the original owner of the knowledge. Human capital leaving the organizations is the primary cause of spillovers to take place (Becker 1964).

Technology entrepreneurship occurs from both the market pull and technology push. The emergence of new technology, application of existing technology in a different way, the discovery of new materials, and change in processes cause the technology push. Technology push can instigate massive disruption in the industries, business approaches, business models, and start new industries. Most dramatic market disruptions and the emergence of new industries and business models transpire owing to breakthrough innovations. The Internet, mobile technologies, and computers are some examples of critical technologies that have completely transformed the market landscape. Market pull takes place when products and services concepts emerge in response to the actions of market forces such as new consumer demand, new products launched by competitors, or a new threat appeared from substitute products.

Technology entrepreneurship is a subset of knowledge-based entrepreneurship or simply knowledge entrepreneurship. In knowledge-based entrepreneurship, the primary input to the production process is knowledge, and the resulting outcome product is also significantly embedded with knowledge. Technology's unique capability of boosting innovation that creates new opportunities is one of the primary underlying sources of knowledge-based entrepreneurship. Entrepreneurship relies on an individual's vision, zeal, cognitive perception, personal knowledge, motivation, and approach toward the external environment. Adding to that innovation based on technology and scientific knowledge along with technological advancement reveals a new dimension of entrepreneurial possibilities. While in most cases knowledge-based entrepreneurship utilizes technology as a resource, such entrepreneurship does not necessarily depend on ICT.

In sporadic cases, technology entrepreneurship is about an invention made by a single person and a business venture built upon it. In most scenarios, this type of entrepreneurship involves specialized knowledge as a critical resource and collaboration of experts in a strategic team that work on concept creation based on the identified opportunity, knowledge integration, and the development of the products or services.

Corporate Entrepreneurship In the heightened market competition, companies also hold entrepreneurship as a strategic approach in new product development, market penetration, and revenue growth by applying internal resources and capabilities, and through strategic acquisition. Such entrepreneurial activities within an existing company are often referred to as "Intrepreneurship" (Richter and Teramoto 1995). Companies realize that in a dynamic and rapidly shifting market and customer demand, it is essential to foster agile, innovative, and adoptive units within the firm which are entrepreneurial enough to follow market trends, stimulate innate creative potential, and exploit evolving technology changes.

Universities, research institutes, and scientific organizations are progressively becoming a source of new ideas, innovation, and creative destruction. The unlikely prior candidates for the entrepreneurial quest and members of scientific communities are now actively pursuing business opportunities emanating from their knowledge resource. Spillover effects from educational and research institutes' working relationships with industries are contributing to the growth of entrepreneurial activities within the research communities.

Governments and Entrepreneurship In most advanced economies understanding the potential that the entrepreneurship holds, governments are working on crafting effective market conditions by enacting regulations, providing funds, and supporting the launch of start-up accelerators, incubators, industrial zones, innovation clusters, and hubs conductive to the rise of entrepreneurship.

The technology revolution and knowledge proliferation have brought a considerable improvement in the human productivity and the way people live, work, communicate, and spend their free time, but fundamental problems in many areas still left unresolved. Moreover, even though knowledge economy instigated a new chapter in financial prosperity, technology innovation, and opportunity generation, it is also deepening inequality between rich and poor in many countries due to rising knowledge and technology gap.

Social Challenges

The question is how we harness technology, apply new knowledge, and boost entrepreneurial approaches in a manner so that they can produce a maximum positive impact on critical social issues the world is still facing. The problems are serious. Over two billion people continue to live on just 2 USD a day or less. Wars, government atrocities, poor economic conditions, and environmental changes are creating a massive pattern of migration. In many developing countries, a large portion of the population lacks primary education and women and girls are devoid of adequate human rights. Widespread food shortages and acute malnutrition are affecting a large number of people in many countries which are caused by failing institutes, dysfunctional systems, internal conflicts, poor governance, and natural disasters (Torres and Anderson 2004; Pelling 2012).

Lack of clean water supply and access to sanitation facilities are severe threats to the health of a vast number of people in the world. In today's world, 25% of children under the age of five die due to water-linked diseases. Contaminated water, and poor sanitation trigger around eighty percent of sicknesses, and patients with diseases infected from water occupy fifty percent of the beds in the hospitals. Improvement in the areas of clean water and sanitation can significantly reduce contamination, diseases, and deaths and raise the quality of life in developing part of the world (Hutton and Chase 2016; Mara et al. 2010).

Rampant forest deforestation, particularly in tropical regions, is a threat which is bringing devastation to the wildlife, triggering the extinction of many rare species, and shifting the delicate balance of the natural ecosystem. It is also one of the primary reasons for climate change. While agricultural expansion, logging, cattle rearing, overpopulation, and urbanization are the leading causes of forest degradation, impoverished population, illiteracy, and lack of adequate knowledge are also critical factors. However, if we address these issues adequately, it will be possible to prevent further destruction (Whitmore and Sayer 1992).

It is not just the developing world which is encountering severe and pervasive social and economic challenges. There is no shortage of social problems even in the developed countries. The concerns include drug abuse, opioid crisis, unwanted pregnancy, and issues that are endemic in poverty-stricken segments of the society such as illiteracy, poor consumer credit, underserved but in need of support population including recent immigrants, children with disabilities, and families with primary caregivers with grave health problems.

While excellent progress is made in recent years and many new initiatives were taken to alleviate the situation, it is still just the tip of the iceberg. Knowledge-based social entrepreneurship may have the answer to many of the problems the society has so far failed to address appropriately.

Social Entrepreneurship

Social entrepreneurs find new methods, business models, and conduits to resolve pressing social problems through their vision, desire, capability, and zeal. Social entrepreneurship accentuates on finding solutions to deeply seated social problems that cause human misery (Margolis and Walsh 2003). Social entrepreneurship is the process of creating social value by establishing a venture which could be a for-profit, non-profit, non-governmental organization (NGO) or even a public institution. The emphasis of a social enterprise can be directly targeted to social value creation or indirectly through the creation of economic value that later translates into social or environmental value. For example, the company TOMS shoe adopted an innovative social enterprise model where each sale of a pair of shoes correspond to the giveaway of another pair of shoes to a child in need from a penurious region (Torelli et al. 2011).

In order to sustain their ventures and fulfill their social mission, for-profit social enterprises need to make money and expand their business. The profit in social enterprises is a medium for serving their higher purposes. For-profit social enterprises do not rely on donors for their existence, which forces them to introduce management methods akin to commercial companies and to obtain a better knowledge of market intricacies and stay agile.

Social entrepreneurs are people with the vision of social change in an innovative manner with available scarce resources. They are the change agents for social issues. They are mission-oriented with a vision to make sustainable change that creates social value. Social entrepreneurs are innovative, and in their relentless pursuit of change, they apply creative ideas. As entrepreneurs they are the risk taker but at the same time cautious with their financial approach. Social entrepreneurs are engaged in the pursuit of making a difference in the social sector through a series of institutional practices.

Unlike commercial ventures, social enterprises do not belong to a group of shareholders, and they are not driven by making profits. While they differ in their goals, tax ramification, and in organizational forms from commercial enterprises and might rely on government funding, they are not state organizations.

Social entrepreneurs are a unique category of people who can connect the dots between commercial, operational methods, and processes with solving persistent social problems. They look at social challenges from a very unconventional angle which allows them to approach the issues, recognize the deeper structure of the problem, and find innovative solutions. They create jobs and engage socially concerned productive young minds in bringing benefits to the society and world. Knowledge-based social entrepreneurs go one step ahead as they apply innovation using knowledge and technology as prime resources and work out solutions to social problems, generate social values, and build ventures to address their focused social challenges.

While describing constituents of social entrepreneurship, mainstream literature often points to the problems of education, healthcare, poverty, and other social challenges. However, behind these apparent reference points, a very complex notion is hidden that encompasses a gamut of issues that often get overlooked while depicting these processes. Elements of social entrepreneurship process include the enterprise's goals, missions, and values, opportunities that originate from the social issues that the enterprise is addressing, the innovative approach or product that is deployed to address those issues, a business model that is sustainable, and the social impact that the venture is planning to make.

Several catalysts have activated the growing interest in social entrepreneurship. First, with rising living standards, more people with better education, and increased awareness which is brought by better access to information, individuals, and society as a whole have started to pay more attention to social challenges; second, the increase of the number of empathic people with more ability to contribute to the society and environment; third, the apparent inability of the social agencies of governments to take care of expanding social problems due to the lack of adequate funding, ineffective management, and unaligned objectives; and fourth, more people with business acumen and management knowledge are figuring out that many social challenges should be better served with commercial practices and by applying business strategies and methods.

Social entrepreneurs—individuals that work on finding solutions to society's most acute and pressing problems—are increasingly becoming primary change agents and economic growth factors in developing countries. Although knowledge-based social entrepreneurship is a recent phenomenon, it is already making significant footprint in various areas.

The concept of social entrepreneurship is not new. For centuries, there had been people those who have tried to address social problems by applying commercial tools. For example, temples and churches in their effort to feed hungry people from the street had not just relied on the donation of worshippers, they have also sold merchandise like candles, incense sticks, and handicrafts as well.

Social entrepreneurs today cannot just hinge on to charities and donation to create a sustainable venture that will continue to address the social issues that they deal with. Their business models now must incorporate commercial principles, market values, and business and operational strategies that are common for for-profit corporations, at the same time learn to collaborate with various public institutes and government agencies, and still keep their focus on their core missions. The trick here is to be aware of and stay over the top of both outcomes of the double bottom line: the quantifiable social impact and profit.

We should note that the social entrepreneurial industry in developing countries encounters significant hurdles due to the lack of required knowledge, access to vital information, and proper data management.

Integrating traditional social projects with knowledge-focused information systems and developing knowledge-based social entrepreneurship where knowledge is the critical economic factor, we can improve the efficiency and effectiveness of the social projects as well as fuel growth using much of local capacities. In this scenario, education will be the fulcrum as experienced, educated, and knowledgeable workforce will be required to marshal the knowledge-based social industry.

Impoverished people not just own fewer assets and have limited access to resources, they also have nonexistence capacity of identification, extraction, absorption, and utilization of business, technological and scientific knowledge essential for moving up the ladder. Technical know-how and scientific knowledge make an incommensurable contribution to the economic development and improvement of the quality of life in any society.

While this type of knowledge requires adequate learning capabilities and education which indigent people often lack for apparent reasons, there is also another type of knowledge often referred to as "knowledge that" which is readily available such as where and how to obtain specific information relevant to improving life at a basic level. For example, in the agricultural sector, in many developing countries farmers continue to sow traditional crops with a low-profit-margin when excellent opportunities with better crop yield are readily available. Another example is the importance of clean water in life—bringing enough awareness about the health issues caused by unclean water could save many lives in many poverty-stricken regions of the world. Not surprisingly, the level of social prosperity is directly related to the availability of knowledge, its access, and utilization within a society and across countries.

Knowledge and Social Entrepreneurship

The gap between haves and have-nots is expanding in societies at an alarming rate along the growth of the knowledge economy in many ways due to its dependence on advances in technology. With the continuous knowledge growth and technology shift, more radical inventions, innovation, and emergence of new entrepreneurial opportunities are bound to take place. Many of these entrepreneurs and businesses will accumulate massive wealth creating even more divergence between the wealthy class and poor than what we observe today. It means that this enhancing difference is one more reason why it is imperative to focus on the market potentials that knowledge economy is engendering from a balanced perspective and study the possibility of the use of technological advances and knowledge growth in innovation that finds solutions to social challenges.

Technology

Technology has multifaceted use in the economy and business. Technology as a tool facilitates making better products, enhancing the capabilities of existing products, creating new components as well as inventing new products and services. It acts as a manufacturing platform, brings efficiency to value chain, and raises productivity through functional improvements. It is also traded as capital goods such as machines, tools, equipment, and as a package that includes information, know-how, tangible, and intangible assets.

The convergence of products and services where knowledge is becoming the primary source of value creation exemplifies the high impact of technology. The digital revolution bolstered by technological advances attributes the shift toward the economy powered by knowledge. Ever since its emergence, the Internet along with its ubiquitous presence contributed to the formation of a global communication infrastructure that has been the platform for tremendous growth in information creation and dissemination. Another good example is the auto industry. The automobile has been a subject of considerable innovation for the last couple of decades. As a result, today cars resemble rolling computers with massively complex electronics which are embedded with more software and computing capabilities than early supercomputers.

ICT

The emergence of breakthrough technologies has changed the old linear trajectory of predictable, incremental, and slow metamorphosis to rapid, vibrant often tumultuous shift ushering the age of discontinuity or knowledge age (Drucker 1969). The main force that propelled the transformation of the economy to the knowledge-based one is the information and communications technology—a term refers to the combination of information technology (IT) and communication technology (CT). Information technology is applied for information integration, storage, production, use, and dissemination, while information delivery and access utilize the CT. ICT comprises a vast array of evolving technologies which include computing, information and data processing, and communications tools and systems. It is one of the most rapidly changing, innovative, and expanding field as new tools to improve, optimize, and process information and communication are continuously appearing. ICT is a technology-based power behind the creation and growth of much of the Internet-based business sectors and continues to disrupt the market environment with new potentials. The economy transformed from the dimension of business based on mass production to a new plateau of knowledge-intensive products and services. ICT is also deemed as a general purpose technology that spurs the development of a large number of complementary and spiral innovations.

Economy and Technology

Gig economy is a term coined for an economy around temporary, short-term work engagements, freelancing, and micro-working which is proliferating owing to market aggregators, outsourcing marketplaces, and online platforms. Two primary forms of work are involved in this technology—enabled economic sector. First one is freelancing when independent workers are hired through an online platform to complete a task usually requiring some level of cognitive skills; second, on-demand work, when a person is hired through a mobile or online platform to perform a traditional job on a temporary basis such as a construction trade or housecleaning (De Stefano 2016). Gig economy is showing a sign of accelerating trend that offers benefits to workers, companies, and the society. The flexibility of work hours provides better work-life balance for many along with a sense of personal control over life. It is shattering the traditional management-employee relationship in legacy companies. Companies are having access to more qualified talents as they need. Importantly, it is producing a generation of workforce with an entrepreneurial mindset.

Technological advancement is disrupting industries reshaping them and expediting the emergence of new industries. Technologies such as the Internet, artificial intelligence, robotics, Internet of things (IoT), blockchain, quantum computing, 3D printing, 5G communication, and several other new technologies are transforming manufacturing, supply chain, and operational processes in all industries creating new entrepreneurial opportunities, introducing new jobs and rising demand for new services. These technologies are also at the forefront of developing automation, next-generation communication, payment, and transportation systems that promise to bring higher productivity and economic growth.

In the knowledge economy, the efficient and effective use of technology propels innovation and enacts the underlying framework for building prosperity and creating wealth. As mentioned earlier, the emergence of the knowledge economy and the revival of entrepreneurship both occurred to a greater degree thanks to the advances in technology. Technology is a crucial resource in many types of entrepreneurship, particularly ones that are relevant to the knowledge economy. For knowledge-based entrepreneurship, they are also vital tools, enablers, and a mechanism to operational and functional excellence.

Knowledge

Throughout human history, knowledge was always a critical component for the growth of a civilization. The development of language and later the writing were the forms of communication methods needed for sharing information and knowledge. From the printing press to telegraph and from telephone to Morse codes, all were efforts that enhanced our communication ability and addressed the problems of information delivery by continuously making it better. However, it is only in the middle of the last century the real breakthrough in information creation, and dissemination started to take place which entailed from the emergence of ICT.

Knowledge had always been a part of the production factor as a residual element (Enachi 2009). Even at the dawn of the civilization, humans needed to know which animals to hunt, how to hunt, and what fruits and vegetables are suitable for consumption for their survival. The knowledge portion as an individual factor of production since then has increased along with the complexity of the economy over the centuries. In an agrarian economy, it was crucial to know agriculture cycle, methods of cultivation, irrigation, harvesting, and storage. In the industrial economy, knowledge became more salient as know-how and skills were a vital component of the entire production and sales processes.

Knowledge as a production input differs significantly from other factors such as land, capital, and labor. Traditional factors' contribution to the final product is quantifiable which is not the fact about knowledge. What would be the outcome from the use of knowledge in the production, what economic value it will produce, and how long the value will remain unchanged are challenging questions as uncertainty engulfs knowledge, its potential use, and its outcome.

The impact of knowledge in today's world is profound. It touches every single economic relation, process, and procedure. While labor productivity still contributes to output growth, its importance is diminishing as machines and technology, their use, and the knowledge factor are increasingly having more influence on the production method. At the same time, more and more profound niche knowledge is becoming necessary for the development of intellectual skills which enhances labor productivity. Owing to automation and robotics, cognitive work and technology use are becoming the norm diminishing the need for physical labor across the board.

The modern economy is founded on knowledge, and the use of which as an economic means is fundamentally different from traditional raw material-based resources. The new economy demands a continuous upgrade of production facilities with automation, rapid response to market environment and customer preferences, and faster innovation in products and services by embedding more knowledge component. In consequence, possession of unique knowledge that brings economic value and competitive edge is becoming so profoundly compelling that it is forcing companies, universities, and research institutes to intensify R&D, innovation, and new knowledge creation. The escalating competition at the global level and the pressure from the evolving market are also making the development of technological and scientific knowledge a major national priority. Advanced post-industrial countries are leaders in most fields necessary for solving complex problems in science, technology, and education. These nations are also relentlessly working to create favorable conditions for innovators and entrepreneurs to sustain their competitive positions. However, for the rest of the world to reap the benefits of knowledge economy a combined, inclusive, and sustainable effort that includes a particular focus on free trade, foreign direct investment and a fair level of technology, and know-how transfer are crucial.

Knowledge and Entrepreneurship

The main ingredient in conceiving an innovative idea is knowledge. For entrepreneurs, sources of knowledge from where they can extract creative ideas are located in new technologies, industry structures, market dimensions, policies and regulations, social trends, and macroeconomic factors. Knowledge garnered from such disparate domains contributes to the fulfillment of an entrepreneur's desire in seeking out new ways of resource recombination and introducing more valuable products and services. These goods, whether tangible or intangible, are increasingly becoming more knowledge-based as growing number of knowledge components are getting embedded in them. Entrepreneurs, who possess the unique capabilities of applying advanced knowledge and technologies in the production and development of new products, are leading the growth of the economies, particularly, in regions where knowledge workers possess the best-required skillset. The efforts of these knowledge entrepreneurs are generating financial and social values, creating new knowledge and bringing a new level of prosperity to the society.

The evidence is clear. Knowledge-based companies are augmenting their market shares at a staggering speed. The market value of companies like Amazon and Apple has already surpassed the trillion-dollar mark dwarfing the former resource-based giants like Exxon. No wonder that in most advanced countries today the bellwethers of the economy are overwhelmingly knowledge-based technology companies. Knowledge is not just initiating new industries in technological front, but also transforming the traditional sectors at an incredible pace. The societies are benefiting from this changing dynamic facilitated by the advances of the technology and knowledge growth. Technologies such as AI, IoT, the blockchain, cloud computing, robotics, and automation are promising to bring even more significant changes than what we have achieved so far.

Knowledge and Corporations

What effects is this knowledge-induced technological evolution making on the companies? Most firms realize that the economic value that stems from the material part of a product is decreasing surrendering it to a combination of intangibles comprising of intellectual properties, branding, marketing, innovative attributes, and human capital. In this new realm without cultivating sufficient level of the scientific and technological knowledge base, concentrating on innovation, and building a system conducive of knowledge creation, sharing, and exploitation, companies will have a hard time competing in the marketplace. In the changing social and economic environment, companies are destined to lose their competitive edge if knowledge and innovation do not become their core priority. Drucker (1969), who foresaw the coming age of knowledge society as early as in the 1960s, has suggested that organizations must rely on knowledge as a primary resource for achieving competitive advantage.

Knowledge and Job Market

The skillset and the possession of niche knowledge essential in the knowledge economy are different from the previous economic stages. Take the example of the job change. Occupations have disappeared or transformed for various reasons. Some are related to lifestyle changes thanks to the rising prosperity of the society (e.g., door-to-door salespersons) and others due to technological obsolescence (e.g., typists and telephone operators). However, in recent years, artificial intelligence is causing massive disruptions and getting unsuspecting workers by surprise in several domains where some jobs were deemed invulnerable because cognitive skills needed to perform them (e.g., law clerks, sports reporters) are threatened by technology. Jobs that less likely to become a replacement subject, at least in the near future, are ones where people are required to work closer to the decision-making processes because these works demand more of in-depth domain-centric knowledge and specific skills.

Global Competition and Knowledge

Companies are also becoming susceptible to unexpected competition from new external entrants more frequently due to the faster growth and diffusion of knowledge and globalization. The contemporary new players are deriving from random places and diverse regions. Many of them armed with sophisticated knowledge and advanced technologies are well-prepared to compete not just based on pricing alone but also by qualitative attributes such as features, craftsmanship, and functionalities. This continuous market pressure forces companies to become more innovative in every sphere of their business. It was not too long ago the US automobile companies were compelled to yield their market shares to Japanese cars. The rise to the preeminence by Japanese car companies in the late 1970s and early 1980s was possible, owing to their engineering quality, attention to the details and reliability. However, the most crucial factor, perhaps, was their relentless efforts to source ideas and knowledge from competitors, refine them, and incorporate to their business practices. Present extreme competition between Apple and Samsung in the smartphone arena is an example of competitive intensity which is pushing both companies to bring out new models with unique functionalities faster than before. Companies those are not prepared for the changes that the globalized knowledge economy brings will endanger their very existence. Companies have to be innovative and acknowledge the value of knowledge acquisition, integration, utilization, and exchange to compete in this new environment. While the changes are more apparent in the technology sectors, other industries from health care and education to manufacturing and retail are already feeling the pressure.

Innovation

In today's globalized and dynamic marketplace, the need for innovation has drastically intensified (Harborne and Johne 2003). From management to workers, culture to infrastructure, and processes to products, innovation is a determinative cause that works as an impetus, spurs growth, and instigates changes in every corner of a firm's ecosystem. It enables refining processes, creating products and services, and winning market segments. It plays an invaluable role in improving productivity and gaining a competitive edge (Crespi and Zuniga 2012). It is an elusive attribute, but it also is the crux of entrepreneurial processes. Because of its importance, interest in innovation, its processes and outcomes, its determinants and enablers and questions such as how entrepreneurs can effectively use and extract maximum benefits from it are real concerns for entrepreneurs, business world, and governments alike.

Innovation is about generating new creative ideas in the form of new or improved products, services, processes, or business models and, work on these ideas, and generate economic value from them. The generated ideas can be a recombination of old ideas, an invention that challenges the conventional way of thinking, or an adoption of an idea from the unrelated place. Innovation can occur serendipitously, or it can emerge from many years of toil. For entrepreneurs, innovation is a result of their orchestrated endeavor. It is also closely associated with market-related uncertainly and requires resources that the entrepreneur does not always possess.

Innovation can be radical which brings disruption, changes in the traditional methods, opens new industries, and imposes ways to do things differently. Most innovations, however, are incremental—a gradual process of refinement and the creation of an improved product, and more effective and efficient processes and services. Incremental innovation mostly takes place surrounding a problem or opportunity with which the players involved are quite familiar. They get engaged in refining things that are within their domain where they are either frustrated with the established practice or see a window of opportunity to do things differently. Innovation is about changing the status quo and redefining the old method of doing things not just because of internal needs but also due to external stimulants. These signals can be a new technology, market conditions, regulatory change, social factors, and new knowledge. Radical innovation causes paradigm shifts in technological and scientific spheres, and market structures. They may also create entirely new industries. These innovations are the catalysts that introduce new approaches, new lifestyles, and new methods of productions and consumptions. They install new rules and methods that force all stakeholders to go through learning curves. Schumpeterian "creative destruction" happens when old orders and methods get reorganized from an innovation so radical that it forces the market and the users to accept the new reality and discard the old pattern.

Innovation starts with understanding that there exists a need for a specific product or service or a problem that requires a solution. It implies finding, creating, and developing ideas that work reasonably better than the existing ones and implementing them in a way so that they generate profits, improve productivity, and reduce cost.

The supremacy of knowledge in the economic activities and ubiquitous use and availability of new technologies characterize the knowledge economy. It is also about innovation, creativity, and well-prepared stance of all economic sectors in embracing new ideas and advances in technology and new knowledge.

The system of innovation in the knowledge economy hinges on knowledge, its spillover effects, and its unobstructed proliferation. Industrial and knowledge clusters where government, educational and research institutes and firms are interconnected, specialized infrastructures are created, and skilled labors and competitive technologies are available are fertile grounds for innovation growth. These places are proven to be not just where new technology and innovation germinate but also the breeding ground of entrepreneurial ventures thanks to the access to resources, talents, spillover knowledge, and innovation.

Innovation brings competitive capabilities, rising economic activities, new expansion potentials, and increasing profit. In the knowledge economy, it originates from multiple sources. First, it generates from active research and development work conducted by companies, research institutes, government agencies, and educational institutes; second, from individuals, knowledge-related activities coupled with their experience, on-the-job tasks, and learning from observation; and third, from the integration and use of technologies.

Every new technology and unique knowledge create a floodgate of new possibilities of transforming and inventing new products, processes, business models, and strategic approaches. Potentials stemming from them produce numerous ideas and opportunities for starting businesses for alert entrepreneurs and a new way of doing things for businesses.

In the last two decades, the growth of the massive amount of knowledge, its distribution, and exchange have built a global platform for knowledge sharing and creation where the Internet and mobile technologies are the primary channels. The Internet itself has become a giant arena of experimentation and research leading to the fostering of innovative concepts and the emergence of an immense number of enterprises. The explosion of data with its massive volume, velocity, and value, which the literature calls "big data," along with such technologies as cloud, machine learning, and others have also debuted a series of innovations. It possibly is the beginning of another round of dramatic technology-led economic growth.

In today's globalized and competitive marketplace, sustaining the market position, penetrating a new market, satisfying customers' changing requirements, and countering market uncertainty all require active participation in innovation endeavors. Ignoring innovation and its importance for far too long can have an adverse effect that may even threaten the survival of the firm. Entrepreneurs and companies now have far better access to knowledge than ever. However, the problems and challenges that they face are also more complex and pressure to find solutions are immense and immediate. For organizations, it calls for employing skilled people capable of exploiting scientific, technological and general knowledge, engaging in R&D, and continuously coming up with new ideas that translate into innovative products, processes, and services.

Innovation is an integral component of the entrepreneurship. Entrepreneurship is itself a specific form of innovation. Innovation is not just about generating ideas. Many original and exciting entrepreneurial ideas from innovation perspective stay as ideas due to the aspiring entrepreneur's resource constraint, lack of knowledge, and failure to stand uncertainty. Innovation is by nature complex and chaotic, in social areas where challenges are often age-old and persistent even more so. Social entrepreneurs need to perceive better the role of innovation in entrepreneurship, its development, and implementation processes, and learn to harness innovation-related complexities in order to create a sustainable social venture.

Innovation and Social Entrepreneurship

While innovation is an essential component for any entrepreneurship, for enterprises trying to solve social problems innovation is indeed a core factor. The reason is most social problems are persistent and tagged along with social processes for far too long. Finding solutions for such problems is difficult and requires original ideas, mechanism development, and implementation. Each of these steps and elements is intertwined deeply with innovation. The evolving nature of social challenges exacerbates the complexity of innovation in the social sphere. In social issues similar to commercial businesses, innovation, depending on the problems it addresses, could be a process or product innovation. However, one element somewhat works as a constraint in the social innovation unlike an innovation for commercial purpose which is the goal of social value creation.

Innovation and Social Change

The successful continuation of the growth of a company hinges on its ability to stay innovative and continuously come up with new ideas for its business processes, revenue generation models, and improving its products and services.

Social innovation refers to the introduction of new products, services, processes, and business models that primarily create social value. Social entrepreneurship lies at the juncture of innovation, entrepreneurship, and social causes. Social problems are fundamentally different from most market-related issues because they are persistent and integrally linked to the process of humanity's progress and due to their tenacity and complexities finding innovative ideas that can solve these problems and bringing these ideas to life require a creative approach. One of the specificities that makes them unique and difficult to address is that these issues are often very local with their own embedded cultural, ecological, anthropological, and sociological contexts. Social innovation, hence, is inherently more intricate and far more complicated to pursue.

Conclusion

Knowledge-based social entrepreneurship holds significant unleashed potential in reducing poverty, creating opportunities, and improving life for many. This new front of social entrepreneurship can spearhead the creation of new forms of organizations, new methods of bringing changes, and develop new business models that may fundamentally transform the sector.

Unlike many other industries, social entrepreneurship in most cases receives full-scale supports from all stakeholders. Governments are enthusiastically backing social enterprises and trying to create favorable conditions for their growth by making policy changes. Universities and business schools are introducing numerous courses. Large corporations and rich philanthropes are assisting in the creation and expansion of many social ventures through their foundations, and most importantly, a growing number of conscious young people are embracing social entrepreneurship as their preferred occupational choice.

Social entrepreneurship is a fast-growing segment with huge potentials. A recent survey on the state of social enterprise in the UK found that social enterprises are indeed a growing phenomenon, they have more diverse leadership, females run 41% of them, the wage difference between the CEO and the lowest salaried personnel is far lower than in commercial companies, and they are more commercially resilient (Social Enterprise U.K. 2017). These are all good news for entrepreneurs planning to devote their time and money to social causes. The fact that social ventures contribute to job growth, market expansion, environmental protection, empowering women and girls, poverty reduction, literacy and child care is an aspect that also works as a key motivational factor for many. As a result, a more significant number of people for whom ethics, social responsibility, and sustainability are essential is getting involved which is assisting the sector to grow and become influential throughout the world.

Although the sector is growing fast and receiving sympathetic supports from most stakeholders, it still faces barriers and problems far higher than their commercial counterparts. Finding and securing funds to start and grow a social business and taping into the needed talent pool to recruit right employees are the two most critical hurdles social start-ups encounter today. Social enterprises often adopt the strategic approach where they plan to generate revenues through commercial activities and at the same time pursue their social cause using profits made from those activities. In doing so, they also face two-prong competitions. On the one hand, they have to compete with rivals in their commercial activities; on the other, they have to compete with other similar organizations for vital resources such as talent pool. Having two goals might also exacerbate the situation with the potential distraction that may cause a shift in the enterprise's attention from its primary focus and obfuscate management's long-term vision. These are crucial issues for any social entrepreneurship which includes knowledge-based social entrepreneurship as well.

Knowledge-based social entrepreneurship is a novel, complex, and dynamic phenomenon. In this book, to bring a better understanding to it and to establish its theoretical underpinning, we explored its nature and identified what the key elements that define the emergence and proliferation of this new type of entrepreneurship are. Besides discussing it from various comprehensive approaches, we have analyzed many of the critical factors that have created the present environment and context for its proliferation. We reviewed the knowledge economy and its key attributes which are globalization, knowledge society, and technological advancement as the aspect that created the necessary and sufficient conditions for such entrepreneurship to evolve. The foundational pillars and factors of the growth of knowledge-based entrepreneurship are technology, knowledge, and innovation. We have thoroughly covered these topics and their impacts. While discussing why, how, and what made the emergence of knowledge-based social entrepreneurship possible, we looked into the phenomenon from the perspectives of the entrepreneurs and their traits, entrepreneurial opportunities, entrepreneurship process, and strategic approaches. We particularly highlighted the strategies and business models that are going to shape the future of this phenomenon.

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Part I

CHAPTER 2

Knowledge Economy

Introduction

The world economy is going through a radical process of transformation bolstered by technological advancements, globalization, rational government policies in many countries, and a new generation of a technology-savvy talent pool. Ever since the Information Age started to set its foothold in the mid-twentieth century, the economy is moving toward a different stage of growth period where the relations between economic agents and functions, production factors and processes, market variables, and institutes are also going through an intense makeover. Knowledge replaces the traditional factors of production, which are labor, capital, and natural resources and gains the primary role in this post-industrial economy. In this paradigm, the ratio of labor-based and manufacturing-based industries gets reduced paving the way to knowledge-intensive and service-based industries to secure a larger share of the economy. It shifts the focus of the national economy to information-intensive and innovation-driven sectors as competitive advantage and growth of nations will depend on knowledge creation, innovation, ICT use, and human capital. Moreover, both in products and services, knowledge-related activities in this new economy will continue to generate a more substantial portion of the economic output gradually.

The degree and scope of knowledge use in the economic processes have brought significant structural transformation throughout the

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economic functions and operations (Artelaris et al. 2011). These changes encompassed the entire socioeconomic ecosystem and generated new economic relationships, institutional structures, rules and regulations, government policies and even cultural norms which have become the foundation of the knowledge economy.

The concept of the knowledge economy is closely linked to the evolution of economic relations, the new role of the individuals, impacts of intellectual and social capitals, change in perception and mindset, and the emergence of new social groups. These issues and complexities which it produces dictate to review theories, specifications, and models of the modern economic theories and include in the analysis ideas, concepts, and structural patterns that will shape future of the new economy, social processes, and personal well-being.

The knowledge economy is a combined effect of ICT, innovation, skilled workers, and knowledgeable people that create economic expansion. For economies to achieve a smoother transition to this new growth stage would mean to have a common platform in understanding the importance of knowledge in the society by all stakeholders including public and private institutions, government agencies, businesses, and entrepreneurs. The fact that knowledge has such a unique attribute as nonrivalry—it does not deplete from its use, on the contrary, its use only increases the value and potential unlike other means of production—makes it an extraordinary resource with multifaceted economic consequences.

Although there exist many definitions of the knowledge economy, here we define it as an economy where knowledge-related activities such as production, creation, use, and dissemination are primary contributors to the economic growth (Brinkley 2006).

Historical Perspectives From the early days of economics research, even though the importance of knowledge was always noted, it was viewed as an auxiliary component in economic factors. That has changed recently when new growth theory highlighted the value of knowledge and technology in productivity enhancement and economic progress. Adam Smith (1776) argued that the division of labor takes place because of skill development. Learning and knowledge accumulation are necessary attributes in building skills. Hence, knowledge is not a separate factor but a part of the labor. While writing about speculation and trading of commodities, he also clarified that traders cultivate specific interest in their trades, develop an intimate knowledge of the market and skills in conducting the trade. These elements are idiosyncratic to traders alone making their roles in the commercial operations that they conduct crucial. The knowledge that merchants possess thus benefits society by producing essential to economic activities information. Alfred Marshall (1990) regarded knowledge as a propulsive element in the production system. He wrote people accumulate capital by manipulating nature using knowledge through the production of goods or services. For him, knowledge was an integral part of human capital entrenched in the production factor of the labor.

Hayek criticizing the assumption of perfect competition indicated the value of knowledge as an economic concept. In neoclassical economic theory, information is a crucial element. It assumes that people possess complete and relevant information when they make an economic decision. Hayek argued that knowledge is unevenly distributed within society and individuals possess only a partial fragment and often contradictory knowledge. The problem in the economy is not how we should allocate a given resource, but how to maximize the benefit of the resource using the best knowledge that a person in the society holds (Hayek 1945).

New classical growth theory explains how an economy can achieve a balanced economic growth rate by having access to an adequate level of three factors. National income stems from three sources: expansion of labor force, an increase in physical capital which refers to machinery and buildings utilized for the production of goods and services, and residuals of all other factors. The impact of residual factors is deemed as quite high. One of the central tenets of the theory asserts that since technological change's influence on the economy in a big way, for continuous economic growth to sustain, it requires technological progress. Solow (1957) proved that a significant portion of economic growth indeed depends on this technological change, which is one of the principal residual factors.

Solow's model acknowledges the importance of technology and knowledge in production, but for the sake of simplicity treats technology shift as an exogenous determinant and a fixed one. It does not provide any clear answer to the question of how knowledge propels economic activity and does not explain what causes the growth in social prosperity. Nevertheless, the model incorporates the idea that knowledge generation is vital for long-run economic development.

Recognizing the importance of the knowledge industry, Machlup in 1962 conducted a study to measure knowledge production and distribution in the USA. Before him, economists were more concerned about scientific knowledge, if at all, in the form of R&D only. He introduced the measurement of knowledge as a broader concept that included R&D, education, information, and communication and prompted keen interest in knowledge by economists. Machlup concluded the rise of knowledge's economic importance was caused by its increasing shares in the country budget, social benefits that it brings, its deeper connection with economic growth and productivity, its link with ICT and the impact it is making on the growth of the ICT industry, and the increasing demand for knowledge workers among others (Godin 2008).

Arrow (1962) integrated the concept of learning by doing as an endogenous factor and showed that the effects of innovation and technical change are possible to include in the growth theory. He referred to learning as the process of knowledge acquisition gained from experience while solving a problem. Romer (1986) and Lucas (1988) based on Arrow's work have incorporated in endogenous growth model factors such as investment in R&D and innovation, human capital development and knowledge because these elements play significant roles in the economic growth. Romeo also postulated that knowledge spillovers effect from company R&D endeavors entails the creation of new knowledge by other companies. Learning, training, research, experimentation, and product development facilitate the growth of technical knowledge. From the economics perspective, people and companies are engaged in these activities because they bring economic values. Companies tap into external and internal sources for knowledge and technology that are applied as an input resource along with capital and labor to the production functions. The goods and service generated from this process embody enhanced value with increasing returns. Technological knowledge consequently is an integral part of a sustainable and continuous rise of a country's economy.

The Schumpeterian growth theory represents operational models that evolved from his ideas surrounding innovation, entrepreneurial activities, and creative destruction. As a framework, it involves macroeconomic growth structure as well as aspects pertaining to policies, incentives, and innovation outcomes and impacts (Aghion 2002). The theory assumes that Intellectual Capital (IC) differs from the physical and human capital and it has a significant role in thrusting technological advances.

Innovation causes the growth of IC while the accumulation of physical and human capital takes place through the process of saving. The theoretical underpinning of Schumpeterian growth theory originates from his works where he concluded that economic growth occurs only through innovations, which are new combinations or recombination of resources (Romer 1994). The main actors who identify the needs in the marketplace which they can convert into opportunities and make existing products and services obsolete are entrepreneurs. The disruptive innovations and technological changes are results of the entrepreneurs' efforts. Occasionally, they bring about a tsunami of changes in the market by introducing new products and services, launching a new production system or finding new sources for production materials. It shakes the market equilibrium and often permanently reshapes it. Schumpeter calls it "creative destruction" that eventually brings economic growth. One of the most important concepts in his thesis is the role entrepreneurship plays in the introduction of innovative products and services and starting the process of creative destruction which alters industry structure, destroys previous economic relationships and creates a new one (Schumpeter 1942).

Schumpeter (1942) took the notion of creative destruction from Marx's work. While for Marx, the critical factor of production was labor where the proletariat acts as the catalyst for change, Schumpeter treated entrepreneurs as the main force that instigates economic change. He took the concept of creative destruction and used it in the Kondratieff's theory of economic wave (Garvy 1943) to explain how the disruptive technological innovation ignites the process of radical change in economic structure beginning a new wave which lasts around 50–60 years. Smihula hinging on the ideas of Kondratieff proposed that technological innovations also get introduced as waves and along with advances in technologies these waves are shrinking. His modified version of Kondratieff's wave concept relies on technological revolution and more aligned to the Schumpeterian creative destruction. According to this theory of waves of technological revolutions at initial stage accumulation of technological innovations takes place. It is the period which he calls technological revolution characterized by economic revival. Adaptation and dissemination of the innovation occur when it becomes known as reliable and valuable. At this period, the interest in the development of further technological innovation diminishes and focus transfers to profit-making from its utilization. It is called the application stage. The economy might grow at a rapid pace at this period (Smihula 2009).

Knowledge Economy and It's Characteristics

One of the critical concepts in microeconomics is perfect competition, which implies market forces control the market structure. This is a hypothetical concept where all stakeholders of the market have perfect knowledge of the market, products, and services, products, and services offered in the market are identical, companies don't set the prevailing market prices, and barrier to entry or exit the market is nonexistence, in the real world no such market that conforms with these conditions exist.

Imperfection in the market conditions occurs when a buyer or seller holds the ability to dictate the price or production of goods owing to information not commonly available. There are many reasons such as government intervention, monopoly, or IP protection, why and when this might happen and how that causes the imperfection of the market. As Drucker (2012) pointed out that knowledge economy is inherently imperfect as first movers in the creation and exploitation of knowledge thanks to IP protection can gain an advantage that often becomes permanent. For example, consider Google with its superior search engine algorithm which gave it a head start that became insurmountable for the competitors.

Since the emergence of the Information Age industries that are related to knowledge activities such as creation, use, and dissemination of knowledge have been playing the pivotal role in the economy by continuously overshadowing the shares of agricultural and manufacturing industries. Even in those traditional industries, successful companies are those who have transformed their value chain processes by adopting advanced technologies and integrating effective methods of conducting knowledge-related activities. In this new economy, manufacturing industries may still be profitable, but in comparison with dominant companies of knowledge industries, their income would be marginal.

A knowledge economy displays specific characteristics that discern it from other forms of economies (Houghton and Sheehan 2000; Olssen and Peters 2005):

- In knowledge economy, significance of knowledge is profound as it becomes a quintessential product and a commodity on top of being a primary factor of production
- Knowledge is the most valuable component in innovation and its standing only surges

- Innovation systems become essential for firms, industries, regions, and nations
- Society is compelled to absorb more knowledge
- Codification of information and creation of knowledge take place at a staggering pace
- The percentage of Knowledge workers in society becomes substantial
- Intangible assets gain significant value in most firms
- The trajectory of ICT use grows almost exponentially
- the technology claims a deeper penetration into an individual's life-style touching every aspect
- Experts with in-depth knowledge in niche areas are in rising demand
- Continuous and lifelong learning is crucial both for individuals and firms
- Creativity, idea generation, proactive problem-solving are cherished traits and skills for workers
- Knowledge becomes the main catalyst in the transformation of the social, cultural, technological, and economic aspects of the society
- Knowledge-based entrepreneurs become a critical source of innovation and economic and social development.

A glaring characteristic of the Knowledge economy is the recent productivity transformation in the services sector. As many services were not possible to deliver by machines before the rise of the automation, artificial intelligence and robotics, productivity growth as recently as a decade ago in the services sector was markedly slower than industrial and agricultural sectors. In those sectors, adoption of technology for years has facilitated a faster productivity surge. Now, the implementation of machines and programs in areas where human presence was considered as irreplaceable is dramatically changing the situation rising productivity across the board.

Services Sectors and Post-industrial Society

Colin Clark (1940) in his book "Conditions of Economic Progress" categorized economy into multiple sectors: Extractive which is primary, manufacturing which is secondary and services which is tertiary. The degree of productivity in each of these sectors defines the economic progress of a nation, and we can assess the economic development of a nation by observing the shares of these three sectors in the economy. In low income developing countries, agriculture is the most critical sector. With the rising purchasing power of the population, agriculture loses its importance, and industrial sector takes over its place, middle income developing economies and newly industrial economies show these characteristics. In post-industrial nations, services sector gains prominence and effectively enjoys the larger share of the economy.

Like Marx, Clark considered that services are an unproductive sector of a national economy and only manufacturing industries create necessary productivity through labor. Bell (1973) pointed out that based on how the economy works we can easily claim that it is an erroneous view. On the contrary, services are the primary economic activities in the industrial societies and services like education, health, and entertainment are keys to productivity growth in any society. He maintained that one of the central aspects of the post-industrial society is access to codified knowledge and changing relation of science and technology thanks to it. Almost all of the industries in century started from the inventions that can be attributed to a single entrepreneur while today in any given product, especially, in knowledge-intensive products and services, we can spot a coalesce of a tremendous amount of knowledge contributed by numerous people.

New Knowledge and the Economy

As an economic factor, knowledge influences the economic activities and functions in various ways. Technological and scientific vanguard knowledge facilitates the formation of intellectual properties. Companies and individuals earn value-added monetary compensation by licensing and incorporating IP knowledge to products and services. Product and service innovations integrate IP knowledge creating new businesses, markets, and even industries.

Knowledge has the tendency of becoming obsolete which requires continuous work on knowledge creation through creativity, idea generation, and R&D. In the knowledge economy, the technology-based products' life cycle shrinks relentlessly due to the competitive pressure and market demand which force companies to continuously refine product quality and enhance features relying on incremental innovation until a disruption brings discontinuity and displaces the product. This process is fundamental in the creation of new knowledge, replacement of the old one, and adding economic values to new products. New knowledge creation takes place from prior knowledge, the absorptive capacity of the organization, team, and workers, and actions taken toward innovation. The R&D efforts conducted by companies, research institutes, public agencies, and universities are the primary method of producing such knowledge. The goal is to generate more financial and social significances through the development of new knowledge. The use of knowledge as a factor of production increases its value which impacts positively on the well-being of the society as a whole.

ICT and Productivity

Since the first transistor-based processor developed cost of transistors has been reducing, and the number of transistors installed on a chip is doubling every two years, a trend which has been continued for the last four decades. In 1965, Moore, the then CEO of Intel observed this phenomenon which later became known as Moore's law. Undoubtedly, the continuous rise of this remarkable capability improvement of computer chips is the reason behind the growth of much technological innovation that advanced economic development and social prosperity since then. However, this enormous potential did not translate into a substantial productivity growth right away. Back in 1987, Solow noticed the ushering of the computer age did not improve real productivity as expected. One main reason for this was the mismatch between the hardware availability and user-friendly applications. Companies in a rush to gain productivity growth have spent a vast amount of money on the installation of computers. However, the lack of skilled employees who can take advantage of technology and software to execute complex real-life problems were still scarce in those days. Things started to change much later. In the decade from 1995 to 2005, information technology sector contributed to twenty-five percent of the economic growth, while it was still only three percent of the US economy (Jorgenson et al. 2005).

It shows that the impact of the ICT on productivity is not always straightforward. Mere installation of hardware or bringing high-speed communications will not automatically increase productivity. The real productivity increase occurs when skilled workers have adequate access to the right software and apps and other means to exploit technology efficiently. Instrumental to productivity rise through ICT are the following aspects: improved and efficient distribution of information and access to knowledge, improved conditions for knowledge creation, better methods of payment and market transactions, and improved operational and value chain processes thanks to automation, process elimination, and process optimization (Biagi 2013).

One noticeable distinction is that in knowledge economy knowledge-based products and services are susceptive to continuous price decline despite their quality and efficiency increase over time. The precipitous fall of semiconductor price and the simultaneous doubling of chip's capacity as detected by Moore's law had dramatic positive consequences for products where semiconductors are used, which include all ICT hardware and equipment. The fall of ICT hardware price and their improved capabilities instigate the proliferation of innovation and cost reduction in a plethora of products which heavily rely on ICT in their production chains such as cars, engines, assembly lines, machinery, electronics, and others. Rising employee wages from the productivity gain and increased consumption thanks to lowering the prices of knowledge-based products are factors that fuel the growth in the knowledge economy. Moreover, value-added gains received in the goods and services from knowledge and ICT as a primary resource input get converted into additional capital. Companies invest the growing capital to accelerate further innovation. It creates a continued spiral growth of the economy till the economy hits the end of its expansion stage due to other market and policy-related reasons.

While in the USA, the positive contribution of the ICT on the productivity growth since 1995 is well documented. In European countries, such as the UK, the evidence is quite sketchy. There are two possible explanations for this conundrum. The real capital expenditure in ICT and knowledge could be lower than declared, and there could be a problem with measurement accuracy. A study found out that it seems that the US companies tend to invest more in the R&D and the UK firms are more inclined to invest in training and design. It also discovered that investment in R&D which a precursor to innovation fetches productivity growth and subsequently creates a competitive advantage (Marrano et al. 2009).

Social Change and Technology

Social change refers to a situation when the majority of society engages in activities or ways of doing certain practices which radically differ from previous norms. Social change might impact one or many phenomena of the followings: practice, behavior, attitude toward certain things, communication and interaction methods, social strata, structure, and individual lifestyle. Changes may take place on various levels of the society: individual, group, organization, institution, or the society as a whole. It may imply improvement, development, or decline. The pattern of change can be incremental or sudden. Technology is a defining radical force behind changes as argued by many (Ogburn 1922). Along with technology, knowledge accumulation and learning also play vital roles in a social change (Webster 2014; Bryant 1998).

American sociologist William Ogbum (1922) offered a theory of social change which postulated that technology development is the primary process that contributes to the social and economic progress of society through four stages of technology-induced growth. The invention is the first of them. An invention according to him is a combination of various cultural artifacts. Inventions profoundly impact on the social evolution. However, inventions to transpire the society must achieve a high level of innovation capability bolstered by an excellent knowledge base and skillset in a specific area.

Ogburn's (1922) viewed cultural elements, and their recombination is necessary ingredients for an invention. He categorized culture as material and adaptive. Adaptive culture consists of social aspects, and the material culture involves tools to machines and mechanical processes to invention. However, this categorization is not very clear and hardly quantifiable as some critics have argued (e.g., Sorokin 1933). The invention for him was not just scientific or technological breakthroughs; he also considered social constructs and their novelties as an essential part of the invention spectrum. The invention is the first factor impacting the social evolution. The second factor is accumulation. This process includes the addition of new technologies which outpace the old ones making them obsolete. More substantial accumulation facilitates further expansion of inventions and radical social change. He noticed that while there could be spikes of growth but in general the process is cyclical. The third factor in this evolutionary process is diffusion. It is the distribution of inventions to the broader audience. Social changes according to him can be orchestrated by borrowing and incorporating inventions from various sources. Fourth, and the most popular factor of his theory is cultural lag. He expounded that modification of the society does not transpire immediately it takes time to adjust with inventions and new technology. This gap is called cultural lag. A single invention might spur the growth of a new social trend, but in most cases, multiple trends work by pushing and pulling the trends in combination. Inventions have two types of effects. An invention can have a direct and immediate impact on the social process, or it can have tangential or derivative effects.

Globalization

From an economic sense, several concepts are closely intertwined with the knowledge economy and have an impact on the economic and social progress of the world. One of them is globalization. Many countries have observed the positive impact that globalization, trade liberalization, and more economic integration make and reap the benefits of such policies.

Globalization is the process of eliminating social, cultural, and economic barriers between states and developing closer integration in trade and finance. The concept of globalization is a multifaceted theme with various foci points such as internalization, liberalization, westernization, and interconnected globalized society (Scholte 2000). From the perspective of internationalization, it is characterized by the expanding trade relations and more unobstructed capital flow between states which promote closer ties, economic interdependence and broader cultural exchange (Hirst and Thompson 1996b).

When nations remove or reduce various artificially imposed barriers and restrictions that exist in the form of tariffs, quotas, excise duties on goods they import and export, it is called trade liberalization. Liberalization takes place when a government decides to eliminate previously enacted restrictions on the exchange of goods with other nations. It makes the international borders irrelevant for the movements of goods and to a certain extent for people. Trade liberalization and opening up of the markets have brought prosperity to many countries. It increases the effectiveness of the use of available primary resources of the country that adopted liberalization. It creates market competition from foreign companies which reduces prices and enhances the quality of the products that benefit consumers.

Globalization for many is the spread of Western political, social, economic, and cultural dominance throughout the rest of the world. The consuming society with its wants and culture of consumption has created the necessary platform for industrial growth of Western countries, and they are still crucial for changes in other parts of the world (Berg and Clifford 2007) which is evident in the ubiquitous presence of many

Western multinationals throughout the world. However, the present wave of globalization also provides an equal level of opportunity for countries to compete at the global base owing to closer links, information access, and trade liberalization.

Globalization refers to "a process or set of processes which embodies a transformation in the spatial organization of social relations and transactions - assessed in terms of their extensity, intensity, velocity and impact - generating transcontinental or interregional flows and networks of activity, interaction, and the exercise of power" (Held et al. 1999).

Globalization has a tremendous positive impact on the export-oriented countries, their people, and organizations. It facilitates improved productivity, innovation, technology development, knowledge creation and stimulates economic prosperity. These improvements become possible due to the understanding that firms no longer compete at the local level, and that the global competition is fierce and intense. Success will follow if only companies are capable of producing a better product with a relatively lower cost, build brand recognition and develop a smooth supply chain link.

Globalization Background

Globalization is a non-linear and somewhat chaotic process. It causes wealth creation and at the same time disparities. Some consider the intensity and growth of globalization a new phenomenon. Others view globalization as a trend that has been taking place ever since the colonial period has started, but we can observe its intensity only comparing with the recent development in connectivity. Others conclude that globalization tags along from the dawn of human civilization and demonstrated intense spikes several times in our history.

Globalization as the integration of world affairs more closely along with free movement of people, goods and services seem like a new concept that started recently, but the idea is as old as the first humans. In the ancient ages, major migration pulses were related to technological progress as well. While the migration of a higher number of people was on the rise since Holocene era, which has roughly started around 11,500 years ago, the first massive surge took place around 7500 years ago when people learned to domesticate cattle and cultivate agricultural products. The next major expansion took place at the peak of Bronze Age around five thousand years ago when complex civilizations in

Mesopotamia, India, Egypt, and China have started to shape and trade routes between Asia and Europe begun to open. The third surge of migration took place around 3200 years ago at the period of Iron Age when trades became global and universal across the centers of civilizations from China and India to Egypt and Greece. In the later period, causes of migration include territorial expansion by conquering kingdoms, and exploration by people for better life, resources, and trade. A new thrust of exploration and trade took place in the eleventh century by traders and voyagers from Italian city-states like Venice. From the thirteenth century for several hundred years, Mongols have expanded their territory from China to Europe through the vast steppes of Russia bringing Chinese technological knowledge of paper, gunpowder, windmills, and many others to Europe. From the early fifteenth century, European maritime traders found new routes, explored new territories and started a new era of globalization through colonialism. The Industrial Revolution has increased the pace of financial and trade integration which only expedited since the emergence of Information Age (e.g., Boivin et al. 2012).

The level of globalization that the world has achieved till today became possible in a significant way thanks to the emergence of new technologies and innovation. The invention of the steam engine launched the growth of railways bringing regions closer. The telephone, airplanes, and telegraph made the movement of people and communication faster. Today, mobile technologies, The Internet, cyber optic cables, and satellites have created communication, collaboration, and transfer of knowledge instantaneous generating the concepts of “flat world” and “global village” (Friedman and Wyman 2005). Despite all the fuss surrounding globalization, in reality, the present world economy is less integrated than from the period of 1870–1914 (Hirst and Thompson 1996a). However, it is also true that globalization played a significant role in the disentanglement of the prior exploitative relationship between colonial powers, territories they controlled, and trade rules forced upon poorer nations (Ruggie 1993). As a result, some former colonies have managed to demonstrate enormous economic and social development in a short period.

Owing to their access to better data and information, many countries have opted for the adoption of free-market economic policies which is causing the rapid globalization in the last couple of decades. This liberalization of the economies prompted a freer movement of products, services, and capital between countries and created a vast number of entrepreneurial opportunities, improved productivity and opened access to new markets. The policy liberalization also has accompanied by the reduction of trade and fiscal barriers. Many companies have taken advantage of these liberalization efforts by establishing manufacturing plants, joint ventures, and penetrating previously closed markets. The host countries have received technological, financial, and managerial knowledge conducive to further local and internal trade and business.

Globalization provides companies with access to wide varieties of choices concerning geographical location, market conditions, institutional structures, government policies, and skilled labor. Organizations can select the best options for them and reduce operational costs, open up new markets, effectively use economies of scales, and become more innovative. Globalization also helps organizations to gain a better supply of resources and raw materials, diversify their business strategies, find new investment opportunities, and build strategic alliances. The optimal and pragmatic exploitation of the opportunities that globalization render can help an organization to develop a sustainable competitive advantage.

Information technology has also bolstered the globalization process decisively though rapid information flow, access to critical data, faster transactions making way to the emergence and identification of new opportunities. In fact, the information connectivity is one of the key catalysts in the speeding up of globalization in the knowledge era.

Globalization forces companies to become more competitive. In a globalized marketplace, organizations not just compete with local rivals, but also, they have to struggle to keep their market share from the continuous flow of new entrants from foreign countries. In the era of knowledge economy, the pressure from foreign companies with their competitive advantages is tremendous. Survival of a company in this highly competitive market landscape, where uncertainty is the prevailing rule, depends on its agility and innovation capabilities. In many industries, competition is so intense that product lifecycle shifts at an increasingly faster pace. Take the example of mobile phones. While in the early days of mobile communication, companies such as Nokia and Motorola were making upgrades to their products that are significant in each two to three years. Today, however, the major competitors in this industry such as Apple, Samsung, Xiaomi are compelled to enhance the capabilities and features of their mobile devices in less than a year due to the fierce market competition. This global competition expedites innovation, creates new opportunities, and opens up new markets.

More advanced economies are already feeling the pressure of competition from peers and new entrants in areas where they previously had a comparative advantage and realizing that they must work on gaining more productivity and stay competitive by being innovative, producing new knowledge, and embracing technological advancement at a rapid rate. Cheaper and faster communication technologies are making information dissemination easier across the borders. The instantaneous access to knowledge is helping to create new knowledge and foster innovation more quickly. This trend is forcing companies to work relentlessly in generating new knowledge to outpace competitors.

Globalization and Developing Countries

There are several ways how globalization helps spurring innovation in developing countries. Removal of trade barriers increases cross-country trade and provides companies with an opportunity to exploit economy of scale which brings more rent for successful companies. Companies entering into a new market encounter competition which forces them to innovate in areas such as quality, customer satisfaction, brand building, marketing strategies, and cost optimization. Also, part of the rent received from additional sales makes its way to R&D and innovation. Access to the foreign market also introduces companies to new technologies and various innovative concepts from process optimization to business models and marketing to sales strategies. Deep industry knowledge, specialized technology knowledge and knowledge about new markets that companies acquire from having access to the cross-country trade may also have a spillover effect on the industry vertical at the local level.

Free trade also bolsters the flow of foreign direct investment (FDI) into a country. FDI is an investment made by an entity from a foreign country to the host country's business (Liu 2008). There are several ways FDI takes place. Merger and acquisition are a method where a foreign company buys a local business or merges with one. Starting a company targeted to the local market or setting up of an export-oriented manufacturing plant is another way. Other methods include the creation of a joint venture, direct purchase of a local company's equities, and establishing a subsidiary. For many developing countries, it is one of the primary sources of supporting their export growth and economic development. There are numerous benefits for host countries, particularly of developing economies, to have the presence of foreign entities.

Through knowledge sharing, workers' training and education foreign investors provide a level of knowledge which can have a lasting effect on the economic development of a country. For example, managerial skills. Many types of management skills are often challenging to imitate just by observing and require going through the process of learning by doing.

A vital contribution of FDI is technology and knowledge transfer. Sometimes new technologies that the FDI is bringing due to their novelty are not available for acquiring by purchasing or licensing. For countries that are trying to develop a new sector, where the host country companies do not own required technologies, one option is to support setting up joint ventures or other types of alliances to lure potential foreign investment. The spillover effects of technologies from joint ventures with foreign partners and international subsidiaries influence positively on a countries quest for developing homegrown industries.

Often foreign investors have better knowledge of the international export market, know-how and market strategies about how to penetrate previously untapped by the host country companies. This invaluable knowledge likely bolsters the export efforts of the innovative local companies those who are ready to learn by emulating.

Foreign investment not just improves the productivity of the particular venture where the investment is made but also in local companies those who are somehow integrated or related to that venture or located nearby.

Removal of the trade barriers has helped developing countries with comparatively better institutions, entrepreneurial culture, and policy support from the government to gain relocation of manufacturing plants from industrial nations in a host of industries. Developed nations where the labor cost is significantly higher, and work and environment regulations are stricter transferred manufacturing factories to countries with a cheaper labor cost and other resources and turned their focus on knowledge-based sectors which is a win-win move for both parties involved.

Globalization and Government Policies

From the ushering of the knowledge economy, it was assumed that globalization would reduce the income equalities between most affluent and the poorest citizens of a country. Recent studies have shown that it is not the case. The rapid integration and globalization have enlarged the gap between rich and poor. The knowledge economy in the globalized world is supposed to produce an increasing amount of wealth. It was expected that with rising prosperity it would eventually have a trickle-down effect that will significantly improve the living standards of the people located at the lower bottom of the economic pyramid. However, both of these assumptions came out to be wrong. Strikingly, it is a fact for both developed and developing countries equally. While the wealthiest one percent globally possessed sixteen percent of world wealth in 1980, the number increased to twenty percent by 2016. The national income share of the top one percent richest in the USA went up from less than eleven percent in 1980 to twenty-one percent by 2016. In the same period, the share of fifty percent poorest dwindles down from closed to twenty-one percent to thirteen percent. Even with the phenomenal growth observed in many emerging countries since 1980, globally the wealthiest one percent increased their income twice as much as the bottom fifty percent and in some areas such as sub-Saharan Africa income growth for poorest fifty percent stayed stagnant or extremely slow (Alvaredo et al. 2018).

Dramatic economic and social transforms such as the one instigated by globalization and technology shift always produce winners and losers. Particularly, the opportunities that technology creates are not accessible to all. New skillset are required for identifying and exploiting new possibilities that globalization and digital growth deliver. Education and training and technology knowledge are necessary tools for acquiring the rapidly changing skillset for the new economy. The level of education and absorptive capacity necessary for workforce integration and exploitation of business opportunities in knowledge economy is very different than what it used to be several decades ago. Because of this, to foster a more inclusive growth governments must adopt policies that are supportive of wider distribution of prosperity that the new economy is producing. These policies must address challenges related to poor education level in public schools, inability of the poorer mass to get access to opportunities that emerge with the advent of new technologies and bringing technology and entrepreneurial knowledge to the mass.

Deregulation

To gain competitiveness, especially, in the era of globalization, one aspect of the structural reform of the country is to remove the regulations that stifle competition in the marketplace. Studies (OECD 2017) have found that the elimination of archaic and unnecessary regulations contributes to industrial productivity, brings competition and push companies to optimize their business processes and innovate. A country's willingness to pursue deregulations as a part of its commitment toward free market and globalization encourages foreign organizations to make direct investment in profitable sectors. Deregulations and lesser state involvement create a better environment for business growth making easier for entrepreneurs to explore new ventures and organizations to enhance their business activities. Companies in countries that pursue protectionist approach by enacting regulations supporting import substitution, in the long run, lose productivity, efficiency, and competitiveness. The vivid example of this is the Russian Federation. Despite having cutting-edge technologies in defense and aeronautics, the country is unable to manufacture any globally compatible technology product.

The present widespread advanced state of communication industries in many developing countries became possible thanks to deregulation policies on telecommunication and the Internet adoption that swept much of the world in the 1980s and 1990s. Trade liberalization adopted by many of these countries around the same time also influenced this success. The positive policy changes included: (1) removal of market protection in the industries such as aviation, insurance, finance, and telecommunication, (2) opening up of currency market and financial institutes, (3) policy changes made to foster FDI, and (4) improved intellectual property rights protection.

Although deregulation is critical without the liberalization of the trade policies, it does not produce a productive outcome. Companies that are at the forefront of the technology use receive tremendous gain from the combined effects of deregulation and open trade policies. However, more stagnant sectors with lower technology utilization gain little from regulatory changes (Ben Yahmed and Dougherty 2017).

Globalization and Finance

Globalization is the closer financial integration of the countries and lifting of many previous barriers. To some extent, this integrated global financial market bolstered the growth of the economy in both developed and developing countries. Like several other areas, the financial sector also has benefited from the profound transformation the knowledge economy delivered. ICT penetrated deeply into the entire financial system bringing significant structural and procedural changes. Leveraging data and human talents financial sector managed to reorganize many of the processes, improve decision-making and develop new financial products and services generating tremendous financial values.

Globalization and Migration

Globalization has intensified labor mobility and immigration like never before. For various reasons, more people are leaving their countries of origin and migrating and living in other places that include a search for a better future, economic stability, political freedom and the possibilities of having a better education. Many recipient countries are facing the problems of aging population, labor shortage, employability mismatch, and demand for skills needed in the changing economy. While there are numerous challenges in this rising migration trend, there are net benefits that labor mobility brings to the globalized world. Members of various diasporas, for example, having capability knowledge of their country of origin, technology, economic, and market knowledge of the host country along with their unique perception of the market asymmetry have been fostering global trades for centuries. In host countries, immigrants are a conduit of entrepreneurship and innovation, often far more than the natives. For example, over three times more technology firms are founded by immigrants than native-born citizens in the USA alone, one of the most advanced knowledge economies in the world (Blume-Kohout 2016).

Knowledge Economy and Globalized World

Knowledge economy delivers unique opportunities for all countries whether a developed one or an emerging nation. At each level of the development stage of a country, the need for knowledge and market demand for products and services are different. Countries with advanced economies which are ahead of the curves are in need of products and services that are not viable for producing in the country due to economic reasons such as higher wages, unviable supply chain link and smaller market. Emerging countries with comparative advantage thanks to better trade integration can fill that gap. The demand for better quality and competition from multinationals and peer economics force the exporting country to improve its productivity through technology and knowledge transfer boosting the prosperity of the country. This trickle-down effect benefits the global economy as a whole.

Conclusion

Globalization's influence on the world economy through improved trade exchange is undisputable. The elimination of trade barriers and more international trade eventually can contribute to the rise of world GDP at the rate of 0.5% annually (e.g., Keck et al. 2018). However, globalization in the era of the knowledge economy is no longer about linking raw materials and cheap labors of developing nations to more developed industrial regions. It is more about the unobstructed free flow of knowledge, IC and technologies across the borders. Right now, monetary resources, human capital, and knowledge industries are still concentrated in megacities and specific areas of advanced nations along with some outliers. Some elite people still control the world economy, and FDI flow in most cases occur within the OECD countries. Moreover, if we look at patents and academic papers as intellectual outputs and proofs of knowledge and technology intensity, true globalization is still seemed like quite far away. In any case, despite some temporary setbacks that politically charged policies in some countries have brought lately, the process of globalization will inevitably stay as a long-term trend by dint of technology shift, information accessibility, labor mobility, and market pressure.

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CHAPTER 3

Knowledge Society

Introduction

A society where economy thrives from the creation, use, and sharing of knowledge and information, and these are elements that work as the primary conduit of economic relationships between various actors of the society, and where citizens' well-being depends on the effective and efficient use of knowledge is called a knowledge society (Stehr 2012). The concept of knowledge society where knowledge is the principal resource for economic and social growth might be a relatively new one. However, there is no question that societies since early days one way or another have depended on knowledge for attaining development and prosperity. The reinvention of the printing press in Europe brought a powerful impetus to the diffusion of knowledge paving the way for intense social changes that culminated into the Industrial Revolution which even more accelerated the process. Before the advent of the printing machines, knowledge was the prerogative of an exclusive circle of people in society. Printing machine has changed that and in a significant way contributed to the ushering of enlightenment period thanks to the new ability of knowledge dissemination and access.

Knowledge is the instigator in the structural transformation of the society. The foundational base of a knowledge economy is characterized by education, training, absorptive capacity, prior knowledge, knowledge flow, technological knowledge transfer, R&D capabilities, and innovation

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diffusion. The high-level presence of these attributes contributes to the economic growth owing to new economic efficiency, innovation-orientation that encompasses every segment of the society and better knowledge use creating the precondition for the existence of a new type of society. The acceleration of the process of this transformation to knowledge society is taking place as a result of increased investment in the knowledge-intensive industries and the diminishing cost of knowledge acquisition, codification, maintenance, and dissemination.

Apart from the proliferation of scientific and technology with the rising share of knowledge in the production process and more need of on-the-job knowledge, the overall knowledge stock in the society also started to grow in a rapid speed. Today, many factors made knowledge one of the most valuable economic assets and the foundation of the knowledge society. Knowledge has transformed from being a tool in the production to a commodity. Most companies' survival and growth depend on innovation and new knowledge creation as globalization is making all industries highly competitive. The Internet and mobile connections have unleashed a massive potential for knowledge creation and diffusion. Knowledge-based industries are carving out the dominant share of the economy, and finally, the expansion of knowledge reserve is creating a fertile ground for discovering new marketable opportunities rising a new class of entrepreneurs. The society now needs more skilled people with the knowledge in niche areas than any time before. Moreover, most members of the society feel the mounting pressure for continuous learning and acquiring new knowledge because of the growing complexities of work tasks, the emergence of new jobs and the disappearance of many old ones. As a result, lifelong learning is becoming a norm to keep up with the expanding knowledge in any specialization.

Information and Knowledge Societies

In literature, information society and the knowledge society are often treated as a similar concept. However, in reality, that is not the case. Before the advent of the knowledge society, focus used to be more on information, its creation, and transmission which was the foundation of the Information Age. There is a significant difference between information and knowledge. Knowledge is validated and actionable information where information is deemed as data with semantics (Kabir 2013). Information society relied vastly on the use of ICT in the transformation of the social, economic, cultural, and political structure of the society. It is the result of the information explosion that occurred thanks to the cheaper communication, presence of the Internet, lower computing and storage costs. For the industrial countries, it is the precursor to the complete transition of the economy and society to a knowledge-based one. Knowledge society covers many dimensions that include technology-based innovation, knowledge creation and sharing, human development and learning and the impacts of all these aspects on society. Although, universal access to information is crucial in knowledge society the exploitation of knowledge as the most valuable economic resource for continuous development of the society and building knowledge activities and knowledge processes-based competencies is an important goal in such societies.

Knowledge society refers to a broader area of social structure including economic, cultural, and political spectrums where modern technologies and scientific breakthroughs have considerable influence but more importantly, knowledge activities play a more significant role across all dimensions (David and Foray 2002).

Knowledge society implies having fluid access to knowledge as a public good by all individuals. This availability of knowledge when it is needed is having a profound impact on the societies of both developed and developing countries. In developed societies, knowledge access is opening opportunities for underprivileged by providing higher paying jobs, easier access to education, reducing unemployment, and delivering better health care. In developing countries, the initiatives to transfer the society to a knowledge-based one can have even more sustainable shift by having more rapid industrialization and deployment of sophisticated technology which will have a profound impact on many spheres of the society.

A striking feature of the knowledge society is people will understand less and less with the rapid advances in technology how the tools and equipment that surround them such as mobile phone, computers, and cars work and the complexities of many services such as from the bank that they receive. In the knowledge society, we are forced to learn how to trust the knowledge of others (Leadbeater 2000). Especially, when it concerns technological tools most people have no clue how things inside those technologies work. At the same time, even as a consumer, to exploit the full potential of many household tools and machinery we need to go through a learning curve. We learn to trust another people's knowledge by either being deliberately ignorant, but in many cases, we are compelled to do so without having any other choice. Undoubtedly, to take the full advantage of what a knowledge society has to offer education and lifelong learning should become a priority for us. This ignorance in areas that are not of our primary interest is not that bad as it makes us free to focus on learning and receiving expertise in our core areas. The flip side of this is that it creates a segmentation in the society where knowledge workers and particularly knowledge-based entrepreneurs have a better chance of success than the others.

The economy in the knowledge society thrives owing to the presence of a large number of knowledge workers who are the main driving force there. These societies are also prolific in the development of innovation and commercialization of new and original ideas. The processes of knowledge creation, exploitation, and diffusion play a significant role in the economy and bring prosperity to their citizens.

The knowledge society is built on the assumptions that to take maximum advantage of what the new economy and technological progress have to offer, education in the knowledge fields, particularly in science and technology, creativity and innovativeness are the way to sustainability and prosperity. Creative thinking and innovative ideas are now not just the forte of some specific sectors, but also necessary attributes in all industries and every single process whether it is retail, manufacturing, service, or finance.

Division of Knowledge in the Society

In the knowledge age, The Internet and ICT have created the possibilities of having access to knowledge more convenient and equal for all stakeholders of the society. The world is producing now more knowledge in one year than the entire previous history of humankind (Helbing 2017). However, the division of knowledge as propounded by Hayek (1945) has become more pronounced now. The exponential growth of knowledge virtually in every field has created a unique problem. To become an expert in any area today due to the massiveness of knowledge in the domain a fundamentally deeper knowledge base is essential. As a result, the division of knowledge is getting extrapolated on the social fabric. People with a more profound technology and business knowledge, critical and innovative thinking abilities, and the entrepreneurial mindset are having better access to wealth and prosperity than those with limited education.

At the accelerating pace how knowledge gets generated, acquired, integrated, and disseminated is a trend that has always followed along the growth trajectory of the human civilization and exemplified by the technological and scientific progress of the world. Historically, only a part of the society always managed to take advantage of greater access to knowledge and only some sectors of the economy had been more knowledge-intense than the others. Even in the twenty-first-century knowledge economy things are no different. In the present economy of knowledge, this process has speeded up more, and many of the successful organizations now are knowledge-based.

Having access to the educational system and technologies is only the first necessity. Learning and education level of the citizens will define the level of progress a society made in integrating knowledge in its core system. For this to happen, societies need to emphasize on the building of a workforce which is capable of incorporating, managing, and supporting technological, social and innovation capabilities that scientific, technical, and social progress has to offer. Investment in the educational system from both formal and informal learning perspectives, the creation of high-value content, training of educational instructors to meet the rising demand, and participation of underserved members of society are also vital for materializing the opportunities. Increasingly, more nations understand how crucial it is to nurture an entrepreneurial ecosystem as well for maximizing the knowledge society's full capability.

Intellectual Capital

Intellectual capital (IC) is referred to a set of intellectual factors comprising of information, knowledge, know-how, and intellectual properties that organizations and individuals apply to produce wealth (Stewart and Ruckdeschel 1998). As a source of competitive advantage, IC should receive the utmost attention from the management of any company in present heightened market competition. The term IC was coined by Machlup (1962) to point out the importance of knowledge in the growth of a national economy. Contrary to popular opinion, IC is not a new notion. The expression was first used by economist Nassau William Senior as early as in 1836 where he noted that IC is a valuable element in the production and business. It is also defined as a combination of intangibles that help to increase financial return and improve a firm's economic performance (Roos and Roos 1997). Although, IC is instrumental in fostering value in the organizations, its effect on the performance of a firm is mostly indirect and largely depend on its use through innovation and knowledge creation. Critical features of IC are characterized in the followings: it is intangible, it consists of value-creating knowledge, and it is usually an outcome of a collective practice (Cabrita and Vaz 2006). In the knowledge economy, companies must put substantial efforts in cultivating and sustaining IC as an essential process of participating and competing in the marketplace. The potential of IC grows at a fluid pace in the economy if societies meet the following conditions: presence of free market economy with healthy dose of competition and collaboration, a social culture that foster both entrepreneurial activities, strong educational base focused on problem-solving and technological progress, government policies supporting public and private R&D, collaboration between private and public institutes, elimination of trade barriers, and a supportive market for innovative ideas, technologies, and new products and services.

IC consists of three components: relational capital, structural capital, and human capital.

Relational capital includes customer loyalty and vertical channels relationships from suppliers to the market distribution and partners to consultants. Company employees' attitude is another type of relationship associated with this capital (Kale et al. 2000). The brand built upon the product quality, services, marketing, and customer relationship is also an invariable intangible in the relational capital.

Structural capital contains company operation that supports intangible resources and assets including culture, routines, norms, and processes and procedures (Fernandez et al. 2000). It implies intangibles that stay behind in the firm when the employees leave at the end of a workday (Youndt et al. 2004).

An organization's human capital composes of the workers' knowledge, competence and skills, and internal and external relationships. Company employees' skills and experience get shaped through years of work and engagement with the company, education, and training they receive, and knowledge that they accumulate (Sveiby 2007). It is the primary component of the IC and the main source of innovation and strategic advantage (Edvinsson and Malone 1997). Human capital is an essential asset for a company to acquire and sustain a superior market position. It is an individual knowledge worker's skill, learning ability, knowledge base, and creativeness combined with other employees contribute to the organizational knowledge resource.

The shift in the production demands the development of skillset that support different ways of organizing financial and economic processes, applying resources, and acquiring knowledge of the competitive landscape. These are unique expertise and qualification that include entrepreneurial, managerial, and financial skills need for which will only accelerate in the knowledge economy.

In any economy, investment in the development of human capital promotes productivity growth as people learn to perform their tasks in a better way, improve their creative and critical thinking ability that is used in the decision-making and apply acquired knowledge in innovation. Skills and knowledge that education provides contribute to the generation of new knowledge, technology shift, and diffusion of knowledge which is essential particularly in the knowledge economy.

The human capital theory is a concept that refers to a person's embodied tacit and explicit knowledge and other characteristics which add values to the economy and contributes to personal productivity. The skills, knowledge, education, capacity, experience, and other attributes that one possesses can be inherent or acquired (Becker 1994).

The Importance of Human Capital

Analysis of a various relevant set of macroeconomic indicators for the years from 1960 to 1990 revealed that 22% of productivity growth of an average OECD country stems from human capital and a significant amount of this is attributed to the effect of schooling. Moreover, an additional school year can contribute to the raise of a person's salary up to 6.5% (Fuente and Ciccone 2002).

World economic forum conducts ongoing research on the status of human capital globally. It evaluated positions of countries in comparison with others in the improvement and use of their human capital by focusing on four key criteria. Capacity—Education level across generations, development—emphasis put on educating and skill building for students and workers, deployment—the level of workforce participation across all ages and know-how—available opportunities for working population's ability to grow concerning more productive work. Unsurprisingly, the top countries of the index are also the most developed knowledge economies. It demonstrates that despite incredible progress in technologies human capital will remain the vital driving force for building and developing the knowledge society. In the process of human capital development, focus should be given on the quality of formal education, lifelong learning, and on-the-job training. The entire population should have the opportunity to build their skillset in the areas of their choice and have the ability to utilize their knowledge and capacity as a productive member of the society.

Since better human capital contributes to the growth of productivity and innovation at organizational scale and crucial for the expansion of the economy, countries must consider monitoring the performance of the educational institutes and if necessary, enact policies that support quality education and lifelong learning. They must invest and work on creating an entire ecosystem that enhances opportunities and capabilities for their human capital potential.

The social capital of the worker which is the person's relationships with other members of the company links that the individual has developed with external counterparts, and the ability to exploit these relationships are also constituent parts of firms' human capital (Nahapiet and Ghoshal 1998).

The knowledge society is driven by technological advances, innovations, and continuous structural and cultural reforms. However, entrepreneurs and other types of human talents with their aspiration, creativity, and ideas have also played an insurmountable role in the evolution of knowledge society.

For societies to convert to a knowledge-based one and sustain the transformation, the members of such society must continue growing educated and trained talent pools that can expand the economy by applying potentials of advanced technologies, integrating necessary social, scientific and technical knowledge to their domain, creating new knowledge, and starting new enterprises.

Service Sector

The service industry constitutes of jobs and products that companies, workers, and professionals render to customers in the form of intangible items. The transformation of the societies to the information-based and then knowledge-based has accompanied with the technological advances and shift of the labor force to service industries. The change of the economies to service industries can be attributed to the rapid growth of the percentage of services in consumption and their shares in value-added products. In the USA, the service industries surpassed the manufacturing in the share of the GDP in 1950 which exemplified a crossing of a threshold to a new economic prosperity level (Buera and Kaboski 2009).

Rising service consumption buoyed by the demand for skill-required services is one of the factors that drive economic growth. While it is a belief for many, low-skill jobs were not the crux of the service industries' growth. It is the knowledge-intensive and skilled jobs comprised of value-added services were the driving force behind the rise of service industries. From the beginning, these information-laden service industries have prompted the surge of processes that become the foundation of the knowledge society.

The structure of the society gets shattered multiple times in one generation from the sheer force of new knowledge and technological advances. We have witnessed the changes that the personal computers, then the Internet and then the mobile devices brought to the societies in the way people communicate, collaborate, work, and play. These changes reflect on our cultural value, and fundamentally change our perception of the world. We learn to understand and model our surrounding, society, and the external world in the context of new norms and values that these technological shifts, changes in cultural and social expectations bring.

The knowledge society is an ideal framework for bringing social equality and prosperity for all relevant individuals. However, there is no single way to the transition. For countries, it is a complex tactical and strategic approach encompassing needed education, training, and skills development, building functional R&D and innovation ecosystem and making institutional structural changes conducive to innovation, technology shift, entrepreneurial activities, and growth.

Digital Divide

Despite the expectation that knowledge society will work for the well-being of the entire society by allowing each member of the society to produce, use, and share knowledge, the real situation at the ground level is still far from perfect. The digital divide that has started since from the early days of computer use has progressed significantly with the advent of the Internet and mobile communication. The term digital divide implies the disparity that exists between social layers, age groups, and geographic areas in the access and use of ICT. It is true that people with Internet access are growing at a rapid speed all over the world, but it did not help to reduce the gap between the social disparity as yet.

On the contrary, it has now created an even more significant gap in knowledge access and use. The problem starts with primary education. The challenge can be ascribed to the slower development of the cognitive potential due to the poor educational system, lack of qualified teachers, lack of motivation, and lack of understanding the need to learn math and science-based subjects. The situation also exacerbates due to the lack of emphasis on the logical, analytical, and reading skills at the early stage of a child's development. These cohorts grow up with the inability to learn, compete, and absorb knowledge essential for proper integration to the knowledge society. There is a glaring difference between countries with the presence of the knowledge economy and developing countries at the educational level.

The technology fields are also evolving into more granular, complex, and sophisticated ones with the advent of such areas to prominence as artificial intelligence, IoT, virtual reality, nanotechnology, and many others. As supporting and underpinning technologies, they are lifting other sectors from manufacturing to aerospace, and autonomous vehicles to biotechnology to an unprecedented level. It is also creating the rift between advanced knowledge economies with the developing countries creating the digital divide at the world level even more.

Before the Internet, the divide was referred to the rich and poor segments of the society and regions in the use of telephones and televisions. As the Internet infrastructure firmly positioned itself as the main rostrum for networking, connectivity, and knowledge source, the digital divide started to receive more attention. The claim is that without embracing computers, mobile communication and the Internet the less fortunate segments of the society and the more unfortunate part of the world will stay destitute and the gap between rich and poor will only broaden. However, the reality is more intricate than it seems. There are various reasons why this imbalance in the adoption of the Internet and disparity in knowledge access exist in society. Poverty alone is not the only cause why an individual might not be digitally literate. Other persisting challenges include the following impediments: first, very low or nonexistent digital exposure for reasons comprising technology fear, trust in own abilities, and insufficient interest in technology. Second, failure to develop a minimum level of technology skills, and third, lack of motivation for not seeing opportunities in the application of technologies and fourth not owning tools for having an Internet connection. The last one apart from some impoverished areas of the world is increasingly becoming rare (Van Dijk 1999).

The Internet and the Digital Divide

When from school projects to job search and works to entertainment largely depend on the availability of the Internet, the economic implication of having an Internet connection is an absolute necessity.

Moreover, it is established that the increase in Internet use in a country positively contributes to the development of the nation. A study conducted grounding on the data of Internet users from 207 countries discovered that one percent increase of the ratio of the Internet users in a country enhances its Gross Domestic Product (GDP) growth by 0.057 percentage point (Choi and Yi 2009). Several other studies have shown that ICT use has a significant impact on productivity and the wage growth of workers (Oliner et al. 2007; Sichel 1999).

Understanding the impact the Internet access makes on the growth of society, several large Internet companies have started working on the process of bringing online connectivity to the people where a vast majority of the population still don't have access.

OneWeb, a company supported by Richard Bronson, is planning to launch around 600 little satellites that will hover 1250 km above the ground level and relay Internet connection to the earth. The project is supposed to go online in 2019. Elon Musk's SpaceX also has similar satellite program to bolster communication connectivity. In a mission to bring the Internet to every person on earth, Facebook has created a program to send drones called "Aquila" to the altitude of 20 km and beam signals. The drones are supposed to fly uninterrupted for three months at a time and able to cover a radius of 80 km. The Google plans to float solar power balloons that will connect devices and ground stations to the Internet. These balloons are supposed to fly over three months at a time as well. If all these projects become successful by 2020, the problem of delivering Internet connection to everybody in the world will be solved. Importantly, these connections will appear without investing an enormous amount of money on extending fiber optics cables over a broad segment of remote areas.

Thanks to the Internet people even in the remote areas are having free exposure to a broad number of courses, textbooks, blogs, and other repositories of knowledge. However, it does not mean that this exposure will transform into receiving mastery of domain knowledge. Reasons are many. First, to successfully acquire knowledge of any domain an individual must have a foundational knowledge base. Second, the person has to possess the cognitive potential to learn and assimilate knowledge and most importantly, she needs to have the motivation and desire to pursue the goal of leaning. Moreover, without the ability to apply learned topic to practice the efforts will turn out to be in vain. So, the question is not just an individual's ability; it is also in large part the environmental, infrastructural, and social issues.

There also exist negative aspects of technology-laden social changes. The digital divide is not only prominent between rich and developing countries, but also within a country itself. The prosperity gap between the wealthy and upper middle class with lower middle class and the bottom of the pyramid is rising fast. The biggest losers are the weakest class of the society who severely lack access to the opportunities produced by the technological changes. As Scott Galloway pointed out in his book "Four," one of the problems of the knowledge economy is it is creating enormously profitable huge companies in a brief period. These companies are applying advances of the technologies aggressively to optimize their business processes. As a result, hiring far less high-salaried employees than the previous generation's large manufacturing and energy companies. However, the proliferation of knowledge-based companies is also creating a massive demand for a large number of knowledge workers.

Knowledge Workers

Even in the 1960s, people from various fields have started to notice the growing demand of ICT and an increasing need for a kind of skilled workers those who can support the expanding ICT industries and those who have expertise in knowledge creation and sharing. Drucker (1968) called this group of employee knowledge workers, and at the same time, he also predicted the ushering of the knowledge society. By that time, it was already becoming evident that knowledge gained from the schools and universities are no longer enough for furthering one's employability. Because, along with the rapid technology shift and growing scientific advancement, knowledge related to technology use, and many areas of science and even management fields are quickly becoming obsolete replaced by more advanced knowledge. Moreover, many disciplines are going through paradigm shifts and branching out to new categories of scientific and technological fields establishing grounds for spurring new knowledge.

Contingent Workers

Knowledge workers and talent pool are the underlying social base that are mandatory to have for a society to take advantage of technology as a tool for attaining progress (Henslin 1998).

With the increasing use of ICT in manufacturing, service, trade, and management knowledge workers' jobs have started to expand at a rapid speed. At the same time, the skill requirements for many jobs are getting redefined as the ICT deployment pushes for more knowledge-intensive work.

Many industries are inherently knowledge-based. Apart from well-known ICT related fields, for example, the movie industry is always a fertile ground for creativity, freelancing and for trying out new technologies. In the filmmaking field, creative people need to combine their expertise and knowledge to produce a movie—a complex process where actors, directors, writers, producers, and other types of knowledge workers are involved.

Independent consultants in the areas of management, marketing, finance, and human resources and several other areas are another segment of the knowledge economy that proliferated as a result of technological change, advances in communications methods and easier mobility.

The technology changes also help to expand the contingent workforce. People are opting for part-time, temporary, and project-based freelancing, consulting and other specialized jobs for various reasons. Control over lifestyle is one reason. Others, for example, include a passion for pursuing one's hobby, highly professional parents with babies at home, flexibility in work schedules, corporate downsizing, and layoff. One of the most significant benefits of adopting a contingent worker lifestyle is the possibility of gaining control over work-time and achieve greater work-life balance. In the knowledge economy, the percentage of contingent workers will only increase over time as there would be more part-time jobs available in the future and more people will embrace this type of work by preference.

For businesses, these workers are also often a practical solution when they do not have the needed experts on their payroll or an expert is required to perform a particular task infrequently. Outsourcing periodic jobs or tasks located beyond the normal boundary of the firm's business operation is also a cost-effective way of getting tasks done professionally.

Apart from the above mentioned, several other factors are also facilitating the growth of contingent workers and outsourcing. First, there is an enormous number of marketplace platforms that cater to various types of outsourcing and freelancing emerged in the last two decades. These online platforms are opening up a worldwide market for freelancers and providing them the facilities to tap into business needs beyond their geographical area. Companies and individuals those who are looking for outsourcing their projects these platforms provide access to a more significant number of potential experts with competitive pricing. Increasingly, more companies are optimizing their workforce keeping the employees necessary for core business operations and resort to outsourcing for many other aspects of running a business.

Learning in Knowledge Society

The situation related to learning and staying involved is quite complicated right now. ICT has intertwined with our society, work, and habits so firmly that even an average person must revise their knowledge frequently for taking advantage of the technologies penetrating in life. It is even more demanding for the people and organizations those who want to stay relevant and competitive. For them, lifelong learning has become an issue of paramount importance. The impact of the technology shift is so intense now that skill capacity building implies learning a new way of thinking, new subjects that are in demand right now, and, crucially, apply acquired knowledge before it gets superseded by others. It appears new way of living and working thanks to networked and globalized connectivity, need for specialized skills and knowledge, and a new realization of the importance of knowledge in society, lifelong learning has become a critical component that will continue shaping our future in the new economy.

The prosperity of society largely depends on productivity growth. The growth occurs from bringing effectiveness and efficiency to the production process which starts from learning how to do things better. It implies learning is a vital element in the economy and policymakers must emphasize on learning capabilities and eliminating knowledge gap between the most efficient individuals and firms with others (Stiglitz and Greenwald 2015).

Traditional educational systems in the knowledge economy need to adopt a strategic approach that takes care of the myriad of problems that the teaching and learning are facing in the technology-driven world and bring better effectiveness in teaching by evolving with the changing needs. At present, their efforts seem like slower than it should be. Market demand compels us to realize that conventional education is only a springboard to jump-start a never-ending learning life. In the coming future, educational institutes will continue to play a leading role in finding new ways to respond to the rising demand for improved education. However, the new generation of students has to take the decisions on how to learn, and where to learn in their own hands.

Today, information explosion, online collaborative platforms, knowledge repositories, and MOOCs have fundamentally changed the very way learning takes place. In this push for more learning when the time is an essence in order to excel in schools, workplaces, and society people are forced to embrace the idea that learning how to learn is also a real challenge. No wonder, the most popular course on Coursera, a MOOC, is the course "Learning how to Learn" (Martin 2012).

Learning Society

Learning in the present economy blurs the difference between learning in schools and continuous education. A learning society ensues from the concepts that to bring prosperity and growth it must offer learning opportunities equally to all segments of the society, invest in lifelong learning initiatives, education policies aligned with labor market need, promote workplace education, stress on learning by doing when possible and extensively use ICT to foster learning. The goal is to provide each to have the opportunity to pursue lifelong learning in order to achieve the better ability of self-realization, reaching carrier goals, and social success. It means not just providing traditional subjects for learning but also competencies necessary in the knowledge society and the sources of personal and career growth for individuals that include technology knowledge, critical and innovative thinking ability, domain-specific expertise, leadership, and soft skills.

Organizations must get involved in the process. Development of the skills through on the job training and learning by doing is a logical way of acquiring knowledge that improves employee productivity, organizational competitiveness, and job satisfaction. These skills offer greater job market mobility for workers as they can show how aligned their skills are with present market need. However, this method of skills development works when employers are willing to invest in this and embed learning as a core cultural value of the organization. Workers also need to have motivation and willingness to embrace learning as a conduit for personal and employment growth.

Job Prospect in the Society

Before the advent of the knowledge economy, most people in the industrial nations had a very linear trajectory of personal and financial growth. People were going to school, studying hard and after graduation getting a job and slowly rising through the corporate ladder. They often had a decent, comfortable and most importantly predictable life. Comparing that with the future of the children those who are attending primary schools today. Most of these kids when they grow up will have to take up a job which might not even exist today. While the knowledge economy has brought prosperity and well-being to many parts of the world, it has also created enormous wealth and earning disparity in most societies.

Knowledge Society and Developing Countries

Since the beginning of the first Industrial Revolution, massive divergence has taken place between the wealthy and developing countries. Many reasons were given to explain the gap from colonial practices to financial constraints and lack of access to needed technology and knowledge to limited entrepreneurial activities. Developed countries under several favorable conditions were quick to adopt technology change that brought improved productivity and comparative advantage, implemented institutions that helped innovation to spawn, and invested on education that created an agile, proactive and technology-savvy workforce. These elements have created the foundation for lasting social growth and prosperity and advanced market conditions conducive of competition between rival companies (Landes 1999). In a competitive environment, it is the market that dictated firms in these countries to relentlessly work on developing and sustaining IC which is the crux of the matter in a knowledge society. In present world economy, as previous experiences of the developed countries show policy strategy in fostering the development of human capital in the relevant fields is an important step a developing country can take to exploit opportunities delivered by the knowledge economy which will help them to improve peoples' well-being (Chen and Dahlman 2005). These policies should include among others information empowerment and access to education as two of the main components.

Information Empowerment

Information is a key to good decision-making. Often in developing countries, people do not have access to the right information due to either lack of education or unavailability of the needed information. Exposure to information provides people with the freedom of finding, extracting, and using information as they need. It facilitates them to apply and create new information and help them achieve their life goals. Fundamental educational information should have no boundary and must reach even to the remote areas so that people can take advantage of the connectivity, explore and assess opportunities and maximize their skills.

Access to Education

Even though access to educational courses and materials has become free and reachable thanks to the proliferation of such platforms as Khan Academy, and massive open online courses (MOOC), quality of the education still suffers in most places of the developing countries. Future workers fail to receive an adequate level of education to compete in the present market landscape. The problem also lies in the quality of education at the elementary and primary levels in the technology-depended world which hinders them from developing necessary knowledge absorptive capacities demanded at the later stage of education. This problem is, however, prevailing not just in the developing countries.

The ubiquity of the Internet access, massive proliferation of information and data, the trend of knowledge sharing by many large corporations under their open innovation policies had simplified accessibility and provided the opportunity to tap into valuable knowledge for a little or no cost. Having access to knowledge is not enough for its practical use. Challenges exist across the board due to the shortage of absorptive capacity, and lack of know-how and skills necessary to integrate, assimilate and use rather readily available knowledge. Notably, the issue is more acute in creating, acquiring, and accumulating a satisfactory level of tacit knowledge vital for such capabilities as knowledge integration. However, one of the best things about knowledge economy is that developing countries have an opportunity to have access to the newer technology and knowledge related to them without engaging in the primary R&D for the development of those technologies. The only caveat is the countries must work willfully on the factors such as building absorptive capacity, creating an entrepreneurial culture with high tolerance to ambiguity, and setting up and strengthening good institutions.

For many developing countries growth model of the Asian tigers, countries that have managed to go through rapid industrialization, are good examples to follow. In these countries, technology transfer and FDI played a prominent role in their quest to the transition to the industrial economy. Technology transfer without having the necessary knowledge base, institutional regime and absorptive capacity of the companies in the host country cannot take place effectively. Moreover, production, linkage, and investment capabilities and the knowledge related these capacities are also important factors at the firm level.

Entrepreneurs have always played a vital role in the growth of a national economy. The entrepreneurial level of a country does depend on the traditional factors of economic growth: land, capital, labor, or even knowledge that the country possesses. That is why entrepreneurship should be the focus for the developing economies in their quest for economic prosperity irrespective of other factors (Smith 2010).

The Impact of Technology Change

The continuous improvement in technology and the emergence of new ones are bringing massive benefits in the form of economic prosperity, improved communication, transportation, entertainment and overall living standard to the members of the society. However, the question of adaptability to technologies and the impact of knowledge economy on the environment, income gap between haves and have-nots, and unemployment are some of the pressing questions that the society is still grappling to understand and handle.

Technology change also reflects on the culture of the society by providing new possibilities and convenience that members of the society incorporate to their core lifestyle activities and transform them. Two examples from the communication field are messaging and emailing services. The ability to communicate instantaneously using these methods has dramatically improved how the way people work and live. These are not alone; a considerable number of new technologies have appeared in the last couple of decades that have brought sweeping changes in the very essence of our daily life.

Along with ICT and its use in pertaining areas almost anything technology related from cars to phones and from televisions to machines have gone through one spike after another growth momentum. Some technologies are having a limited impact on our life. Others are so revolutionary that they are bringing massive disruption to individuals, organization and even to the entire society. These disruptive technologies are altering the way we work, play, and live. By changing our lifestyle, they have started a process of enrichment and renewal of the society with far-reaching significances. The emergence of ICT age has exemplified by the speed of information exchange, communication, and access to knowledge. The possibilities that ICT has to offer brought revolutionary outcomes on many levels. However, the new technologies which are on the cusp of penetrating our life are going to have an even more radical and profound impact. The depth of their effects is difficult to fathom for the societies, individuals, and businesses. Later in this book we have reviewed some of the most critical technologies that are going to shape the future of the knowledge economy and have the possibilities of helping us to eliminate many of the existing social challenges.

Benefits of Knowledge in Society

The impact of knowledge on society is substantial. Knowledge propels technological and scientific innovation. These novelties carry changes that improve productivity through process elimination or optimization. New tools and machines that originate from innovations make accomplishing tasks easier with better efficiency. The underlying economic value created by these evolutions work as a base for the social transformation. The economic prosperity also generates more educated citizens and rising middle class. With better knowledge and understanding of cultural and technological issues, these people realize a need for social and political changes by actions such as modification or enactment of laws, regulations, and policies.

Knowledge Clusters and Knowledge Hubs

The idea that it is possible to reap economic benefits from collocation is nothing new. The importance of spatial geography in economic activities was first mentioned by Thunen (1826) in "The Isolated States." Alfred Weber (1909) in his theory of industrial location suggested that firms seek to locate in an area where labor cost, transportation cost of both raw materials and final products can be minimized. Marshall (1890) also had similar views in his theory of agglomeration where he tried to figure out the reasons for spatial clustering and their effects on the economic activities. He observed factors like spillover effects, networks of suppliers and manufacturers, the linkage between them and access to required labor market are keys for cluster formation (Duranton and Puga 2004).

A knowledge cluster is a local ecosystem organized around universities, research centers, and large firms that fosters innovation, cultivates entrepreneurship, and bolsters new industries. Porter (1998, p. 78) defined a cluster as a "geographic concentration of interconnected companies and institutions in a particular field critical masses-in one place-of unusual competitive success in particular fields." Clusters help developing networks among individuals, academics, businesses, and public institutions by providing a systemic foundation for joint projects, joint researches, and other forms of exchanging ideas. These networks facilitate building necessary ties of close communication, collaboration, coordination, and trust between research institutes and firms. They are mutually beneficial as businesses get access to innovations and the research institutes receive opportunities to commercialize their innovations.

A cluster's value, effects, and quality are measured using various dimensions that include geographic scope, density, breadth, depth, activity base, growth potential, competitive level, innovative capability, industrial organization, and coordinating methods (Enright 1999).

Knowledge Creation and Clusters

Whether it is an individual or a firm engaged in knowledge creation, the process of knowledge creation requires significant temporal and monetary commitment. First, the initial knowledge base is developed often by formal education and training. The next step is to identify a knowledge gap which is economically or socially worthwhile to pursue. Once it is discovered, the creativity part starts with the R&D process. It includes researching the competitive landscape to identify available knowledge in the selected area, extracting the needed knowledge from the source, integrating acquired knowledge effectively to the R&D process and finally, producing new knowledge from the R&D activities. For companies, it is a complex process of hiring the right talent, creating the infrastructure for conducting R&D, developing effective R&D team, and having a proper management system for the entire structure and framework.

Companies, research institutions, policymakers, and local governments are increasingly realizing that proximity of the stakeholders in the form of geographical agglomeration or clusters facilitates faster knowledge creation and innovation which in turn bring sustainable growth (OECD 1999). Knowledge clusters differ from the notion of geographical agglomeration in the sense that knowledge clusters are deliberately created, socially constructed and highly network-oriented entity.

Geographical agglomeration of industries takes place, as Marshal (1920) pointed out, for three specific reasons: by locating closer to the raw materials suppliers and end buyers a firm can save on transport cost, it can achieve more natural access to specialized labor pool with specific skills, and it can take advantage of knowledge spillovers and information collaboration. It means natural cost advantage and spillover effects are significant causes why companies prefer industrial agglomeration (Ellison and Glaeser 1997). Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutes such as universities, standards agencies, trade associations in a particular field where rival companies not just compete, but also cooperate (Porter 1998). Natural clusters can occur for other reasons as well. For example, wineries are often concentrated in particular regions under climatic conditions best suitable for growing grapes.

As the decision where to locate firm is often taken based on cost factors, owing to the natural cost advantages companies often prefer a preexisting cluster (Carlton 1983; Henderson 1997). Studies suggest that advantages like an abundance of the unskilled labor pool and the availability of specific resources are responsible for around fifty percent of geographical industry concentration. Nevertheless, localized intra-industry spillovers play a significant role in the proliferation of agglomeration (Ellison and Glaeser 1999). Evidence also shows that the cumulative effect of all three reasons from Marshallian theory has a more significant impact than just natural advantages. However, the vertical links to suppliers and customers are the least determining attribute among all three factors from the theory (Ellison et al. 2010).

There is a difference between spontaneously spurred concentrations and artificially created industrial clusters through active endorsement and support from governments. Artificially created clusters do not always produce the desired outcome if they miss one or multiple vital elements of critical success factors. These elements comprise of competitive R&D capabilities, availability of skilled labors, seed capital, educational and training infrastructure, energy, transport, and information infrastructure, the presence of market-leading companies, entrepreneurial culture and climate, business climate and quality of life (e.g., Schmitz and Nadvi 1999).

The clusters are widely accepted as geographical sources of innovation (Beccattini 1987; Porter 1990). In "Silicon Valley," Saxenian (1996) noted that the collaboration and social networks are essential conduits in improving the rate and speed of innovations for firms located in the agglomeration. However, a survey among the Norwegian firms, located in clusters, proves that as far as new knowledge creation and innovation is concerned cross-pollination with diverse partners from other countries is capable of contributing more on innovativeness of a firm as oppose to having relationship with the firms within the region alone (Fitjar and Rodriguez-Pose 2011). The lesson from this is while it is essential for knowledge-based firms to take advantage of colocation within a knowledge cluster but at the same time, it is necessary to build up network and connections with global partners (Bathelt et al. 2004). For companies, particularly SME, to partake in a cluster is a beautiful idea if the knowledge flow within the participants stimulates growth to the knowledge base of the firms. Participant SMEs of an industrial cluster enjoy a better opportunity of staying competitive at national, regional, and even global level. However, if the cluster does not foster new ideas and is not conducive to constant innovations, presence in such clusters may even hinder the innovativeness of a firm (Moodysson 2008).

Many economists predicted that with increasing globalization and a free flow of knowledge and products through borders, the importance of industrial clusters would significantly diminish over time. The early evidence from the analysis of the knowledge economy shows that it was a wrong perception (Evers 2008). On the contrary, knowledge clusters and knowledge hubs are ever more valuable attributes to local knowledge economies, today. It looks like the expanding dependence on knowledge will only strengthen and make clusters and hubs flourish more.

Higher Education

Knowledge economy created an unprecedented demand for knowledge and skilled workers. It had an immense impact on the educational system. Higher educational and vocational institutes and schools are flourishing all over the world. In most cases, higher education does bring employability and better salaries, but in increasingly demanding present market conditions the equation is not that simple. Just having a pool of highly educated people will not guarantee in the successful transition to the knowledge society either. Because in a knowledge economy the demand varies by sectors, they are not consistent, and the rapid emergence of new industries only exacerbates the situation. The mismatch in education and job requirement is quite apparent in all countries not just in the developing nations. One problem is the educational system and skill development aim are not aligned with the industry-based growth requirement, advances in technologies, and present innovation need. One factor is to focus on the right kind of education with higher chances of employability in the new economy, but other concerns should be considered before investing in higher and tertiary education and pushing students to get degrees. First, the education should be aligned with not just present but also the future needs of the economy. Second, the focus should be made on the industry clusters and networks of firms with more substantial growth potential. Third, the quality and level of the educational systems should meet the intensely competitive global arena (Kruss et al. 2015).

The consistent disappearance of jobs and the creation of new jobs are one of the characteristics of the knowledge economy. Technological progress drives this endless shift in the employment market. Every year a good percentage of jobs disappear, and new jobs appear (Davis et al. 1996). It is a process propelled by innovation. However, the recent advances in technology suggest that this process might be radically accelerating with the emergence of automation, robotics, and machine learning soon expediting the mechanism of creative destruction as envisioned by Schumpeter (1942).

Knowledge economy eliminates traditional jobs in alarming speed much faster than the required skills development for the new types of jobs takes place in society. Facebook, Google, and Amazon are three of the largest companies in the world, but they employ far fewer numbers of people compared to industry behemoths form the pre-knowledge economy companies such as General Electric or Ford Motor. Automation and artificial intelligence are already wreaking havoc on the job market. Economists claim that within the next decade or so jobs such as truck drivers, a 3 million strong job pool in the USA alone, taxi drivers, farm-helps and many other jobs will all but disappear. Undoubtedly, as mentioned earlier to have a smoother adoption of the rapid and devastating change in the job market, societies must focus on the right type of tertiary and higher education along the line with the technological shifts that knowledge economy and innovation are generating.

Is There a Need for Higher Education in the Knowledge Economy?

Skeptics about the knowledge economy argue that economies in the developed world do not need more people with higher education degrees. For each vacancy in the technology sector, there are three jobs in menial works. In many countries such as the UK, the highest job growth recently is happening in the basic jobs of service industries not in the knowledge-based sector.

These claims are at best dubious. A recent Pew research paper found that college graduates are not only better in earnings and economic prosperity, but also in job satisfaction and carrier goals. More educated millennials also consider that training and education are necessary steps toward their career advancement and their education was useful for furthering their career objectives. One important takeaway from this research was that among all graduates the main subject a person studies matters more in their career move. STEM majors claim that their jobs are more closely related to the subjects they have studied (Pew Research 2016).

Network Society

The present network society has emerged thanks to the technology ubiquity. Many of the social changes that have been taking place in the last several decades are in a way directed by the technology evolution and infrastructures built on the Internet, and telecommunication networks. Links between companies and individuals in the new economy are no longer based on vertical or horizontal integration. They are increasingly getting more interlinked through graph-like nodes. The graph-like interconnection of entities, if we consider each or organization and their connection with other objects as an entity, always existed. These connections used to be, however, small due to geographical and physical constraints. Technologies, such as telegraph, telephone, mail system, and railroads have seriously augmented the networked sphere significantly from the time of the first Industrial Revolution. The ICT has dramatically increased the capacity potential of networks and grew extraordinarily since the Internet backbone was installed.

Networks are a system of weak and strong connections between nodes (Strogatz 2001). The nodes are mutually inter-depended in human society and an integral part of how we work, interact, and live. Networks bolster the way we cooperate and communicate with others and with the networks or both. While before the technology influence on the structure of the social networks, they tend to be more hierarchical. The networks started to morph where interlinking started to transpire more graph-like clusters as a result of decentralization that ICT and in particular the Internet has brought. The ability to connect instantaneously and the continuous flow of information have shifted the importance of the direct relationship to weaker but valuable links. The process of decision-making has become quicker supporting productive growth both on individual and organizational levels.

Castells (2004) has defined the concept of the network society as a society where underpinnings of social structures are ICT-based networks. The idea of network society follows the same principles and models of knowledge economy only with a greater emphasis on the network aspects of a knowledge society and their role in the context of the economic, cultural, political, and social spectrum.

One of his central views of network society is the issues of inclusion and exclusion that occur in the network society (Warschauer 2004). Their values determine the inclusion of the entities within a network.

As the network evolves, some entities drop out from the system and new entities which bring more social or economic value by offering resources or capabilities that the network needs get included. A network is a system with its own goals. It links with the other network systems to achieve these goals. However, the weaker network while linking with stronger one must comply by the norms and methods of the stronger one and work on achieving their shared goals. The network economy along with the technological capability has given the rise of a new type of economy which is called sharing economy.

Technological Determinism

A discourse about the impact of technology and innovation on societies and what role they play in shaping the social constructs inevitably calls for an explanation of the technological determinism view on social changes. Veblan (2017) drawing upon Marx's theoretical concept of the effects of autonomous technology on social changes coined the term "technological determinism." In its essence, the term means technology characterizes changes of norms and values of the society and its progress.

However, the level of technology's influence on society is a subject of much contentious. There are views which are called hard, soft, and neutral determinism (Chandler 1995). Hard determinism postulates the idea that technological progress march on despite any social concerns and innovation and new technologies compel societies to adopt them and change social structures in the process. Technologies, in this view, direct societies to come up with rules, norms, and ideas that determine the values of a society, and the shifts that take place propelled by technologies are inevitable (Ellul 1967). Human consciousness had received a dramatic swing when the script for writing was invented. From wheels to modern technologies, there were technologies such as printing machines and electricity that have predestined the continuous progress of human societies (see, Ong 1982). Soft determinism advances the notion that the adoption of new technology is an incremental process where technology and society both affect each other in shaping the social changes and the growth trajectory of the technology. Technology, from this perspective, is only one of the change agents, albeit sometimes a significant one among many others that exist within the social and technological context that drive the progress. Some people recognize technology as a neutral factor having an effect only when it is utilized. Technological determinism is also tagged as a reductionist approach to the complex interaction between new technologies, innovation, and social systems (Chandler 1995).

Reductionism

Reductionism tries to explain a complex phenomenon with some simple theories. Reductionism is a way of thinking that prefers taking shortcuts (Gallagher and Appenzeller 1999). In many real-life scenarios, reductionism works well when it is applicable based on the notion that all complex systems can be reduced to the interaction of their constituent much smaller parts. However, the crux of the problem lies in that it is often impossible to dissect a highly complex system to such granular level that it can provide a clear holistic picture of all the necessary interactions of every single element of the system. Thus, reductionism may induce a false assumption about the nature of the phenomenon examined.

The fact is new technologies impact on society and the development of technological progress due to social progress are more complex reciprocal actions that are hard to categorize in a manner mentioned above. Some technologies have revolutionary effects on the progress of societies, and others have a more benign influence on social changes. Development of technology is also a result of market demand or the push from the use of other technologies by the users. Technologies can have little effect on society if the members of the society do not possess the absorptive capacity required for effective utilization of the technology.

Conclusion

The knowledge economy is bringing a unique opportunity for achieving the ultimate goal of human development. It has the capabilities to improve the quality of life for the entire society by providing access to knowledge and skill development for each. Individuals in society will become not just consumers of knowledge and technology but will also play an active role in its production and dissemination. Rapid advances in technology and globalization have created an opportunity of growth for all nations whether it is already a part of knowledge economy or still a developing country. The success of an economy in this changing environment will depend on how fast the society manages to prepare itself for the uncertainty and economic and social complexities that the new technologies are bringing and take advantages of new possibilities that will emerge thanks to the faster adoption of technologies and their spillover effects.

For organizations, the implementation of these advanced technologies will bring more efficiency in the business processes and spur massive productivity growth. Well-prepared societies thanks to their human capital will observe spawning of a plethora of new innovative ideas leading to the enhancement of entrepreneurial activities and a new level of prosperity.

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CHAPTER 4

Technologies of the Future

Introduction

Everything surrounding us is either natural or human-made. Most of these human-made things are the results of our creativity and scientific and technological invention. Our very existence today depends on technology, and this need for more technology is rising continuously. The ICT has brought a revolutionary effect on the economy, our lifestyle, and our environment. Since the emergence of the first computers the technological innovation has been experiencing tremendous growth. Each new wave of technologies whether it is personal computers, mobile technology or the Internet since then has brought a new way of thinking, created conditions for building new systems, methods of communication and the proliferation of entrepreneurial opportunities. These technologies bolstered the unprecedented level of connectivity, ability to create knowledge, and distribute information.

We can define a technological revolution as a spontaneous powerful surge of the economy fueled by new technologies that create impetus for the emergence of more new technologies, use of existing technologies in new areas, building of new supportive infrastructure, radical changes in organizational value chain processes, which in combination improve productivity, and raise economic well-being. The transformative impact of these technologies establish new industries that eventually become defining segments of the economy. The new technology-based

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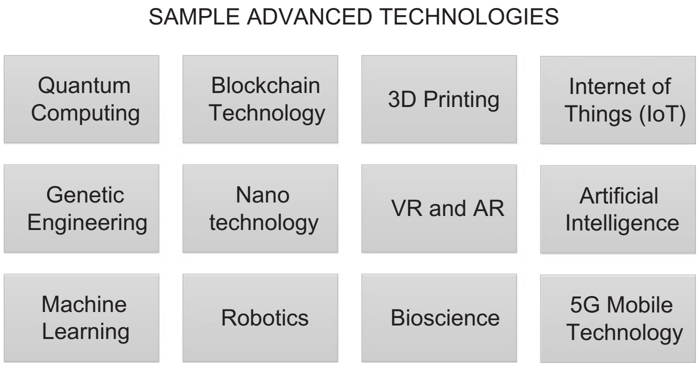

Fig. 4.1 Some key advanced technologies

industries are at the forefront of industrial growth, job creation, and wealth building (Fig. 4.1).

As these technologies sprawl through the economy setting roots in every single industry, we will observe the emergence of an incredible amount of innovation from the interconnection of technologies, augmentation of industries, R&D in adjacent and new areas, the creation of new business models and entrepreneurial activities. The technological revolution that is yet to take place thanks to new ways of linking the emerging and established technologies are going to be unprecedented in its size, nature, and impact.

ICT Growth

The remarkable growth of technologies in the last several decades has supplied tools and platforms to produce an immense amount of knowledge. The networks and connectivity have accelerated the dissemination of knowledge. In this connected world, for organizations and individuals to stay competitive, they must speed up the process of creating value-added knowledge and share it at a rapid pace.

Time difference in the networked world has become a thing of past. Platforms like Linkedin, Facebook, Salesforce have given the opportunity to both the individuals and the companies to stay in touch with their circles be it family, friends, or customers at the fingertip. Our ability to be creative, innovative and generate knowledge, and share with others have amplified many folds owing to the Internet with numerous repositories and information platforms, facility to learn just about any subject through the MOOCs such as Coursera, EDX, Udacity, and number of others and have access to the coding repository such as GitHub.

The Internet and mobile communications with ever-increasing capacity provide us not just the ability to share knowledge but also create knowledge products and commercialize them. Numerous independent consultants, programmers, coders, and other services providers from all parts of the world have gained the opportunity to sell their knowledge services to the available customers through platforms like Guru, Upworks, and several others. The outsourcing business alone is helping a vast number of people from developing countries to generate decent incomes and financially leap forward.

While knowledge has become more available and its circulation cheap and rapid, one new problem emerged with the explosion of information production which is identifying and integrating knowledge from the enormous heap of relentlessly growing information making it a daunting task.

Entrepreneurs and companies in knowledge industries are always particularly concerned about the emerging and possibly disruptive technologies that can bring disruption to the market and displace sustaining technologies. Here, we have analyzed some such technologies that have immense potentials and have every chance to become game changing. Some of these technologies are already changing our economy and society and more radical changes will follow soon.

5G Mobile Technology

Fifth-generation wireless technology (5G) is going to revolutionize wireless infrastructure and data connectivity. It is not just an incremental leap to the next generation. It is much like a hyperjump in the evolution of mobile networks and innovation. 5G is a far superior mobile connectivity network than the existing 4G. The speed of twenty Gigabit per second (Gbps), virtually nonexistence latency of one millisecond, and huge bandwidths with the possibility of connecting many devices at the same time exemplify the differences. These numbers translate into a minimum of ten times faster speed from what we have today with over ten times less average latency and a hundred times more traffic capacity on average (ABI 2017).

5G creates extraordinary opportunities for entrepreneurs and innovators. We will see new ideas and enterprises in the areas where massive data transfer with minimum latency is essential. For example, it will make the true autonomous driving a reality. Cars, traffic lights, and road signs will be able to communicate with each other in lightning speed and transfer a massive chunk of data instantaneously creating the level of seamless connection necessary for flawless autonomous driving. Live video streaming will give a boost to entertainment, security and surveillance, agriculture and farming among others. Various telecom companies have been testing the technology with pilot projects and some are planning to launch it in 2019.

VR and AR

Virtual reality (VR) and augmented reality (AR) spheres will get a new life which will spur the emergence of various innovative products and services. Pokemon Go was a massive success based on older mobile networks. There would be many innovative products with the increasing adoption of faster mobile networks which will bolster interests in AR and VR from consumers. Presently, the main reason for AV and RV not to generate expected demand yet is the latency and lack of sufficient bandwidths.

AR adds one new ICT supported layer over a user's total sensory perception of the ontological objects of the real world in a specific surrounding. The virtual objects work like real objects by getting integrated seamlessly within the surrounding as a composite picture. The sensory perception ideally should include all five senses. VR is an ICT generated simulated environment, where the immersive experience for a user feels like a real-life one. The simulated environment can be a reflection of real life or a fictitious scenario (see, e.g., Oh and Bailenson 2017).

VR technology market started in 2010 when Palmer Luckey, a tech-savvy teenager, came up with the idea to develop a headset which will allow visualizing the given environment in 3 dimensions, which became known as oculus rift. Facebook later purchased the company. Within the next couple of years, major companies like Microsoft, Google, and Nintendo all produced their version of VR equipment. Shortly, we can expect that 5G technology will spearhead many innovative products in the areas of AR and VR.

Autonomous Cars

Driverless cars will transform our lifestyle and economy more ways than we might think. It is expected to bring enormous economic effect. Both automobile companies and technology companies understand this. All car companies and some prominent technology companies are involved in developing automated and connected vehicles. According to the US Department of Transportation, there are five levels of car automation (Clements and Kockelman 2017). Level 0 implies there is no automation in the car. Level 1 means the presence of task-specific automation such as adaptive cruise control and assistive parking. In level 2 cars, several of these automation functionalities are integrated making an automobile semiautonomous. Level 3 cars are supported by self-driving technology. However, at this level, drivers must remain vigilant and ready to take over whenever it becomes necessary. Level 4 refers to full automation when driverless cars will not require any human intervention. Level 4 cars will not only have complete automation, but they will also coordinate with other cars and traffic systems through the Internet of things and 5G communication technologies. In 2018, there are already several level 3 cars available in the market, and these numbers will increase significantly within a couple of years. The potential impact of the automobile automation across all levels of society and economy is enormous.

Ninety-five percent of a car's lifetime it sits idle. It is an enormous waste of capital that also depreciates quickly. Driverless cars will reduce the need for owning a car, and car sharing will become the norm. The productivity of the commuters will increase as they will be able to use the commuting time for work. There would be more free time for people to pursue their hobbies and passions.

A tremendous reduction of car-accident related death will take place once most cars become autonomous. Carbon emission problem from cars will be a thing of the past. As the cars will be able to optimize their routes real-time and communicate with each other on the road thanks to the ushering of 5G technologies there would be virtually no traffic jam on the roads. An enormous amount of urban land mass will become free as the need for car parks will be drastically reduced. These lands will go through gentrification as a part of urban planning contributing to the economic growth through construction and optimized utilization. Disable persons, older adults, and children will receive greater mobility when level 4 cars penetrate the market. People will also take longer trips in a car. As a result, car use will increase up to 20%. Car sharing alone will reduce transportation cost per Kilometer from 5 to 10 times (Clements and Kockelman 2017).

There would be a significant impact on the labor market once the market penetration of self-driving cars gets to the tipping point. It will eliminate the need for truck drivers, taxi drivers, and parking attendants to name a few.

For the broader economy, the universal use of autonomous vehicles will have a substantial implication. New opportunities will appear along the line of the broader acceptance of autonomous cars. Software and apps for burgeoning vehicle automation will proliferate new ventures exploiting the rising need. On average, software is ten percent of the car's cost which will probably rise to 40% over the years. A level 4 autonomous vehicle will become a platform on its right. Relaxing commuting passengers will become a large target market. Opportunities will arise in supplying this target audience with in-vehicle entertainment to work-related apps, products, and services. Augmented and virtual realities will help to transform confined vehicle spaces to gaming, multimedia, and work environments.

Many other industries will feel the ripple effect of the autonomous vehicle field. Ground-shipping and trucking industry, for example, will be revolutionized by self-driving technology. The industry will save anywhere from 100 billion to 500 billion per year by 2025 in the USA alone. Although most of these gains will be accrued from the elimination of truck drivers' jobs, not necessarily these people will ultimately lose their employment, at least in the near future. Many of them, probably, will be retrained to pick up new relevant jobs such as truck attendants with different sets of core functions such as monitoring the smooth functioning of the autonomous system. The other industries that will also feel the pressure include auto repairing, auto insurance, legal support, traffic violation, and energy industries.

Depending on the levels of the driverless cars penetration into the economy, there would be from nine to forty percent energy consumption reduction by 2050 (Auld et al. 2017). From improved energy efficiency of the engines, smoother traffic flow to faster traveling time and fewer collisions there are many reasons for the energy required to decrease (Stephens et al. 2016). Complete penetration of level 4 automation would mean a reduction of 90% of the crushes and the virtual elimination of auto repairing industry. The low number of accidents will also influence the need for personal injury attorneys.

Quantum Computing

Quantum computers are the next revolutionary approach that will change how computing at the machine level is done since the vacuum tube-based first-generation computers were introduced. The underlying mechanism of a classical computer is that it works with binary codes of 0 and 1 representing two states of electrical pulse or charge and based on Boolean algebra and logic gates. Quantum computers change this notion fundamentally and enhance the computing capabilities manifolds thanks to the following quantum mechanical effects (De Wolf 2017):

- Superposition—a quantum system can take many states simultaneously till a measurement occurs.
- Interference—a quantum particle has a wave-like characteristic which can interfere with its trajectory and change its direction.
- Entanglement—refers to the idea how quantum particles once correlated behave similarly in relation to each other even in a great distance.

Using these principles, a quantum processor can power a vastly superior computing machine unparalleled in capacity in comparison to today's digital computers. The kind of information this new type of processors handles is called quantum information. Qubit is the basic unit of quantum information. Unlike classical bits, qubits are capable of assuming the states of 1, 0, and any quantum superposition of the two states. The fascinating thing about the quantum chip is with each additional qubit its computing capability doubles (Wilde 2013).

Quantum computers require a very different category of algorithms than the conventional method we use today. Quantum computers are not universally better than the classical counterparts. They are good at solving only a certain kind of tasks. At present, three key areas are considered as best where quantum computing will make the most significant impact soon. These are the simulation of quantum systems, cryptography, and optimization (De Wolf 2017).

Quantum computing with the ability to create and distribute crypto codes in lightning speed would be the future of cybersecurity. Qubit encryption keys will be relayed to the sender and the recipient. These keys will be impossible to crack as any intrusion will change the properties of the key due to the effect of interference and can be immediately replaced.

Quantum computing will possibly bring enormous opportunities for the economy. Nobody had the faintest idea when transistors were first used that how much impact these tiny things would make or how they will power the transition to the knowledge economy. Quantum computing theoretically may induce similar game-changing effects. Once it goes mainstream, the technology will facilitate reaping benefits from entrepreneurial opportunities in diverse areas from life science to marketing and from traveling to autonomous machines.

Once molecules structure and attributes can be simulated using quantum computers, this will open enormous opportunities in the research areas of biotechnology, drugs and hormones, and their interactions with the human body. Modeling physical systems at the primary level which is possible on quantum computers, can produce ground-breaking results in many fields that include manufacturing, energy resources, and environmental research.

Organizations will be able to use quantum computers to resolve their optimization problems and improve decision-making. As many real-life optimization problems are hard or impossible on classical computers to solve, the use of the quantum computer will give a positive boost to the solutions of many AI and machine learning problems.

With the present speed of development by 2022, the technology is expected to become a real force of growth in the knowledge economy.

Quantum particle entanglement can be used for diverse purposes. For example, once linked a state of one particle such as its spin will have an impact on the entangled particle no matter how far it is. This phenomenon will allow transferring information instantaneously on a considerable distance. This method of transferring data through direct replication of the status of one particle with the entangled one is called quantum teleportation (Bouwmeester et al. 1997).

The entanglement phenomenon is also used for storing a quantum state of light in a photonic quantum memory. This storage can hold a considerable amount of information. Earlier the entanglements were created two particles at a time. Now a new method has been developed which promise to deliver many entangled particles at the same time and use them by separating them into groups. The method entangles a cloud of atoms simultaneously by freezing them to near absolute zero temperature in a confined small volume getting them into the state of matter called Bose-Einstein condensate. The cloud is later gets divided into groups as needed with the help of a laser, but they still carry the entanglement connection with others from the cloud. This outcome can have a far-reaching impact on the faster development of quantum computers (Fadel et al. 2018).

Blockchain

The central concept of blockchain is it is a ledger in the form of database. It keeps records of transactions and their values in a list or ledger. Each list is a block. The blocks are decentralized, distributed, and located in various nodes. Each transaction once transmitted gets updated in each node. The entries in the list are chronological, securely protected by cryptography, and linked to the prior and following group of entries. The name blockchain derived from the fact of the transaction blocks link to each other and form a chain. The chain link is connected through hashes. The hash is the digital signature that links two blocks chronologically and sequentially and gets created through a secure hash algorithm (Crosby et al. 2016). Blockchain system is built based on the following technology stack: cryptography, P2P network, and blockchain protocol.

There are immense benefits of using blockchain. Blockchain makes a transaction completely transparent. Once an entry is made to the ledger, anybody can view it. Moreover, after the entry is added to the block, it becomes unchangeable. Another decisive factor that blockchain embodies is decentralization which refers to the ledger in the form of blocks to be located in various places. The participants of the blockchain do not have to relinquish their control of the process to a single authority. These characteristics together make blockchain a reliable instrument as in most real-world transactions trust is a critical element.

In many cases such as financial transaction, we use the third party like a bank as an intermediary because we have absolute trust on banks. This involvement of a third party comes with a cost and often adds time-consuming complexity to a transaction. Blockchain eliminates the need for an intermediary and allows the parties to deal with each other directly. The elimination is advantageous because in many transactions the presence of a third party might be undesirable. The intermediaries also often charge for their services. Their removal from the process simplifies and makes it cost-effective and quicker.

The blockchain is transforming into a key underlying technology where trust is a salient issue. Supported by blockchain any document, event, or intellectual property can become a smart asset. Once blockchain is integrated these smart assets can be monitored, shared, and transferred with complete transactions records. Smart contracts, the exchange of smart assets, for example, won't need any third-party involvement. With this strategy, the smart contract of a smart asset will convert to a programming script that will execute the negotiated terms when the conditions are fulfilled. The smart document would be located in decentralized nodes providing the necessary security and keeping it unalterable.

Blockchain concept emerged with the introduction of Bitcoin cryptocurrency. As blockchain came into prominence as a result of being an embedded technology of Bitcoin, understandably the value of its use in the financial sector is undeniable. Blockchain's ability to speed up a transaction, reduce costs, and improve transparency and security makes it a prime technology for the financial arena. From stock trading to banking and payment system to remittance blockchain improves the quality of services and makes them more secured. Unsurprisingly, most banks including central banks and other financial agencies are actively pursuing this technology and working on the introduction of many products and services based on it. Blockchain can be the unique substrate technology for creating any registry, whether it is voters identification, shop inventory, list of assets, or just about any information that can be listed in a spreadsheet-like format. The blockchain is already having a tremendous influence on the world economy. Cryptocurrencies at the time of writing this book are valued at more than half a trillion US dollars.

A cryptocurrency, in essence, is a digital currency. Digital currency is referred to a digitally represented unit that stores a value and can be exchanged on the Internet. The appeal of Bitcoin as the first cryptocurrency lies in its several attributes. First, decentralization is one of the main selling points of any blockchain-based project. No authority controls Bitcoin. It resolved the issue of double spending, when a digital currency can be reproduced and reused, through the process of encryption, hashing, and economic incentives. Second, it is a convertible currency. Bitcoin can easily be converted to any fiat currency, which is a legal tender backed by a government or exchanged with a product or service. Third, it has comparatively more anonymity. A Bitcoin sender or recipient, unlike a bank transaction, do not require to divulge their identity allowing a fair bit of anonymity. Fourth, the supply of Bitcoin is limited and capped at 21 million units. Bitcoins are churned out through a process called mining. Mining entails solving of Bitcoin's hash algorithm which is costly and time-consuming to generate. The miners receive a reward in the form of Bitcoin for their work once the algorithmic problem is resolved. The difficulty of solving a hash problem rises as the number of miners increase. Fourth, the Bitcoin is divisible up to 8 decimal points. It gives enough flexibility in its use. Fifth, thanks to the encryption technology embedded in it, it is entirely safe. Sixth, the Bitcoin has an excellent track record of growth trajectory as a digital currency (Nakamoto 2008). The success of the Bitcoin instigated the emergence of a slew of new digital coins. Most prominent of them at the time of writing are Ethereum, Ripple, Litecoin, NEO, Stellar, IOTA and NEM, and Primecoin.

Ethereum is particularly interesting as it is not just a cryptocurrency, it is also a platform based on which others can issue cryptocurrencies and other decentralized blockchain applications. Ethereum achieves this by superimposing smart contract over blockchain. The apps are written using programming languages such as Solidity or Serpent and then compiled and run in Ethereum virtual machine environment (Huh et al. 2017).

Blockchain technology is transforming our world from centralized governance where traditionally a third-party arbiter is used to resolve the issue of trust to a decentralized autonomous environment. This concept enables creating the framework of Decentralized Autonomous Organizations (DAO) based on smart contracts. In a DAO system, all business processes can be organized through blockchain and automated using smart contracts (Buterin 2014).

There are two types of cryptocurrencies: altcoins and tokens. Altcoins or coins are alternative to Bitcoin digital currencies. Many altcoins use the same underlying original blockchain protocol as Bitcoin but differ in features. Some currencies such as Ether and Ripple are developed based on their native blockchain protocols. The fundamental difference between tokens and coins is that a token is a digital asset which is built atop a stable platform such as Ethereum. Tokens can be a currency by itself for making a payment between users or a digital asset representing a share, a fee, or an accounting method among others (Ahamad et al. 2013).

The capability of creating DAO and issue tokens using Ethereum and other blockchain environments have ushered a new way of raising money for a blockchain start-up in digital sphere using a concept called Initial Coin offerings (ICO). The start-ups issue ICO and offer crypto-tokens for various purposes and in different forms such as securities, currencies, or embodied by other unique properties. The ICOs are creating a unique intermediate market for crypto investors to trade, fund, and back start-up offerings. Many start-ups found that it is easier to raise money through ICOs rather than going through the process of receiving funding from venture capitals and other sources. The success of some early ICOs gave a boost to the crypto-token market. In the first quarter of 2018 alone ICOs have raised around 2.3 billion USD (Chuen and Linda 2018). For a blockchain start-up, an ICO is an excellent way of crowdfunding without imposing any significant constraint. Kickstarter and crowdsourcing sites have proven that people are willing to prepurchase products and support a project, ICO provides a similar type of liquidity for intangible products and services.

Although ICOs are based on Ethereum with smart contract features that allow decentralization of voting rights and control, in most ICOs the issuers keep full command over them after the ICO. It creates an environment susceptible to misuse. Because of this, while investing in ICOs, it is good to remember that start-ups with clearly described monetization strategy with a proof of concept that works will have a better chance of developing a lasting business.

The blockchain is an emerging and revolutionary technology that will play a crucial role in the knowledge economy. There will be an explosion of entrepreneurial activities concerning organizing ledgers, apps with new features and functionalities and target markets. As this technology brings transparency, immutable audit trail, decentralized control, and higher security, their use in everyday business will continuously increase over time.

3D Printing Technologies

In recent years, 3D printing technologies have shifted from a complex, theoretical and slow process to an efficient, quick and cost-effective way of manufacturing, replicating and prototyping a wide array of objects. Its fast diffusion means, within the next decade, we will increasingly observe 3D printed products everywhere. 3D printers build items from an array of different materials that include glass, polymer, metal, ceramic, cement and such improbable components as living cells, fermented whey, and others. The process is similar to printing 2D items, except it imposes bonded layers on previous layers to create a 3D product (McMenamin et al. 2014). The latest 3D printers in many areas have gained an acceptable level of accuracy and precision which were not possible just a couple of years ago.

3D printing is a part of the digital fabrication process and also referred to as additive manufacturing. Digital fabrication starts with 3D modeling using various software such as computing-aided design (CAD). Fabrication then can be continued either through 3D printer-based additive manufacturing or more traditional subtractive method of cutting and hollowing with Computer Numerical Control (CNC) routers, milling machines, laser cutters, and a few other techniques. However, 3D printing is overtaking the manufacturing of many products as it eliminates material waste, faster to deploy and manufacture, and more economical (Wong and Hernandez 2012). 3D printing is presently getting implemented in diverse industries such as aerospace, medical device, car industry, smartphones, high-end fashion, and many others.

The overwhelming majority of the organizations that use 3D printing considers it as a strategic competitive advantage (Weller et al. 2015). A large number of companies mainly apply it for rapid prototyping and building proof of concept in the product development process. A popular application of 3D printing is also product customization. Other areas where 3D is setting stronger foothold include production, education, marketing samples, and art. The materials that are used most at present are plastic, resins, and metals but more sophisticated materials are expanding the list as the adoption of 3D penetrating fields like biomaterials, composite polymers, food materials, and even solar cells. Both consumer and industrial goods are seeing the tremendous growth potential of the 3D printers as more industries are seeing the viability of deploying 3D printing.

3D printing technology has enormous potential in biotechnology. Researchers are already working on printing various types of tissues of bone, cartilage and muscles, skin on damaged areas, and soon will be able to bio-print some organs and complex tabular structures such as blood vessels. The progress is taking place in biomedicine is fantastic. In reconstructive surgeries, there is evidence of successful implantation of 3D printed bones from titanium, doctors have created brain tissues printed from stem cells, and researchers are experimenting with living retinal cells of mouse eye which can become future human eye tissue replacement (e.g., Fedorovich et al. 2008). These are only a few examples of a growing number of 3D printing's application in medicine. The technology is transforming the healthcare delivery making it more personalized and individual focus. Prosthetic limbs are getting manufactured through 3D printing according to individual measurement. Soon even the pharmacies will be able to print pills with exact doses as prescribed by the doctor. A concept called polypill, having several drugs encapsulated in one with different time release created for a specific patient's need is becoming possible thanks to 3D printing.

In the food industry, 3D printing is producing pizza, chocolate, and cheese to an individual's taste. Research is going on to develop a 3D food printing machine which will be somewhat universal in printing food from micro-sized food materials.

Electronic circuits have become possible to print on the skin. Among other uses, these printed circuits, for example, can embody sensors that can warn a person about the imminent threat of a chemical or biological weapon in the environment.

Several construction firms have successfully built various sizes of modular homes in 24–48 hours applying 3D technology. The lower cost and shorter build time of the 3D printed houses can have game-changing effect for developing countries as estimated 1.2 billion people in the world live in urban areas in terrible housing conditions.

In the consumer world, such as fashion, 3D printing is permeating rapidly. Companies such as Nike and Under Armour are using 3D to prototype products for some time. Now, 3D printed shoes to fashionable sunglasses are already available on sale. Researchers and companies are building highly complex objects such a complete jet engine and parts for spacecraft. NASA is planning to integrate over 100 3D printed parts in their upcoming Orion spacecraft for moon travel.

Generative design along with 3D printing is also expediting manufacturing process. Generative design cloud-based software platform applies machine learning algorithms to produce design options from given data such as length, depth, weight, elasticity, and preferable type of manufacturing material to be used. The program delivers hundreds or even thousands of options from where engineers can pick up the best ones that correspond with optimal parameters. Once the best options are selected, they can be manufactured using 3D printing for rapid prototyping and experimenting. The final product can be superior to what the engineers of the firm can conceive through their efforts thanks to machine learning algorithms, access to enormous amount of relevant data, and cloud computing (Matejka et al. 2018).

3D printing is going to have an exciting impact on the knowledge economy. The ability of consumers to print an item as opposed to buying it will diminish international trade in some consumer products.

It is one of the rare technologies that will seemingly work against globalization in trade. However, the broader impact is not apparent yet. The rapid prototyping possible thanks to 3D printing will undoubtedly expedite innovation and commercialization process. It is also helping in the cross-country technical and cultural collaboration. As innovation is sensitive and talents are located in various organizational offices in disperse places of the world, 3D printing is becoming an integral part of the R&D process of the product manufacturing.

Internet of Things (IoT)

The idea of the bidirectional connection of digital objects for improving performance exists for quite some time. In recent years, availability of cheap sensors, better wireless connectivity, and expanding cloud computing have given a tremendous boost to the proliferation of the Internet of things (Xia et al. 2012). The practical need and use of the IoT also accelerated significantly with the improved capacity of data storage, aggregation and analysis, and understanding that data are an incredibly valuable source of insights, predictions, and decision-making. The digital connection of our surrounding objects is increasingly generating more data unparalleled in its volume, speed, and scale. By extracting, collecting, assimilating, and analyzing these data, we are drastically improving our ability to optimize business processes, detect and respond to critical situation instantaneously, bring more comfort to our environment and ameliorate our daily life.

The acceptance and utilization of IoT are accelerating thanks to the emergence of new technologies in the communication field, miniaturization and betterment of computing powers of the processes and chips, availability of better quality and cheaper sensors and actuators, increasingly more extensive connecting networks, and the development of the required frameworks. As a result, ordinary objects in the areas of personal, home, industry, utility, and transport are progressively embedding sensors and actuators furnishing them with the Internet connection, which allow monitoring and controlling objects and collect, aggregate and analyze data from them. The concept of the IoT is defined as a robust network of interconnected physical and virtual things through existing and changing interoperable ICT that improve the services provided by these things (ITU 2012). The service improvement would be facilitated by interconnecting real-world objects through an intelligent interface, software, and data computing. It does not just concern the object itself but also the connected environment where the object is located.

IoT is steadily encompassing our everyday life. At a personal level, it is wearables such as a smartwatch and smart jackets and at the home level, security system, thermostat, refrigerator, TV, sound system, lights, and air conditions. Transport systems include smart cars, traffic control, and smart health. The smart city includes intelligent building, smart parking. In the utility sector, smart meters, smart grids, healthcare, environment monitoring (Wortmann and Flüchter 2015).

The penetration of visible areas, where IoT already has a stronghold, is also paving the way for far-reaching implication in many other parts of the economy. For example, interconnected health-related devices will save lives, reduce cost, and increase our longevity. In environment monitoring, we will be able to shift from predicting to prescribing approaches. In business, IoT-supported industrial automation will enhance the capabilities of machines, assembly lines, manufacturing processes, and industrial robots. Intelligent logistics and transportation will optimize transport system, improve service quality and lower operational costs. Within the next decade, IoT-supported sensors are going to be embedded in non-technology things like furniture, food packaging, documents, crockeries and utensils, and fashion accessories. The use of IoT in the agriculture sector alone will bring considerable benefits to the developing economies.

Edge Computing

Along with the ubiquitous connective of the IoT, we are going to face the problem of data deluge and the need for rapid computation at the source. Many of the connected objects are going to produce significant data. For example, a car connected via 5G technology will continuously communicate with other cars, street signs, traffic lights and might be even the roads. The same is true for drones, planes, robots, trains, and some of the smart home components. Relaying that data to the cloud and computing there would be time-consuming and ineffective for time-sensitive decision-making. The solution is to execute and process some of the computing in-object or in-sensor and transmit only the required information and computed result to the cloud for further use. This process of computing and taking specific actions on the spot where the sensors are located is called edge computing or fog computing. Eventually, with the rising number of IoT, edge computing will open new possibilities and entrepreneurial opportunities.

IoT is creating a new round of opportunities for developing innovative products and services, optimizing manufacturing and industrial processes, finding in-location and responsive solutions, and introducing new business models and strategies. In the coming years along with more connections between devices, there will be more and more opportunities that are difficult to quantify at this time and their possible impact is hard to predict.

Smart Home

Thanks to the IoT, the home automation that connects from window blinds to bulbs and hot water tanks to the security system is becoming a mainstream product. It is creating conditions supporting high-quality life which brings security, simplicity, and comfort to our living. Energy efficient devices such as smart thermostat deliver not just convenience but also substantial cost savings. Connected refrigerator, washing machine, microwave, and ovens are contributing to better energy management for consumers.

Home automation is expected to be a significant business segment with close to 20 billion dollars market share by 2020 (Tang 2017). Amazon, Apple, Google, Samsung, and several other technology companies are presently competing for the dominance in becoming the preferred automation hub from both consumers and automation products suppliers' perspectives. However, there is an apparent divergence in the views of home automation product manufacturer and consumers. Consumers are overwhelmed with the choices of the central hubs and expect to have simplicity and ease in smart products so that they work as plug and play and preferably with their preferred smart assistant be it Google, Amazon, or Apple. Manufacturers are trying to develop interoperable products that work with all the available major hubs. The smart home is still a nascent market.

How this will work out in future, it is tough to say. One thing is sure, in any case. It will be going to have a significant impact on our lifestyle. According to IDC (2018), the entire automation market will grow by around 18.5% per year soon.

Industry 4.0—A Subset of the IoT

In a broader sense, Industry 4.0 is a subset of the Internet of things. It is an ecosystem of smart products, smart machines, networked connections, and platforms working together in a secured interoperable framework throughout a manufacturing process or a company value chain process.

The concept of Industry 4.0 was proposed by the German government as a strategic initiative and policy framework to support German enterprises to become more competitive in the global market. While the notion of fourth Industrial Revolution in its essence comparable with the concept of the knowledge economy, Germany's focus with the policy of Industry 4.0 on manufacturing stemmed from the more substantial role manufacturing plays in its economy. When the knowledge economy encompasses the broader economic processes and linkage, Industry 4.0 is confined within the manufacturing and industrial value chain process and their digitization. The main impetus to this transformation is the emergence of smart products and machines; hence, we consider it as a subset of IoT (Lasi et al. 2014).

In the previous industrial stage, which is called the 3rd Industrial Revolution, automation was taking place in an individual machine or process, and it was instigated by the emergence of ICT. Single machines started to receive automation capability thanks to the embedded software. Combination of these partially and sometimes fully automated machines together brought automation to the production process, which was the precursor to today's Industry 4.0 production line. In this new realm of Industry 4.0, the goal is to digitize entire systems with all relevant value chain processes in a holistic manner.

Industry 4.0 is an integral part of the knowledge economy and the propeller to the transformation of the manufacturing process to a fully knowledge-based one. Its promises are enticing for businesses as they are underlying forces of gaining and retaining competitiveness: cost reduction, process optimization, and enhanced market value. Although the concept and its impact are disruptive, the process of transformation to Industry 4.0 itself for the factories is evolutionary.

Industry 4.0 is characterized by the interlinking of products, machines, processes, and system with integrated automated production through IoT, ICT, and AI, vastly enhancing the capability of the manufacturing value chain. The IoT at the factory level is the prime mechanism of making the products, machine, and elements smart and interconnected, allowing them to communicate with each other on a shared network and use interoperable interfaces (Lasi et al. 2014). Ideally, it should connect every single element of the value chain process of the factory from securing the production materials to market delivery of the finished product and interlinked with all relevant processes, services, and logistics.

The fierce competition in the marketplace along with rapid technological advancement causes the product lifecycle for many consumer and industrial items shortened. At the same time, consumers are becoming more discriminating in their selection and demand more personalized features in the products and services. These issues are compelling the companies to adapt to the market need to stay competitive. They are embracing technological advances which can deliver the foundation for competitive advantages. For factories, it means to leap forward leveraging IoT-based manufacturing process.

The benefits that derive from the deployment of the Industry 4.0 concept include increased production capacity and pace, improved quality of products, optimized production system with fewer errors, embedded production flexibility, improved logistics, and greater control in operational management.

The immediate rush toward the deployment of IoT in the manufacturing value chain accelerated thanks to the convergence of the technologies and methods that include better connectivity, significant developments in industrial robots and machine learning-based data analytics; reduction of cost in sensors, storage, and chips; growth in AI-powered automation; and innovation in production methods. In Industry 4.0, factories are also interlinked with smart infrastructures such as smart grid, intelligent building, smart transport and logistics, other divisions of the company through Intranet, and connected platforms.

One core concept within the Industry 4.0 ontology is cyber-physical systems (CPS). CPS is referred to the ecosystem comprised of physical elements supported by IoT, interconnected through digital networks, interface, and platform that allow controlling, monitoring, and coordinating the entire system (Rajkumar et al. 2010). At the physical level product, machines and elements are embedded with connected sensors, actuators, and chips making them smart things. They are networked by communication technology, and at the cyber level, these smart things are linked to a central information platform via interfaces. Data are relayed to this central platform from all smart things of the network. These data are gathered, combined, and synthesized if needed, and then analyzed for an efficient and seamless operation of the whole system. CPS is specifically designed to work in manufacturing and production environment integrating physical and virtual dimensions. The goal of cyber-physical systems is to run, maintain, and repair operations with minimum human intervention.

Digital twins Digital twin is the dynamic reflection of real word asset, process, or construct in cyberspace. It is the digital model that incorporates all aspects, attributes, specification, communication, and connection of an object or a process. It is the virtual embodiment that includes all the components and reflects the shape, and pattern of the product and related data (Boschert and Rosen 2016). The twin can be the replication of an entire factory, simulation of single or multiple processes or assets. The digital twin concept is quickly gaining ground in the context of Industry 4.0 thanks to the benefits it provides. With lowering cost of both IoT and digitization, digital twin is going to be a ubiquitous phenomenon expanding its sphere beyond the manufacturing sector to all valuable assets and processes. The advantages of having a digital twin include (Glaessgen and Stargel 2012, April):

- Ability to have an overall picture of the asset's capability
- Capacity to identify faults and deficiency by running simulation
- Improved and optimized operational processes by analyzing simulated data
- Faster decision-making thanks to insights received from visual data.

When the digital twin replicates an end to end system, information received from the virtual interactions and their analytics can make an invaluable contribution to the understanding of the system, its processes, action, and the reaction of those processes within the system and with the outer world, and its advantages and faults.

In a true Industry 4.0 ecosystem, supply chain, innovation, distribution, sales, and customer interaction, and contact with external partners such as government, utility companies, and others will become integral parts of the smart system. For example, distribution logistics can include smart trackable packaging with augmented features and digital identity. Packaging with Near-field Communication (NFC) tag allows adding features such as guides, specification, and value-added content, ability to inform when a product is getting expired or need replenishment by sending data, observing if the product storage meets all necessary conditions and inform if not. A smart packaging aims to carry out one or some combinations of following actions, e.g., tracking, communicating, sensing, detecting, recording, and measuring (Yam et al. 2005). The supply chain processes within this system at the very least must have digital mapping capability and eventually may add autonomous transportation, smart packaging, smart warehousing, smart shelves, and smart interaction with the supply chain platform and humans at every stage of the logistics. As a part of the Industry 4.0 ecosystem, the goal of the smart supply chain is to bring efficiency, flexibility, speed, autonomy, and economy to the logistics process. Using machine learning algorithms on data collected from the sensors businesses can learn more about their products, receive insights and apply acquired knowledge for enhancing their service-related operations.

Value-added services that stem from the use of IoT along with smart products will spawn new opportunities for entrepreneurs and existing businesses. Manufacturers of machinery and tools are already embedding sensors in the parts that require regular services, and in the areas of the machine which allow performing remote diagnostic analysis and predictive maintenance. By monitoring the product, its interaction with customers throughout its lifecycle, companies can obtain invaluable insights, optimize its features, customize and provide individually designed functionalities, enhance customer satisfaction, and upsell and cross-sell products and services.

Taking advantage from the Industry 4.0 would require organizations to accept a value-driven strategic approach that transforms cultural, managerial, ideological dimensions and not just confined in the technology dimension. Reinventing the business model that integrate and leverage Industry 4.0 technologies and capabilities should be the core of this new strategy. A plethora of new start-ups and in-house development teams are coming up with radical new ideas about how to exploit the Industry 4.0 vision. Overall push from the knowledge economy with new technologies, availability of knowledge workforce, demanding customers and globalized competition, companies are bound to react to the changes Industry 4.0 is bringing. The Industry 4.0 technologies are not just the prerogative of industrial giants, SMEs must embrace the technology shift as well to stay competitive, explore new opportunities and satisfy market demand.

Nanotechnology

The present growth and the future potential demonstrate that the Internet of things is going to encompass most mundane objects of the physical world beyond the security locks, refrigerators, garage doors, thermostats, cars, and lights. The IoT is going to be embedded in every single object that we use in our daily life, from coffee cups to tables and toys to toothbrushes. This transformation to occur, the sensors and actuators need to be miniaturized, and the cost has to go down. Thanks to nanotechnology this is already happening. Nanosensors which are measured in nanometer, one billionth of a meter, are soon going to be a common element, paving the way to an explosion of the use of the Internet of Nanothings (IoNT) in medicine, construction, food, Industry 4.0, and many other industries (Akyildiz and Jornet 2010). Nanosensors can be embedded in every single layer of an asset, which will create and deliver data from the entire object in excellent details of any minuscule change in temperature, color, light, vibration, and identify the tiniest effect of environmental stimuli. Such sensors, for example, have applications in medicine from delivering drugs to targeted cells to detecting disease biomarkers.

Smart dust is the epitome of the use of nanoparticles. Smart dust comprises of nano-equipment such as a smart sensor, data processor and a transmitter, and can sense the environment, detect changes at the nano-level, check the value of the data and transmit the most critical data. Smart dust that is called microelectromechanical sensors (MEMS) can detect signals from the environment and may also control it (Ilyas and Mahgoub 2016). MEMS consist of sensors or actuators. Nanosensors can measure parameters such as pressure, radiation level, magnetic impulse, velocity, and light wave. Nanoactuators such as carbon nanotubes can respond to light and heat and work as optical switches and valves for controlling flow. They work by converting environmental signals into mechanical motion which is applied to perform an action. An electronic device as smart dust is also called a mote (Chawla and Kumar 2016). The best thing about motes is once deployed in huge numbers like thousands or even millions in the environment they can create an ad hoc network for monitoring and collecting data providing a comprehensive portrait of the observed area. Smart dust can bring intimate surveillance capability to hazardous and hostile environments when applied as surveillance IoT.

The use of nano-level IoT for the Industry 4.0 improves the efficiency and effectiveness of IoT in machinery and production lines where slightest changes of calibration make a huge difference. It also brings monitoring maintenance need of sophisticated machinery and assembly lines to a more granular level. Smart dust embedded in construction materials and pipes allow monitoring, detecting, and taking preventive actions for aging infrastructure and water and gas pipelines.

Commercial application of nanomaterials can be observed in aerospace and defense, and in consumer products like batteries, dental fillers, stain-resistant fabrics, cosmetics, and sports items. Surface coating with nanoparticles, for example, has extensive use in nanoscale engineering that leads to equipment protection from wear and tear and natural corrosion, self-cleaning surface films, heat resistant engines, antibacterial bandages, and many others.

Nanotechnology refers to the engineering, design, and development of nano-components and their application. Nanotechnology is instrumental to the creation of nano-level products and process with new features and functionalities by manipulating nanomaterials (Whitesides 2005). It is one of those promising technologies that is expected to make a massive impact on the future of knowledge economy. Although right now nanotechnology is receiving more acceptance in industries such as electronics, medicine, construction, transportation, energy, and environment, space exploration and food faster than conservative areas like wood and paper industry with diminishing cost, the interest in nanotechnology is expected to rise across the board.

Nanotechnology is about the manipulation and development of materials and tools smaller than 100 nanometers. The idea of having machines that would work at the molecular level believed to originate from Richard Feynman's speech "There's Plenty of Room at the Bottom" delivered in 1959 (Feynman 2006). It is Eric Drexler, who took the concept of nanotechnology mainstream with his book "Engines of Creation: The Coming Era of Nanotechnology" published in 1986 (Baum 2003). However, the term nanotechnology was first used by Norio Taniguchi of Tokyo University of Science in 1974 in the context of ultra-precision materials processing technology (Taniguchi et al. 1974).

Nanomedicine, a fast-developing field, aims at the molecular level identifying, curing, and repairing diseases that occur in various internal and external parts of the body. Nanotechnology made possible the development of lab-on-a-chip (LOC) devices (Hejazian et al. 2015). These devices are used for performing laboratory testing and screening on a tiny chip smaller than a few square centimeters for such diseases as breast cancer, HIV, and many other infectious diseases. LOC devices are easily portable, a lot cheaper than conducting the same tests in a laboratory facility, and comparably a lot faster to perform a test. The chips are more sensitive because of this they need much smaller samples. Some of these low-cost point-of-care devices can also perform multiple tests.

The DNA nanotechnology made tremendous strides which is the design and development of synthetic structures based on artificial nucleic acid. DNA stands for Deoxyribonucleic Acid, which is the nature's molecular level building block of chromosomes and carries genetic information. Various metallic and semiconductor nanoparticles based on DNA structure are finding applications in nanomedicine, nanosensors, solar cells, and photonics diodes (Chen et al. 2015).

Drug delivery to the point of action or inflammation without causing side effects used to be a difficult task. Some nanoparticles (NP) are presently investigated and used in delivering drugs to specific cells for clinical intervention aimed at disease detection, prevention, and treatment. NPs have the capability of encapsulating, transmitting, and dispersing drug to a targeted area in a broad spectrum of clinical issues that includes treatments for infectious diseases, cancer, diabetes, and even Alzheimer's. Many advantages exist for using this method such as with time control release mechanism the dose frequency can be reduced. Since the drug gets released at the location, it diminishes side effects. Encapsulation of the drug prevents it from a chemical reaction which happens in the conventional process of oral or injection-based drug delivery, keeps its potency and required dose intact till it reaches the location, and the site of action receives a uniform dose of the medicine as prescribed.

DNA origami, customizable self-assembling structures created by folding single-stranded DNA template molecules, often referred to as nanobots for the fact that they are programmable. The use of such bots for various purposes like targeting and eliminating cancerous tumors, fighting superbugs, and separating bacterias from food and water is a promising area of growth with tremendous economic consequences (Schreiber et al. 2014).

In the biotechnology alone the nanotechnology has catalyzed the emergence of several threads of R&D that include: nanostructures, drug delivery, biosensors and bio-imaging, gene therapy, and much other clinical applications (e.g., Takeda et al. 2009).

The synergy between nanotechnology with biotechnology is evident as in bio-clinical field from virus to DNA, working with microscopic components are essential. Nanotechnology is in a position to provide much-needed robots, sensors, tubes, tools, and materials that facilitate doing active research, developing drugs and clinical therapies, and treat diseases.

In renewable energy front, nanotechnology is also producing products that are applying innovative ways to generate power. One such innovation is hybrid solar cells based on triboelectric nanogenerator (TENG) that can extract electricity from raindrops. Static electricity generated from shifting electrons that friction of two materials causes is the source of TENG's energy production. On this particular solar panel, two polymer materials are coated on the photovoltaic cell to create the TENG (Han et al. 2014).

Cost is the biggest issue for mass scale deployment of the IoT. The nanotechnology is influencing the lowering of the prices of many of the elements, indispensable for building IoT infrastructure. Nanolevel IoT gets to benefit from the fact that the motes require very little power and with more miniaturization, it is diminishing continuously. The speed of growth witnessed in nanotechnology in the last decade alone proves the existence of a vast future potential which will make a positive impact on the economy.

Nanotechnology is attracting considerable attention both from government and the industries as a strategic focus area. Substantial funding has been allocated to the research, development and market activities by governments of many countries. The industry integration of nanotechnology is growing, its presence is becoming pervasive, and mass adoption is taking place in many fields. Innovation in the area is also becoming more complex, and radically versatile products are emerging as a result.

Nanotube A carbon nanotube is a nanoscale material with a tubular structure which was discovered in 1991. Nanotubes have unique mechanical and electromagnetic properties such as high tensile strength, high thermal and electrical conductivity, high flexibility and elasticity, and a low coefficient of thermal expansion. These attributes make it an ideal candidate for versatile applications including energy storage, optics, composite and structural materials, nanoelectromechanical systems, chemical field and in nano-electronics (Kaushik and Majumder 2015). Most importantly, as recent researches suggest, carbon nanotubes might soon become an alternative to silicon-based transistors (Cao et al. 2015).

Moore's law predicts that the number of transistors on a single integrated semiconductor circuit will double every one and half year to two years. Despite the expectation otherwise from skeptics, so far, the semiconductor industry has managed to keep up with this law with the ever-diminishing size of the chip with more and more densely populated transistors for the last fifty years. That might come to a stall at least for the silicon-based single integrated circuit, but the exponential growth of technology as predicted by Kurzweil's law of accelerated return will continue in the semiconductor field thanks to nanotubes.

Artificial Intelligence

Artificial intelligence (AI) is a branch of computer science aimed at the development of programs to emulate human intelligence, behavior, and understanding for solving real-life problems (Konar 1999). AI-based tools are at the forefront of the workflow and process automation. These emerging systems are aimed at emulating workflows and automating routine and repetitive tasks by redesigning the processes using machine learning and other AI technologies. The advantage of using these systems is that people get discharged from many routine tasks and become able to focus on their core capabilities. Many knowledge-intensive business tasks are already fully automated, and more activities that are rule-based and deductive are in line. However, AI tools can make a real impact in the areas where processes are dynamic, attributes are irregular, and the system has to learn and adapt in order to automate the workflow successfully. Example of these types of systems is dynamic pricing automation, tailored insurance programs, and patient care (Davenport and Harris 2005). In the future, adaptive systems that can make decisions in response to environmental changes, seamlessly work with other systems adapting to their needs, and function autonomously irrespective of conditions are going to be used in performing many complex tasks eliminating human intervention. AI-powered systems are bringing radical changes in business processes and operations. Their sophistication and emulating capacity of many complex skills are streamlining, strengthening and optimizing business processes delivering superior productivity and profitability to the deploying organizations. In Industry 4.0 environment for manufacturing companies to sustain competitive advantage, companies are embracing the strategy of incorporating automation of the entire production process using robots and intelligent automation tools.

Predictive Analysis Analytics is the process of finding patterns and insights from data through computing. The insights discovered from the data are often get used for various relevant decision-making processes. Predictive analysis is about finding patterns from historical data and apply the information to forecast future possibilities. Although the concept of analytics exists for a while, the explosion of its use started to take place just recently with the emergence of big data, an adequate level of computing power, and cheaper communication and storage. The importance of rich data from where potentially valuable information can be extracted is not a novel idea. The problem used to be the limitation of data storage capacity, heterogeneity of data, and lack of enough computational availability. These things started to change in recent years. Cost of data storage has become incredibly cheap, increased communication bandwidths brought significant growth in the data flow, and cloud computing brought the ability to perform a complex computation to the reach of most organizations. These factors have primarily influenced the massive demand for the systems like predictive analysis. The convergence of big data, predictive analysis, and intelligent decision-making system along with sophisticated machine learning algorithms is transforming the way of running business completely. Already many companies are using predictive analytics to find value from their data, and the pace is showing no sign of abating.

Three types of data analysis are presently used. Descriptive analytics try to figure out what happened based on predefined indicators. The predictive analysis focuses on forecasting future behavior based on patterns observed from past data.

Companies are even going one step further. Increasingly, they are trying to use the insights extracted from data not just to make a prediction but also discovering what should they do about it by using mathematical models and optimization algorithms. This approach is called perspective analytics.

Web-based advertising and marketing companies are deploying predictive analytics to understand how the customers are going to behave in future and what products they might like by analyzing data extracted from link click stream of data, point-of-sale (POS) systems, and customer profiles. Financial institutes manage a massive amount of data from such sources as payment transactions, credit card processing, ATM deposits and withdrawals, and everyday banking. Analyses of these data by advanced analytics techniques help companies in areas such as fraud prevention and service improvement. Another reason for the popularity of such a system is doing data analysis is also becoming quite affordable thanks to free access to many open source technologies. One example of data-driven decision-making is AI-based security market trading systems. Stock market trading with the help of a predictive analysis model is the ultimate use of a data-driven algorithm. The way it works is; first, we select the parameters for technical and fundamental analyses. Next step is to choose algorithms to apply. Then, we feed the system with training data. If the outcome seems satisfactory and meets our expectations, we conduct some trial runs on real-time data. If still the system is working as we expected, we are ready to deploy the system. AI-based systems are increasingly getting used to simulate and work with complex systems.

Complex Systems A complex system is a structure comprised of numerous independent but interlinked components. It is not just a complicated system. These components can be a single element, a process, or a subsystem and it can be a part of a more extensive system. Complex systems are characterized by nonlinearity, feedback loop, spontaneous disorder, no centralized control, robustness, hierarchical organization, the large number and emergent behavior that only understood at the system level but not appear at the component level (Ladyman et al. 2013). Complex systems are all around us. Our brain, a single cell or the immune system, are the examples of complex systems in the human body. An organization, a division within the organization, stock market, traffic within a city, all these are complex systems created by humans. In many areas of the organization to take a better decision, it is crucial to understand the implications of complex systems. Simulation of a complex system allows us to understand the system better, how it works and extracts vital information from the system that is critical in decision-making. AI-based programs in modeling simulation that help understanding how feedback works in the system, how robust specific properties are, and what are the emergence properties provide valuable information essential in the decision-making process.

These systems are contributing to the improvement of the decision-making processes in a wide range of fields including transportation logistics, urban traffic control, manufacturing, automated product planning, healthcare to name a few.

AI-based Recommender System In a world of explosive information growth getting the right information just in time is crucial for decision-making but becoming quite tricky. Data, undoubtedly, is now a significant source of insights. Companies deploy analytical programs to extract valuable information from continuously renewing and growing volume of data. Even that gleaned information often time become overwhelming to manage and apply due to their sheer volume and time it takes to select the best options. The type of programming tools that would suggest the best possible list from all the available information based on AI and machine learning algorithms will bring real value to decision-making process. These tools are called recommender systems. Recommender systems now are an integral part of the majority of web entities where a large number of buyers, visitors, and users interact with numerous products or services. Companies big and small rely on these programs to provide personalized services to their users and create enhanced value from a large number of items or information. For example, online retail sites deliver personalized products recommendations to the visitors tailored to their specific interest. Thanks to the recommender systems each client sees a unique personalized store where the page displays what matters most for the particular client. Recommender systems achieve this level of personalization from data culled from customers' profiles, click-through, purchasing history, locations, and many other attributes. At the machine to machine decision-making, the recommender systems can work as an add-on to the predictive analytics software, where the most valued information or several pieces of crucial information are passed on to the intelligent decision-making system to incorporate to its computation.

Machine Learning

Machine learning (ML), a branch of the AI field and a critical instrument which powers computational analyses such as predictive analytics. Machine learning algorithms have reignited the interest in artificial intelligence lately because of their ability to carry out many of the tasks that only humans could do until recently. ML as an AI branch works based on various computational and statistical algorithms in developing tools for solving complex problems. These tools or programs are capable of learning from experience and contextual environment and improving their capabilities progressively (Carbonell et al. 1983). ML algorithms are an underlying AI technology in many apps and devices we use today, and soon there would be very few things left where in one way or other machine learning algorithms will not be present. ML differs from programming in a significant way. We do not program an ML-based system to identify and discern a dog from a cat. The system learns to do this from training data that were introduced to it. The ML sphere includes data mining, statistical modeling, data, and predictive analytics, adaptive systems, and pattern recognition to name a few (Marsland 2015). The emergence of big data fueled the growth and utilization of ML in data-depended business processes bringing better efficiency and optimization to them. There two main types of machine learning algorithms: supervised and unsupervised (Hastie et al. 2009). Supervised learning system depends on labeled data in the training process. The system is ingested with training dataset that comprises input data and output values, which are also called supervisory signals. With a sufficient amount of data, the system becomes able to create a model that can infer output signals from new examples.

The unsupervised system learns to identify patterns from structures of the data attributes from a given dataset by grouping similar ones together and by creating an inferring model that allows the system to recognize a pattern (Chapelle et al. 2009). Unsupervised implies that data are not labeled. This learning method is used for various estimation problems such as compression, filtering, clustering, blind source separation, and statistical modeling. Most commonly used ones of them are clustering and dimensionality reduction. Clustering means grouping together data in different clusters and dimensionality reduction refers to the reduction of the data volume to a manageable level for more comfortable computing while still maintaining the maximum amount of relevant structures of the data.

Reinforcement Learning It is a method that refers to goal-oriented learning algorithms. The word reinforcement here implies the system gets punished for making a wrong decision and rewarded for a correct one. By trial and error and working with data extracted from the environment over many steps it achieves the set goal. These algorithms are potent tools in diverse areas such as package sorting by robots, warehouse operations, power grid performance, and for the evaluation of trading strategies.

The Variations of Machine Learning Algorithms

Five different types of ML exist which are neural networks, evolutionary models, probabilistic and statistical models, symbolic learning and rule induction, and analytical and fuzzy learning (Chen and Chau 2004). At this time, the most popular type of algorithm is artificial neural networks (ANN) thanks to their ability to handle numerous tasks related to pattern recognition, time-series analysis, image processing, data analytics, classification, and system identification. ANN, as its name suggest, tries to emulate the complexity of biological neural networks by creating a mathematical model in solving tasks.

Artificial Neural Networks ANN loosely reflects its biological comparison as neurons and their working process inspired the concept. In essence, ANN is a nonlinear method of statistical analysis where nodes, called neurons, are connected through one or multiple input, output, and hidden layers. The network obtains information through a learning process from its contextual environment. This obtained information is stored in synaptic weights, the strengths of the interneural links. The changes in these weights alter the output result of the ANN. The data is inserted into the system through the input layer, and the output layer delivers the result (Haykin 1999).

Deep learning is a term which refers to an ANN with a large number of hidden layers. The ability of the deep learning algorithms to work with a considerable amount of data and process them have instigated the current massive interest in AI (LeCun et al. 2015).

Semi-supervised learning is a technique which combines both supervised and unsupervised learning methods. In supervised learning, a data scientist teaches the system which variables are critical for solving the stated problem. For a large training dataset, it is a time-consuming and expensive process. Moreover, with more than necessary human intervention might cause an infusion of inadvertent human bias to the system's learning process. An excellent solution to this is to apply semi-supervised method which refers to the training of the system with a small amount of labeled data and use that to impose labeling on the rest of the data. This technique is getting more popular thanks to the emergence of some new algorithms such as Generative Adversarial Neural Networks (GAN). GAN is a system that uses two competing neural networks to achieve an outcome (Goodfellow et al. 2014).

Knowledge-Based Systems KBS provides reasoning-based smart decisions for a domain. By incorporating domain knowledge, it tries to emulate human type reasoning in delivering answers (Wiig 1994). Expert's knowledge in many domains is indispensable for solving critical problems. KBS adds knowledge of the expert along with other valuable knowledge in a rule-based structural representation. KBS consists of rules, frames, programs, and techniques for knowledge identification, acquisition, and representation (Studer et al. 1998).

Before the emergence of the Internet, acquiring knowledge was a complex problem as information in most cases was available on paper-based documents, and there was no method of extracting knowledge from heterogeneous formats. Operators were developing the knowledge base from bits and pieces of information available about the domain (Giaretta and Guarino 1995). The in-depth knowledge of the domain that an expert possesses was the underlying foundation of a rule-based expert system (Buchanan and Shortliffe 1984). There is a difference between the term knowledge-based system and an expert system, although often they are considered the same. An expert system is a knowledge-based system that includes a knowledge base, user interface, inference engine, and a supportive environment (Hayes-Roth et al. 1983). Knowledge engineers develop rules, logical connections, and problem-solving heuristics with the help of a human expert of the domain and aggregate the information to the knowledge base. Interface and a supportive environment are developed by programmers to work with the represented knowledge located in the knowledge repository. Expert's heuristic knowledge built from years of experience is an inseparable and valuable part of the knowledge-base (Studer et al. 1998).

The demand and popularity of the expert systems in the 1970s stemmed from the fact that true experts with in-depth knowledge about the domain that they acquired from years of experience, learning, and training were never that many. Thanks to the expert systems in many cases critical problems were possible to resolve without the human expert's presence. These expert systems seemed like a variable alternative to having experts in places where it was difficult to obtain one. In the beginning, it looked like an excellent idea. However, soon it became clear there exist many insurmountable problems in the use of such systems. First, experts were not able to articulate everything they knew or explain things to the operators in a coherent manner which can be transformed to a rule-based system. Second, with the changing technology and environment knowledge tends to become obsolete and it was quite challenging to maintain the accuracy of knowledge with changing versions of the system. Third, the issues of ambiguity and vagueness that accompany the use of a natural language also create uncertainty which was tough to overcome. Fourth, for various reasons that include having access to the right expert and lack of conformity of the system with surrounding technology, it was not possible to use the system when needed. Because of these issues, soon expert systems started to fall out of favor, although some of the problems expert systems were facing later were possible to resolve using technologies and methods that were developed later (Kruse et al. 2012).

Artificial Intelligence and the New Economy

Today, AI is considered as a foundational technology. Every single industry is either using or going to apply AI technologies one way or the other. Several factors are working in favor of the tremendous growth that AI is enjoying today. Uncertainty reduction and risk mitigation are at the core of any decision-making process. Better productivity and forecasting ability improve the decision we make. Especially, in the cases where the data is too overwhelming, time-sensitive and relates to a complex issue.

In many cases, AI systems have achieved the ability to predict with near hundred percent accuracy. AI also boosts process optimization capability. Better optimization of processes converts to improved productivity. One of the most significant benefits of AI is process automation. From manufacturing to driving automation it is freeing our time which we can use for more productive and satisfying work. The cost of building, implementing, and using AI programs are also falling in a rapid pace bestowing AI application a commodity status. As a result, in the future, we will observe, even more, accelerated penetration of AI technologies in our everyday life.

Underlying core technologies were the critical success factors for many major technology companies. Microsoft capitalized on its operating system and Google on its page ranking algorithm. However, as far as artificial intelligence is concerned companies are readily sharing their AI systems with the public by making them open source. There are inherent advantages of open sourcing software and scripts. Free access to software often increases its acceptance and use rate. Public scrutiny, support, and contribution make the source code more robust, bug-free, and deployable. It is easy to verify and compare where the technology stands and its adaptability by observing the strength of the community engaged in the development. Open source initiatives are also more customer-centric as more users participate in the process of the development.

These reasons are quite compelling but often do not align with company business interests. So, why Microsoft, Google, Amazon, Facebook, and others are making their AI platforms open source? There are several factors motivated them to go open source. The AI revolution is in its early stage. It is necessary to build a community of developers and followers to establish an active leading role in the future AI platform market. Most AI opportunities are still nascent, the platform a ground-breaking innovation use will have the upper hand over others.

Moreover, big data is the primary raw material for most machine learning applications. Major tech companies still control this vital raw material for many of the AI projects. This trend of open sourcing AI platform is already bringing enormous benefits. The cost of building an AI application or a tool is falling precipitously. It is helping more people to tinker with machine learning technologies and making the penetration of AI tools and apps in the industries beyond the technology sector faster.

The AI induced technology revolution is also a result of the convergence of several contributory factors.

AI Is Not a New Idea

While recently it started to receive main street attention, machine learning, expert systems, and other AI tools and technologies have been getting implemented in various commercial products for years. Before recent influx in AI-based standalone applications, most AI programs in commercial projects used to be a segment of a much larger system such as NASA's mission control center, Microsoft's Office Assistant and in many other programs from car assembly lines to communication systems.

One of the reasons why AI could not set a strong foothold earlier is due to ICT constraints. Many of the cutting-edge machine learning algorithms have existed for a while, but it was difficult to implement them due to the lack of sufficient computational capability, storage capacity and access to an adequate level of data. These problems have started to resolve only in the last decade.

Astoundingly Positive Results in Many Areas

AI has made a tremendous stride in many fields in recent years and became a power behind many favorite tools, services, and applications. With smart home, autonomous cars, virtual assistants from Google, Apple, Amazon, search and recommendation engines and others, AI programs have become an integral part of our life. Their influence on our daily life is growing at a phenomenal speed covering more and more areas. From private sectors to government AI projects are receiving attention and investment in almost every industry leading with financial, retail, healthcare, transport, energy, and defense.

AI programs have also achieved near human level or even better capabilities in several key areas. Particularly impressive are the progresses made in facial recognition, computer vision, natural language processing, recommendation systems, and predictive analytics. In facial recognition, AI application is not just better than human in recognizing a face, deep learning-based facial recognition programs are more accurate in identifying such nuances as sexual orientation of a person where humans fail (Wang and Kosinski 2018). Visual computing using deep learning is driving advances in healthcare, where images count for the majority of data, to a level which was difficult to perceive a decade ago (Giger 2018).

The Abundance of Areas Where It Can Be Applied

AI is treated as a foundational technology for a reason. Although the discipline is over 50 years old, at present the algorithms that are at the core of most AI initiatives are remarkably small in quantity that includes ANN-based algorithms such as convolutional neural network, autoencoders, recurrent neural network, and others like naïve Bayesian and support vector machines.

Different algorithms can be mixed and match to handle data, find patterns, extract knowledge and insights and find solutions to problems. Same algorithms also can be reconfigured and deployed in an entirely different field for achieving different goals. This versatility of the use of algorithms makes AI so convincing as a generic tool. Moreover, the very fact that large companies are making the frameworks to work with them free, also adds to their universality.

Change of technology continues in an exponential trajectory of growth (Kurzweil 2004). The convergence of the technologies reviewed here has the potential to accelerate this growth even more and, in the process, expand the global economy bringing prosperity to every corner of the world.

The Implication of the Technology Change

The society will face tumultuous times from disruptive changes that the technologies mentioned here will produce in the coming years. The job market, for example, will go through a radical and deep transformation. This dramatic change means that nearly 65% of the kids starting their school life now will work in the jobs that don't even exist today. Some of the jobs such as office cleaners, agricultural-helps, truck, and taxi drivers and warehouse assistants will inevitably disappear in the future. Many fears that these technologies will probably kill more jobs then they will create. However, if history is a lesson to consider, the fear might be overly exaggerated. In the coming years, we will see many new jobs that are difficult to project at this time. There is a sense of urgency in understanding what the impacts of these technologies are and how an average person can prepare her for the drastic and unexpected way the job market, economy, and society as a whole are evolving.

Technology Knowledge in an Organization

From the competitive strategy perspective, technology is a highly relevant and critical element for companies in their quest for competitive advantage. However, in the ever-changing market landscape the presence of the right technology is a prerequisite but not necessarily a sufficient condition for sustaining competitive advantage. In recent years, with the emergence of a myriad of new technologies and rapid advances in this front, technology management has become a complex and nonlinear strategic nuance. For entrepreneurs in knowledge industries technology has even more vital importance. Technology is also closely related to company R&D. The ability to utilize most advanced technologies of the field in R&D process facilitates companies to deliver innovations and improve their market performance significantly. Technology is not just a physical tool, machine, or equipment, it is the combination of knowledge and artifacts that we utilize to design, create and diffuse products and services. The efficiency of technology use at the firm level and its management depends on users' skills, company capabilities, management practices, and value chain processes where it is deployed.

Firms usually have better knowledge of their technologies than those which are located outside of their realm. Surprisingly, they often have a low level of understanding and knowledge of the technologies that are dissimilar but functionally equal or better than their own. The degree of technical knowledge a firm owns depends on the firm itself, its industry, location and country's economic level. A firm's ability to acquire technology also relies on its technology adoption level, available skillset, understanding the need for a technology shift and what should be the method of technology change.

In the evolving market demand, technology push and heightened competition, technological advances and their effective use allow companies to keep up the growth pace and develop competitive products and services. The constant diminishing prices of the hardware bring technology affordability which is a source of new opportunities for entrepreneurs and companies. New price range allows more people to engage in experimenting and finding solutions to problems as the cost of technology is no longer an obstruction to have access to it. The removal of the barrier provides a new class of business and entrepreneurs possibilities to invent, innovate and open new markets.

With the vast array of ICT technologies available, their management and use call for some categorization aimed at bringing clarity to the focus areas. The enabling technology is the one which are prior disruptive inventions that significantly lift specific capabilities and help to develop new products, services, and technologies for broad segments of the economy. The Internet is a prime example of such technologies. The established, proven, or sustaining technologies are those who are in everyday use in present period and only can grow through the expansion of the existing market. Personal computers are one example of this. These technologies are composed of most of the tools, machines, and apps that we use daily at work and home for boosting productivity and enhancing capabilities.

Conclusion

Knowledge economy will continue to evolve societies and bring economic prosperity in decades to come. Government, organizations, and individuals need to understand the considerable impact the new economy with automation and advances in technology is going to have on every sphere of our life and prepare for the transformation they will impose. It means for individuals having a focus on continuous education, understand, learn and embrace technologies, and cultivate entrepreneurial mindset and approach toward new opportunities that knowledge economy brings. For an organization to stay competitive, it is imperative to have a clear strategic approach toward technology change, deploy advanced technologies such as AI as a core component of business processes, adopt a culture conducive to the faster adoption of technology and business changes, nurture talents instrumental to growth and continuously look out for new opportunities.

There would be massive policy challenges for governments to readjust societies to the radical effects of the new economy. Technologies are bound to shift the workforce composition that will necessitate implementation of new types of education and training. Automation will not only eliminate the low-skill job, but many white-collar jobs are also vulnerable to replacement due to AI encroachment. From agriculture to manufacturing and transport to retail, machines are poised to replace many of the low-skill and entry-level jobs which has been visibly occurring for years. However, with increasing penetration of the AI tools and applications mid to upper-level managers engaged in cognitive works are also susceptive to job loss as machines are becoming more efficient in many financial, administrative, logistical, and managerial works.

Past technology-induced job market changes have shown that while there were always job losses due to technologies, the job created thanks to the new economic realm and transformation far surpassed those losses. However, people those become unemployed as a result of technology shift and those who gain new jobs are often from different demographic and educational backgrounds. The experience shows that the labor market shift becomes more acute with the accelerating change of technology.

As new technologies based on AI are going to have an unprecedented in the history level of impact on employment, the labor market structural shift will require emphasizing retraining, re-skilling, up-skilling, and continuous education in a massive scale. It is not going to be an easy task, however. Unlike the previous periods, this time the emerging domains will require a different level of cognitive skills, which will need a fundamentally different approach to education and training (Brynjolfsson and McAfee 2011).

In order to accommodate these structural and social changes, governments must enact policies that spur R&D, improve human capital planning, mitigate the impact of radical changes, and foster an educated workforce prepared for harnessing advanced technologies and capitalizing on new entrepreneurial opportunities. Governments must take the educational need of the future economy more seriously. With lack of enough visibility of what the AI influenced future will look like and the simultaneous emergence of several game-changing technologies, the traditional approach to the education will be a recipe of failure. The century-old education system is bound to change under pressure from technologies, and at the same time, new educational frameworks are necessary to educate and train students to become adaptive to the changes that advanced technologies are going to produce.

The technology-induced disruption is shaking the core of our social and economic fabric, either a society should be an active participant of these changes, formulate, and adapt to the upheaval caused by these shifts or lag by becoming a passive observer of the transition taking place.

The technologies mentioned above will have a twofold impact on knowledge-based social entrepreneurship and the entrepreneurship as a whole. First, with the expansion of new technology and its penetration into the economy, new opportunities for entrepreneurs will arise. Second, many of these technologies are already ready to be incorporated into existing businesses. Particular emphasis in this regard should be given on the AI, machine learning and IoT as these technologies are now getting used in many industries.

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Part II

CHAPTER 5

Knowledge

Introduction

In the knowledge economy, knowledge has become the most critical production factor surpassing others such as land, capital, and labor, which were the primary elements in prior economic stages (see Powell and Snellman 2004). Apart from being a factor of production, it is also an end-product with a significant market share in the knowledge economy (Teece 2010). In the complex, shifting, and ever-sophisticating market environment achieving superior performance on a continuous basis requires making rapid, timely, assessed and precise decisions. Knowledge is a critical element of this process. Having access to relevant, contextual, and valuable knowledge just-in-time is essential for a well-informed decision-making process in the present globalized and highly competitive marketplace.

Rapid transformation in the business environment, the recent remarkable rise of knowledge-based entrepreneurship, explosive growth and ubiquitous access to knowledge are creating unexpected changes in the market environment. Dramatic disruption is taking place in many sectors where incumbents are losing grounds to more agile, sophisticated, and knowledge-savvy entrepreneurs. For social entrepreneurs, the question is how they can take advantage of this accelerated evolutionary shift and solve pressing social problems.

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Knowledge has always been a constituent of production, now that it has become the dominant factor in many industries and the primary driver of economic growth, firm's sustainability, growth, and even survival depend on it (Salojarvi et al. 2005). Both companies and entrepreneurs realize that without having access to the vital knowledge at the right time, without faster absorption, sharing, utilization and continuous creation of new knowledge, penetrating the market with new products would be a daunting task. In this new paradigm, entrepreneurs must take in the account that they need a whole new strategy in respect of knowledge as knowledge has a unique property of becoming obsolete quickly (Dierickx and Cool 1989). Moreover, in the modern competitive economy, the expedient of growth for a firm includes the objective of making its knowledge outdated deliberately before the competitors. This new approach calls for managing knowledge-related activities more efficiently and effectively and creating new knowledge faster. For this to happen, firms have to recognize how the role of knowledge in the organizations is changing rapidly, perceive how to harness the power of knowledge and become more innovative and productive, and clarify what is required to achieve this goal.

A firm with the dynamic capabilities of implementing new technologies, capturing knowledge from external sources and assimilating that knowledge with existing knowledge can develop new applications, products, and knowledge (Kogut and Zander 1992). Having a clear understanding of the knowledge integration process and how the knowledge flow through various organizational divisions take place is vital for any effort of streamlining and improving knowledge processes and benefit from it (Grant 1996).

Capturing, learning, integrating, and sharing knowledge occur in any organization at different levels of a firm. Important is to consciously and actively pursue these processes so that the company becomes capable of generating creative, task-related, strategic, technology and market-oriented combinations and recombination resulting development of innovative products, services, processes, and strategies (Birkinshaw et al. 2008).

The rise of the knowledge economy compels firms to reassess the value of their knowledge assets, understand the importance of knowledge in their business strategies, and realize the impact of new knowledge on their innovation efforts. This new role of knowledge and the need for the practical use of it makes managing knowledge-related activities a critical issue of the firm.

What Is Knowledge

Despite the long and evolving history of the study of knowledge as an epistemological concept, it has started to gain further traction in recent decades as the study of knowledge theory from organizational perspective brought new ideas and had instigated a further debate in this intricate, multifaceted, and ambiguous matter. Until the twentieth century, the subject of knowledge has been studied mostly by philosophers in epistemology and considered as propositional and personal (Dancy 1985). With the advent of technology era, the growth of knowledge economy and realization of organizations that knowledge is a vital resource in their quest for the competitive advantage the field of knowledge study has augmented considerably and now covers organizational, economic, and social spheres along with the previous focal point of personal knowledge.

These discourses have altered the previous perception of knowledge and produced many different definitions, classifications, and perceptual understanding of knowledge which in many cases differ from the epistemological—the philosophical theory of knowledge—view. The questions that epistemology is concerned about are: What exactly is knowledge? Is knowledge quantifiable? Can knowledge be solely analytical? What should we consider as knowledge? (Williams 2001). These questions are very different from the practical problems of knowledge acquisition, integration, retention, utilization, diffusion, and protection that knowledge management address and study.

Moreover, epistemological discourses mostly revolve around the notions related to desirable qualities of beliefs such as justification, truth, coherence, and foundation by using the methods such as causality, evidence-gathering, and assigning these beliefs with necessary attributes (Morton 1997). These issues are interesting from the lens of the historical precursor to present perception of knowledge in organizational science and relevant as grounding concepts. However, they are not crucial for the practical use of knowledge in an organization.

In organizational knowledge science, there had been numerous attempts to provide a universal definition of knowledge. However, none of them had been accepted widely by the research community. This dilemma of bestowing a universal definition of knowledge can be attributed to the dynamic and highly subjective nature of knowledge. Some of the definitions stated below show the vast differences in the understanding of the perception of knowledge.

Knowledge Definition

Hassell (2007) argues that organizational knowledge science is set on a shaky epistemological ground, that is why it is facing difficulty in defining the concept of knowledge. The problem transpires from the fact that knowledge such as "know-how," which is of immense importance in organizational knowledge science are not of concern in epistemology. Epistemology focuses on propositional knowledge and covers all fields of study where truth is knowable or even possibly unknowable from the perspective of the nature, source, and extent of knowledge (Klein 1998), and unlike organizational science utterly indifferent to the economic value of knowledge. In organizational science, on the contrary, it is considered a factor generated by economic agents through a rational optimizing behavior (Langlois 2001). Moreover, epistemology's emphasis is on the generation of knowledge by an individual, and personal knowledge. Organizational science, however, is preoccupied with the capture, collection, creation, utilization, and sharing of knowledge in a collective context (Aarons et al. 2006).

In the organizational context, knowledge is defined as "a fluid mix of framed experiences, values, contextual information, and expert insight that proves a framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knowers. It often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms" (Davenport and Prusak 1998, p. 5). In a stark contrast from the epistemological view of "Justified True Belief," this definition assumes that knowledge is a tool, a system, a mechanism, and a product that is used for perceiving the environment and engaging in practical activities. However, this seemingly elaborate and all-encompassing definition still has rooms for criticism.

Butler (2006) pointed out that although this definition seems to cover virtually everything and can claim to be nearer to a universal definition, a closer inspection shows visible cracks in its foundation. According to his social constructivist perspective, knowledge cannot be ingrained in files, databases, and repositories or any of the organizational silos because knowledge cannot be separated from knowers and objectified. In his opinion, the aspects of knowledge that needed to be considered are (1) socially and experientially constructed knowledge is a phenomenon of concurrent existence in society and an individual. (2) its nature is contextually and content-wise particular to a group and the members of the group, those who hold the mental representation of it. On the other spectrum, the positivists will also contend and disagree with the idea that "knowledge originates and applied in the minds of knowers (Davenport and Prusak 1998, p. 5)." According to this view, knowledge can exist independent of the human mind, and it can be applied without the intervention of the originator of knowledge (Kabir and Carayannis 2013). From an organizational perspective, knowledge is cognitive sense-perceptions and observations (Rasmussen 1983) which are structured, stored, and ingrained in a context. Organizations and individuals employ it to evaluate and interpret environmental situations, and react, act and resolve various issues according to the internal and external environmental stimulants through experience, thought process and communication (Maier 2007). Knowledge in this context is an outcome of cognitive processing instigated by the impact of new stimuli (Alavi and Leidner 2001) where organizational members can be regarded as a knowledge repository.

Definition linking knowledge with information found widespread popularity in organizational science as well. For example, knowledge consists of relevant and actionable information founded at least partially on experience (Leonard and Sensiper 1998). It is related to humans and gets created from information flow based on the knower's commitment and beliefs (Nonaka and Takeuchi 1995). It is verified, assessed, and codified information (Earl 1994).

Data—Information—Knowledge

In the organizational context, a popular conceptualization in defining the elements representing content depicts the relation between data, information, and knowledge as a hierarchical continuum (Stenmark 2002; Meadow and Yuan 1997; Rowley 2007). In this understanding, data is the crude form and basic foundational building block of information, information is data with semantics, and knowledge embodies information with experience, insights, expertise that is used in the decision-making process (Zins 2007). Knowledge in this sequence is the final product based on data and information as inputs (Rowley 2007).

Without knowledge, data and information remain uninterpretable and useless. Knowledge is not just the final manifestation of the data and information; it is also the binding agent for producing new knowledge from the prior raw levels. Human mind and technologies are the catalysts in this linear process of conversation. Technology often is a tool that facilitates people to communicate, aggregate, transfer, share, and store data. Data is used with various decision support systems, analytical systems, and expert systems to convert to information in preparation to work in actions and decision-makings.

From the perspective of human knowing the process is more complicated, and despite extensive research remains opaque. Piaget (2013), for example, in his constructivism theory, considers that information is presented in the human mind in the form of a specific dataset, which he calls schemata. Through, the processes of assimilation—aggregation of information to existing internal mental representation and accommodation—the transformation of the schemata by adopting new information, knowledge is manifested in the human mind. Knowing, as a result, is not a mere process of data collection, storage, and transformation but a highly complex mental process of information curation and creation. The growth of knowledge through knowing thus is incremental with continuous evolvement (Piaget 1976).

Data-information-knowledge hierarchy (Tuomi 1999) from the beginning of the emergence of information technology has been receiving particular attention.

From an information technology perspective, Knowledge is a hierarchically higher-level entity than data and information (Stewart 1997), and it is considered as a set of meaningful information (Nonaka and Takeuchi 1995). How the meaning is obtained, how the information is processed to become knowledge and what portion of information constitutes added value that makes information knowledge is interpreted by cognitive analysis. It means there are two different approaches to defining knowledge in this manner. The first one is the hierarchic structure of data, information, and knowledge (DIK) which has been accepted as the de facto model in the information technology literature (Rowley 2007) and the second one is the knowing process that converts information to knowledge (Shin et al. 2005).

The clarification and conceptualization of what data, information, and knowledge are, their relative concatenation and useful contextual application of their hierarchy are an ongoing process and still a topic of further debate. The most contentious of them is still knowledge.

Not too long ago, knowledge was considered as personal and embodied in human, but now we accept the fact that knowledge dwells in multiple places of a firm (Levitt and March 1988; Walsh and Ungson 1991). For example, Walsh and Ungson (1991) denoted that five knowledge repositories exist in organizations: (a) workers and stakeholders, (b) roles and organizational structures, (c) organizational routines, (d) culture of the organization, and (e) the physical structure of the business. It is an example of the dynamic understanding of knowledge and how the perception of knowledge evolves. Of course, some scholars vehemently oppose this stand and claim that knowledge is and will always be inherently personal (Cook and Brown 1999).

Lacking any universal definition of knowledge, scholars are circumventing this issue by successfully developing a working definition of knowledge suitable for the task at hand and relevant to their distinct subject matter. We define knowledge as contextual, relevant, and actionable information (Kabir and Carayannis 2013). It can be embodied by individuals, groups, networks, and firms and it can also reside in systems, products, processes, structures, and other organizational silos (Cepeda-Carrión 2006).

Knowledge Classification

The importance of knowledge as a primary production resource, a value-added product and a vital element in entrepreneurial activities is a new phenomenon. Society, government, and businesses are still struggling to figure out the questions what are the actual effects of knowledge, which type of knowledge is most critical for a particular business, where this knowledge is located and how to extract, assimilate, and use this knowledge. Without a clearer understanding of the concept of knowledge, this task becomes difficult to comprehend and manage.

Polanyi's (1962) concept and classification of tacit and explicit knowing act as the theoretical foundation for many later scholarly works in organizational science. His concept of knowledge postulates that logical and empirical approach solely is incapable of producing genuine knowledge as rules, and empirical analyses alone can't explain scientific discoveries, knowing by nature is personal, and explicit and tacit knowings are inherently intertwined (Sveiby 1997).

Two fundamentally different types of knowledge exist. Explicit knowledge is the knowledge that is explicable and can be expressed using language and other symbols, and tacit knowledge is difficult or impossible to express. Most essential and personal knowledge is tacit. Nonverbal and pre-verbal knowledge, which is overlying and superimposed on explicit, is tacit knowledge. It also includes somatic skills. In the learning process and acquiring skills, tacit knowledge is critical and fundamental. However, in any knowledge body, the amount and ratio of tacit and explicit vary (Polanyi 1962).

Knowledge has the characteristics of a public good as it is non-rival and non-excludable over time. However, it also possesses several interesting traits, unlike many other public goods. Access to knowledge does not always translate to its use. In order to apply knowledge, users must have enough absorptive capacity to integrate it into their base knowledge. For its practical use, users also need to have a goal, awareness about the existence of the required knowledge, and the ability to discern and extract knowledge from a vast amount of available information.

In many cases, from the sharing and transferring knowledge, its value gets extended, and there is no limit to its expansion capability. This expansible ability of knowledge lies at the core of the expression attributed to Newton when he penned the words “standing on the shoulders of giants.” Patent citations and research citations are the examples of such type of knowledge expansion.

Knowledge is also a producer of a positive externality—from knowledge transfer not only the party involved in the market transaction benefits; many others also gain from its exchange. Knowledge spillovers effects are the direct outcome of such externalities.

If all knowledge inherently conceives the properties of a public good, there will be little incentives for companies to produce new knowledge more than their immediate necessity. It is one of the main reasons why Intellectual Capital (IC) calls for some protection. Valuable new knowledge in the form of IC receives protection through patents, copyrights, mutual agreements, nondisclosures and even guarded trade secrets. Such economic measures as royalty, subscription fee, and commissions control its distribution process.

The property of knowledge—non-excludability—implies only in sporadic cases knowledge leakage does not take place. Often, arguably, Coca-Cola’s recipe is given as an example of knowledge that managed to stay inaccessible for a substantial period. However, with today’s technology to reverse engineering a recipe of a soft drink is not that difficult. While in the early days of market penetration for Coca-Cola to keep its recipe clandestine was crucial, now the company's real strength lies in its brand name, production, marketing and distribution capabilities, and its ubiquitous presence rather than its secretive recipe. It means that the best way of sustaining competitive advantage is not just by imposing more restrictions but continuing expanding market through innovation and new knowledge creation.

Not all knowledge is easy to transfer or convert into explicit knowledge. In many cases, the absorptive capacity required for assimilating knowledge to the base knowledge is a critical combination of tacit knowledge in the form of experiential knowledge and know-how, and adequate level of technology along with explicit knowledge. This complex transferable capability allows companies to impose economic rent on their valuable knowledge while diffusing.

Knowledge in Business and Entrepreneurship

The importance of knowledge in the economy as a production resource and the concept of organizational knowledge derived from the works of Hayek (1945), Penrose (1959), and Arrow (1962). Drucker (1966, 1968), for example, introduced the notion of a knowledge worker and a few years later knowledge society. Others have propagated the importance of knowledge from an economic perspective (Machlup 1962). These works have created the required ground for positioning of knowledge as an organizational resource vital for starting ventures, accelerating innovation, and creating competitive advantage.

Knowledge is also a valuable strategic resource in any company (Zack 1999). A superior knowledge base helps the firm to exploit available resources far better than competitors. Organizations can build and sustain superior performance if they develop better capabilities to aggregate, curate, use, and disseminate knowledge. Context-specific tacit knowledge gained from experiences and use of knowledge ingrained in the organization's people, process, and practices contribute to the sustainability of the competitiveness. This type of knowledge is unique and challenging for competitors to emulate. In the present knowledge economy, any firm if it is not even from the knowledge-based industry must prioritize its knowledge use to improve its ability to compete in the marketplace. Better ability to extract knowledge from external sources, embed it in knowledge-related processes along with the internal knowledge and apply it for the development of new products bolster a company's competitiveness. In this respect, explicit and tacit knowledge complement each other. The synergistic interaction of these two kinds of knowledge causes knowledge conversation which in turn creates new knowledge (Nonaka and Takeuchi 1995).

Tacit Knowledge

Innovation and development of core capabilities both require the use of in-depth knowledge that human talents possess. Codification and externalization of tacit knowledge bring efficiency to sharing, transferring, and utilization of this knowledge (Ambrosini and Bowman 2001). Tacit knowledge, which is embodied, intimate and subjective, and represented through our cognitive abilities, physical experience, perception, somatic skills, mental aptitude, and sense-making, is also instrumental in the creation of new knowledge. Tacit knowledge is also inherently difficult to delineate clearly, construe and formalize due to its fuzzy nature (Reed and De Filippi 1990). However, many types of knowledge which were considered tacit have become entirely explicable thanks to the advances in technologies, and the trend is continuing thanks to machine learning and AI (Kabir 2012) (Fig. 5.1).

Tacit Knowledge Confusion The confusion about the tacit knowledge transformation stems from two generalized beliefs: all knowledge is inherently personal and most crucial tacit knowledge can be transferred only with the help of socialization (Inkpen and Dinur 1998). The first assumption finds its root in historical epistemic ideologies and the second one transpires from overly simplified but archaic vision of knowledge domain. Until the advent of the knowledge economy, the epistemological perception of knowledge being personal was probably justifiable. When organizations started to realize the economic value of knowledge then only knowledge residing in various organizational silos including technology, machines, processes, structures and systems, and collective knowledge became vital for them. This newly found value of knowledge, the faster growth of knowledge and rapid advances in technology changed the way the society perceives knowledge. The need for

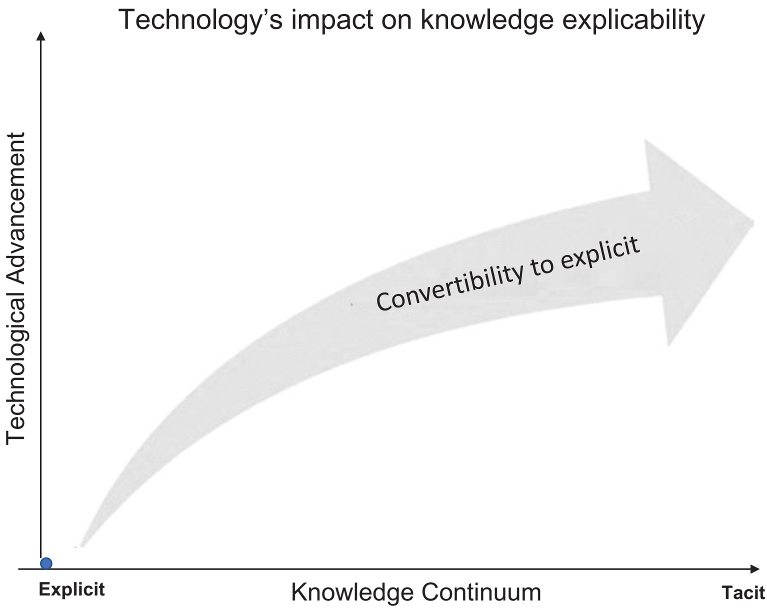

Fig. 5.1 Technology makes tacit knowledge more explicable (Adapted from Kabir 2012)

knowledge is becoming so vast, and the domains of expertise are getting so narrow that it is now impossible for a single person to possess enough knowledge for performing increasingly sophisticated and knowledge-demanding tasks.

Meanwhile, machines are becoming more advanced in doing cognitive works, which were only several years ago considered as the domains of human experts. For example, eDiscovery programs are already doing a better job than the law clerks in many cases (Yang et al. 2017) and finding insights from Big Data is inconceivable without the help of machine learning technologies (Lohr 2012). Knowledge is highly context-dependent, subjective and shifting concept, especially, its tacit part. Our perception and approach toward it will continuously evolve as more intelligent programs will work with progressively complex knowledge tasks.

Organization and Knowledge

The resource-based view of the firm Strategy management research is duly concerned about the factors behind the performance difference between the firms (Grant 1991). The Resource-Based Views (RBV) address this strategic question by offering a theory. It suggests that resources with some unique characteristics owned by the firm are the foundation of a firm's better performance compared to its competitors (see Penrose 1980; Wernerfelt 1984; Barney 1991).

As products and services originate from available to organization resources which ultimately explain its performance, resources should be significant focus elements in understanding a firm's capabilities of creating superior competitiveness (Wernerfelt 1984). The growth and direction of a firm are dictated by the resources it owns and knowledge, skills, and competence that it has developed over time (Penrose 1959). RBV thus postulates that "organizational resources that are valuable, rare, difficult to imitate and non-substitutable can yield sustained competitive advantage" (Meyer 1991). Unique Knowledge possessed by an organization is one of the resources that fit into this category. Hence managing knowledge is of utmost importance for a firm's survival in the present economy (Nelson and Winter 1982). Moreover, knowledge is undoubtedly one of the most salient of these resources. To deliver sustainable value from the use of knowledge requires managing efficiently a complex set of knowledge-related activities that the organization controls.

Knowledge-based view of the firm Knowledge-based view (KBV) of the firm, which is an offshoot of RBV, claims that a firm's ability to capture, integrate, assimilate, combine, create, diffuse, and maintain knowledge explains its market position and success (Conner and Prahalad 1996; Kogut and Zander 1993). Organizations depend on knowledge resources more and more, which have particular characteristics and demand a strategic focus on aspects such as the development of competencies, organizational learning, and management of tacit and explicit knowledge (Curado and Bontis 2006).

Arrow (1962) indicated that R&D is primarily engaged in the creation of knowledge, and the invention is risky because information as an output can never be predetermined from its input. A firm's performance depends on the knowledge resource it owns and skills, capabilities, and competencies that it has developed in successfully leveraging the resource. Thus, managing organizational knowledge flow and knowledge activities are imperative for any firm (e.g., Lee and Choi 2003; Gold).

The Uniqueness of Knowledge as Production Input

In the production method of prior economic stages where land, labor, and capital were main input, the output product had a limit to which extent the marginal value will increase over the aggregated cost of all inputs. For knowledge as the primary resource input, things are different. As quantifying knowledge input is somewhat tricky, the output product's value would depend instead on market acceptance which can be substantially higher than the combined cost of all inputs.

The second interesting fact is many knowledge products once developed they can be replicated and gain economy of scales for minimum cost.

Knowledge Strategy

The critical areas that a business needs to explore while formulating any strategy are the competitive landscape, company value proposition, resources and capabilities, long- and short-term goals, and core competencies (Grant 2016). The question that the strategy tries to answer is how the firm can gain and sustain competitive advantage (Porter 1980). A segment of this broader strategy coverage is knowledge strategy that demands clear understandings of knowledge need to compete at existing and future market, and knowledge gap—the missing knowledge crucial for success. Recognizing and identifying knowledge that is required but missing actuates from goals that firm is trying to achieve through its knowledge strategy (Kim et al. 2003). The focus of the knowledge strategy and the type of approach the firm selects mostly depend on it.

Success of Knowledge Use A knowledge strategy has to recognize and create access to knowledge and build human capital needed for the strategy to work successfully (Hansen et al. 1999). As a progressively ever-larger share of these resources is located on the outside of the firm, where precisely these resources reside and how to tap into those resources are critical. Successful Discovery and Integration of these resources and eventual incorporation through collaboration, distribution, and production have an impact on the creation of real value from knowledge use (Hagel et al. 2010). Because the required knowledge is also increasingly becoming esoteric, profound and complex, without having a rich knowledge base, high absorptive capacity, and strong motivation organizations will not be able to take advantage of the available knowledge (Cohen and Levinthal 1990; Zahra and George 2002). Companies must nurture and upgrade the complex set of skills, expertise, and technologies compulsory for this continuously because once lost these attributes are difficult to cultivate again. These problems compel firms to ponder about what should be its current strategy of knowledge. Should it focus on the codification of knowledge from diverse sources and provide access to this explicit knowledge to the employees or it should emphasize on tacit knowledge available within the firm and exploit this knowledge more efficiently for achieving the set goals (Hansen et al. 1999; Xie 2009).

Knowledge Audit Before opting for a specific knowledge strategy, companies have to assess their knowledge resource by performing a knowledge audit. The audit should disclose the firm's right knowledge base of both explicit and tacit types, knowledge created by the company, knowledge acquired from external sources, users of particular knowledge, the usage frequency of specific knowledge, knowledge need for each task, routine, process, and activity. It will also show where and in which form the knowledge is stored. The analysis of this audit will determine whether critical knowledge for achieving company objectives and conducting the activities necessary for that are available to the firm. It also has to recognize the sources of necessary missing knowledge and find barriers to knowledge integration from internal and external sources.

The firm has to cover all key areas to map its knowledge and determine if there is any gap between what knowledge already exists within the firm and what knowledge it needs. These areas include market knowledge, human capital knowledge, knowledge of the company structure and intellectual properties (Brooking 1999). Armed with this information a company can evaluate its strategy requirement and methods and processes that the firm needs to focus on to achieve its set objectives pertaining knowledge.

If clear knowledge gaps are identified, the firm has to take the exploration approach of acquiring the needed knowledge from various sources, assimilate with existing knowledge and if necessary, create new knowledge (Zack 1999). Exploration is one of the two knowledge-related strategies in the implementation of innovation (March 1991). If the knowledge audit showed that the firm possesses knowledge that can be refined, improved, or recreated and conceive an innovation, it opts for the exploitation strategy (Toni et al. 2011).

Codification and Personalization Hansen et al. (1999) identified two approaches related to knowledge strategy: codification and personalization. Codification refers to the transformation of knowledge such as tacit knowledge to a format which will allow to transfer and share knowledge. The goals of this approach are the followings. (1) To transfer all available and valuable information, except the one of highly sensitive nature, in codified form, store in repositories that are accessible for further use and dissemination. (2) To work closely with the experts to retrieve expert knowledge and codify, and (3) to use technologies to augment and create new knowledge. The advantage of this strategy is organizations reduce the reinventing the wheel syndrome and experts' time gets freed for a more productive venture. When access to knowledge becomes more general, the organization can also streamline business processes and free resources. The other benefit of codification is that it allows knowledge chunking where modules of knowledge can be combined and recombined for new knowledge creation (Cohendet and Steinmueller 2000).

However, overdependence on readily available knowledge may have a damaging effect such as the tendency to use available knowledge as opposed to creating new, lack of timely update of knowledge can have its adverse impact, and lack of personal focus may increase attrition.

Personalization strategy values tacit knowledge more. Organizations adopting this approach emphasize importance on the critical role human capital plays (Moitra and Kumar 2007). This strategy deems that tacit knowledge that workers embody should be transferred with the help of socialization, i.e., person to person meetings, brainstorming, mentoring, and apprenticeship (Lave et al. 1991). Companies that adhere to this strategy are focused on human resources where how to hire and retain talents is the critical issue. The information system in use is targeted to deliver a social platform like communities of practice, where people can communicate and socialize online as an extension to offline contacts and provide information about who knows what. The biggest drawback of this strategy is a sudden loss of critical talents can be devastating for the organization.

Personalization approach, according to Hansen et al. (1999) is unavoidable if the firm caters individual customers with tailored knowledge products or services based on tacit knowledge of a particular person or a group. Codification strategy, they concluded should be the preferable choice if the company deals in generic knowledge products and services, with standardized business processes and procedures which can be modified in accordance with the needs of the customer. They advanced the idea that whatever the primary strategy the ratio between the two approaches should be 80–20%. Mukherji (2005) proposed that companies in sectors such as software industry would be better off if they try to keep a balance between the two approaches.

Application of codification strategy compels the company to make a technology-oriented cultural shift, adopt new processes, routines and procedures, and allocate substantial capital. It can be initially painstaking but once deployed this strategy is capable of bringing substantial benefits. For example, once the knowledge of an expert is codified, it will stay in the repository for others to access and use. The loss of knowledge due to retirement or attrition will be diminished, and importantly, the firm will have a more explicit awareness of existing in the organization knowledge.

Even in recent years, the biggest stumbling block of codification strategy was the necessity of converting all types of data to structured format to integrate to knowledge base and repositories. The use of AI technologies eliminates or reduces problems such as information overload, data reuse, unstructured data, and critical knowledge loss as they have the capability of interconnecting heterogeneous data format from diverse sources and extract the required information from there.

Entrepreneurship and Knowledge

For entrepreneurs, knowledge factor is an important determinant that influences their decisions to start a business. It also effects on the performance of the company, mainly, if the business is knowledge-based (Van Praag and Cramer 2001).

With faster communication services and cheaper repositories, Information has become easy to transmit and store. It made the proliferation of explicit knowledge, its dissemination and exchange faster. However, we cannot say the same about tacit knowledge. Tacit knowledge, which is difficult to codify and often uncertain and subjective, is the source of creative ideas where social interaction, human capital, and face-to-face contacts are necessary. Many innovative ideas that translated into entrepreneurial endeavors are the results of chance encounters of founders in social settings. Conversion of creative ideas to the meaningful outcome is also context-dependent and requires access to right resources.

For entrepreneurs having a solid command of the subject field knowledge and access to the latest knowledge also indirectly help them through self-efficacy. Self-efficacy is the confidence that an individual has and her belief in her ability to pursue entrepreneurial and career-related goals (Bandura 1978). The subject matter knowledge an entrepreneur holds stems from her formal and informal education and training, work experience, and exposure to current knowledge. The exposure to external knowledge that others hold is also crucial for aspiring entrepreneurs. Entrepreneurship is a complex undertaking. It is impossible for one person or even a team to have adequate knowledge of all relevant areas to absorb, assess, and integrate into the decision-making process with a favorable outcome. Hence, they must depend on external sources such as experts, consultants, suppliers and offline and only market, technology- and industry-related knowledge resources. That is why networking plays a huge role in entrepreneurial success as it is often a valuable supplier of critical knowledge for entrepreneurs (Moensted 2010).

In knowledge-based business, knowledge is often the means of production. As a production resource, it can be intellectual capital in the form of patents, codes, embedded knowledge in technical, operational and production processes and human capital as employees, partners, consultants, and service supports. While not all, but the majority of knowledge-based enterprises are technology-related and technology-induced. Founders of these companies are usually high-skilled, educated, and well-versed in technical and scientific matters relevant to their areas of expertise. In most cases, their entrepreneurial ideas are conceived from the knowledge body of the same sectors where they worked.

Innovation spills from larger corporations, universities, and government institutes through employees are a sustainable source of knowledge behind many new enterprises. Some of these employees are engineers, scientists, and technology experts who consider that their ideas will have better utilization from a practical perspective through new entrepreneurial ventures. Knowledge spillover theory, as mentioned before, explains that under-appreciated or recombined knowledge that did not find economic value in the incumbent organization seeps through and becomes a source of entrepreneurial opportunities (Acs et al. 2013).

Knowledge leakage from an organization takes place in many ways: through informal communication of the workers with their external networks, via collaboration and cooperation with other parties, and along with the information the company must divulge to the market and customers while securing a sale (Hippel Von 1988). According to some studies, information related to company innovation percolates to competitors within six months and enough technical details within a year (Mansfield 1985).

Conclusion

In the knowledge economy, the unique position of knowledge is accelerating the proliferation of knowledge-based entrepreneurship worldwide. The continuous innovation in the technology field and the emergence of new and advanced technologies are producing new opportunities in knowledge sectors. Entrepreneurs are taking advantage of the new knowledge that is getting generated in the process in innovative ways and starting up companies that are quickly becoming formidable forces. Expectations from the promising technologies are even higher, and we will soon observe that knowledge-based small companies have started to play a prominent role even in developing economies. Social sectors will also go through a significant transformation once innovative knowledge-based enterprises start to make inroad in solving pressing social challenges in a significant way.

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CHAPTER 6

Innovation

Introduction

Ever since Schumpeter (1934) introduced the concept of innovation as the catalyst for change in the economy, it has been widely studied in many disciplines. With faster technological advancement and extreme competition, lately, it has evolved even more into a subject of intense interest for individuals, corporations, and governments. Because of the wide diversity of the group that is involved in the study of innovation, the perception of what constitutes innovation also differs significantly. Innovation is associated with the introduction or a new combination of the essential factors of production into the production system (Chen et al. 2004). It encapsulates the technical, physical, and knowledge-based activities that are central to the formation of product development routines (Cardinal et al. 2001). Innovation is deemed as both a process of the creation and an introduction of a new idea, method, and device (Gopalakrishnan and Damanpour 1994).

Over the years, innovation has been scrutinized through a myriad of theoretical perspectives in efforts to define, clarify, and perceive it. It had been regarded as a serendipitous (Porter and Stern 2001) as well as a rational and purposeful phenomenon (Nelson and Winter 1982). It is a process wherein knowledge is captured, shared, and aggregated with the further objective of creating new knowledge which gets embedded in products and services (Harkema 2003). Stressing on change,

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Drucker (2014) asserted innovation is a change that builds a new performance dimension. On the other hand, claims have been made that defining innovation by change alone lessens the value of the concept making it narrower and it is necessary to differentiate innovation with the notion of organizational change very clearly (King and Anderson 2002). However, there is no doubt that innovation entails change, and entrepreneurs are quintessential changemakers. Based on entrepreneurs' vision, goal, strategy, resources, capabilities, and intention, they focus on the kind of innovation they need. Searching for change is an integral part of this quest.

Schumpeter (1934) introducing the concept of innovation weighted heavily on the novelty factor. He penned innovation is the debut of a new product, a new production method, a penetration into a new market, finding a new sourcing option, and creating a new enterprise. Later the idea has been broadened and elaborated with the concept that it does not have to be a new thing, it can be new to the unit which is implementing it (King and Anderson 2002). It can even be an imitation as long as it is new to the adopting firm (Van de Ven 1986). In many organizations, the relative newness of innovation in the processes and outcomes has overshadowed the notion of complete newness (West 2002). Others have treated invention as the primary cause of innovation. Invention while is not innovation it is still an essential factor behind many innovations (Amabile 1983). Generating new and useful ideas in any field is an innovation (Amabile 1996); however, it has to be actionable and successful in the market (Twiss 1992). Without the distribution of the product or service and their adoption by users, economic value creation from it will not be possible. From this angle, innovation is also distinguished as diffusion and adoption (Kimberly and Evanisko 1981).

We can perceive innovation better by its following characteristics (King and West 1987):

- Innovation is tangible. It can be an organizational product, process, or procedure.
- An idea is a small beginning of the innovation and cannot be considered an innovation by itself.
- Innovation ought to be new to the entity that introduces it. It does not matter if for the individual who conceived the idea it is not entirely new.
- Innovation has to be premeditated and cannot be unintentional.

Innovation may be difficult to define, but for entrepreneurs in the knowledge economy it is crucial and even lifeblood for their ventures' growth and survival (Zahra and Covin 1994).

We agree with Damanpour's (1991) definition where he declared, "Innovation is a creation and implementation or adoption of a new or modified process, product, service, or strategy which produces social or economic value".

Innovation Spectrum

These definitions of innovation illustrate that there are two distinct standpoints in viewing innovation: innovation as a process and innovation as an outcome (Van de Ven 1986). Innovation as a process is seen as a process of generating new problem-solving ideas (Dosi 1982), a diversified learning process (Rosenberg and Nathan 1982), a process of interaction between stakeholders (Kline and Rosenberg 1986), and a knowledge transformation process from tacit to explicit and vice versa (Patel and Pavitt 1994). When innovation is perceived as a process, it facilitates observing, studying, and analyzing the constituent parts of the innovation (Greve and Taylor 2000).

Several innovation process models exist in the literature. For example, the innovation process is regarded as a concatenation of three phases: emergence, growth, and maturity (Howard and Guile 1992). A number of stages: invention, development, realization, and distribution (Maidique 1980) and from application perspective as development, design, and use (Niosi 1999). A generic approach separates the innovation process in three distinct steps: idea generation, development, and commercialization (Kamal 2006). These steps demonstrate innovation as a process is quite similar to the entrepreneurship process. From innovator's perspective on a need to create the process of innovation covers three phases which are generation, acceptance, and implementation (Aiken and Hage 1971). More granular and broader stages include creation, generation, implementation, development, and adoption (Baregheh et al. 2009). As a process, it starts with the generation of new ideas, continues with the development of the new product, process, or service, and completes with the phase of an implementation of the outcome. Although the process seems linear, it is a phenomenon characterized by convergence and divergence from various departments, stakeholders, and management of an organization (Van de Ven et al. 2007). At every step of this process, it requires a foundational knowledge base, knowledge acquisition, and aggregation along with clear strategic vision (Xu et al. 2010).

Innovation as an outcome exemplifies in a new idea (Von Hippel and Finkelstein 1979) a combination (Leiponen 2006), a recombination (Amburgey et al. 1990), a solution (Shelton 2009), a product (Roberts 1999), a process (Davenport 2013), a strategy (Johnston and Bate 2013), and a business model (Chesbrough 2006). The objective of the innovation outcome is to introduce new products or services to the market and make an economic gain. If the innovation's outcome is a new or improved process, the goal is to increase productivity or reduce cost by optimization of the business routines, processes, and procedures (Greve and Taylor 2000).

Increased complexity of the innovation and market demand for faster implementation force companies to seek knowledge from external sources by hiring new talents and through knowledge partnerships that include mergers and acquisitions, alliances and outsourcing (Powell et al. 1996). Better knowledge flow, knowledge sharing, and transfer within various departments of the organization and with multifarious external agents create opportunities of new knowledge generation and recombination which is the precursor to innovation (Inkpen 1996). Moreover, innovation is also a tool for entrepreneurs to create and exploit new opportunities that derive from market and technology knowledge combining with the entrepreneurial vision (Drucker 2014).

Innovation Forms

Innovation has been categorized under various forms. One typology includes seven forms, which are a product, process, organizational, management, production, commercial/marketing, and service innovation (Trott 2008). However, it seems some of them are redundant and can be organized under one type. For example, production and marketing are both process innovation. Organizational and management could be either strategy or process innovation depending on the innovation context. Tidd et al. (2005) offered a slightly different model that includes product, process, position, which is market focus shift, and paradigm, which is the firm's operational change. Again, both change of market focus and operational changes could be considered as business model innovations which can very well fall under the category of strategy innovation (Johnston and Bate 2013). Four areas of the firm where innovation takes place are product, process, services, and strategies and forms of innovation can be designated along these areas (Utterback and Abernathy 1975).

Product Innovation Product innovation is the most likely form of innovation because of the clear visibility of the changes that are deployed. Generally, it is the case in the consumer products area. Product innovation covers the novelty of the product itself, improvement of its performance dimensions, and its design and aesthetics.

The need for product innovation has lately intensified due to the following challenges that companies are facing: continuous pressure for cost reduction, shortening of the product lifecycle, increased competition, globalization of markets and supply chain, faster commoditization of products, and increased product complexities (Brown 2005). Success in developing new products requires in-depth knowledge of technology trend, market audience, a method of distribution, and customers' applications (Urban and von Hippel 1988).

New product development is directly responsible for the market success of entrepreneurs in technology sectors (Maidique and Zirger 1984). It is also recognized as an engine of the firm's renewal (Dougherty 1992) and its market position (Floyd and Lane 2000). As new product development modifies the resource configuration of the firm, it can be seen as a dynamic capability (Eisenhardt and Martin 2000). Moreover, entrepreneurial ventures often compete in the marketplace focusing on the development of a new product (Brown and Eisenhardt 1995). Entrepreneurs should take into consideration that if the new product innovation stems from their prior experience and knowledge, and expertise developed from years of practice, the product has a better chance of gaining market success.

Service Innovation While it is not always that evident, services are still the significant contributory portion of the economy in the developed world and a significant part in developing economies.

Services are a set of knowledge, skills, capacities, and competence that are provided to a customer as solutions to problems in the form of processes, performances, and contracts (Gadrey et al. 1995; Vargo and Lusch 2004). Innovations that bring novelty and refinement to these services are called service innovation. A good definition of the service innovation that encompasses service sector fairly well is: “A service innovation is a new service experience or service solution that consists of one or several of the following dimensions: new service concept, new customer interaction, new value system/business partners, new revenue model, new organizational or technological service delivery system” (Den Hertog et al. 2010). New business models, the proliferation of online services, and diversifying relationship with customers are attributes that impact service innovation more than any other (Snyder et al. 2016). Most social enterprises are service oriented, and they are more engaged in the development of service-related innovation.

Process Innovation A series of activities or operations that transform input into a specific outcome is called a process innovation. Process innovation is often referred to as streamlining or improving a process to reduce costs (Bonanno and Haworth 1998). An organization is full of processes such as product development to after-sales service and from performance management to resource allocation. Process innovation obligates to step back from the process itself and focus on the objective of the process (Davenport 2013). Process innovation can be both incremental and revolutionary. It may involve reducing steps, introducing new steps or even eliminating the process, and reintroducing of a new process.

The economic and market impact of product innovation is visible as it entails revenue growth and profit generation. Moreover, it contributes to the market shift. A process innovation, on the other hand, does not have any direct impact on the market, unless it is a market-related process. Its contribution to the firm’s performance exemplifies through improvements in various product dimensions, cost reduction, time saving, and faster investment turnover (Baer and Frese 2003).

There are two types of process innovation: technological process innovation and organizational process innovation (Edquist et al. 2001). Process innovation is targeted to either cost reduction or refinement and improvement of processes such as a production process (Wheelwright and Clark 1992). It is considered as the implementation of new technology such as capital machinery, processing machines, robotics, and ICT to improve a process or building capabilities and skills thanks to learning to do things differently (Reichstein and Salter 2006).

The infusion of innovation within the production process is referred to as technological process innovation which has three phases: discovery, development, and deployment (Hollen et al. 2013). At the discovery phase, new technology knowledge gets created or combined with external knowledge a new way of using existing technology knowledge is found. Development phase takes place when the discovered knowledge is utilized to build up scales for commercial production, and a trial is conducted. At the final phase of deployment, the actual production using the new technological process gets initiated (Lee et al. 2008).

Strategy Innovation As the business environment shifts, the need for strategy innovation becomes increasingly urgent for an enterprise. Social enterprises are often not so keen on working on strategy innovation because it requires a different set of skills and knowledge. However, it should be a priority today because of new possibilities that technology-led strategy innovation can bring.

Strategy innovation helps to identify new sources of opportunities. It aids new entrants to penetrate the market despite resource constraint and for incumbents to stay competitive (Hamel 1998). Strategy innovation is an expedient of new value creation for customers and opportunity exploitation for the organization. Business model innovation can be deemed as a type of strategy innovation (Teece 2010). Two methods of creating strategy innovation are: applying strategies that work in other industries but still not adopted in the industry yet and improving on the present strategy (Choi and Valikangas 2001). The result of the adoption of a new strategy is the creation of a new future by deviating from the predictable path (Johnston and Bate 2013).

Business model innovation is increasingly becoming a crucial factor in the era of rapid technological shift and globalization. In a 2006 study done by IBM, the majority of the participants accentuated on the importance of business model innovation for their continuous growth. The study also found that more successful companies overwhelmingly implement business model innovation (Pohle and Chapman 2006). Although innovation in business models is gaining much attention lately, according to Chesbrough (2010) it is quite challenging to develop and implement due to several issues. Among them, cultural change, structural and organizational process change, leadership, and path dependence are some critical impediments. However, strategy innovation is deeply related to other forms of innovation. Firm's business model, for example, evolves and it embraces new strategic options thanks to the development of new products and services (Schoonhoven et al. 1990).

Stages of Innovation from Historical Perspective

The concept of innovation itself is a process continuously evolving and went through several stages. The evaluation of the innovation process from the historical perspective was elaborately described by Rothwell (1994). The first-generation innovation process, which was based on the technological push, started in the early 1950s and lasted for around 15 years. The technology push theory of innovation postulates that scientific research and industrial R&D focused on the invention are the primary sources of innovation that get embodied in new or improved products. Innovation, in theory, is considered a linearly sequential phenomenon with progressive growth. The role of the marketplace in it is tiny, and attention to the change process is negligible (Carter and Williams 1957).

In the second generation, which is called market pull (Myers and Marquis 1969), the emphasis on market demand started to grow, and R&D ideas had been obtained predominantly from the market. This view originated in the 1960s due to the apparent limitation of the earlier technology push theory. The new theory proclaims that market demand should be the driving force for innovation where research is aimed at finding and developing solutions to problems posed by the market. Technological feasibility and the firm's capabilities are salient elements in this theory. This era lasted until the 1970s.

The third generation was characterized by the combination of market pull and technological push. This interactive model is also called the "Coupling" model (Mowery and Rosenberg 1979). In the coupling model, the core idea is innovation occurs thanks to the interaction and concurrent coupling between ideas and knowledge within three distinct functions of the firm which are R&D, production, and marketing (Rothwell 1992).

The fourth generation, thanks to IT-based manufacturing, emphasized on alliances and emerging notion of global strategy. It was the period of integration and parallel development and called parallel lines model (Kline and Rosenberg 1986). The model is also known as functionally integrated innovation model and characterized by the concept that innovation occurs when idea and knowledge from suppliers, customers, and partners integrate with functional activities and development processes of the organization. This integration process can be simultaneous and parallel. The model is based on interconnected links between the stakeholders of the entire innovation value chain and their interactive feedback loops (Galanakis 2006).

The fifth generation, which started in the 1980s, was marked by growing technology dependence, system integration, extensive networking (Tidd et al. 2005), development of platforms, focus on the quality of products, and speed to market. The most important strategic change in this period and which has become even more intense in the present century was the introduction pace of products and services. Companies, especially, in technology-dependent sectors, facing global competition were forced to accelerate the innovation cycle and product outcome. Dubbed as chain-link theory, it is realized that the connection between the technology, knowledge, and market is not entirely evident and has produced this new theory of innovation. Chain-link theory observes that innovation value chain starting from ideation to sales is more integrated than previously thought, and each stage is a breeding ground of new possibilities and entrepreneurial opportunities (Kline and Rosenberg 1986).

Innovation Value Chain

While numerous models that divide the innovation process into various stages are available as stated above, Birkinshaw and Hansen (2007) proposed value chain framework with a slight modification which covers from the beginning to the end of the entire chain.

It includes weakly interconnected three different stages of the innovation process: front-end innovation, conversion, and diffusion. Fuzzy front-end or front-end of innovation is the initial stage of the innovation process (Koen et al. 2001). It involves from the step when a decision to take an innovation initiative is operationalized to the idea portfolio completion steps. This stage is engaged in opportunity identification, analysis, and selection (Khurana and Rosenthal 1998).

Koen et al. (2001) proposed that to systematize the front-end process five mutually interconnected steps are necessary. It includes (1) opportunity identification, (2) opportunity analysis, (3) idea generation, (4) idea selection, and (5) concept and technology development (Fig. 6.1).

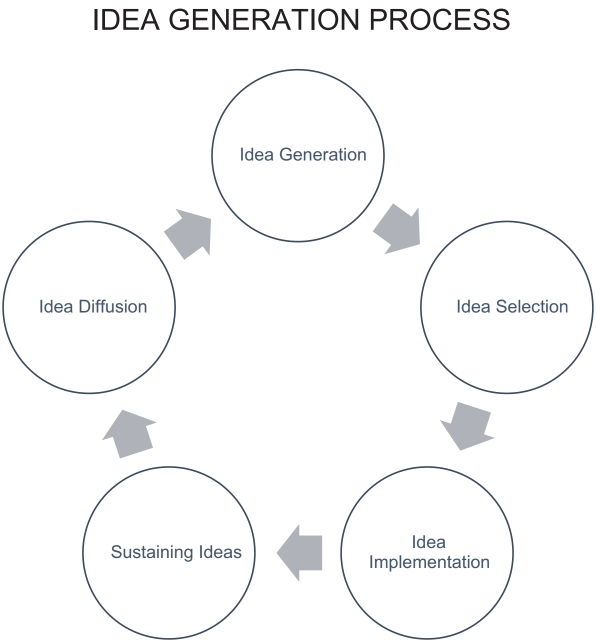

Fig. 6.1 Idea generation in opportunity finding

There are three ways to generate ideas in this framework: in-house—idea development within a unit; cross-pollination—collaborative idea generation among multiple units; and external—acquisition of ideas from external sources (Birkinshaw and Hansen 2007). Once ideas are garnered, they have to go through extensive analysis.

Factors that are valuable at the idea generation level include identifying the domain of interest, problems of interest, adjacent areas of interest, sources of interest, idea capturing tools, a method of idea selection, and the development of a portfolio of ideas and its management (e.g., Wooten and Ulrich 2015). The quantity of the idea developed at the idea generation makes a difference in the implementation of ideas. The more the ideas are generated, the more chances of some of these ideas to come to fruition.

However, quantity should not adulterate the quality threshold set for submitting ideas (Clegg et al. 2002). Screening eliminates the ideas that have low chances of success and might incur high costs (Desouza et al. 2009).

The ideas that have been selected also go through the refinement process to qualify for portfolio acceptance. The screening criteria should include the evaluation of ideas through the lens of both present business model and future possibilities.

When ideas are selected as concepts to work on, they end up in the innovation portfolio. Innovation portfolio contains information such as the origin of an idea, an idea generation-related event, matured concepts that are accepted for R&D, and their status. Innovation portfolio is the link between idea generation and product development. Innovation portfolio is very different from a project portfolio management (Mathews 2010). Like project and investment portfolios, innovation management portfolio is also a tool for risk mitigation (Bard et al. 1988) but it is more necessary for bringing clarity in the process of perfecting concepts. Moreover, it is adaptive and exploratory, unlike project management which is sequential and organized (Mathews 2010).

Once a concept is identified as a viable innovation project, the conversion stage starts. The conversion stage in new product development includes linear, iterative, and simultaneous steps of the design of the product, the creation of the product, prototype making, and commercial production (Adams et al. 2006). Nonaka and Takeuchi (1995) propose that R&D and production divisions should work closely and share knowledge from the initiation of an innovation project. That way, it will speed up the entire innovation process. Innovation projects are risky, the ideas that fuel them are often opaque in the beginning, and figuring out what might be the real outcome is difficult.

A company's R&D strategy gets defined by its corporate goals. The approach to R&D differs significantly depending on whether the organization emphasizes on increasing market share, opening new markets, compete with a rival on a specific product level, or creating a disruptive new product (Lowe 1995). A firm's innovation capital forms from its capability of developing creative ideas, R&D competence, producing new technology, products, and services that satisfy a market need (Chen et al. 2004).

Knowledge is the main force behind any R&D achievement. R&D capabilities evolve along with the access to new knowledge, combination, and recombination of new knowledge with the prior knowledge base. A presence of "strong knowledge" (Nelson 1982) propels the technological advancement faster. Lack of capabilities that bolster knowledge will forestall any possible innovation success even if a high market demand exists. The efforts will be futile without knowledge (Mowery and Rosenberg 1979). Nelson (1982) equalized R&D activities with a search. According to him, strong knowledge and the connection with externalities are necessary attributes for having a better ability to perform R&D search.

Stronger knowledge not only works as an enabler for better R&D outcome, but it also reduces the cost of any R&D product. R&D intensity of the firm shows its technological opportunity capturing capabilities and readiness of withstanding external threats (Phillips 1966).

The purpose of the diffusion phase is to gain economic value from the innovation (Kanter 1988). It is a well-recognized stage of the innovation process. A firm is a profit-making entity. All its innovation endeavors are targeted to create economic value. It is true for social enterprises as well. Social enterprises with the mission of tackling a social challenge and at the same time generating revenue must understand the importance of innovative methods in the commercialization process.

Diffusion of innovation is the commercialization of products or services by making a connection with the prospective audience through various conduits. There are five groups within the target audience. These are innovators, early adopters, early majority, late majority, and laggards. Much of the diffusion success depends on how innovators and early adopters are communicated (Rogers 2010; De Tarde 1903).

The diffusion curve demonstrates the progressing acceptance of an innovative product or service. First, the acceptance moderately grows until it reaches a tipping point. Once it crosses the point, the growth rate rises at a quicker pace. After touching its height, the acceptance level finally starts to taper off (Abrahamsson 1991). Developing competitiveness from innovation does not occur just from the new product or service. No doubt, ideation, R&D, and new product development are critical stages, but the most critical stage is still commercialization of the product. Innovation brings real value to the firm only when it uses innovation to improve productivity or earn revenues.

The Linear Model Approach and Its Problem

The evolutionary perspective of innovation underlines the linear process method of innovation. As stated above, it entails three stages: variation—the emergence of new products often in multiple manifestations; selection—the process of survival and emergence of the lead product;

and selection—the apparent dominance of the lead product (Garud et al. 2013).

The linear model (Kline and Rosenberg 1986) of innovation does not illustrate the actual nature of the innovation process. Innovation, unlike an experiment, does not transpire with the help of a predetermined script. The various asymmetric loops that correspond to each stage of an innovation process is rather complicated to grasp and systemize. A plethora of possibilities that appear at any of these loops makes impossible to determine which idea might work as a catalyst for a breakthrough. Like an invention, each small act of the innovation process can produce unpredicted outcomes which could transform into an unexpected and offbeat innovation. Because of this, we should not consider innovation as a distinct linear process.

The existence of a framework will not make a firm or an entrepreneur suddenly innovative. Innovation is a product of a confluence of events and knowledge which stir up one or several ideas, these ideas evolve into formulated concepts, and only from these concepts, the innovation spawns up. However, at each downstream stage, it becomes increasingly more possible to systematize the processes with predefined frameworks.

Levels of Innovation Analysis

There are three levels of innovation analysis: individual, group, and organizational. At the individual level, innovation is motivated by the natural explorative human mind (Nicholson and West 1988) and the need for a sense of safety (Maslow 1943) and these motivators essentially compel humans to take a risk and conduct experiments (Ford and Gioia 1995). When individuals are genuinely interested in a project and consider the work meaningful, and have substantial control and autonomy over the task, they become more inclined to innovate (Amabile 1983). Many successful entrepreneurial ventures start from an individual's creativity and willingness to pursue a project.

At the group or team level, the researches indicate that innovation emanates when the following criteria are present: job-relevant diversity that includes education, function, profession, knowledge, expertise, and skills (Milliken and Martins 1996). A team's background diversity refers to the presence of members with very different perspectives, approaches, and mind-set resulting from age, gender, and ethnic disparity (Webber and Donahue 2001). Other factors that most influence on the innovation proliferation are collaborative and democratic leadership, understanding and synergy between the members, group's length of existence—the younger, the better, and group adaptability (King and Anderson 1995).

At the organizational level, innovation occurs when the firm is risk-prone, market-oriented, aggressive, learning, problem solver, organized, and motivated (e.g., Amabile 1988). While for analysis, these three levels are separated, in reality, the boundary is somewhat arbitrary. To extrapolate a holistic understanding of the significance of the innovation for the firm, its attitude, and relationship toward innovation, and employee acceptance of innovation, it is necessary to combine the analyses of all three levels (Staw 1984).

Strategic Options of Innovation

Innovation strategy is an integral part of the organization's business strategy (Hamel 2000). Innovation strategy sets the goals and objectives of innovation and facilitates creating a plan of action to achieve those goals and developing innovation competencies (Hurley and Hult 1998).

An organization is a system with its various components and subsystems. For the organization to function, all its components need to work as per their expected roles. For an optimal outcome, not just these components need to perform seamlessly, but also they have to work in congruence with other components symbiotically. The higher this congruency between various components, the better the efficiency and effectiveness of the organization as a cohesive system (Tushman 1997). Innovation as an organizational subsystem is composed of various components of its own. Often in firms, the R&D department does not have any direct relationship with departments such as shipment and delivery unless they individually work on a combined project. As company resources and capabilities are limited, innovation strategy requires that these resources be used effectively (Grant 1991). Unfortunately, finding traction in different divisions is often tricky due to the organization's deeply rooted culture, individual idiosyncrasies, and lack of knowledge of possible common areas of interest. The innovation strategy has to bring far-flanged sections of the company on a common platform, develop needed innovation capability, and execute a well-thought-out tactical plan to achieve a fruitful result from the cross-pollination of ideas and resources. After all, firms do realize that effective implementation of innovation strategy facilitates performance improvement and curving out more significant market share (Han et al. 1998).

Innovation strategy is a set of policies, decisions, and action plan that indicate how the firm is planning to reach its innovation goals using available resources and capabilities. Steps need to determine an innovation strategy include analyzing competitive landscape, setting strategic objectives, formulating a strategic plan, implementation of the plan, assessing progress, and keeping overall control (Grant 2016). There are various internal and external factors of the organization that have an impact on the innovation capabilities of the company (Bate and Robert 2003). Strategies help to sort out what should be the firm's action, policies, and mechanism of interaction with these factors (Grant 1991). In a large company with multiple divisions, the strategy choice, their mix, and evolutionary path of strategy practice and knowledge growth may vary division to division (Perrow 1986; Scheepers et al. 2004).

Exploitation and Exploration Both individuals and organizations perform two sets of activities to achieve their innovation goals: exploration and exploitation (March 1991). Exploration is associated with environmental scanning in search of new knowledge, technology, market demand, relationships, and ideas for enhancing the firm's innovation capabilities and resources. Exploration strategy often takes longer to produce beneficial outcomes (Benner and Tushman 2003).

Exploitation, on the other hand, is identified with the activities related to the refinement of existing knowledge and capabilities. With better visibility, this strategy is characterized by a greater certainty, precise control, and limited change resulting in more immediate benefits (Amason et al. 2006). Entrepreneurs and firms need to engage in both exploitations, to create value from existing resources and exploration, to stay competitive and connected with the external environment (March 1991). As an entrepreneur's resources and capabilities are limited, she must act judiciously and make a concerted effort to come to the right choice and right strategy balance to maximize benefits from innovation. It is a challenging task to do for many reasons. Since exploitation is more specific and produces more immediate results, entrepreneurs and firms are more inclined to emphasize this strategy. Firms develop routines, processes, and procedures from the long-term and continuous engagement in exploitation. These structural factors are hard to change, and refocusing on exploration, even when the firm understands that a strategy change is in order for the survival of the firm, is tough. However, without exploration in time of radical market shift, firms become susceptible to failure (O'Reilly and Tushman 2013).

Two approaches exist to mitigate the dichotomy between these two strategies: ambidexterity (He and Wong 2004) and punctuated equilibrium (Romanelli and Tushman 1994). Ambidexterity assumes the concept of developing both exploration and exploitation capabilities simultaneously and paying attention to both all the time (Tushman and O'Reilly 1996). Exploitation focuses on improving present business through incremental innovation, operational capability, marginal productivity improvement, and bringing value to the market through quality improvement of product dimensions. Exploration, on the other hand, founded on the idea of focusing on disruptive innovation and growth from it. The core characteristics of exploration strategy are knowledge search from external sources, continuous experimentation, risk-proneness, and swiftness in decision making. Becoming equally adept in both is the strategic objective of the ambidexterity strategy (O'Reilly and Tushman 2013).

According to the punctuated equilibrium theory, organizational growth takes places alternating a more extended period of incremental change embodying convergence, and a short and saturated period of disruptions. As per this theory, exploitation which is characterized by incremental innovation should be firm's focus for an extended period of time, and then, there should be an intense but short shift to exploration. As a stimulant to this change will work external factors such as radical technology shift and change in the market environment and internal factor such as business model reorientation. The problem of this strategy is an ill-prepared company might find it hard to realign its resources and capabilities to exploration on time. The disruption can cause such technological discontinuities that it might make present organizational competence obsolete creating a threat to the existence of the company (Tushman and Romanelli 1985).

Innovation is uncertain, complex, and chaotic. It also needs an intricate network of a large number of stakeholders, where some are directly involved in the process of innovation and others have infrequent input in it. The innovation ecosystem consists of a diverse array of interconnected organizational features and functions covering its structure, management, culture, routines, processes, procedures, and planning. Moreover, the selection of the domain of the innovation, the types of opportunities the firm decides to focus, the ideas that might graduate to the concept level, and the resources required for the entire innovation process are complicated questions. Other issues are how the development of prototypes and production will take place and how the company plans to commercialize the innovations. All these questions require fast, optimal, and consistent answers. It means without a holistic, systematic, and implementable innovation strategy in the evolving marketplace with changing customer preferences, the continuous advent of new technologies, and the emergence of new rivals it would be hard for a firm to gain and retain competitive advantage (Lengnick-Hall 1992).

The all-encompassing growth of knowledge in any domain in the present day makes continuous augmentation of organizational knowledge necessary for staying innovative (Boekema et al. 2000). The size of a company does not matter. Even the large companies are bound to rely on external knowledge to satisfy their innovation need. Although it is proven that more distant knowledge is capable of producing better innovation, most firms tend to focus on their subject field and market scope (Miller et al. 2007). In order to change this behavior, the firms need to emphasize the importance of knowledge aggregation from exogenous sources in their innovation strategy and focus more on exploration (Kabir 2016).

Determinants of Innovation

Damanpour (1991) identified some factors that influence organizational innovation capabilities. These include specialization, functional differentiation, professionalism, managerial attitude toward change, managerial tenure and technical knowledge resources, administrative intensity, slack resources, external communications, internal communications, and vertical differentiation. According to Dewar and Dutton (1986) distribution of knowledge, its extent, heterogeneity, and access to a substantial level of knowledge from external sources are factors of innovation success. Having in-depth knowledge of the subject matter internally within the organization and access to a large amount of new knowledge is preeminent requisite for radical innovation to take place. However, for incremental innovation knowledge depth is not a crucial determinant but access to external knowledge is still essential. One set of success and failure determinant of innovation listed by Myers and Marquis (1969) includes in-depth knowledge of user needs, superior marketing capabilities, efficient product development capabilities, assimilation, and use of external knowledge with internal knowledge and management leadership.

Knowledge is also a determinant of innovation. Firms accumulate technical, market, and organizational process knowledge and utilize it as a strategic resource which combined with human creativity and technological readiness craft the foundation of innovation proliferation (Nonaka and Takeuchi 1995). Sources of innovation comprise of cross-pollination of knowledge from disparate disciplines, new connections, and networks made, knowledge absorbed from socialization, and recombination of existing knowledge with knowledge gained from external sources (von Hippel 2007).

Types of Innovation

As an integral part of firm's strategic innovation choice, what type of innovation is its core focus, what resources would be allocated to it, and how the innovation competence would be developed depend on the clear understanding of various types of innovation and their characteristics (Ettlie et al. 1984). Factors that contribute to the innovation success vary depending on the kind of innovation process implemented. Because of this, it is impossible to examine innovation as one single unit (Damanpour and Evan 1984).

In the innovation field, different types of innovation have a different impact on the organization, its structure, its strategy, its potential, and performance. Because of this, innovation has been routinely analyzed and differentiated based on various categories. Depending on the focus area within organizational system, the intensity of innovation efforts, its granularity, and collaborative level innovation are typified as radical and incremental (Freeman 1974; Dewar and Dutton 1986; Nord and Tucker 1987), continuous and discontinuous (Tushman and Anderson 1986), sustaining and disruptive (Christensen 1997), open and closed (Chesbrough 2003), administrative and technical or technological (Daft 1978; Damanpour 1987), and modular or architectural (Henderson and Clark 1990).

Radical and Incremental Innovation Radical innovation is the catalyst of Schumpeterian (1942) "creative destruction." It often starts a new product category or evolves the present category drastically. It changes the market environment and the relationship between stakeholders. It takes the market by storm and displaces the incumbents, and it can create a sustainable competitive advantage for the firm (Leifer 2000).

While most innovations are incremental comprising of marginal improvement on existing product, service, process, and technology, radical innovation is a complete shift from the existing business model (Tushman 1997). It embodies attributes that differ significantly from current practice and causes a paradigm-shifting change that often creates a new market horizon and unexpected applications (Nelson and Winter 1982; Cooper and Schendel 1976; Tushman and Anderson 1986). A new entrant with radical innovation grabs market share from others leaving the previously dominant in the industry companies lose their competitive edge.

Radical innovation constitutes some degree of novelty and differentiating factors in combination. In most cases, radical innovation is not just new, it differs significantly from existing products in the value proposition. That is why radical innovations are often described as game-shifting (Lafley and Charan 2008), groundbreaking (Larsen and Lewis 2007), rule-breaking or status quo changer (Skarzynski and Gibson 2008). However, the perceived radicalness of innovation is relative and changes over time. Once it becomes the dominant market product, it transforms into a platform for incremental innovation.

Growth in established companies mostly comes from incremental innovation such as improved products and processes (Abernathy and Utterback 1978). In the knowledge economy, especially in technology sectors, radical innovations emanate more from entrepreneurs through start-ups that create game-changing products and new industries. The effects of entrepreneurial activities are prominent at the beginning of a technology lifecycle because at this time the technology and its trend are still malleable and evolving. While incremental changes are the primary contributor to growth and prosperity, radical innovation efforts always receive more attention. Ignoring incremental changes and hanker after only radical innovation creates a distorted view of future expectations (Lundvall 1992). Moreover, for a firm to stay competitive, it often has to rely on the inventions that are incremental, even though an initial radical invention was the base for these changes (Mokyr 1990).

In the literature, a version of radical innovation is also called breakthrough innovation.

Breakthrough innovations are innovation opportunities that have the possibility of creating a new growth platform (Cooper and Edgett 2009). It significantly changes market consumption pattern (Wind and Mahajan 1997) and embodies the attributes of being new and unique and reflects superior technological advancement. Zhou et al. (2005) further classify the breakthrough innovation as technology-based innovation and market-based innovation. When a new product with substantial improvements of benefits based on advanced technologies is introduced to the existing market, it is technology-based breakthrough innovation. A shift from the present market with technologically advanced products addressed to a new customer base is market-based breakthrough innovation.

Internal knowledge sharing in a firm with a broad knowledge base entails incremental innovation. Radical innovation, however, needs a broad knowledge base, access to market and technology knowledge, and the capability of assimilating valuable knowledge discovered from diverse external sources.

Administrative, Technical, and Technological Innovation As a response to the environmental shifts, firms are compelled to make technical and administrative structural changes that facilitate them to stay innovative (Rosner 1968). Decision-making processes for administrative and technical innovations are utterly different (Daft 1978). The reason is technical innovation is concerned about products, services, and technological processes and administrative innovation is associated with organizational structures, administrative systems, processes, practices, and techniques (Damanpour 1991). Administrative or managerial innovations are exemplified by such improvement methods as total quality management, just-in-time, kaizen, and six sigma (Bhuiyan and Baghel 2005). The changes in the social systems are defined as administrative innovation. Administrative innovation is concerned about the relationships of people, communication, and collaboration among them; the link between people and the firm's environment and the structure supports this ecosystem (Damanpour and Evan 1984).

Technical innovation differs from technological in the sense that it is not concerned about just technological innovation. Improvement and changes made to a firm's technical system and work activities related to it are the issues that fall under the domain of technical innovation

(Damanpour and Evan 1984). Technological processes and the iterative process leading to successful commercialization are referred as technological innovation (Teece 1986). The introduction of new products measures the outcome of technological innovations, and intellectual properties (IP) generated. The process of technological innovation is evaluated and calculated by the number of new ideas accepted and introduced, the innovation portfolio and the R&D cost (Ziman 2003). However, the same can't be done for administrative innovation.

Disruptive and Sustaining Innovation The process when a new entrant with limited resources manage to challenge and displace the incumbent is called disruptive innovation (Christensen 1997). There are two ways how an entrepreneur creates the disruption. The first method is since the incumbent is usually concern about the high end, less demanding, and a high-profit segment of the market, the less profitable and low-end part is often left neglected. The entrepreneur starts catering to this segment and builds up the business with competitive products soon challenging the incumbent's position. The second method is when an entrepreneur starts with an entirely new market. It creates new demand and eventually unsettles the incumbent from its place (Christensen and Raynor 2013). Two particular properties among others of the products offered by an aspiring entrepreneur that cause the disruption are improved performance on several dimensions and better value proposition at lower costs (Adner 2002). It does not have to be always the low-end market. Sometimes, disruption also occurs at the high-end market with a new product that creates an entirely new market segment (Govindarajan and Kopalle 2006).

Types of Disruptive Innovation

Innovation makes the present product obsolete A new product or service that is so superior to the products in the market that it instantly becomes the new paragon of quality. Apple's iPhone is a perfect example of this type of disruptive innovation (Carayannis et al. 2003).

Blue Ocean Innovation An innovation that creates an entirely new market which did not exist before the product or service was introduced. Another example from Apple here is the iTunes marketplace (Kim and Mauborgne 2004).

Future Disruption A product and service essentially have the ability of market-changing impact, but the market is not ready for it yet. Many of the innovations that have been made years ago are just making inroads to the market, and many of the disruptive innovations of today's will be market changing only in future (Paap and Katz 2004). From 3D technologies to IoT and nanotechnology to autonomous cars have just started to penetrate the market and their real effects will become apparent only in the future.

Sustaining innovation is the refinement and improvement of existing products targeted to the existing market and the same audience without any substantial change. Innovation in this context is aimed at improvement of performance of various dimensions of the product gradually (Christensen 1997).

Modular and Architectural Innovation Propagated by Henderson and Clark (1990), the concepts of modular and architectural innovation differ from radical and incremental substantially.

A product is an amalgamation of various separate components. A component is meant to deliver specific functionality. An improved version of a component also improves the quality of the product in its entirety. The innovation within the component level is modular innovation. If the design concept of the product is a whole change without any significant modification in the components' linkage, this type of innovation is labeled as architectural (Handerson and Clark 1990).

Whether it is a product, service, or a process, the result of innovation is a combination of multiple components. Some products such as a plane consist of even a million components. In the high-tech product development arena, components of the product are developed and produced in diverse geographical areas. Kraemer and Dedrick (2008) described for various personal computers and related products, how product concept and planning took place in the USA or Japan, platforms and applied R&D were carried out in Taiwan, and manufacturing was executed in China. Knowledge of these components is essential in designing and developing of the end product. The knowledge of how to connect components, assemble them, and transform into a product is called system knowledge (Henderson and Clark 1990). Superior knowledge and skills in this area can become an active core competence of a firm ensuring competitive advantage.

Networked Innovation For idea generation, personal knowledge growth, and collectively solving a complex problem, professionals participate in various kind of formal and informal networking arrangements. In this type of collaborative environment, knowledge coordination and integration take place freely. The collaboration among peers produces knowledge that is often difficult to create singlehandedly (Powell 1990). In a networked environment, knowledge generation, exchange, and sharing are the activities that contribute to innovation. In the technology field, a large number of innovations originate from knowledge network (Owen-Smith and Powell 2004). Cluster theory covers aspects of knowledge sharing and creation via collaboration between firms and industry connection (Huggins 1998). Firms located in a concentrated geographical area create an opportunity for professional networking, inter-firm links, access to spillover knowledge, and talent pool (Krugman 1998). These elements support the spawning of innovation in relevant areas.

Knowledge generation through collaboration between educational and research institutes that produce innovative ideas and the development of viable products are increasingly getting more impetus. Firms and governments understanding the importance of this type of collaboration are taking a keen interest in it. Many of today's breakthrough innovation, such as the Internet, is a result of the government and university collaboration (Abbate 2001). Innovation at the networking level also stresses on firm-level collaboration with cross-functional teams, cross-regional subsidiary, cross-country-wide subsidiary, and cross-pollination with institutes. Since firms do not innovate in isolation and work extensively interacting with its environment, it is necessary for firms to take a systematic approach in their collaborative practice by deploying systems such as an online community of practice (Hildreth and Kimble 2004).

Innovation Leadership

Innovation process with its numerous unknown variable and exogenous factors creates unpredictable situations and difficult challenges. To maneuver innovation vessel through the currents of uncharted territory, it obliges having a strong leadership (Sarros et al. 2008). Organizational setup for innovation composes of a complex structure of people, processes, resources, and infrastructure. Leading and managing this setup require a mind-set that is open to learning, possesses the knowledge base of the domain and market, and reflects agility and flexibility in decision making. The leadership qualities for innovation also include a deep understanding of the company innovation strategies, the ability to cultivate a culture fostering creativity, and the ability to recognize great ideas (Bass and Avolio 1990). Innovative leaders like entrepreneurs have to be goal oriented, technology savvy, communicative and persuasive. Other leadership skills crucial for innovation include responsibility and accountability, the capability of separating grain from the chafe, the ability to dissect a complex issue into a simple, transparent and smaller modules. Ability to appreciate an expert's opinion but hold the capability to discern good expert opinion from bad one, oriented to details, be strategically apt, ability to see the bigger picture, positive mind-set and motivation are must have skills as well (see, e.g., Adair 1998). The innovation leaders have to possess a certain degree of the innovation domain expertise. Similar to entrepreneurs, they also have to demonstrate their support for innovation, tolerance to risk and failure, and tolerance to ambiguity (Surie and Hazy 2006). Innovation leader monitors the implementation of innovation strategy, makes sure the innovation capacity of the firm at the adequate level, and provides necessary support at each stage of the innovation cycle.

Customers-Led Innovation

Many organizations consider customers a vital source of and contributor to the creation and emergence of new products and services (Leonard-Barton 1995). Many large companies such as HP, 3M, IBM use teams to work with important customers to generate ideas that can be used in product development and service innovation (Quinn 1985).

As a direct consumer of the product or service, the customer possesses insights and competence that the development team often does not have. The advantage of having customers as a source of new ideas is that they can direct the company to make products that are required by the market and relevant to customer needs. Customers look into a product or service quite differently than most internal experts. Customers have the outcomes they want to achieve, they have in-depth knowledge about their circumstances and contexts, and often are not happy with the way they had to do things today (Ulwick 2002). Lead customers can help the firm to understand the gap between existing product and required by the customer product. Working together with the lead customer by engaging them in the innovation process firms can generate innovation faster with a guaranteed market (Seybold 2006). Knowledge, how a customer uses the product, in which context they do it and what improvement the product might need from their perspective, is valuable for developing market offering with better acceptance by customers (Johnson 1998). Entrepreneurs with close interaction with customers have a better chance of discovering new ideas from the customer base.

Open Innovation

In the present environment where specialization has granulated to the extent that often the practitioners lack time to make themselves familiar with new knowledge created even adjacent to their disciplines, collaboration is the way to innovation. Moreover, diversity has proven to be a prerequisite for many types of innovation. Collaboration with external partners helps improving business performance, sustains revenue growth and streamline, and speeds up innovation processes (Chesbrough 2003). Chesbrough (2003) defines open innovation as, “A paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market as the firms look to advance their technology”.

Adoption of open innovation practices and policies facilitates expediting R&D processes by bringing outside-of-the-box ideas and diversity resulting in lower expenditure, better design, and higher outcome (Chesbrough 2003).

In the closed innovation model, the entire process from ideation to development to implementation takes place within the perimeter of the company. Even the knowledge resource is mostly developed internally and depends mostly on the company talents. It used to be the dominant model of innovation in the last century (Chesbrough et al. 2011).

With better communication thanks to the Internet and ICT, information flow within the organization and outside of it became more fluid, which turned out to be one of the main reasons for the sudden surge in the popularity of the open innovation concept. The concept of open innovation comprises of various preexisting management theories and suits well for present networked and collaborative innovation context (Huizingh 2011). Within open innovation, there are two distinct types of innovation present. When knowledge from external sources is used internally to develop innovation, this type of innovation is called inbound, and when knowledge generated by the firm is exported and applied by another firm in its innovation initiative, it is outbound (Chesbrough 2003).

Presently, crowdsourcing, award-based open challenges, and collaboration through a global community of practices made developing products, generating ideas and tapping into talents a norm for many innovative firms. At the same time, companies found a new way to commercialize their underutilized IP through licenses and joint ventures. However, the very process of implementing open innovation also requires some much-needed homework for firms to do. Among them, adoption of new business models, development of needed capabilities, allocation of substantial resources, the creation of strategical and tactical plans that will support knowledge acquisition and integration from external sources seem to be crucial (Lichtenthaler and Lichtenthaler 2009). The idea behind the open innovation model is to adopt a strategy to make a concerted effort in finding and leveraging external knowledge sources and partners to bolster internal growth. Mainly, from ideation to commercialization, any stage can profit from external collaboration and communication.

At the front-end of innovation, openness to new ideas is a required attribute. Innovation is a recombination of internal and external information, technology, know-how, skills, perspectives, understanding, and motivations. The broader the exposure to new knowledge, the better the chance of occurring a new combination. That is why companies with an open culture are more prone to be innovative.

Seventy-five percent of CEOs from diverse types of industry concede that external collaboration is vital to their innovation endeavors (Rowell 2006). It shows a fundamental shift is taking place in the present economy where firms started to realize that incorporating open, networked, and collaborative innovation models is essential (Tapscott and Williams 2006).

Closed innovation, according to the definition of Chesbrough (2003), is when a firm executes the entire innovation value chain of ideation, development, and commercialization including financing, marketing, servicing, and supporting on its own. However, there is hardly any firm in the present day that is capable of performing all the necessary activities required for innovation or carry all of them out on their own (Huizingh 2011).

Open innovation starts with applying at the beginning addition of an extra layer on the existing innovation processes and practices (Chesbrough and Crowther 2006). The integration of the concept of open innovation hence takes place gradually.

Stage-Gate Method

Many firms today use Stage-Gate methods and techniques to streamline their innovation processes and reduce chaotic vicissitude that often follows a new product development (NPD) process. Stage-Gate contributes to the substantial reduction of a project's lifespan and improves various steps of the innovation process. It is a combination of both conceptual and operational methods of initiating ideas and bringing it out to the market. The system comprising a series of cross-functional stages is based on the best practices culled from successful companies' NPD processes. It is an effective method of diminishing uncertainties and mitigating risks (Cooper and Kleinschmidt 1993).

An organization's resource and capabilities are limited. To satisfy its knowledge requirement, it still has to spend resources on the discovery, assimilation, and storage of knowledge from external sources and development internally. Stage-Gate adopts strategies and structures to reduce uncertainty, and optimize resource use (Daft and Lengel 1984). If deployed diligently, the Stage-Gate is proven to be a powerful method which can accelerate and invigorate a company's innovation endeavors (Grönlund et al. 2010).

Management of Innovation

Innovation is chaotic and full of uncertainty (Mansfield and Wegner 1975); it is a search for unknown based on limited known variables (Teece 1996). The uncertainty stems from unpredictable changes due to natural causes, lack of communication between stakeholders, and effects of the environmental components.

In these conditions, there is no guarantee of success in it. Most innovation endeavors fail (Ram 1989). That is why it is imperative to manage innovation activities and try to improve the success ratio (Tidd et al. 1997). Multiple factors influence the management of an organizational innovation project. Damanpour (1991) listed four factors which are innovation type, innovation stage, innovation scope, and organizational type. Tidd et al. (2001), however, contended that industry dynamics and the organizational context are essential aspects that deserve attention as well.

Critical success factors for innovation encompass four areas: firm-related, product-related, project-related, and market-related factors (Van der Panne et al. 2003).

For innovation to succeed, firms ought to implement proper organizational routines, processes, and system and scan the environment continuously for possible factors that might impact on the innovation negatively (Tidd et al. 1997).

Human Factors in Innovation

Although, there is increasing evidence of the influence of the factors like technology, tools, and R&D on the innovation success (Leblanc et al. 1997), human factors such as employee knowledge, teamwork, cross-pollination, corporate culture, leadership all are essential determinants of successful innovation (Zien and Buckler 1997). Creating a culture supportive of innovation and having the right employees, good team spirit, motivated workers, and other human-related factors comprise the required ingredients for successful innovation context within an organization (Dougherty 1992). Top management's support and leadership are considered two of the critical success factors for innovation (Smith and Tushman 2005). Innovation processes are complex, often fuzzy, erratic, and unpredictable. Such an environment requires particular resources, system, relationship, flexibility, and responsibility necessitating decisive leadership for promoting a fertile innovation context. Apart from the ability to use technology for knowledge exploration, an innovative company also must have champions—boundary spanners, those who are consistently seeking knowledge outside of their domain and beyond their usual knowledge need (Davenport et al. 2003). Knowledge workers within the process of extracting, gathering, creating, sharing, using do devise ideas often as a collaborative effort that works as a precursor to a firm's innovation (Amar 2002).

As far as the role of people in the innovation success is concerned, studies have identified the requirement of an innovation champion—a key person who pushes the innovation cause (Chakrabarti 1974). When the structure of the organization is informal and less bureaucratic, employees are more innovative which results in better innovation success.

A healthy innovative corporate culture calls for the introduction of several HR-related practices. They include empowerment and involvement. Innovation is a risky business. Most innovations do not graduate to the diffusion level. If people do not have a certain degree of autonomy in their experiments, and if they are not a part of the critical innovation-related decisions, they will not be able to work with full motivation (Amabile and Grykiewicz 1989; Barney and Griffin 1992).

Technology and Innovation

Knowledge, technology, and people are critical components of innovation. Innovation hardly can be imagined without technology input. In technology push-based innovation, technology is the primary subject of innovation, but in market pull technology plays a substantial role (Roberts 1988).

Technology can be a production input, production tool, the innovation itself, and an enabler of innovation. In any advanced technology-based innovation, the core components are also technology centered. Industrial progress is characterized by new technology implementation in the various sphere of the economy including factory production processes. Schmookler (1966) noted that both product technology and production technologies are vital for understanding innovation from an economic growth perspective.

Increasing automation and introduction of robotics are innovations that are bringing productivity improvement by lowering production cycle, optimizing material use, reducing human intervention, and manufacturing superior new products (Hirukawa 2015, June). In innovation management from idea generation to prototype building, and product development to commercialization at every level, various systems and tools based on advanced technologies are increasingly getting used for faster, better, and cheaper outcome of innovation.

Technology tends to evolve based on path dependency (Arthur 1989) which means not necessarily the best technology will become the dominant preference. An inferior technology with faster diffusion has a better chance of becoming the dominant design. When a specific technology becomes the dominant design (Utterback and Abernathy 1975), it starts to get additional momentum (Hughes 1987) raising the chance for even further growth. Technology also has ripple effects. A radical innovation in one area facilitates emerging new products and services in the adjacent areas as well.

Technology as an innovative product is one of the main propellers of economic growth in a knowledge economy (Machlup 1962). There are more disruptive and radical innovations taking place with advances of the technology and in almost every industry. These innovations are instrumental in the growth of the knowledge economy and the transfer of industrial economies to the knowledge economy. They are also bringing dramatic changes to our everyday life.

Schumpeter (1942) argued that innovation stemmed from recombination creates a new array of opportunities and set a foundation for further sprawling of the new combination and technological advancement. This continuous process enhances the economy, shifts markets, and in its turn open more new possibilities, technology change, and innovation capabilities. We are observing this spiral effect of technology innovation at an unprecedented scale in today's economy and society.

Firms often are not ready to embrace new technologies at an early stage for fear of not knowing how sustainable the particular technology would be. Conversely, they also understand that failure to integrate advanced technologies might result in the loss of their competitiveness. Innovation is one area where technology plays a key role. The dichotomy of technology acceptance that worries firms can be addressed by developing better absorptive capacity, continuous environmental scanning for relevant knowledge, strategic clarity, technology readiness, and visionary leadership.

Conclusion

Innovation has become more complicated due to changing customer needs, colossal competitive pressure, and rapid technological changes (Cavusgil et al. 2003). Globalization and advances in technologies have made innovation as a critical component in the entrepreneurs' quest for finding new opportunities. The social enterprises are no different. Innovation is a tool that helps social enterprises to exploit opportunities that market and technology changes and environmental tensions produce.

Moreover, innovation activities also generate new knowledge. The entire innovation ecosystem morphs and reinvents itself continuously as its knowledge base keeps on growing, its absorptive capacity deepens, and assimilation of knowledge from external source percolates and diffuses across the ecosystem building new capabilities. These capabilities can become instrumental to any enterprise's innovation efforts and create a foundation for innovation-led growth.

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Part III

CHAPTER 7

Entrepreneurs and Entrepreneurship

Introduction

New technologies, globalization, innovative ideas, and expansion of knowledge are continuing to transform the world economy, social structures, country borders, our lifestyles, and our financial well-being. For centuries, entrepreneurs have been a pivotal force behind the economic and social prosperity nations have enjoyed. However, in the most part, despite its massive contribution to the social growth, entrepreneurship stayed behind the scene, and economics to policymakers just has taken its presence as granted. This attitude toward entrepreneurship has started to change in the last couple of decades, and now more and more people are becoming convinced that entrepreneurship is indeed the engine that spurs economic prosperity and one of the primary ways for people to become financially successful. Moreover, it is playing an essential role in eliminating some of the most pressing challenges that societies face. The AI, IoT, quantum computing, robotics and automation, and other technologies described here are going mainstream and penetrating deeper into the economy.

Along with it, entrepreneurship is also going through a massive transformation in several dimensions. First, knowledge-based entrepreneurship is becoming a significant movement propelling the economy and not just in the industrial nations. Second, increasingly more people are selecting entrepreneurship as their career choice. Third, more people are

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becoming educated, socially conscious, and compassionate about social issues which are expanding the number of social entrepreneurs throughout the world, and finally, same as conventional entrepreneurship, social entrepreneurship is also becoming more knowledge-based.

The last dimension is crucial because the impending radical changes the forces of the knowledge economy are bringing will also take social entrepreneurship by storm. Many social entrepreneurs are not aware of the power of technology and knowledge, and how these factors can and will alter the entrepreneurship processes they are so accustomed to.

Entrepreneurship research revolves around four main aspects, which are opportunities, entrepreneurs, environments, and the interlinking process (Venkataraman 1997).

Opportunities are the objects of an entrepreneur's unique visions that they see in the market environment. These objects could be embodied in preexist situations which others do not recognize or a new product or service that is a materialized embodiment of the entrepreneur's vision. In both cases, an opportunity stems from the market imperfection resulting from the market shift. The shift in the market occurs due to industrial and market-related environmental changes. This environmental change often takes place due to the emergence of a new technology that influences the method of resource allocation and instigates the development of new products, services, processes, and procedures. Entrepreneurs find a new opportunity of using the technology in this landscape and exploit it (Shane 2000).

Entrepreneurs are unique individuals with the abilities to think creatively, take initiatives, organize social and economic structures and instruments, recombine resources and conditions, build ventures, take risks, and accept the consequences (Hisrich 1990). Entrepreneurship research that focuses on entrepreneurs as the unit of analysis examines such properties as entrepreneurs' traits, behaviors, personalities, backgrounds, prior experiences, and their cognitive process (Ucbasaran et al. 2001).

Entrepreneurship environment reflects the external attributes that contribute to the development of the entrepreneurship which includes social, cultural, and political factors that shape an entrepreneur's ability to engage in entrepreneurial activities and institutional and social support structures conducive to venture creation (Van de Ven 1993). Geographical location, for example, plays a vital role in the entrepreneurship concerning resource availability among others.

The entrepreneurship process covers the entire array of activities, routines, functions, and tasks related to opportunity identification, creation, and exploitation (Bygrave and Hofer 1992). The process perspective provides a wide range of angles in analyzing and understanding entrepreneurship that includes viewing it as a journey with a starting and end points, and a decision-making process covering multiple phases (McMullen and Dimov 2013).

Entrepreneurship process portrays a better picture of the entrepreneurship and provides more insights about the activities and various states of its existence which is rather enhanced than viewing it through the prisms of risk-taking individuals or a venture creation alone (Gartner 1988). Social entrepreneurship owing to its added focus on the social cause by nature is a complex phenomenon. The technology-induced changes that are already occurring are essentially making the entrepreneurial process even more chaotic, demanding, and challenging. Many of the social entrepreneurship-related aspects will remain as it is. However, several areas related to the entrepreneurship process will go through fundamental alteration which are business models, business strategy, and business opportunities among others.

What Is Knowledge-Based Social Entrepreneurship?

Definition of Entrepreneurship Entrepreneurship refers to envisioning and creating products, services, processes or business models, and building ventures based on them. It entails sense-making in market imperfection where others see uncertainty, ambiguity, and confusion. It is the practice of applying new and creative ideas to develop business enterprises (Eckhardt and Shane 2003). Entrepreneurship is a dynamic process which facilitates building wealth, adds values to resources, creates new markets, and satisfies market demand. As a set of processes, it is related to entrepreneurial activities for the quest of generating economic value by introducing new products, processes, and services or leveraging a market disequilibrium. Entrepreneurs do not always seek financial profit or personal benefits. They can be motivated to create social values by addressing social issues such as inequalities, unemployment, poverty, and illiteracy and environmental issues like pollution, deforestation, and animal protection. The process also entails activities linked to combining knowledge and other resources to create new knowledge, new products or services, open new markets, and serve a market segment in a different manner than what is available presently in the market (Kuratko et al. 2001; Smith and Degregorio 2001).

Social Entrepreneurship Social entrepreneurship is the process of bringing social and social cause-related values to communities by recombining public and private resources to address various socioeconomic challenges (Fig. 7.1).

The process is exemplified by founding economically viable and sustainable ventures and aimed at achieving social objectives using business principles, practices, and policies (Reis and Clohesy 1999). From the operational processes in the utilization of resource perspective, social entrepreneurship hardly differs from its commercial peer (Meyskens and Bird 2015).

Knowledge-Based Entrepreneurship The radical advances in the technologies, the proliferation of knowledge in new areas, and new entrepreneurial horizons that the symbiosis of these elements is opening up are shaping the understanding of the entrepreneurship, its context, and practices from a unique perspective. This new landscape is more than the coupling of technological innovation and traditional entrepreneurship. It is the ushering of a new type of entrepreneurship, where knowledge is the primary constituent as well as the resource. The signs of changes are

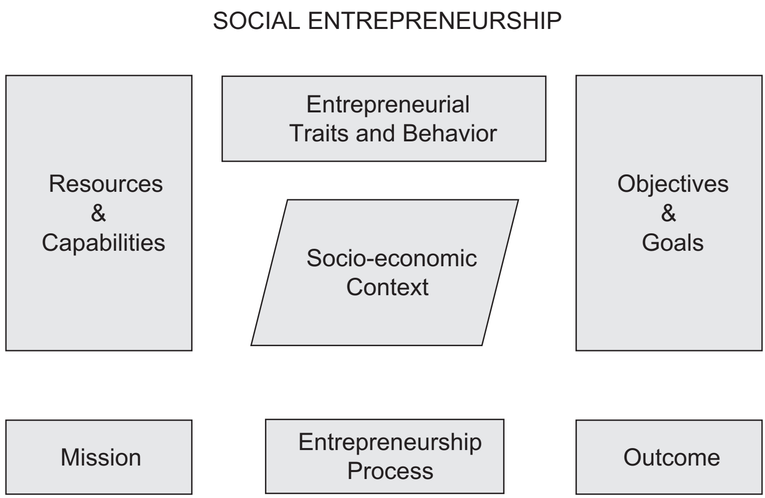

Fig. 7.1 Social entrepreneurship framework

already visible. In countries like the USA and China, the most significant impact on the economy is making technology companies with their breakthrough innovative ideas shaping a new future for not just in their own countries but also for all the humanity.

Technology start-ups, consulting and services enterprises where knowledge is a primary product, spinoffs from universities, graduate businesses from tech incubators, and new companies in knowledge industries exemplify knowledge-based entrepreneurship. These knowledge-based enterprises have become a dominant force in improving productivity, job creation, and regional growth (Hayter 2013).

Opportunities for knowledge entrepreneurship can stem from technology shift, new knowledge creation, and market demand. The objective of the knowledge entrepreneurship is to find a market imperfection and develop new goods and services where knowledge is the primary resource and introduce them to the market. The focus of such entrepreneurship is the use of knowledge as the primary factor for the production and commercialization of a product, service, process, and a business model. The increasing dependence on knowledge as a means of production and the deeper penetration of technology in more industries, the spheres where knowledge-based entrepreneurship is sprawling are also continuously expanding. The instigators of this expansion are entrepreneurs who extract and utilize essential knowledge resource from their life experience, education, knowledge gained from prior work, and various technological, commercial, and scientific information from public and private sources (Shane and Venkataraman 2000).

New technologies are unraveling unprecedented level of opportunities that are stemming from AI, the blockchain, IoT, and many other spaces. These are high impact areas with tremendous potentials and positive economic consequences for the world economy. As the growth in these sectors has just started, new industries that are still nascent will soon flourish and create more opportunities in the core, adjacent, and supportive fields. It means we can expect enormous growth in the entrepreneurial activities in the coming years. This exponential growth will also bolster social entrepreneurship in many areas.

The factors that are critical for innovation and knowledge to become real forces of the economic growth and instigators of entrepreneurial activities include market maturity, innovation culture, talent pool, peer competition, required resources, infrastructure, support policies, and institutions. Once innovation-led and knowledge-based entrepreneurship

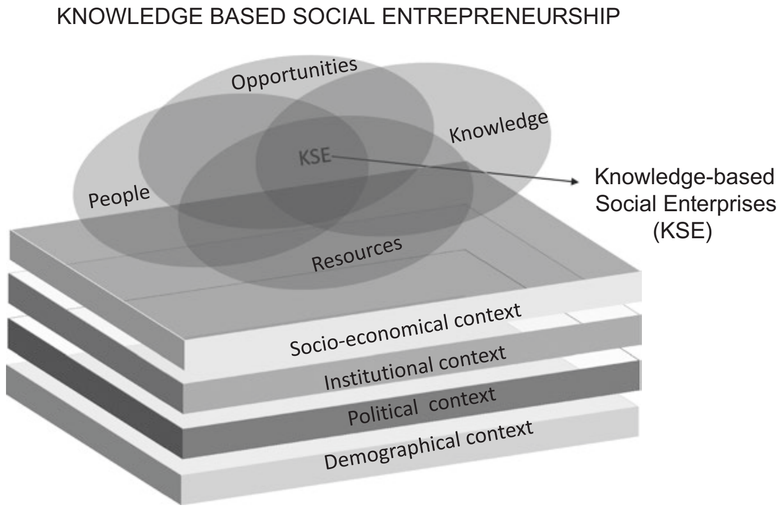

Fig. 7.2 Knowledge based social entrepreneurship framework

set a strong foothold in a specific location, an entire supportive ecosystem starts to emerge helping the dissemination of innovation through entrepreneurial endeavors.

From these discourses, we can construe that knowledge-based social entrepreneurship harnesses technologies to tackle social problems where knowledge is the primary input (Fig. 7.2).

Who Is an Entrepreneur?

Definition of an Entrepreneur A person motivated to bring economic or social value by engaging in activities that combine resources, make products or services, and introduce them into the market is an entrepreneur. Entrepreneurs devise ideas, modify them, and turn them into exploitable opportunities, organize resources, and engage in activities to make a profit by exploiting those opportunities (Gartner 1988). From the early period of entrepreneurship research, there had been various approaches to explain the profile of a generic entrepreneur.

While proposing the theory of the entrepreneurship, Richard Cantillon (1755) offered the first comprehensive definition of an entrepreneur as a person who participates in the activities related to product or service exchanges for profit and makes business decisions in uncertain situations (via Hebert and Link 1988). Jean-Baptiste Say (1803) popularized the term "entrepreneur" as an adventurous person who discovers a new way of doing things and consequently brings economic growth to society. He wrote, "The entrepreneur shifts economic resources out of an area of lower and into an area of higher productivity and greater yield." For Schumpeter, an entrepreneur is a person who is engaged in innovation activities. The entrepreneur creates a new product, process, or services through recombination of resources.

Peter Drucker (1985) recognized the importance of innovation as well and even defined entrepreneurship as an act where innovation is applied to available resources for producing wealth. However, he also emphasized more on the opportunity aspect and believed that entrepreneurs do not cause disruption, they are involved in the exploitation of discovered by them opportunities. The process and the outcome of their endeavors, nonetheless, may bring the disruption. Kirzner (1973) focused more on entrepreneurial alertness and entrepreneurial opportunities. Entrepreneurs, for him, are people those who are alert enough to seek out and exploit market opportunities and by doing so act as an equilibrating force in the marketplace. For Kirzner, the most important type of knowledge for an entrepreneur is "knowing where to look for knowledge" (Kirzner 1973, p. 68).

Still, entrepreneurship is closely related to innovation as it is an innovative act that brings financial benefits through a venture (Bessant and Tidd 2007). Entrepreneurs are committed to pursuing activities that produce innovation embodied by new products, processes, markets, and services and apply resources to market them. They are individuals who are engaged in a value-adding production process in order to create wealth. They are people with self-motivation who undertake actions to develop an enterprise based on their ideas and set goals despite having resource constraints. They often become business owners and using the venture engage in the economic activities that engender value by transforming their ideas to marketable products, services, and processes. Entrepreneurs are business founders, an epitome of the perception of a businessperson, and business owners with a vision and desire to enhance their ventures.

Entrepreneurship literature emphasizes the individual as an entrepreneur and the person's traits and activities while defining entrepreneurship (Venkataraman 1997). It created the mainstream understanding of an entrepreneur as a person who discovers a market opportunity and starts a venture to exploit it. Entrepreneurs not just recognize a market imperfection, they also often create one. It means that some entrepreneurs might scan the market environment continuously or periodically, and actively or passively to find a new opportunity, and others concentrate on creating a new product or service that engenders market demand.

Entrepreneurship also is a process of learning from all kind of sources such as market, customers, competitors, partners, past experiences, and industry literature and applying this knowledge effectively. Entrepreneurs learn to see the bigger picture while still overwhelmed with daily activities. They need to consistently project new assumptions, analyze them, and embrace the ones most aligned with their present situation and future objectives. Strong determination and perseverance are at the core of being successful in the entrepreneurial endeavor. Change management is one area where an entrepreneur must become an expert. To be successful, entrepreneurs have to be observant, open-minded, and analytical. Facing problems, they need to have the capability to see all possibilities and identify, evaluate, and select the most viable options.

Social Entrepreneurs Social entrepreneurs are people from the private sector who are dedicated to making changes in social challenges that are often the domain of the public sector. They are game-changers with innovative ideas, ethical beliefs, strong problem-solving capabilities, and committed to finding solutions to pressing social problems. They are the real change agents in the society who develop creative methods to handle such stubborn social problems as illiteracy, hunger, persistent diseases, juvenile crime, clean water shortage, sanitation, and drugs dependency among many others and bring sustainable social values. They adopt social missions and find innovative ways to pursue them through continuous learning, integrating new information and realigning limited resources available to them. In the process, they often apply underutilized resources, find volunteers, and figure out how to get public and private support for the causes they are fighting for. In their efforts, they learn to do things differently, take stewardship of investments, and find opportunities to resolve unmet social needs that attracted their attention. They try to understand the root causes of the problems and find workable solutions to address them. Social entrepreneurs build organizations, which could be for-profit or nonprofit and set missions for both earning profits through the commercialization of innovative products or services and make a social impact by taking care of a crucial social challenge (Brouard and Larivet 2010).

Social Enterprises

Social enterprises are firms that apply business solutions to resolve social problems (Tracey and Jarvis 2007). Social enterprises are viewed as a unique type of phenomena with issues that traditional ventures either don't face or encounter in a lesser degree because they require to work on two parallel goals: economic value creation and developing solutions for social problems. Government and nonprofits operating on business principles, companies with strong social responsibilities, organizations with large philanthropic activities, and companies targeted at social innovation are also treated as a social enterprise (Dacin et al. 2010). Whatever the form of the enterprise, the central goal of the social entrepreneurship is to address social problems and issues. Often, social enterprises emerge when traditional businesses fail to address a socially relevant problem, or strictly commercial approach where the sole purpose of the venture is to create wealth for shareholders does not work.

Social entrepreneurs possess a unique altruistic trait with the conviction that they can make positive social impacts and solve one or several of the prevailing social problems. This trait is a crucial motivator for them to become entrepreneurs (Tan et al. 2005). Their works change how societies perceive social issues, influence on government and public policies and agenda, and create social wealth (Waddock and Post 1991). Social entrepreneurs seek out opportunities at the crossroad of unmet needs in social areas which commercial ventures will not pursue, and the state alone cannot handle. Their innovative approaches not only target solving these issues but also do it sustainably. They try to make a difference in the world through limited resources often relying mainly on volunteers, dedicated to social cause talents, and support from people. The strength of the most successful of these initiatives lies in their innovative business models. One of the best examples of this is Grameen Bank that Dr. Yunus, the Nobel peace prize owner, has founded. Yunus started a worldwide movement by figuring out a way how to support most destitute segment of the society—the rural poor and alleviate poverty. The idea behind the business model of the approach initiated by him is to provide small loans for low enough interest rates to the poorest people of the village in their efforts to start a means of sustainable living such as cultivating lands with profitable crops or raising livestock. Unlike conventional banks, the Grameen Bank does not require collateral for providing a loan (Yunus 1998). Microfinance, as studies suggest, positively impacts on the entrepreneurial activities and business growth which linger even after the access to microloan ceases to exist. This sector alone is making a tremendous impact on the improvement of the living standards of the world's poorest. Worldwide the sector is enjoying annual growth of over nine percent with a significant room to continue this expansion considering more than 25% world population does not have access to any financial institution. The loan portfolio of the sector was 102 billion USD as of 2016 (Banerjee et al. 2015).

Another example is Kiva, an online platform, which was started inspired by the concept promoted by Yunus. It connects micro-borrowers to lenders expanding access to financing vastly for a large number of people who are in need of this kind of services throughout the world. Kiva platform which instigated peer-to-peer microfinance is a classic example of knowledge-based social entrepreneurship. It shows how leveraging technology untapped potential of networking effect can be used for social cause (Flannery 2007, p. 126).

Yunus (2010) considers social entrepreneurship as an innovative endeavor to help people be it for-profit or nonprofit organization. According to him, a social enterprise's goal is not to maximize profit but create sustainable economic value in support of a social cause either in alleviating poverty or in other social issues. Investors of the business must get their investment back but without any dividend or interest. The profit must be reinvested in the growth of the enterprise. A social enterprise is environmentally conscious and values its employee by providing superior working conditions and market-based salaries.

Businesses including the multinationals increasingly understand the importance of addressing social causes. Their customers are demanding that companies take more social responsibility and engage in meaningful social changes. The stakeholders of many companies are also becoming more empathic and searching for ways to make a positive difference in the world. Many companies also realize that there is a substantial untapped and potentially profitable but underserved market in developing countries. Bringing these people from abject poverty will create a new market with exponential possibilities. As a result, corporations are also gradually shifting toward being more socially responsible and inclusive. A survey conducted by Deloitte (2018) found that over 75% of corporate executives now consider that citizenship and social impact are critical issues for their companies. Companies are looking beyond corporate social responsibility activities and adopting innovative methods that resemble more like social entrepreneurial mechanisms. The objectives are to create social value through strategic initiatives that tap into innovative ideas from the stakeholders of the company and engage in the process of reformulating company mission, adopting entrepreneurial principles, and organizing new systematic approaches but at the same time not to lose the main focus of generating profits for shareholders.

There is a difference in the understanding of the concepts of social business and social enterprise. Social business is a company that is culturally people-centric, driven by an operational approach deeply integrated into socially embedded experience, and considers the customer as a stakeholder that participates in co-developing products and the company value chain is transformed to the maximum possible extent by technology-supported socially networked processes.

Small Business and Entrepreneurial Ventures There is a difference between small business owners and entrepreneurial ventures as well. An entrepreneurial venture often is a growth-oriented innovative company with product or service offerings that are new to the market. Small businesses could be entrepreneurial ventures. Most entrepreneurial ventures start as a small business. However, some discernible characteristics still differ them. Most small business owners work with known products and services aimed at incremental growth, and their innovation is focused on sales, marketing, and market expansion. Entrepreneurial ventures incorporate a different set of strategies. These entities are aimed at rapid growth and apply innovation and creativity at every node of the business process. They work with new offerings, and they face a lot more uncertainties; hence, their strategy calls for continuous work on mitigating uncertainty and risk reduction.

Entrepreneurship Management Management in the context of an entrepreneurial venture in most cases represented by entrepreneurs. The personal trait of the entrepreneur plays a vital role in the formation of the organizational culture and its strategic approach (Mullins 1996). Entrepreneurs' prior experience, technical knowledge, and education along with their entrepreneurial traits impact on goal setting, attracting necessary resources and capabilities, selecting a right strategic approach, and design and follow functional plans to combat uncertainty (Balboni et al. 2014). How motivated entrepreneurs are growing in their ventures, and how they relay their vision and goals to others also impact on the success of a start-up (Davidsson et al. 2010). The growth of an entrepreneurial venture in the knowledge sector also depends on the entrepreneur as well as the management team which should be diverse and must possess needed technological and managerial expertise (Colombo and Grilli 2005).

Legal Structure of Social Enterprises When entrepreneurs decide to start new ventures, they need to assess the pros and cons of various types of legal structures available. The legal structure is not just a governing framework that sets the rules of internal and external interactions and organizational operation. It also means positioning the venture for possible ways of sourcing capital.

Social enterprises are structured as nonprofit, for-profit, and not-for-profit organizations. Not-for-profit enterprises often also referred to as NGOs and for most practical purposes are same as nonprofits. Both nonprofit and for-profit forms of social organizations carry out their respective activities toward social causes. Both can also engage in fundraising drives, revenue-generating business activities, and pursue their core social purposes. Any profit made from their business activities, however, in nonprofits must be reinvested and cannot be transferred to directors or members apart from the remuneration in the form of salaries.

Blended Value—Toward a Social Enterprise For-profit social enterprises and even many commercial organizations feel the necessity to get a better picture of positive social and environmental impacts that they are making along with profits they make from their business operations. The economic value a company makes is identified through the net profit it garnered after deducting all expenses from the revenue generated, which is also referred to as a company bottom line (Hillman and Keim 2001). Nowadays, concepts of double and even triple bottom lines are used to imply social and environmental values along with the notion of the net profit (Elkington 2013). A blended value is a term which means a deliberate effort of understanding organizational value creation from a mixture of social, economic, and environmental values (Emerson 2003). An enterprise's blended value will provide more significance to the value which corresponds to its core focus. Companies pursuing philanthropy, impact investing, and social causes can better grasp their operational efficiencies and impact by incorporating the practice that account blended value. However, the strategy is complex and difficult to adopt in comparison with purely commercial value creation or just targeting social impacts (Bonini and Emerson 2005). Undoubtedly, knowledge-based social enterprises, particularly the ones with for-profit business identity, will eventually prefer to adopt blended value creation strategy to measure the efficiency of both their commercial and social returns.

Entrepreneurship Process

The mainstream literature puts heavy emphasis on the entrepreneurs as individuals. They portray that these individuals possess some unique traits that most others lack. Whether this notion is true is a contentious question with mixed research outcomes. However, one thing is sure that having the right traits alone are not enough for an entrepreneurial endeavor to take place. The process of the entrepreneurship unfolds through a series of activities which must satisfy several factors. These factors include the availability of the opportunity in the marketplace, an alert entrepreneur with corresponding knowledge, entrepreneurs' access to the needed resources, and right circumstances.

Entrepreneurship is a dynamic process with a linkage between its key components (Aldrich et al. 1986). Entrepreneurship process reflexes a person's activities related to the discovery and exploitation of a market opportunity. Entrepreneurs recombine resources accessible to them to take advantage of market imperfection. Often, they organize a venture and a commercial relationship or use an existing company to engage in the process of product development and sales. This process is better understood by dissecting it to several ascending steps (Shane and Venkataraman 2000).

Characteristics that make a person an entrepreneur are important; studying them from the perspective of human psychology and motivation is necessary. However, understanding entrepreneurship as a concatenated process of various activities, functions, and related actors is crucial for knowing how to organize essential entrepreneurial functions and activities, evaluate and handle their interactions, make informed decisions, and carry out a start-up effectively (Hendry et al. 1995).

Although knowledge-based entrepreneurship is a complex, improvised, iterative process and evolves with incremental but sometimes sporadic surges of growth trajectory, it still includes a process of a finite number of specific actions (Baker et al. 2003). We can depict this process as a linked framework of three components that include opportunity identification, opportunity development, and opportunity exploitation (Alvarez and Barney 2007; Velamuri and Venkataraman 2005; Venkataraman et al. 2012) (Fig. 7.3).

Opportunity Identification

It is the first stage and a necessary attribute in the life of an entrepreneurial venture (Ardichvili et al. 2003) and a prominent display of entrepreneurial behavior (Gaglio and Katz 2001). Entrepreneurs identify an opportunity thanks to several traits and behaviors that they possess and when certain circumstances occur.

To understand this phenomenon, we need answers to questions such as when, why, and how entrepreneurs recognize and discover opportunities.

If a market-based relationship exists in the economy, it means that there also exist opportunities. Entrepreneurs' primary goal is to discover an opportunity and to convert it into a profitable venture. An entrepreneur can look for the opportunities actively by being alert and in searching mode, or they can be passive in searching but be alert to any possibility that may occur (Ardichvili). Often entrepreneurs also invent a new product or service and introduce them to the market creating new demand.

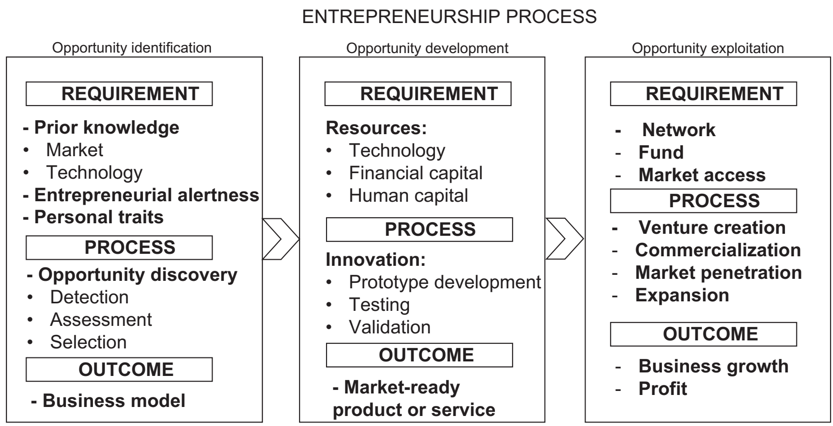

Fig. 7.3 Entrepreneurship process (Adapted from Kabir and Carayannis 2013)

Social Capital

Social capital certainly plays a vital role in the process of opportunity identification. Social capital is exemplified by the network that the entrepreneur possesses and which often helps her to identify an opportunity (Davidson and Honig 2003). Within the entrepreneur's ties whether it is a weak one or a strong one, any of these ties can have a positive impact on the entrepreneurs in finding an opportunity. Apart from having a broad network, entrepreneurs also need an adequate level of knowledge base without which entrepreneurs cannot recognize an opportunity (Ardichvili and Cardozo 2000). Social connections built by the entrepreneurs often become the primary source of opportunity discovery as well as knowledge and power (Aldrich and Cliff 2003).

The closeness of the tie depends on emotional depth, time since the connection established, the level of intimacy, and the reciprocal services rendered. The strength of a tie also relies on resources such as time spent on nurturing the tie and the depth of mutual affinity that forged the tie.

Information Process

In each stage of the entrepreneurship process, access to knowledge and how it is sought, particularly market and technology related, is crucial (see Shane 2003; Garg et al. 2003).

Not all entrepreneurial endeavors end up starting a venture. Entrepreneurial activities can take place within any organizational set-ups or even without the formation of an entity. For example, entrepreneur-inventors can sell their inventions to companies or license the invention to one or multiple organizations.

While we value the importance of the arbitrage entrepreneurship for the broader economy, it is the opportunity created through innovation brings radical changes in the economy and the society. Wealth building in a significant manner takes place in societies from the introduction of disruptive products and services. Entrepreneurs through their unique vision, innovative approaches, and idea implementation engender new demand and consequently economic growth.

Networking

Structure of society, social conditions, and social relationships have a tremendous influence on a person's economic well-being. Financial goals set by an individual often have effects from noneconomic social aspects (Granovetter 1992). Social relationships also contribute to the economic decision making and form the underlying factors leading to the participation of various economic activities by individuals (Young 1988). As a social process consists of many economic activities, entrepreneurship also depends on the interaction with others in the society.

The social network developed by entrepreneurs influences on and shapes up the entrepreneurship process they are involved in many ways. From opportunity identification to resource garnering and from team building to market penetration, entrepreneurs interact with numerous people as suppliers, customers, investors, creditors, service providers, and others. Entrepreneurs' social networks often become a crucial source of knowledge, suggestion, and advice leading to the identification of an opportunity, entrepreneurs' performance improvement, and resource acquisition (Slotte-Kock and Coviello 2010). Often, from these relationships, entrepreneurs also receive crucial information, develop skills, and learn necessary trades (Uzzi and Lancaster 2003). Social networks also influence how the entrepreneurial process transits from one stage to another such as idea formation to product development and venture formation (Reynolds and Miller 1992).

Following the entrepreneur's growth trajectory, the social networks and the structure of various relationships that the individual develops on personal and organizational level change dynamically (Liao et al. 2005). The need for tangible, intangible, and emotional resources necessary for the growth of the business dictates the strength and weaknesses of the ties that the entrepreneur nurtures. The broader the networks and the combination of strong and weak ties, the more benefits the entrepreneurs can draw from these relationships (Renzulli et al. 2000). The tie and its strength indicate the level and the quality of a network relationship. An individual's interaction with others in the network depends on the affinity between the person and her connections, and diversity and uniformity in the network which can be explained by the strength of the ties. Strong ties indicate a closer relationship with regular interaction, while weak tie signifies infrequent contact. Knowledge which is provided by a strong tie is usually more reliable and inexpensive, but it risks to be superfluous as it stems from the same network cluster. However, strong ties also provide emotional, practical, and functional supports in solving problems and furnish with necessary resources. Weak ties, on the other hand, extend access to other network systems and crucial resources which at times present invaluable assistance to an entrepreneur's business growth. Entrepreneurial success requires fostering both types of ties (Burt 1992).

The relationship of the entrepreneurs with other members of the society starts from their immediate family and friend circles and extends to the other less close ties. Relationships are critical as through them an entrepreneur gets access to resources which belong to other members of the society. Social networks depict the connections between various members of the society which can be visualized as an interlinked graph (Brass 1992).

The effects of networks on the entrepreneurship process, entrepreneurs and their ventures, and how entrepreneurship process structures an entrepreneur's social networks are an essential question to study and to understand the linkage between an entrepreneur's network system and the entrepreneurship process (Hoang and Antoncic 2003).

A wide array of resources is necessary to plan, start, and conduct a venture. Some of these entrepreneurs might possess, but a diverse number of essential resources entrepreneurs obtain from their immediate and distant ties (Hansen 1995). The resources provided by the ties that contribute to the entrepreneurial success and these contacts are the entrepreneur's social capital. Social capital is referred to the goodwill inherent in the social ties that can be tapped into while taking action (Adler and Kwon 2002). The social capital of an entrepreneur with an extensive higher degree of a vast network delivers values by providing economic, cognitive, emotional, and cultural supports that give her an edge in the competitive landscape comparing to the peers with lesser social capital (Bordieu 1986). Because of this importance of social capital and relationships, entrepreneurs are encouraged to network more extensively and expand their sphere of influence (Stam et al. 2013). While some personal traits such as how extrovert a person is influence on the networking ability of an entrepreneur, this skill can be developed and must become an indispensable tool in the arsenal of an entrepreneur as the growth, and even the survival of the entrepreneurial endeavor could depend on it (Jack and Anderson 2002).

Opportunity Identification Process Individual's quest for finding an opportunity can be an outcome of an intentional search or a product of the serendipitous moment. Opportunity identification is one of the most vital aspects of the entrepreneurship process which also considered as one of the most valuable abilities an entrepreneur must possess to achieve success (Kirzner 1979; Stevenson et al. 1985). Opportunity identification takes place in the social realm, where the entrepreneur ascribes certain assumptions about market imperfections she recognized and determines how best to exploit the situation. The assumptions made are the result of entrepreneurs' creativity, knowledge base, access to new knowledge, and resources that entrepreneurs consider that they can tap into. These assumptions might lead to an invention or development of a product or service or an improvement to an existing product or service from cost, quality, or application perspectives. Once the offering is introduced, the market decides how viable the assumptions were. The rejection or acceptance of the offering by the market demonstrates the viability of the assumptions made by the entrepreneur.

The crucial point in the opportunity identification that differs entrepreneurs from non-entrepreneurs is their market knowledge, ability to perceive a market situation and assess the market potential of their ideas better than others. They are more attentive and have a clearer vision of the market environment. They are also more competent in defining the commercial implications of the possible opportunity. They do not ignore even small market changes and always ready to descry slight shifts in information cues that can lead to identifying an opportunity. However, just noticing a market distortion does not automatically produces an insight that can convert into a market opportunity. The individual that discerned the market disequilibrium must also need to have an entrepreneurial mind-set and the propensity to get involved in entrepreneurial endeavors (McGrath and MacMillan 2000). Entrepreneurs find opportunities not just because of the changes in the market environment only, but also due to some other requisites that include access to new knowledge, unhappy customers, specific product-related knowledge, and entrepreneurial propensity (Baron 2006).

What Makes a Person an Entrepreneur?

Entrepreneurial Mind-Set Entrepreneurs possess a unique mind-set that pushes them to strive for finding new methods of solving problems (McGrath and MacMillan 2000). Entrepreneurs are visionary, proactive, and own a desire to make changes. Their mind-set assists them to discover opportunities others miss, perform analysis, and assess if there exists a possibility of capturing value.

Entrepreneurs are Change Makers Their route to contributing to the society is aimed at bringing an idea to its fruition that creates financial value. Most people portray an entrepreneur as a person who bootstrapped a venture from the garage and built a successful business. Undoubtedly, these individuals are the best examples of entrepreneurs. However, even in the organizational settings, there exist many entrepreneurs. Many of the successful products and services introduced by established large companies are results of one or multiple individuals' entrepreneurial efforts. These activists come up with new ideas, promote them within the organization, find resources, arrange teams, work on R&D, and develop the offerings they desired to see in the market. Having an entrepreneurial mind-set means being alert to the environmental changes that create new opportunities, once discovered an opportunity to seize it and work on materializing it to a successful offering.

Entrepreneurial Alertness How does an entrepreneur see certain market imperfection when others overlook? This question prompted to probe other ideas divergent from known factors such as entrepreneurial traits, favorable market conditions, and a level of market and technology knowledge. Even if all these factors come out to be favorable for the entrepreneur, she still has to be observant and scan the market environment continuously to locate an opportunity. This watchfulness about the market that entrepreneurs display but others lack is called entrepreneurial alertness. It refers to a specific cognitive and perceptual ability that entrepreneurs possess which works as a driving force for them in identifying an opportunity (Kirzner 1979; Gaglio and Katz 2001). Entrepreneurial alertness is the entrepreneur's inclination to see an opportunity without purposefully searching for one and visualize how the future will look like once the opportunity is recognized (Kirzner 1979). Alert entrepreneurs understand the importance and value knowledge related to market inconsistency and the reasons behind it, and able to design a mechanism aimed at its exploitation. Entrepreneur's alertness level is only demonstrated by the actions taken which means going through the entire opportunity identification process (McMullen and Shepherd 2006).

Entrepreneurial alertness is a precondition that the entrepreneur must own without which the opportunity identification process cannot start. Whether the entrepreneur identified an opportunity by searching for it deliberately or it occurred spontaneously does not make any difference from the alertness perspective.

Absorptive Capacity of an Entrepreneur Absorptive capacity is the ability to internalize exogenous knowledge, assimilate it with the prior knowledge base, and apply it for creating new knowledge (Cohen and Levinthal 1990). In knowledge entrepreneurship, developing the ability to recognize and aggregate knowledge which is vital for the success of the entrepreneurial venture is an essential skill. It helps to identify new opportunities, track market and technology trend more accurately, and recognize the potential importance of information located externally. Companies and prospective entrepreneurs often overlook market potentials and fail to recognize information cues because of the low absorptive capacity of technology and market knowledge.

In the knowledge economy, market disequilibrium is quick to occur and fast to disappear. Technology knowledge also progresses rather rapidly. To identify and exploit opportunities in this dynamic environment, entrepreneurs must become well prepared by developing an adequate level of knowledge absorption capacity which is a necessary constituent of this aptitude.

Absorptive capacity plays a crucial role in opportunity development, R&D, and innovation. It is a required element in recognizing the value of new information entrepreneurs stumbled upon in the process of scanning external environment or by chance, assimilating this knowledge to the prior knowledge base, and applying the combined knowledge to the innovation process. It is also the foundational pillar based on which companies and entrepreneurs unfurl their innovation potential and develop competitiveness.

An entrepreneur's level of absorptive capacity depends on the accumulated work experience, formal and informal education, curiosity, efforts put in mastering a trade or subject, and the eagerness to learn (Odagiri and Gotō 1996). Continuous learning, especially in today's information explosion, plays a constructive role in the development of absorptive capacity.

Entrepreneurial Opportunity Opportunities can be understood as an aggregation of an entrepreneur's assumptions and future vision with market imperfections. They are the constituting ingredients that allow an entrepreneur to develop new products, processes, services, or business models. By commercializing the offering developed and imposing a price for it that includes the value-added cost, the entrepreneur makes a profit

(Casson 1982). Opportunity is also referred to a possibility of fulfilling a market demand through resource recombination in a creative manner that produces economic value (Ardichvili et al. 2003).

The sources from where opportunities stem include market disequilibrium, invention, recombination of knowledge, market or industry structural shift, demand for products, services or business models lacking in the existing market, an introduction of new technology, unresolved problems, and new access to other markets.

Opportunity identification process relies on such components as personal traits, entrepreneurial alertness, prior knowledge, new knowledge, market asymmetry, and social networks. Once the perspective and alert entrepreneur identifies specific market demand or technology shift convertible to a product or service, and possible to commercialize, the opportunity development process begins.

Entrepreneur's ability to identify an opportunity depends on their prior market and technology knowledge in a significant way. Entrepreneurs' knowledge base assimilated with new market or technology knowledge creates the ability to recognize and evaluate a new entrepreneurial opportunity overlooked by others. Entrepreneurs knowledge base gets built over the years from their work experience and formal and informal education. The unique knowledge base that one possesses allows the person to internalize information cues received from external sources quite differently from others and as a result, perceive the external world also differently. In opportunity identification, some factors such as entrepreneurial mind-set, alertness, worldview, motivation, knowledge base, and perceived value of a new information cue work in combination making it a difficult job that only a small percentage of people are capable of processing. It is one of the reasons why the number of entrepreneurs is so low.

Entrepreneurial opportunities are objective phenomena that exist in the market environment (Shane and Venkataraman 2000). Entrepreneurs with better market information, knowledge base, and more alertness are in a better position to discover an opportunity. Entrepreneurs gradually acquire these attributes that eventually allow them to find an opportunity.

The subjective view of the entrepreneurial opportunity claims that entrepreneurs do not find an opportunity they create it. An opportunity only appears when an entrepreneur materializes it. In reality, no opportunity exists until an entrepreneur creates it (Sarason et al. 2006). Uncertainty in this scenario accompanies the entrepreneur throughout the process of creating opportunities (Ojala 2016).

Opportunity identification is just one of the components of the entrepreneurship process, and it must lead to the development, integration, and introduction of the new process, product, or service to the society through innovation.

Entrepreneurial Intentions Views based on personal approaches such as entrepreneurial traits or entrepreneurial alertness or situational analysis such as prior knowledge base and market imperfection cannot always explain why an entrepreneur wants to find an opportunity and take a risk as opposed to staying in the status quo, and alternatively, why she decides to act upon when an opportunity is recognized (see Low and MacMillan 1988; Gartner 1989). This problem leads some scholars to look into the entrepreneur's intention to examine entrepreneurship by taking a different angle from situational and personal factors (Krueger et al. 2000).

Entrepreneurs search for opportunities intentionally. Entrepreneurship is considered as a planned behavior which starts with an intention to seek out an opportunity and convert it to a venture in order to extract economic value from it (Katz and Gartner 1988).

In social psychology, several models tried to define which factors effect on a person's behavioral intention. Entrepreneurs' intention includes two sets of factors: attitude and subjective norms (Fishbein and Ajzen 1975). This model is called the theory of reasoned action (TRA). The behavioral attitude here comprises of beliefs and evaluations, and subjective norms include normative beliefs and motivation to comply (Davis et al. 1989). The problem with this model is it regards many other factors that are indirectly involved in the process of the behavioral intention, external, and does not take into consideration the effect of subjective norms on the person's attitude itself (see Park 2000). Taking into account these criticisms, Ajzen (1985) extended TRA by adding one more factor—perceived behavior control—to the model and named it the theory of planned behavior. The perceived behavior control includes self-efficacy and controllability as underlying factors. Self-efficacy is referred to people's beliefs in their abilities to attain a set objective (Bandura 1977). The controllability in this context is defined as people's abilities to take control of their behavior and related to efforts they put to establish personal control (Bandura and Wood 1989).

If entrepreneurship is regarded as planned behavior, the entrepreneur's intention does act as a good predictor of it. Many of the actions taken by the entrepreneur within the entrepreneurship process such as opportunity recognition and venture creation can be explained by studying the person's intention and antecedents of the intention (Bagozzi et al. 1989).

Entrepreneurial Traits

Entrepreneurial traits refer to the psychological characteristics of the entrepreneur which is a subset of human personality traits. Personality traits are referred to as predispositions of a person in demonstrating specific responses across different circumstances (Caprana and Cervone 2000).

The set of traits that are often attributed to entrepreneurs and considered critical for their success includes independence, propensity to solve problems, desire and motivation to find and exploit opportunities, courage to pursue an opportunity, strong willpower, and a problem-solving knack (Caird 1993; Ogbor 2000). Ability to inspire others, having self-belief, and knowing how to set objectives are also important attributes for a budding entrepreneur to succeed. Another important trait is never to become satisfied with the status quo and work on improvement through continuous innovation. Successful entrepreneurs are enthusiastic leaders. Risk-prone, creative, and determined, these people set their missions to bring positive changes (Zhao and Seibert 2006; Gartner 1989).

While these traits are treated as valuable psychological assets for entrepreneurs, they alone can't be considered as determining factors for the success and failure of an entrepreneur's endeavor as entrepreneurship is a complex endeavor with many intricacies. Moreover, human traits are not always constant, and some tend to change depending on external and internal stimuli. For example, demographic characteristics including gender, cultural background, religion, educational level, work experience, and several others also influence on the intention of a person to become an entrepreneur (Robinson et al. 1991; Reynolds et al. 1994). Entrepreneurs come from versatile groups and don't fall under some universal traits that would indicate characteristics of an average entrepreneur (Gartner 1985). They come in all different shapes and sizes, and each possesses own personality type and idiosyncrasies. However, there are some traits such as self-efficacy, innovativeness, need for autonomy, stress tolerance, proactive personality, and need for achievement which were found positively linked to such entrepreneurial tasks as business creation (Rauch and Frese 2007).

Entrepreneurs as founders of companies own some traits significantly higher than the managers. These characteristics include risk-taking propensity, need for achievement, and tolerance of ambiguity (Begley and Boyd 1987). After doing a meta-analysis of several studies related to entrepreneurial traits, Brockhaus (1982) determined that three characteristics are most salient for entrepreneurs: risk-taking propensity, internal locus of control, and need for achievement.

Risk-Taking Ability

The risk-taking propensity is one of the primary antecedents of entrepreneurial behavior (Stewart and Roth 2001). Risk-taking transpires when a decision ought to be taken where the range of the outcome is quite extensive on success and failure or profit and loss scales. Entrepreneurial risk-taking, however, is not impulsive. On the contrary, their risk-taking is more calculative than other members of the society (Cromie and O'Donoghue 1992). People often avoid taking the risk because they feel more comfortable in their comfort zone. However, a risk is inherently correlated with success. Entrepreneurs create products, spend resources, and set up ventures when most others judge it as an idea with a possible dubious outcome. Entrepreneurial process is about decision making, where each decision carries a specific risk. No matter how calculative a person is, it is often impossible to factor in all the variables that future uncertainty holds. Some risk-taking will not bring the desired results, but it is the cumulative effects of all the steps that usually bring positive results that count. Successful entrepreneurs, as some studies show, are more calculative in taking risks than those who fail in entrepreneurial endeavors (Vereshchagina and Hopenhayn 2009). Entrepreneurs are also more prone to have self-confidence and take more risks in business situations. However, with respect to decision making in regular life, no significant difference between entrepreneurs and non-entrepreneurs exists (Macko and Tyszka 2009).

Locus of Control

Entrepreneurs understand that they are responsible for their actions and most of the outcomes from the decisions they make. They do realize that external factors also impact their results but try to stay focused on matters within their sphere of influence. Locus of control is viewed as an essential psychology trait of an entrepreneur (Perry 1990). It indicates the level of an individual's perception concerning the extent of control the person has of her destiny and capable of influencing the results of actions taken. People who believe that they control the actions and events of their life possess an internal locus of control and those who consider that environmental variables have more control hold an external locus of control (Beukman 2005). Fatalists tend to have an external locus of control and people with an internal locus of control hold the conviction that there is a direct correlation between an action and its outcome, and the person who takes action to a certain degree is responsible for the results and can exert influence on it through efforts, ability, and skills (Rotter 1966; Lefcourt 1976). Entrepreneurs are proactive initiators of tasks related to entrepreneurial processes and consequently feel responsible for the results. If a person does not believe that her actions will have an impact on the future of her entrepreneurial endeavor, she probably won't take risks and try to develop a business. It means that entrepreneurs in their majority must have an internal locus of control (Brockhaus and Horwitz 1986). It is not just the entrepreneurs; most high achievers also display the tendency of having an internal locus of control (Cromie 2000).

Need for Autonomy

Entrepreneurs are often individuals who are not satisfied with the status quo. They do not want to stay confined within existing rules and norms and desire to gain more autonomy in their life by bringing changes through their actions. Autonomy is referred to the ability to make decisions by one's won will (Metaal 1992). When asked many entrepreneurs claim that the lure of independence or the desire for autonomy is one of the primary reasons what motivated them to pursue an opportunity and create an enterprise (Gatewood et al. 1995). The concept of autonomy includes multiple elements such as independence, control, and power. Independence refers to the ability to take actions or make decisions without any interference from others. Control here describes the ability to do whatever the person desires. Power, in this context, means the ability to set one's own rules (Van Gelderen et al. 2003). Researches show that desire to have autonomy and become a self-employed as opposed to working for others is a significant motivator for many to start their own business (Van Gelderen et al. 2003).

Need for Achievement

Need to achieve success often influences a person's desire to become an entrepreneur (Johnson 1990). McClelland (1967) in his book "The Achieving society" advanced the idea that humans have three key motivators that help us to navigate through life. These are the need for achievement, the need for affiliation, and the need for authority or power. If the principal motivator of a person is the need for achievement, she will display the qualities that include persistent desire to set demanding objectives and achieve them, risk-taking in making decisions toward their goals, expect consistent feedback loop of their actions, and prefer to work independently. Entrepreneurs, he describes, are motivated by their need for achievement and possess the following characteristics: moderate risk-taker, decisive, energetic, responsible, organized, capable of envisioning the possible outcome of a decision, able to apply monetary measurement to results, and able to anticipate possible opportunities. While entrepreneurs, undoubtedly, hold a need for achievement, some argue that it is not a core motivation factor for entrepreneurship (Cromie 2000).

Tolerance of Ambiguity

TA defines the way a person understands and reacts to uncertain and ambiguous situations and information cues when encountered by a plethora of unknown, unaccustomed, or unexpected signals in a new circumstance (Furnham and Ribchester 1995). The concept of TA was first applied by Frenkel-Brunswik (1949, 1951) as a personality trait. She argued that tolerance to ambiguity demonstrates a person's emotional and cognitive performance, interpersonal and social behavior, problem-solving ability, systems of beliefs and attitude, and cognitive idiosyncrasies.

People with low tolerance of ambiguity have propensities toward selecting and maintaining a solution at a very early stage when ended up being in a perceived ambiguous situation. They have a dichotomous view of the world and feel a need to categorize everything. They always look for certainty and prefer familiar things over strange ones and unable to recognize that any object can have both positive and negative characteristics simultaneously. These people also tend to reject anything unusual or different and have the inclination to abandon a task prematurely (Bochner 1965).

Entrepreneurial process is often volatile, uncertain, and complex. Entrepreneurs embrace uncertainty knowingly once they decide to start a business. They required to have a high degree of ambiguity tolerance to navigate through the complexities of the unpredictable world of a new enterprise (Koh 1996). TA as a behavioral factor has been used in understanding human personality at the individual level (Budner 1962), organizational level (Furnham and Gunter 1993), and even in a national cultural realm (Hofstede 1980). In these and many other cases, TA has proven to be a defining characteristic of the human personality trait.

Creativity

Entrepreneurs need to think outside of the box to form an idea, detect a market imperfection, identify opportunities, and exploit them by creating new values. The entrepreneurship process itself goes through problem-solving, testing and validating, trial and error, and experimenting, which necessitate having the presence of such capabilities in entrepreneurs as lateral thinking ability and creativity. Numerous studies have suggested that creativity is an essential trait of entrepreneurs (Kuratko and Hodgetts 1995) and it works as a base for innovation and entrepreneurial success (Bilton and Putnam 2007).

Creativity is the process of generating an original idea that can be implemented. It involves identifying, converting, assimilating, and producing ideas, devices, systems, processes in an artistic, technological or scientific domain at individual, organizational, or social levels that somehow diverge from existing ones. Creativity is also defined as the ability to develop an idea which is new and valuable (Amabile 1996). From this view, it is closely linked to innovation.

As a process, it integrates future vision with past experiences and knowledge. People use their brain's logical and intuitive ability to become creative and generate new ideas (Young 1985). Creativity requires an attentive mind-set eagerly to accept uncertainty. Even a slight deviation from standard approach might spur creative imagination. All people are endowed with some degree of creative power, but its intensity of use varies person to person based on various factors such as individual's thinking style, culture, motivation, and environmental conditions (see Sternberg and O'Hara 1999). Creative intensity refers to the degree of the effectiveness and regularity of creative behavior demonstrated by people, organizations, and societies (Morris 2005). People with high creative intensity are receptive, tolerant, flexible, investigative, analytical, and adaptable (Amabile 1983). Creative people are more open to experience, exercise creative thinking eagerly, and accept failure quickly and move on.

Creativity requires intellectual capabilities, domain-related knowledge, style of thinking, an inquisitive mind interested in solving a problem, and a helpful and supportive environment. At the individual level, creativity is the basis of innovation. At an organizational level, it facilitates exploiting new opportunities provided by continuously shifting conditions in the environment (Shalley et al. 2004). The organizational, creative endeavors ignite the process of innovation. Entrepreneurs and entrepreneurial managers of organizations powered by their imagination, originality, and creative mind-set implement ideas that bring changes to the economy and contribute to productivity and growth.

From entrepreneurial perspectives, creativity is the process that helps identifying and discovering an opportunity and finding solutions to problems that occur throughout the entrepreneurial process. From developing strategies to managerial decision making, creative thinking is an indispensable instrument for business owners.

Despite the general perception, creativity is not just a result of momentary outbursts of genius people. Yes, some creative ideas are genuinely radical and spontaneous, but in most cases, creativity is a complex and incremental process with an active feedback loop (Gilson and Madjar 2011). The radical and breakthrough creative ideas are far less common. Moreover, this type of ideas also gets implemented in smaller number than their counterparts.

The creative process in technology innovation while might start from a radical idea; its growth trajectory is mainly evolutionary with numerous iterations of refinement of various functionalities, aesthetics, and usability. The advances in technology take place by a collective creative process of step-by-step improvements. While evolutionary creative thinking is a reason for most of the technological progress made, it is the revolutionary and breakthrough ideas that initiate the beginning of new paradigms and work as a precursor to the fundamental changes in technology, science, industries, economy, and societies.

Many of the traits required for creativity and entrepreneurship are similar that show an overlapping link between these concepts. For example, much like in entrepreneurial opportunity seeking, creative people possess the ability to discern, understand, and explain phenomena often overlooked by others (Carson et al. 2003). Two most prized characteristics connected to creativity are conscientiousness and openness to experience (Costa and McCrae 1995). Conscientiousness describes a person's level of desire for achievement, persistence, goal orientation, and industriousness (Goldberg 1990). Other traits critical to creativity include extraversion, neuroticism, and agreeableness (Goldberg 1990). Extraversion refers to how inclined an individual is in being enthusiastic, ambitious, and energetic (Raja et al. 2004). Agreeableness indicates a person's courteousness, cooperative, and trust (Goldberg 1990). A high score in this area shows that the individual is considerate, tolerant, and good-natured. These are undoubtedly valuable attributes for entrepreneurs as well.

Uncertainty and Entrepreneurship

Uncertainty is a state with many possibilities and unknown variables. Humans are hardwired to look at uncertainty with skepticism and have a tendency to avoid it if possible. However, when it comes to entrepreneurs, they seem to get used to face uncertainty and even anticipate it. For them, there is no other choice as they work with decisions related to an unknown future in uncertain conditions (Smith and Digregorio 2002). The very survival of their business, their economic situation, and income they generate all depend on those decisions.

Moreover, entrepreneurs, in most cases, require making those decisions in the atmosphere of resource constraint. Entrepreneurs manage to compromise with uncertainty because they are more risk-tolerant but loss-averse than others. The propensity to tolerate uncertainty by entrepreneurs is fueled by their unique traits that include attitude, less risk-aversion, and motivation (Douglas and Shepherd 2000). Better knowledge of opportunities that entrepreneurs decide to pursue and their motivation to act are also reasons why they are more prepared to tolerate uncertainty (Higgins and Kruglanski 2000). The approach taken in the decision making in uncertain situations reflects a person's judgment about a future event. This approach is distinctive for different people even in an identical situation as individuals perceive, analyze, and react to a situation based on their knowledge, doubt, temperament, and judgment.

Three types of uncertainty exist: state, effect, and response (Milliken 1987). A situation which is full of unpredictability is an uncertain state. The effect refers to the confusion that the uncertainty produces.

Response uncertainty is when due to lack of sufficient data it is impossible to foresee the outcome of the decision made (Duncan 1972). While uncertainty is considered as a stumbling block in taking actions, for entrepreneurs it is essential to make decisions regardless of the level of uncertainty involved in order to proceed with their business activities. Procrastination, indecision, and hesitance often prevent people from making decisions which for entrepreneurs can translate into business failure (Yates and Stone 1992). Decisiveness and a proactive approach are essential in the entrepreneurial world as market conditions constantly shift and more aggressive players who are quicker in decision making retain a better chance of success.

In knowledge-based entrepreneurship, uncertainty has several additional dimensions. Technology is intertwined closely as a resource and an enabler in most knowledge-based entrepreneurship. It causes uncertainty at multiple levels that include the quality, modernity, and compatibility of the technology used, its future, and its potential as a tool for maximizing productivity and value. The second uncertainty stems from knowledge resource, its application as a production factor, and expectation from the knowledge component of the future product.

Conclusion

Knowledge-based social entrepreneurship is a subset of the broader domain of entrepreneurship. Taking the cue from the entrepreneurship research, in this chapter, we have explored knowledge-based social entrepreneurship from both the perspectives of entrepreneurs and the entrepreneurship process. Given that traditional entrepreneurs might not have the mind-set necessary to become a social entrepreneur, but social entrepreneurs need to have some of the key entrepreneurial characteristics, we have delineated some of those factors and traits. From the entrepreneurship process, we have described the opportunity identification stage and some attributes that affect it.

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CHAPTER 8

Strategy, Strategy Formulation, and Business Models

Once an opportunity is identified, entrepreneurs often rush to the product development process with the intention of bringing the product into the market quickly. They do not give much thought on analyzing the strategic options available and opt for the first one that comes to their mind. While in many cases this rapid action approach works well, in increasingly competitive knowledge economy a better method is to do due analysis and select the best strategy that has a better probability of success. Strategy refers to identifying long-term objectives of an organization, specifying a set of activities, determining and allocating resources, and developing sufficient capabilities required for achieving these objectives under the given uncertainty (Chandler 1962). A firm's strategy seeks to identify and delineate its growth aspiration, target market segments, core competency, resources and capabilities available and necessary environmental aspects affecting its actions, values, and expectations. The strategy incorporates courses of action, policies, objectives, and goals in a holistic manner. It is meant to assign resources to maximize their potential. It pushes the company to develop or acquire skillsets necessary for company success. A strategy anticipates possible environmental changes, prepares the company to sail through unexpected turbulences, and mitigate rivals moves.

It is prudent to do an in-depth data supported analysis of the market potential of the entrepreneurial opportunity, and the positioning of the future venture to the market. The questions that the entrepreneur

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should ask should comprise of what segment of the market the product would target, who are the competitors and how the new venture will position itself against them, and what would be the best way to market the product. These are not the only aspects that entrepreneurs need to focus on in order to get a market foothold and develop a sustainable competitive advantage (Barney 1991). Many activities related to the entrepreneurship process such as conducting a thorough market and competition research, developing a business model, understanding customers, and their needs, laying out the value chain process, and numerous other issues are also needed to be carefully analyzed and aligned with the entrepreneur's business goals.

As an example, at the very first stage of the entrepreneurship process, entrepreneurs need to have answers to questions like how to position their products vis-a-vis competitor, how the real rivals will react to new products and whether there is any possibility of having more entrants in the same field. Defining the competitive landscape is necessary but equally important is to design a compelling strategic theme that will resonate with the prospective market segment, employees and more importantly convey the unique value proposition that is calibrated with the new enterprise's expected operational model (Verweire 2014). A value proposition is a set of benefits that customers receive by purchasing the company's products or services which uniquely differentiate it from other competitors (Kaplan and Norton 2004).

Companies widely evaluate three generic strategies in their quest for gaining a competitive advantage which is also topical for entrepreneurs: cost leadership, differentiation, and focus (Porter 1980).

Cost Leadership

Cost leadership is the standard strategy when the products the entrepreneur plans to offer are similar to the ones already exist in the market. The essence of this strategy is to keep the cost of the production and marketing of the product lower than competitors (Amit 1986). Many companies are successfully competing with this strategy in the knowledge economy.

Can start-up in IT outsourcing industry, one of the most crowded industries, survive the competition and penetrate market applying this strategy?

Epam is an outsourcing company that has a successful track record of growth in recent years. The company applies cost leadership as one of their main strategic approaches. In order to keep the cost down, it recruits engineers, technology consultants, and programmers in East European countries. It works closely with higher education institutes in those countries and conducts hackathons to attract quality specialists. In the knowledge-based industry, the employees are the most significant and most valuable assets. By keeping overhead cost low by having back offices in East Europe, keeping a high standard of work, optimizing project development process, and by targeting specific market segments, Epam has managed to carve a niche area for its growing business in a highly competitive global arena (Leavitt 2007).

Cost leadership strategy is aimed at developing market offers of high demand products and services, finding unique methods to produce these offerings for lower costs and delivering them for a competitive price. This strategy does not provide sustainable long-term market supremacy. Being temporary, it necessitates continuous monitoring and taking corrective actions (Eisenhardt and Martin 2000).

Differentiation

This strategy calls for discerning the company or the services and products it offers from rival enterprises. Entrepreneurs strive to differentiate their businesses can select one or several from many differentiation models such as product, technology, price/quality, customer service, and user experience. Differentiation strategy relies on innovation to position the firm and its products and services in a unique way (Porter 1985). It facilitates creating a niche market, developing customer loyalty, and generating economic value. The strategy is exemplified by innovative marketing, brand image, technology use, and controlled sales channels (Dess and Davis 1984). As unique products, functionalities and specifications are not always easy to imitate, for a growing enterprise this strategy can become a source for sustainable competitive advantage (Grant 1991).

Price/Quality Differentiation Most subscription-based platforms utilize this approach. Depending on the airtime minutes, bandwidths, service areas, and many other specifications, telecommunication service providers create a series of bundle offerings targeting different segments of the society (Ravald and Grönroos 1996). From Netflix to Spotify, most service platforms carry several subscription models to cover a broader range of customers.

Product or Service Differentiation Companies add and improve functions of the product or service and refine the aesthetic look and enhance it with more functionalities and better specifications to distinguish their offerings in comparison with their competitors (Smith 1956). This type of differentiation can justify a price premium of a product or service if it has better specification or quality comparing with the similar items from competitors.

Technology Differentiation Faster adoption of technologies or technology-based business models is a strategy that worked very well for many start-ups that embraced new technologies to deliver similar products or services faster than the incumbents. Netflix had continuously outpaced its primary rival Blockbuster when Netflix just started to penetrate the market. Amazon crushed Barnes and Nobles in bookselling business thanks to its quick and aggressive approach and new business model based on the Internet.

Customer Service While this is a strategic approach usually works in combination with other dimensions, companies have reaped significant profit and brand loyalty thanks to high level of customer services they provide (Porter 1989). All great companies strive to provide exceptional customer service to develop a loyal customer base and limit the possible attrition. Costco, for example, has a legendary return policy that allows returning products after several years.

Speed to Market Speed to market itself can be a differentiating factor (Dell and Fredman 2002). In the highly competitive product market of the consumer electronics updates roll out in an increasingly shorter period. For example, both Apple and Samsung try to introduce some updated version of their cellular phones every six to eight months understanding failure to do so will cost them a loss of a market share to the rival.

User Experience User experience refers to a person's interaction with a product or a service from a holistic perspective that covers aspects like value, satisfaction, actions, and behavior (Garrett 2010). For differentiable products and services, users' experience and satisfaction are key indicators that demonstrate company offerings' market acceptance.

The ushering of the knowledge economy is fostered by the growth and widespread use of the ICT. The interaction between humans and ICT, while consumers use various services provided through the Internet and other communication networks, has become crucial for the growth and success of both consumer-oriented and Business to Business (B2B) businesses. For Web sites, for example, engagement, adoption, retention, and satisfaction are some of the key metrics that provide information about the site's acceptance by the users and growth trend (Rodden et al. 2010). Companies apply many sophisticated and innovative technologies that have the capacity of enhancing satisfaction from the interaction to improve the user experience. For example, to simplify the checkout process, Amazon in the early days of the Internet introduced "One Click" technology where purchases could be made by just clicking the buy button without going through the lengthy process of filling forms. Both Amazon and Netflix were the early adopters of recommender systems, programs which based on users' past behaviors, real-time clicks, and other factors make dynamic recommendations of items aimed at the user (Ricci et al. 2015).

The area of user experience is increasingly becoming a factor of high strategic importance for all companies. Entrepreneurs should arm with a long-term plan aligned with the overall business strategy for handling every user touchpoint of their products or services.

Strategic Planning Strategic planning is the process of strategy formation where the company depicts steps needed to achieve set business goals (Abell 1980). No single standard approach specifies each step as each company is unique with its objectives, culture, resources, competencies, motivation, and priorities. However, a loosely connected planning system can still be used while brainstorming, selecting and delineating a business strategy. Entrepreneurs are encouraged to plan a business strategy before jump start a venture.

The strategic plan should be a road map for navigating through the uncertainty that future planning always carries. It should help in making strategic decision-making easier for the stakeholders. The business model, product development process, marketing method, target markets, and success metrics must be well clarified in it. The plan must reflect the future organization's values and mission as well.

The main ideas behind the development of a strategic plan include the followings (Mintzberg 2000; Vesper 1990):

- Have a better picture of the prospective venture's market position when it becomes operational;
- Understand what resources and capabilities present stakeholders and the future enterprise own;
- Recognize who are the main competitors;
- Clarify what market segment the products should target;
- Understand what the best way would be to compete in the marketplace;
- Define short- and long-terms goals;
- Provide criteria for achieving objectives;
- Assist employees and partners to understand the entrepreneur's vision and strategy to create economic value.

While there exist different frameworks, a strategic planning and management framework usually incorporate several phases that start with the strategic analysis of the current situation followed by strategy formulation and strategy implementation (Abell 1980).

Several tools become quite handy while conducting strategic analysis that includes Political, Economic, Social and Technological factors (PEST) analysis, five forces analysis, market segmentation, critical success factor analysis, Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, competitor and analysis, and a few others (Pearce et al. 2000). The situation analysis, one of the strategic analysis tools, encompasses external environment such as competition, industry, market, and trends and internal environment such as resources and capabilities internally available. These analyses facilitate picturing strategic issues that the enterprise might face. The stakeholders at this point must analyze strategic alternatives available and make a choice based on benchmarking and other criteria. Ultimately, a set of suggestions stem from these analyses that include short-term and long-term recommendations. The recommendations provide information about objectives, road maps to achieve them, success criteria, and contingencies to possible snags (Abraham 2012).

Strategy Formulation

Strategy formulation is the process of defining the organization' strategic approach and implementing the selected strategy (Bowman 1998). This development process either can be systematic or emergent (Mintzberg 1994; Whittington 1993). Most entrepreneurs opt for the emergent option as it allows them to concentrate on rapid product development and commercialization instead of spending their limited resource on the creation of a well-defined strategy. However, in the tough market with established competitors proper strategic planning allows a new venture to improve its odds of success (Bracker et al. 1988). Moreover, entrepreneurs can develop a strategic plan and refine it later throughout the entrepreneurship life cycle gradually by monitoring, executing, improving, and expanding it (Scott and Bruce 1987). Entrepreneurs, in the beginning, are usually not well versed about the nuances of strategic planning, although better awareness of strategic options, formal goal setting methods, and executions augment an entrepreneur's business acumen and positively impact on her venture's growth (McKenna 1996). Strategic planning can seamlessly convert into strategy formulation where clear objectives are set, metrics for reaching goals are identified, road maps and actions to achieve objectives are defined, and the executable version of the plan gets created. A well-formulated strategy with clear road maps and operational actions works as a guide that put the enterprise in a stronger position to achieve competitive advantage.

Strategy Implementation

Strategy implementation takes place through strategy management. It is the process of translating adopted strategy to actions that lead to attaining set objectives and goals (Segal-Horn 1998). Understandably, strategy execution is a more difficult, complex, and time-consuming task than making a strategy choice (Hrebiniak 2005). In an entrepreneurial endeavor, entrepreneurs are mostly responsible for the implementation of the selected strategy. After all, they start the strategy process by picking opportunities, setting goals, and planning the activities required to achieve those goals. In the process of performing those activities, entrepreneurs rely on others such as partners, managers, and consultants to execute their vision. Crucial in this phase is to acquire quality resources and utilize them judicially to develop skills and capabilities imperative for achieving strategic goals (Sirmon et al. 2007). Entrepreneurs through their actions and behaviors influence the conversion of the strategic plan into reality.

Many variables can accelerate or impede the strategy implementation process. Some most critical for the successful execution of strategic plan factors include culture, external environment, stages of implementation, internal guidelines, material resources, market incentives, power structure, and firm size (Li et al. 2008).

Focus

Entrepreneurs work in the atmosphere of resource constraint. Their strategic approach should aim at allocating resources to areas where they anticipate having a better competitive position than incumbents (Porter 1985). It means concentrating their market target on a specific group with specialized products or services. The sharp focus on a narrow segment contributes to the development of niche knowledge of the market, products, customer need, and future trend which in turn works as a basis for competitive advantage. Concentrated focus on specific products also allow the company to optimize the value chain process, source raw materials for a better price, and having better control over the distribution chain. This strategy also brings a better understanding of customers, improve customer experience, and provide quality service. The specialized information gained from the market by the sales and marketing division gets forwarded to other segments of the company such as R&D which helps to bring innovation to market faster. From a resource-based perspective, specialization creates the necessary foundation to acquire and develop specific resources and build unique capabilities that are difficult to imitate for competitors. Although narrow focus strategy facilitates developing specialization of products and target segments which might bring efficiency and effectiveness, it does not guarantee a better than competition performance (Porter 1985). Focus strategy is a conduit for achieving specific business goals. Its success depends on other factors such as the availability of critical resources, the ability of necessary skill development, market acceptance of the product, and high-value proposition. However, for aspiring entrepreneurs focus can be a valuable strategy as establishing barriers to entry in a narrow area so that others cannot target the market with similar products or services are easier than when the target market is too broad. One such barrier, for example, is intellectual property protection through patents.

Intellectual Property Rights In the knowledge sphere, the foundation of recognizing and exploiting an opportunity is knowledge and its application in innovation. Through the innovation process in their efforts in developing marketable products, entrepreneurs generate knowledge. Frequently, this knowledge is the base of the entrepreneurial venture's competitive advantage and requires protection from unfair imitation, copying and applying in the development of competing for products while the diffusion of innovation takes place. Many aspects of a company's knowledge and intangible assets are necessary to protect from competitors that include inventions, trade secrets, company log, and valuable content such as images and texts (Autio and Acs 2010). Intellectual property right laws enable organizations and individuals to safeguard the intangible properties that can generate financial benefits and recognition from their creative works. Intellectual properties include patents, copyrights, trademarks, industrial designs, and geographical indications of origin for specific products. Patents play an important role in protecting new ventures inventions and help convert their creative ideas and innovation potential to revenue-generating products and services. A patent is an exclusive right that allows the owners to wield authority over their inventions and decide how others can use them (Granstrand 1999). For start-ups in the knowledge sector, IP is one of the most valuable assets they own. For them, IP protection is not just necessary for defending their products from copying. It is also essential for getting access to angel and venture capital. It is prudent for entrepreneurs to assess the need for IP protection for their ideas at the stage of R&D. Especially if they are planning to integrate their IP potentials into their business models and need to create barriers of entry from prospective competitors.

Entrepreneurial Leadership

Finding an opportunity that can be exploited using the limited resources the entrepreneur possesses is the first step an entrepreneur takes. From here onward, entrepreneurs need to work with others to execute activities related to the entrepreneurship process. The entire entrepreneurship process is unchartered territory for each new potential business endeavor. Navigating through this complex and uncertain atmosphere means facing challenges with a plethora of unknown variables requiring constant decision-making. Entrepreneurs' leadership capabilities influence the outcome of the successful execution of each relevant process. Entrepreneurs' leadership gets tested by how skillfully they can orchestrate successful completion of various operational activities, make necessary deals, implement strategic plans, allocate resources and organize, motivate and lead the team.

Many of the traits required for being an effective leader are similar to what successful entrepreneurs need to own such as a high desire for achievement, self-confidence, creativity, flexibility, strong motivation, knowledge of the business, and superior cognitive abilities (Kirkpatrick and Locke 1991). Leadership role in a budding venture is a difficult job requiring some essential skills such as the ability to foresee consequences of a decision and plan accordingly, communicate messages clearly to others, motivate team members to attain objectives, identify team's weaknesses and find complementary skills to mitigate them, and learn from experiences and educate others (Eggers et al. 1994).

The leadership process in an entrepreneurial venture is inherently different from an established organization due to the very nature of problems that entrepreneurs require to handle which in many cases are unpredictable and relate to ideas involving future events. Furthermore, entrepreneur leaders work with limited resources and often in a crisis mode where rapid decision-making without an adequate level of advisory support is essential. Successful entrepreneur leaders are visionary, efficient problem-solvers, rapid in decision-making, strategist, and risk-takers (Fernald et al. 2005).

The nature of the entrepreneurial process is such that it compels the entrepreneur leaders to take significant risks. The calculative power and the degree of the positive outcome from the risk-taking reflect the leadership strength of the entrepreneur in this area. It construes proper assessment of the risk giving attention to all possible aspects and conditions that may impact on the outcome.

Established organizations are also increasingly understanding the importance of an entrepreneurial approach in tackling rapid market shifts, changing clients' demand, and threats from global competitions. Corporate managers in this environment must learn what leadership qualities are necessary to engage in entrepreneurial activities within the firm and implement new ideas (Chittipeddi and Wallet 1991).

Strategic Analysis

Entrepreneurs, if time and resources permit, should consider applying Porter's five forces analysis (Porter 1985) to understand the possible positions their enterprises may occupy in the competitive market. These forces influence on the capability of the enterprise to supply products or services and create economic value and constitute of following factors.

The Potential Threat of New Entrants In free market conditions, there always exist chances of the emergence of new firms that will target the same market with similar products and potentially diminish profitability that incumbents were enjoying in the industry. Companies try to enact barriers and prevent new entrants from penetrating the same market to safeguard their interests. Depending on the industry, the common such barriers include the capital requirement, government licenses, economies of scale, admission to distribution channels, brand reputation, customer loyalty, and cost of running the business among others. Entrepreneurs as new entrants need to analyze how high the barriers are to enter into the market of choice and whether these barriers are surmountable. Once the business is started, and the company made successful penetration, it has to ponder how to protect its business from not just the competitors but also from new entrants. Product differentiation, focus on customer satisfaction, building brand reputation, and patenting intellectual properties are some of the ways new companies should strategize to shield their businesses.

Threat of Substitution Substitutes are alternative products or services while not the same thing but can replace what the company offers. An online marketplace is a substitute for a brick and mortar shop. Substitutes can become a real threat of existence if not handled on time. Many companies have learned it in a hard way. Barnes and Noble lost their book market to Amazon, Blockbuster their movie rental business to Netflix, and Kodak and Fuji their photo-film businesses to digital photography.

Suppliers' Relative Bargaining Power Often the cost related to raw materials hails a significant portion of the product price. Suppliers hold a strong position if they have a diverse customer group, the raw materials needed are specific that cannot be sourced from others, and they command a unique dominant market position. In such cases, suppliers can control price, supply terms and quality of the materials.

Customers Relative Bargaining Power When in a market, the customers are the volume buyers, or their numbers are low, products available in the market are very similar in specification and functionalities, and customers can potentially directly work with suppliers, in these scenarios' customers hold strong bargaining power. This power can translate into customers' demand for lowering prices, additional functionalities of the products, or extra services.

Rivalry Intensity Within Competitions The price competition, differentiation efforts, and marketing efforts indicate the intensity of rivalry within an industry. For example, the mobile phone market claims a high-intensity rivalry between the major players.

SWOT

Strength, Weakness, Opportunities, and Threats (SWOT) is a necessary and quick method of performing a strategic analysis for business processes (Jackson et al. 2003). Although this analysis does provide some insights, it is overly simplistic as a tool for strategy formulation. Entrepreneurs may receive some valuable information by knowing what their weaknesses or threats the future competitors pose. It is also a good idea to have a clearer perception of one's strength as an entrepreneur, and opportunities available in the interaction of market demand and entrepreneurs' capability of producing and supply the goods they plan to introduce. There are some other variables also crucial for developing a strategic approach that is aligned with the entrepreneur's business goals. However, strength is one area where a detailed analysis might produce important insights and ideas in the understanding and the development of the future company's core competence.

Core Competence Analysis

Core competence is a strategy model which initiates laying out the organization's strategic approach based on its strength. This strategy model proposes to view the source of the competitive advantage as a strong capability in a particular area that the organization has built. The competencies can be a combination of knowledge, skills, and approach that the company deliberately develops. Core competencies allow the company to obtain a stronghold in the market, gain reputation, and receive market recognition (Prahalad and Hamel 2006). To gain and sustain competitive advantage, companies need to leverage on their core competencies. A resource or capability to consider as a core competence, it must fulfill three criteria: It has to be instrumental in providing better business value to customers, it has to be difficult to imitate or replicate by competitors, and it should be something rare among the competitors. Core competencies can stem from organizational talents, technology use, intellectual properties, brand reputation, available assets to name a few. Once identified, companies must nurture this strength and make sure that it stays unique in their marketplace (Javidan 1998).

Resource-based views (RBV) provide another dimension to the strategy formulation approach. RBV postulates that competitive advantage originates from unique and valuable resources that firm's own.

These resources are classified as human resources, financial resources, physical resources, and knowledge resources (Wernerfelt 1984; Peteraf 1993). If the company can keep the resources that helped to create competitive advantage secured against substitution, imitation, and sharing, it will have a sustainable and lasting position.

Core Capability

Having a specific knowledge set that allows the company to sustain a competitive advantage can be referred to as a firm's core capability. Google's search algorithm and the unique method that Google applies to exploit it in its revenue model is an example of such core capability. This knowledge set is multidimensional and includes tacit knowledge embodied in employees' mind, knowledge embedded in the organizational system, process, and technology, knowledge protected by intellectual property law and trade secrets, meta-knowledge that managers and employees possess that allows them to apply organizational knowledge effectively. The explicit knowledge resides in the files, documents, repositories, and other physical mediums and knowledge in the forms of culture, values, and norms. This interconnected and confluence of knowledge dimensions create the organization's knowledge system which is its knowledge-based core capability (Leonard-Barton 1992). Continuous augmentation of knowledge by searching, finding, extracting, and integrating information from various internal and external sources and creation of knowledge by sharing and utilizing assimilated knowledge are integral processes for innovation and product development that ensues from it. Whether it is a start-up just started its venture or an established organization working on building and utilizing its core capability, it is imperative for achieving long-term success through new product development for both.

Value Chain Analysis

Value chain analysis is a set of actions that companies must carry out within the process of conducting their business and deliver products or services to the market. The concept allows viewing the firm's organizational processes from a holistic system perspective. Porter (1979) developed the model of the value chain for strategy analysis purpose which includes primary and supporting activities. The primary activities consist of inbound logistics, operations, outbound logistics, marketing and sales, and services. Supporting activities are related to company infrastructure, human resources management, technology development, and procurement. Value chain analysis gives an organization a better understanding of how to improve services, reduce operational and procurement costs, and create value. To create economic value through cost reduction, companies can emphasize on the optimization of operational, manufacturing and innovation processes, source raw materials for lower cost, improve delivery logistics and bring innovation to products and services. Innovation can play a vital role in this. Each process can go through the analyses such as can any of the activities of the process be eliminated and can a particular work be done with a lesser number of steps. Questions can also include would it be possible to increase the productivity of the process by integrating new technology, adopting new methods, or developing a new skillset and can a new process be created that will bring more efficiency and effectiveness to the system.

Entrepreneurial strategy often stems from one person's vision, objectives, knowledge, and directions and defines as "a pattern in a stream of decisions" (Mintzberg and Waters 1985).

The entrepreneur's vision is the main guiding force behind the formulated strategy. In many cases, the implementation of the strategy takes place thanks to the individual's control over the organization. The vision only directs to goals that must be achieved. However, the course of action necessary to achieve those goals in the entrepreneurial process is dynamic, fungible, and based on the feedback loop. Over time, often, entrepreneur's vision not just modifies but also changes completely. However, the analyses conducted add new knowledge to the entrepreneur's perception of the business, competitive environment, market requirement, and customer's preference. That is why an entrepreneurial strategy must be more adaptive and agile in comparison with the corporate analog (Mintzberg and Waters 1985).

Competitive Advantage

A company's competitive advantage refers to its economic strength that stems from its resources and capabilities. It also means the ability of the firm to design, manufacture, and commercialize products better concerning price, quality, or reputation than similar ones available in the marketplace (Barney 1997). Business and operational processes that are related to competitive advantage are strategy management, human resources, operational management, and technology management.

Internal to the firm factors such as organizational structure, skills, innovation capabilities, and various other tangible resources such as an advanced manufacturing plant or intangible such as patents are the sources that companies rely on to build their competitive advantage (Hamel and Prahalad 1990).

Firm's operational efficiency, cost-effectiveness, and relentless pursuit for quality translate into the creation of superior products and services. Emphasis on optimization and bringing efficiency to processes such as marketing, technology adoption, innovation, and manufacturing also relate to the development of unique capabilities and productivity growth. With the advent of new information and Internet-based technologies, process re-engineering and optimization have become essential elements in improving productivity.

Productivity growth is directly linked to a firm's competitive advantage as it contributes to lowering costs and differentiating products resulting in the creation of sustainable economic value (Porter 1990). Sustainable competitive advantage can also evolve from resources such as strategic planning, culture, trust, management skills, administrative capacity, organizational alignment among many other (Priem and Butler 2001). The understanding of the concept "resource" itself varies significantly for entrepreneurs. They tend to focus more on the mechanism how resources are leveraged rather than their existence. For entrepreneurs, one of the keys to their success is the ability to maximize the potential of the available resources by recombining and leveraging them aggressively (Kellermanns et al. 2016). Entrepreneurs are usually more concerned about market positioning, customer acquisition, product's acceptance by the market, and need to get a better grasp of how they can achieve these strategic goals with their limited resources.

Scenario Planning

For entrepreneurs, it is pretty difficult to envision what resources and capabilities are going to make a lasting difference in creating competitive advantage due to uncertainties that obfuscate their vision. One approach to strategy formation in an unpredictable situation calls for scenario planning. It is an excellent tool for evaluating strategic consequences in various future situations, looking at the objectives from different perspectives, and uncovering new opportunities. Scenario planning helps in crafting a long-lasting and effective strategy (Peterson et al. 2003). It takes into consideration only the main factors that can have a substantial impact on the strategy in future and simulates what changes might take place when a deviation in one of the critical factors occurs. The exercise facilitates to see possible changes and insights which otherwise get overlooked (Shoemaker 1995).

Competition and Collaboration

Entrepreneurs once identified opportunities ponder what would be the best way to bring their products or services to market. Several options are available to them in this regard.

Competition In a market where similar to the products or services that entrepreneurs plan to market already exist, they often need to combat with others to position their offerings in the market and attract buyers. Market competition is a process of rivalry among firms to gain market share, market reputation, and to make a profit (Hamel and Heene 1994). Competitors strive to attain market leadership to maximize their revenue and potential profit. Competition forces firms to keep their prices attractive through operational efficiency and differentiate their offering through innovation. Firms compete with each other using various methods that include marketing campaigns, faster introduction of differentiating products, customer retention efforts through better services, and lowering price for compatible products. Intense competition based on price is harmful to all rival firms as it diminishes their profit margin. For entrepreneurs, a competition analysis while formulating the strategic approach is necessary to evaluate the market positioning probability.

Collaboration If entrepreneurs feel that the growth potential of their endeavors significantly increase if they participate in collaboration with others as opposed to going alone, market positioning through cooperation for them is justified (Dyer and Singh 1998). Benefits from cooperation can be substantial if the cooperation is bolstered by shared goals, mutual trust and a well-defined plan of action with responsibility shared effectively. On the other hand, low trust level between the partners, opaque common goals, and unclear shared plan hinder the development of a sustainable and productive alliance.

For small enterprises, cooperation can be an active mode to mitigate the risks involving product development, marketing and market penetration (Kohn 1986). Entrepreneurs who developed new knowledge might find more comfortable to get into the market through the collaboration with an incumbent using their distribution capability.

Dynamic Market

The market is a dynamic process where changes take place regularly. These shifts also create new opportunities and take place thanks to the emergence of new technologies, a variation in customer preferences, the occurrence of new distribution methods, and non-market issues such as policy and tariff regime change. Entrepreneurs are in a better position to exploit those opportunities as they are more agile and lack any prior burdens. Incumbents on the other hand often find difficult to deviate from status quo and take advantage of the novel opportunities.

Blue Ocean Strategy

Blue ocean is a metaphorical name of a concept that refers to a product or service market which has little or nonexistent competition, or markets or industries that do not exist yet (Kim and Mauborgne 2004). Some blue ocean markets such as Airbnb, the online short-term rental platform are revolutionary and did not exist earlier, but most blue ocean ideas are new business models that extend the contour of the previous market's boundary. For example, Spotify developed a new market for music listeners, where Apple's iTunes were present for years, by offering a freemium model, a vast repository of music and being platform agnostic.

Blue ocean strategy propagates not to enter into a crowded marketplace. Instead to find a business model that will create a new market. As competitions would be nonexistent in this new market, it will be easier for firms to create new demand and capture value. It also suggests focusing on both cost reduction and innovative ways to differentiate products and services simultaneously. Entrepreneurs even with great ideas often fail to start a successful business due to lack of well thought out strategies that could help to implement their ideas with positive outcomes.

Business Models

Strategy and business models are the objective sides of the entrepreneurship and provide clarity to the structural, organizational, and operational factors of the business endeavor. Focus on the business model of a social enterprise firmly set it within the scope of entrepreneurship in its broader context.

Before the computer era, the emergence of successful business models was more like a fruit of serendipitous ideas rather than a creation of well-formulated design or results of farsightedness and astute business acumen. The viability and potential of a successful business model were recognized only after the fact. The use of spreadsheets as a handy tool to manipulate numbers and play out different scenarios has opened the possibility to forecast how business model might act once implemented (Magretta 2002). Over the last decades, technologies have brought sophisticated methods to the creation, simulation, and verification of business models and in the knowledge-based entrepreneurship, it has become an integral part of the business concept development process. At the same time, new business models are also emerging along with the advances of technologies and the use of the Internet and mobile devices as platforms.

For example, for centuries the very base of the economy was possession. From houses to cars, many significant intangibles people preferred to purchase and own rather than just rent. The new economy based on knowledge is changing consumers' perspectives on possession fundamentally. This shift in the essence of ownership will also reflect on future business models of many firms. The car industry is an example. Many millennials do not consider that owning a car is cool and instead opt for car sharing as the commuting method of choice. This change in consumer behavior is forcing car companies to ponder how to react to this looming issue and modify their age-old business models accordingly. Not surprisingly, many of them at the time of writing this book has started to explore a subscription-based business model. Businesses that provide services over the Internet are already accustomed to the fact that customers expect to receive at least the essential services for free. Developing a sustainable business model that will consistently bring economic value to these new market conditions is not an easy task.

A business model is a framework that provides a holistic view of products, services, and value chain processes, combines stakeholders, their roles and benefits incurred from them, and describes the revenue sources and market segment (Timmers 1998). It depicts the logical links between the opportunity and the mechanism of economic value creation. The framework reflects the critical aspects of a business including the audience, market expectation, and the processes of delivering value to the customers for a reasonable cost and making a profit from it (Magretta 2002). Through a business model, entrepreneur can formulate her assumptions related to the market opportunity, plug in available data, and display how she is planning to create products or services, market them, and make a profit.

The business model comprises four main elements which include customer value proposition, revenue model, primary resources, and value chain processes. These factors in combination create and provide values to the customers (Johnson et al. 2008). The goal of a business model is to reflect how the company will create such compelling value for customers that they will be willing to pay for the company's products or services and the company will make an adequate profit from its offerings. The creation of a business model is vital for any new enterprise, but it must also go through a necessary refinement in the process of developing the business.

As an integral part of the opportunity development process, business models help entrepreneurs understand, define, and organize their next steps toward the opportunity exploitation and provide a holistic perspective of the scope of the business which includes the followings (Teece 2010):

1. What products or services the company is planning to offer to the market and why customers would be interested in these offerings.
2. What would be the company's customer base? Who is the potential buyer?
3. How the company is planning to deliver values to customers.
4. How and using what processes the company will make a profit from its endeavor.
5. Explanation of what would be the cost to produce the company's offerings and what would be the possible margin the company can make from these offerings.
6. Describing the value chain processes from obtaining raw materials to selling the products.

Developing business models are particularly necessary for knowledge entrepreneurship where opportunities are related to discoveries in new technologies and providing services using technologies to customers in a different way than what exist in the current market. To define the right approach here, entrepreneurs will need to explore strategic possibilities as described before.

Functions of Business Models

Bringing Clarification Although the entrepreneur's vision is the initial source of the business concept, the development and exploitation of the opportunity identified by the entrepreneur require support from various other stakeholders. The exercise of the creation of a business model facilitates bringing clarity to the concept, integrating other stakeholders' ideas and concerns, and enables designing a model based on a shared understanding of all parties involved.

Managing Business Processes Business model development is a crucial step at the initial stage of the entrepreneurship process and must work closely with the strategy formulation. The creation of a successful business model gets the business rolling, but to become sustainable, it also should have elements that make it difficult to imitate by incumbents and possible new entrants.

Business model development is more like an art than a scientific endeavor. As it incorporates assumption about future events, getting it right at the very first time is not the primary objective. It is a draft architectural plan which requires tweaking throughout the implementation process before it becomes successful. One reason for this is data necessary to get an acceptable level of clarity and accuracy for each of the elements of the business model in the beginning just is not available. Actions are needed to produce data and evidence. That is why it is necessary to revisit the business model as the entrepreneur makes progress while crossing each step of the entrepreneurship process.

Conduct Analysis The business model forces entrepreneurs to perform a detailed analysis of each critical aspects comprising internal and external elements of the business.

Designing a business model for knowledge entrepreneurship constitutes performing additional analyses to get a grasp of various factors that influence the model. The areas where the design process demands to delve into and extend the model include ICT use and effect, knowledge strategy formulation, innovation, and relationships between them.

Technologies are now indispensable in businesses. Notably, the Internet and mobile telecommunications are the principal sourcing, conducting and delivery channels for most businesses. From the creation of platforms and delivering values to the customers to managing and marketing, they have also become the core technologies and vital force behind many business models. Internet-based new business models, for example, include business process management platforms, social media platforms, marketplaces, content-based advertisement, application, and web-infrastructure development, and service delivery platforms to name a few. Questions related to ICT that a knowledge-based business need to answer include: What types of technology will the business use, how and what benefits they will bring to the stakeholders?

Strategy formulation should work hand in hand with the design of the business model. Because, many of the results received from strategy analyses such as five forces, PEST, SWOT, value chain analysis will provide information that would be integral parts of the business model. In the long run, a successful business model must have an answer to the question of how the business will not just achieve but also sustain competitive advantage (Richardson 2008). As the business model clarifies the processes of value creation and value capture methods, how the company is planning to position itself in the market, and what core competencies will drive company potential should also be unfurled in it (see, Shafer et al. 2005). Strategic choices that the entrepreneurial endeavor is planning to make including developing value proposition, identifying critical resources and capabilities, formulation of the cost and pricing structure, products and services development, building reputation, and setting short- and long-term objectives of the firm, all of these essentially shape the business model (Shafer et al. 2005). The business model itself also can be a strategic management tool for defining, clarifying, and refining firm's value chain process (Tikkanen et al. 2005).

A business is a social process where many types of social actors are involved. From the company shareholders and employees to suppliers, service providers, distributors, and various other partners form a value network of relationships. Some of these links are weak, and some are strong. How the firm plans to interact with these connections and how it positions itself within this network are core issues that mold the business model (Shafer et al. 2005).

Social Enterprise Business Models

When it comes to their mission and objectives, knowledge-based social enterprises face similar challenges like other social ventures and in applying commercial solutions similar issues like any business. Social enterprises fall under the category of the ventures that are engaged in profit-making activities to sustain their core social mission of addressing community interest. Social enterprises with double or triple bottom lines select business models that reflect their method of tackling the social cause, revenue-generating approach, and environmental sustainability. Several ways a social enterprise can embody its commercial operation.

First, the enterprise's process of bringing positive change to the world can ingrain the revenue-generation method within it. For example, micro-financing enterprise such as Grameen handles the problem of poverty and gender inequality by providing loans to disadvantaged women from villages. The company d.light provides solar-powered solutions which are affordable and easy to install to the geographical locations where electric power is not available. Kickstart.org designs and delivers low-cost irrigation pumps to the poverty-stricken farmers of Africa.

Second, the commercial operation can be intertwined with the social mission. An example is when an online and offline enterprise such as a museum provides social services for a fee. Another example is the shoe company Toms, mentioned before. Every single sale of a pair of shoes made by the company generates a similar donation. Livelyhoods.org is a nonprofit that supplies products such as solar lamps, cookstoves, and reading glasses to the base-of-the-pyramid market of Kenyan slums via a hub-and-spoke distribution method that hires young people from the slumps as a sales representative. The enterprise tenthousandvillages.ca is a marketplace that sells crafts and wares from thousands of individual artisans located in the developing countries.

The third one is when the commercial operation is separate from the social mission. A law firm that provides pro bono services to low-income families is an example of such a model. The foundation newmansownfoundation.org gives away hundred percent of its profit generated from the products it sells to charities.

In the literature, these three above mentioned models are called embedded, integrated, and external models (Grassl 2012).

Business Model Innovation

Innovation is an indispensable constituent of a business model (Chesbrough 2010). The process of identifying a commercial opportunity and exploiting entails putting the focus on innovation successfully at many stages. Entrepreneurship, moreover, is primarily about creating value from an innovation where a business model itself can be an innovation. Many innovative ideas fail due to the lack of a viable business model. Kodak is a classic example of a company that could not reinvent itself by developing new business models that could transform it when its primary business of selling films start to falter due to the advent of digital photography even though it spent a significant amount of money on the development of digital technology. Unfortunately, management's fear of cannibalism that would swallow up its current revenue from films sales refrained it from a business model innovation. Kodak purchased a photo sharing platform called Ofoto back in 2001, but without a business model that could have transferred the platform to something similar to Flickr or Instagram, the platform did not add any meaningful value to Kodak. After a slow and agonizing decade, it finally went bankrupt in 2012 (Lucas and Goh 2009).

In the fast-changing world of technological innovation, business models play a critical role in the success of a business. Many of today's largest companies have managed to combine both products and services innovation and business model innovation. Apple's innovative business model of combining iPod and iTunes, product innovations, had created a new platform-based business with enormous potential. Although innovation in business model might appear from an epiphany, business model innovation is an intricate process of refinement, management, and implementation.

Innovation in a business model can have an impact on both value proposition and operational sides. In the value proposition level, the most salient aspects are the products and services, the target market segment and the revenue model (Lindgardt et al. 2009). In the knowledge economy, products and services must go through continuous improvement to compete in the global marketplace. Finding the right market segment or cultivating a new market for the company's offering involve innovative thinking and new ideas. The company strategy identifies, aligns, and incorporates its revenue model. For example, products or services sold through the Internet for a fee can have multiple options such as subscription, pay-per-use, licensing, advertising, activation, and undisclosed fees. Selection of the right kind of pricing, revenue-generation method, and innovative ways of delivering the offering to the targeted customers can be defining elements for the success of a business model.

In the operational side, essential elements are people, organizational structure, cost model, and the value chain. Value chain processes are a fertile ground for innovation through optimization, re-engineering, and step elimination. Innovation in cost model is involved in areas such as resource recombination, sourcing of raw materials, and research and development.

Designing, modifying, and implementing the business model cannot be performed successfully without proper communication between people, strong leadership, assigned authority, and duties. In an entrepreneurial venture, the organizational structure might not seem like a big issue like in large firms. Entrepreneurs still need to ensure that production, R&D, marketing, and sales people interact and communicate frequently, they discuss problems openly and make decisions quickly. To achieve this, the organization's structure has to be lean, nimble, and agile. Compared to more mature firms, new enterprises can remain flexible by being less formal and unstructured in comparison with more matured businesses.

Business model innovation results in having a different strategic approach from the prevailing model and creates new value for the company. In the knowledge economy, increasingly it is treated as a serious contender for long-term competitive advantage for a company by providing approaches to combat disruptions caused by advances in technologies, regulatory and market changes, and a shift in customer demands (Zott and Amit 2007).

Business Models for Knowledge-Based Social Enterprises

The influence of the emerging technologies on the business models and strategies of the social enterprises is still at the preliminary stage of growth. The early signs show that AI and machine learning technologies are already transforming the very concept of technology use in tackling critical social challenges. However, most social enterprises and new entrepreneurs are oblivious about the changes these new technologies are going to make in the process automation, marketing strategy, and operational efficiency among others.

After investigating hundred AI start-ups which were purchased by major technology companies, we have identified five different most common business models prevailing in the industry. All these AI companies have deployed one or a combination of two or more concepts outlined here.

Personalization and Personification The concept that products and services, environment and tools should be tailored to individual needs is not necessarily a new one. The Internet-based platforms and recommender systems in combination made it possible today for even smaller companies. Entrepreneurs must determine three essential aspects of personalization as a customer-centric business approach to implement it successfully. First, it is the personalization of the product, content, interface, functionalities, and delivery method. Second, the level of clustering and how granular this level should be: Is it aimed at individuals or multiple different segments. Third, what types of data would be used to achieve the needed level of personalization (Fan and Poole 2006). The conventional approach to the personalization is to rely on users' past behaviors, preferences, and social relationships. However, a sophisticated recommender system usually works with numerous other data points along with these (Ricci et al. 2015).

Personification is the method of creating a virtual representation of a user with the intention to provide tailored services. It is a virtual dossier of a user with the details that can be used to customize a service or product to a customer's specific preference (Clarke 1994). Google, Amazon, Facebook, Netflix, and all similar platforms use some user personification as well as personalization. Social enterprises while delivering health services and catering people with special need assistance are one of the prime users of AI-based such systems (Krutko et al. 2017)

Subscription This model also refers to as fee-based service and one of the most popular revenue models in many traditional public and social ventures and on the Internet (Wang et al. 2005). Most membership-based associations apply a specific type of subscription approach to generate revenue and deliver services to members. A common way for social enterprise is to provide services to customers capable of paying to charge a fee for the service but deliver the same service to students, impoverished people and senior citizens for free. Even with the deployment of new technologies, this model will stay prevalent.

Mutualism It is the preferred business model for the sharing economy. In its essence, the company provides a community-based online service platform where people rent, acquire, deliver, and share access to goods and services with others for monetary or other compensation (Hamari et al. 2016). The sharing assets are properties, cars, bicycles, and others. Uber, Lyft, Airbnb are some of the most prominent examples that apply this business model. Kiva is an example from the social enterprise world. It is also the prevailing model for all crowdfunding platforms.

For many social enterprises, those who are working with a deprived segment of the population, it is an ideal business mechanism. Enterprises can target from farming equipment to computers and bicycles to books all asset classes in the sharing economy of the impoverished segment of the society (Matofska 2014). There exists significant room for innovation in this area. For example, innovative ride-sharing apps in developing countries have taken the idea to the next level. In places like Dhaka, Bangladesh traffic jam is so horrendous that people spend hours in commuting every day which made motorbike-sharing a way to beat the traffic. There even a bike sharing service exists to cater only to the female population.

Piggybacking It is an ideal approach for smaller companies where they develop a win-win relationship with a more prominent partner. Many software and gaming companies take advantage of the cooperation of larger partners with better access to the market (Ojala and Tyrväinen 2006). Zynga, a developer of social games, applies revenue-generation method that sells virtual objects to the gamers, and advertisement in and around their games. However, its ability to reach users with the efficient use of Facebook's platform and piggybacking on the relationship with Facebook is the primary reason for its success (Runge 2014). Many small companies in their efforts to sell their products internationally use this approach by working with influential partners. In the social enterprise sector, it is still underused, but a promising method as many social ventures are learning from their experiences.

Optimization and Automation Operational process optimization and automation of the production processes are where the Internet of things, robotics, and AI are observing massive implementation as they are visibly reducing costs and increasing productivity. The emerging technologies are excellent tools for addressing the issues of process optimization, elimination, and automation and as a result the maximization of the effectiveness of available resources. Three principles will help to discover opportunities in the implementation of AI and other tools in this process.

1. AI and machine learning can handle repetitive works that require some intelligence.
2. Instead of trying to replace an entire process best option is to go for incremental innovation.
3. It is unlikely that an optimum level of process optimization will take place at the first iteration. If the performance improvement is better than before, the system should be applied immediately.

There is no fundamental difference in the commercial aspect of a social enterprise with traditional businesses regarding business models. The models described here are possible templates that social enterprises trying to venture into the knowledge-based areas can deploy in their endeavors. The important thing for the social enterprise is to illustrate the impact delivery and measurement mechanism within the business model. The models explained here are generic templates. Entrepreneurs are always encouraged to come up with new innovative business models that will work best for their knowledge-based social enterprises. One thing to remember is in social enterprises a business model that works and deployed efficiently embodies the entrepreneurial success (Brouard and Larivet 2010).

A revenue model relies on the type and nature of the enterprise, product characteristics, market competition, customers' expectations, and many other factors. These dominant models may work as a guide to the selection of the model that best suits a particular venture.

Some Example Areas of Knowledge-Based Social Entrepreneurship

Consulting is one area where nonprofits can make headway in the knowledge industry. Many nonprofits have accumulated tremendous expertise in social services and in addressing social issues. With the rising tide in the corporate world to improve their social responsibility efforts, it is a niche that needs professional support that nonprofits generally overlook.

Social enterprises are not taking enough advantage of the big data, predictive analytics and monitoring dashboards supported by AI. The adoption of these technologies will help social enterprises receive a bigger exposer to the market, understand the root problems better, and have real-time knowledge of what works, and how to handle problem areas better. For example, the use of recommender systems can improve the decision-making process in many areas.

In disaster relief and humanitarian assistance, there are many ways AI and robotics are already making significant inroads. The drones are transmitting real-time data of the impact of the calamity aftermath of a disaster and locating survivors. Data from the drones can also help farmers to received information on early detection of crop diseases.

AI-based simulation, machine learning, and game theory are the underlying technology of programs that are deployed to outwit poachers and protect endangered species. One of the programs allows maximizing patrolling vast territory of conservation parks with available resources based on prior data of poaching activities, possible attempts, and animal movement trajectories. These programs along with IoT sensors, GPS, and VR can transform the struggle against deforestation, animal extinction, migration, and many others.

Irrigation- and farming-related social enterprises can apply IoT based weather sensors and farm equipment to improve irrigation and crop cultivation. The AI for monitoring and predicting crop prices, soil data, and anticipated weather conditions use recommender systems for making suggestions on which crop is best to plant in a particular season.

Water supply management systems are already using AI to accumulated data and monitoring of pumps, pipelines, filtration process, and plant assets. The use of this type of programs can have a beneficial effect on the current water systems in the developing countries, where clean water is still a considerable problem and improve water management, save costs, and bring energy efficiency. Nanotechnology is a solution to water purification problem prevailing in many developing countries. Nano-absorbents are capable of reducing toxic materials such as the arsenic in the water common in many places. Water desalination is a promising area where nanotechnology led innovation is gaining ground (Savage and Diallo 2005).

An AI tool is used to identify the peer leaders within the Los Angeles County's homeless teens. The advantage of discovering the peer leaders is, through these kids' critical information about HIV infection and methods of prevention are more straightforward to spread out among the youths of the neighborhood (Yadav et al. 2015). These types of use of AI tools which target persistent social problems from a meta-level have widespread applications throughout many challenging areas.

Virtual reality is used in another area. VR environment-based approaches are targeting psychological problems such as post-traumatic stress disorder of war veterans and are ripe to penetrate other areas (Aukstakalnis 2016).

Knowledge-based social entrepreneurship is also about taking preemptive action in the use of technology and new knowledge in solving not just the social challenges communities are facing today, but also what might happen tomorrow. The massive penetration of AI into all industries are creating a tremendous job market disruption. Many people are going to lose jobs. We can use AI as an instrument today in pinpointing which industries will have the most significant adverse effect from automation and machine learning and other technologies and be proactive in working with various scenarios and develop a premeditated mechanism to mitigate this anticipated significant crisis.

The Base of the Pyramid (BOP)

A socioeconomic term which refers to the unserved market of a large number of world people who is trapped in abject poverty and unable to realize their potential due to minimal access to resources. Prahalad (2004) brought attention to the fact that by supporting and targeting this vast group of people as consumers businesses can help unleash an enormous amount of dormant human creative and productive capacity at the same time eradicate poverty. A growing number of nonprofits and social enterprises are presently addressing various social problems in many countries by targeting the BOP market.

BOP market is complex, unpredictable, and precarious for any business and more so for social enterprises. To make a stride, getting a foothold in the market and scaling up the business require to understand the structure of the market and its intricacies. The market is inefficient, informal, and uncompetitive with many seemingly insurmountable challenges. Rural BOP segment faces issues such as lack of literacy, poor access to sanitation and health care, nutrition deficiency, and social and cultural isolation. Moreover, as consumers, they have low purchasing power, nonexistent financial literacy, inconsistent mobility, and personal values and standards. From business operating environment perspective, entrepreneurs will encounter challenges such as severe infrastructure limitation, inadequate institutional support, the paucity of data, transport accessibility, diverse stakeholders, and tradition and cultural beliefs (Shukla and Bairiganjan 2011).

Developing a business model where the market conditions are different, the governing rules are finicky, a considerable gap exists in expectations of the different stakeholders, and supply chain works based on complex rules is not an easy task. Entrepreneurs have to arm with a clear understanding of the market they are planning to penetrate and create an internal strategic framework to follow as a road map at all three entrepreneurship stages. Innovative ways of using most recent technologies can resolve many of these persistence and pervasive issues.

SDG Goals

There had never been a better time to get engaged in social entrepreneurship where technology, knowledge, and innovation can bring massive effects. Would-be social entrepreneurs can check out the United Nations Sustainable Development Goals (SDGs) aimed at ending poverty, eliminate hunger, eradicate illiteracy, protect the planet, and promote peace and harmony throughout the world. The goals include: No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Industry, Innovation and Infrastructure, Reduced Inequality, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace and Justice Strong Institutions, Partnerships to achieve the Goal (Griggs et al. 2013).

In each of these areas, entrepreneurs can become a dominant force behind the change necessary. Most significant constraints for the underprivileged population in addition to financial issue to make a positive change are lack of adequate knowledge, access to the necessary know-how and expertise, the absorptive capacity to assimilate knowledge and manage resources.

Increased awareness on the one hand among the shareholders of corporations, their increasing desire to undertake social responsibilities and impact-driven investment, and on the other hand and recognition of the problems the world is facing by responsible citizens have created an environment where these forces are ready to participate in supporting social changes actively.

Despite the access to the Internet and other communication systems, the gap between those who need help and those who are willing to assist is still significant due to social, geographical, cultural distance, and barriers. Social entrepreneurs can fill this void in many ways by applying knowledge-based innovative ideas, finding solutions to social problems by designing inclusive business models, and creating product and services that can cater BOP segment as possible clients, partners, distributors, and workers.

The social sector needs to be aware of the paradigm shift knowledge-based social entrepreneurship will going to bring and how advanced technologies will become the force behind the new models of value creation both from the commercial position and the social mission.

Conclusion

Entrepreneurs ordinarily do not like to conduct any strategic analysis before starting a venture. One reason is they usually do not have the resources and capabilities to carry out complex market research, analyze possible threats exist in the market landscape or perform an in-depth cost/benefit analysis of their products. Another thing is time is an essential factor for the introduction of any new product or service, especially, in the knowledge economy where product life cycle is increasingly shortening due to the technology shift and competitions from global rivals. However, these are also the reasons why entrepreneurs should consider some strategic analyses and planning to mitigate risks that are inherently attached to any new venture. Would-be entrepreneurs do not have to perform in-depth analysis using all possible tools. Over-analysis might be even detrimental as the entrepreneur might miss the time to get into the market before others. However, in today's highly competitive environment where success depends on many factors from technology choice to customer segmentation and pricing policy to product features, it is imperative to evaluate the business concept and selection of the business model before launching the enterprise. As many strategic tools and mechanisms are available at an entrepreneur's disposal, entrepreneurs have to decide which ones will work best for their particular situations.

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CHAPTER 9

Opportunity Development and Commercialization

Opportunity Identification and Analysis

Two places where entrepreneurs find opportunities are market imperfection (Kirzner 1979) and information asymmetry (Venkataraman 1997). Entrepreneurs exploit market imperfection by introducing new products and services, new business models, bringing innovation to processes, reorganizing resources, and opening new markets (Shane 2003). Opportunity discovery is the first step and key to the starting of a business. The existence of an overlooked opportunity does not guarantee that it will be discovered and exploited. Recognizing an opportunity requires having individuals with sufficient prior knowledge and experience in the related field with intentions to seek out opportunities (Baron and Ensley 2006). These individuals also need to have access to the market and technology information concerning the opportunity (Ma et al. 2011).

Once identified the opportunity it goes through a selection process based on specific criteria set by the entrepreneur. The first step in the selection process is to perform a customer analysis in order to understand the real need of the offering. The enquiry should provide clarity to the question if indeed there exists a market for this offering. The second is to do the competitor analysis that will answer to the questions who the incumbents in the market and what products they are selling for what

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price. The inquiry should also cast a shadow on if the product or service the entrepreneur is planning to introduce is similar to the ones available in the marketplace, or it is a substitute of what is available. The next analysis should be something similar to five force analysis (Porter 1989) to get a better grasp of the industry, the existing rivalry, and possible threats if they exist from the supplier and buyer sides.

These analyses will unfold thought-provoking insights and information. Based on the data collected from them, entrepreneurs can reasonably establish if there is a market for the product, what is the possible market segment, what specification the product should carry, how the product should be delivered to the market, what is the probable price point, can entrepreneur make sustainable profit from this venture and several other key questions. The business model creation and the strategy formulation ensue from this exercise.

Opportunity Development

Once the opportunity is selected, and a business model has been designed the next step is to develop a commercial version of the opportunity which in most cases is either a product or a service. One of the essential characteristics of a successful business is exemplified by its ability to continuously and rapidly develop new or improved versions of existing products that deliver values more than customers expect. Hence, it is recognized as a highly coveted capability by most firms, and it is deemed as one of the critical reasons for entrepreneurial success (Bullinger et al. 2000).

Product development is the process through which companies react to market signals, respond to changes in customer demand, adopt new technologies, foray into new areas, and ensure continuous growth (Brown and Eisenhardt 1995). It is a core process in achieving strategic objectives, renewal of the company business model and deterring competition from displacing the company from its market position.

From the present visible display of serious competitions between significant technology players, intensification of the appearance of new products in the market and shortening of the life cycle of technology-based products it is evident that in today's marketplace survival of a firm might depend on innovation in general and the product development process in particular.

Product Advantage

A product's perceived quality, benefits, and economic value by customers contribute to its market acceptance and performance vis-a-vis other similar product. Innovative ideas embedded in the product are often the main reason for a product's positive reputation among the customers (Kleinschmidt and Cooper 1991). However, product innovation not corresponding with the market's perception may negatively effect on its customer adoption. Even for disruptive innovation, its value proposition is crucial for its success. The product must solve a critical existing problem or two, at least initially, to position itself in the market. Mass scale adoption of a product takes place only when it can identify the pain point customers are facing and provides a solution that is better than existing products.

Segway is an excellent example of a product which is by any measure a technological marvel seemingly solving a real problem related to mobility but failed to make meaningful penetration into the market. The causes of its demise include its low economic value. A product positioned in-between a bicycle and an automobile, with over 3000 USD price tag, it could not garner enough customer appeal (Sloane 2012).

While developing a product, the crucial aspects that must be factored in include its cost, differentiation attributes, quality, and alignment with the business model.

Knowledge and Product Development

From the development of the strategic approach to product planning, designing of the product and the actual development of the product, the process is closely related to knowledge acquisition, use, and creation. Whether it is an entirely new product or a refinement of an existing product in knowledge industries the integration of knowledge from external sources and cross-pollination of knowledge from other departments such as marketing and sales, and assimilation of this knowledge with knowledge possessed by the team is an essential underlying foundation for innovation. Often the precursor to the discovering of a new opportunity represented by a product is market, supplier, technology, or customer knowledge.

Product Development Product development process differs from the manufacturing of the same product in many ways. The manufacturing process is based on specific input factors, planned activities, clear features and specifications of the product and the defined outcome. Product development process is uncertain, activities are loosely specified, features and specifications and even input resources change throughout the process, and output often deviates from the original plan.

Product development process comprises four primary stages which are opportunity identification, opportunity development, testing, and commercialization (Urban and Hauser 1993). There is a plethora of techniques to improve the efficiency and effectiveness of the product development process. However, most companies rarely apply them consistently and coherently (Nijssen and Frambach 2000).

Antecedents of a product development project comprise of opportunity discovery, market analysis, and financial analysis. While developing a product, the entrepreneur must make their full commitment to the project. Talking to the prospective customers, asking their opinion, and doing customer research at the time of conducting R&D are excellent ways to ensure valuable inputs garnered from these activities are integrated into the product design. As it is difficult for customers to articulate their requirements and solutions they expect from a future product, it is prudent to interact with some prospective customers throughout the development process.

Innovation accompanies new knowledge creation where information sharing is crucial for a successful outcome. Entrepreneurs should make sure that free flow of ideas is taking place within the team and other stakeholders. Valuable ideas that are produced from knowledge sharing, transfer, and brainstorming are rarely spontaneous acts, they are often a series of planned activities aimed at deliberate knowledge creation which is an outcome of collaboration and teamwork.

For a smooth, productive, and nimble product development process that will design and build the product on time, on budget and with a higher probability of success, entrepreneurs should consider arming with the following best practices:

Hands-On Participation in the Product Development Process Entrepreneurs are usually overwhelmed with various activities related to the entrepreneurial process and particularly with searching, finding and attracting resources, and building networks. No matter how busy they are with daily routine and other processes and procedures, it is imperative that they allocate necessary time, energy and engage in every step of the product development process. Entrepreneurship is inherently a risky venture. As the outcome of the product will decide the future the entrepreneurial endeavor, entrepreneurs must appreciate the level of risk-taking necessary and be committed to it. They need to convey the unequivocally clear message to all members participating in the product development process about the importance of the product for the future of the venture. Entrepreneurs also must ascertain that resources necessary for the development process is available. Knowledge-based products require deep technical and industry-related knowledge. Entrepreneurs should keep themselves updated in knowledge areas relevant to the offering they are planning to bring out (Cooper and Kleinschmidt 1995).

Having Clear and Consistent Objectives From the moment the team commences to work on the product development project, a plethora of information starts to pour in. It becomes difficult to stay on course when information explosion, new insights, team members' expectations, and stakeholders' desires put pressure on priorities. What helps in these situations is to stick to the strategic vision and business model rather than trying to adhere to the expected output product which was initially envisioned. An overly rigid approach toward the development process can be risky to its success.

Improvisation Although in the product development process the tactical plan, steps were taken in the development process and changes made, should be well aligned with the strategic goal, the team must be flexible and always open to exploring new ideas and proposals. Development of any product goes through multiple trial and error experimentations. The entire R&D is an ongoing process of testing, validating and refining where insights and ideas emerge on a daily basis. The development team evaluates and incorporates many of those ideas and selects a solution only after comparing, analyzing and benchmarking with other alternatives. During this process, the product specifications might change noticeably. Within the period, while the product is getting developed aspects like changes in trend, customer preferences, and market conditions can also have effects on the process.

Information Sharing Thanks to the Internet and other new communications technology knowledge flow within organizations, employees and other stakeholders have enhanced noticeably in recent years. The need for continuous innovation and quicker product introduction to the market also compel companies to provide access to rapidly changing but important product-related information to the members of the product development team.

Moreover, one of the most critical factors in innovation is knowledge. Product development which is a type of innovation dictates that access to external to organization's knowledge, tacit knowledge embodied by the members of the development team as well as key stakeholders, and the base knowledge of the product, market, and competitions are always readily available. In fact, in the highly competitive market of the knowledge economy, the ability to share, transfer, and distribute knowledge throughout the product development process can itself become a possible source of competitive advantage (Ramesh and Tiwana 1999). As this process is complex, dynamic, and incremental, it demands that people with varying degrees of expertise from different departments of the company as well as the members of the team readily share their knowledge. This knowledge sharing process can take place through a sophisticated knowledge management system or informally by various means of communications. In a Start-up or a new company knowledge sharing often occurs in informal settings, face to face or via messaging, e-mails, and file sharing. The flow of knowledge within the team and from external sources facilitates taking advantage of tacit knowledge, expertise, and experience of the team members and other stakeholders in the design and creation of the product. Not sharing knowledge can produce flaws that can severely hamper the team's effort to develop a product. Because of this, knowledge sharing is considered a key contributory factor in the product development capability of a firm (Hoopes and Postrel 1999).

Collaboration By reducing the boundaries between the participants of the product development process companies can reap enormous benefits. Fundamental to this is cooperation between the members of the team which was formed to work together on the product development process and with other stakeholders.

Organizations are increasingly creating more diversified cross-functional development teams to maximize the potentials of the process. A cross-functional team is referred to a group of participants who possess different knowledge and expertise but work on a common objective (Parker 2003). Customers and supplier are also becoming a critical part of the development team because valuable knowledge they possess contribute to the team's knowledge base and enhance the capability of the research and development process. Collaboration with external sources such as the supplier and buyers who have a vested interest in the favorable outcome of the product development increases the chance of the product's success. Often new products fail to attract traction because the company was unsuccessful in assessing customers' needs and the product features do not correspond to the solutions customers are looking for. That is why seeking active participation from customers in the development of the product a variation of which already being used enhances the possibility that the future product will meet customer's requirement.

On the one hand, all feeds are today producing enormous amount of information, but on the other hand, the specialization of a subject matter is increasingly becoming niche-oriented. As a result, in many industries, product development calls for gathering a team from different backgrounds and with diverse expertise, skills, knowledge, and experience. For example, R&D in the pharmaceutical sector relies on the combination of in-depth knowledge in pharmacology, biology, chemistry, medicine, and biotechnology. Moreover, knowledge from the various departments from sales to logistics and manufacturing to marketing is often essential for designing a viable product.

Whether it is the collaboration within the team or outside participants, its impact relies on the trust level that exists between the group members, their willingness to cooperate, having a shared vision and mutual understanding (Kahn et al. 2006). More cooperation and interaction between the participants of the cross-functional team contribute to shortening the development time, cost reduction, fewer hiccups with prototyping and manufacturing, and rapid commercialization. However, this to occur the team must hold several vital features such as (1) the participants need to have the feeling of having ownership of the project; (2) information flow within the team and outside has to be transparent for all unless it is a trade secret; (3) participants have to be focused on the project with minimal distraction; (4) the element of synergy has to exist within the team and with other participants who show significant combined capabilities that outpace individual skillset (Jassawalla and Sashittal 1998).

The entrepreneur should also note that the outcome from the product development and its success relies on the following attributes: product development process, Organization, product strategy, company culture, and management commitment (Cooper and Kleinschmidt 1995).

Product Development Process A clear, well-defined set of activities that encompasses from opportunity selection to product prototyping with an assigned workload of each participant improves the chance of getting the product developed as expected (Fig. 9.1).

The benefits of having a stage-based approach to product development include efficiency in the management of the process by keeping checks and balances, optimization of resource allocation, keeping the cost under control, and identification of snags at an early stage (Li et al. 2010, April).

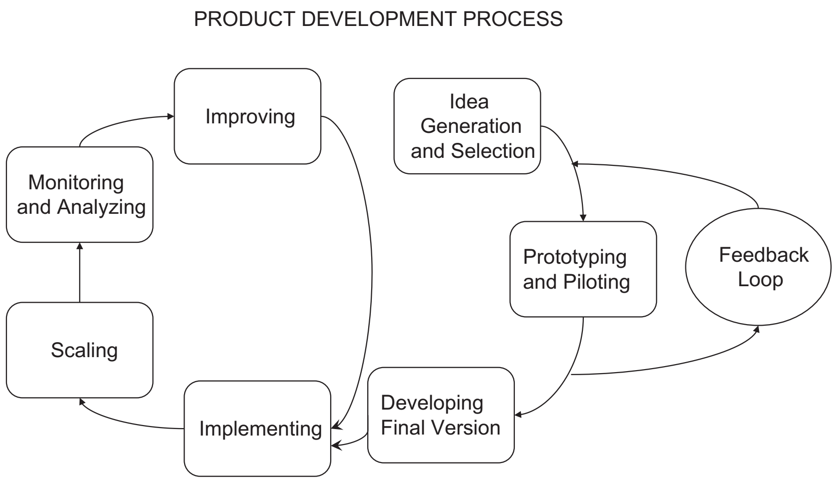

Fig. 9.1 Technology product development process

Success in product development is not guaranteed. However, the odds can be favorably tilted if the following criteria are fulfilled (Zirger and Maidique 1990).

1. The company acquired in-depth knowledge about its customers and the marketplace.
2. It designed a comprehensive marketing and sales strategy and allocated the necessary resources to execute it.
3. Its R&D efforts were well designed, well-coordinated, and well-planned and the team follows the plan.
4. Management is intimately involved with the project throughout the entire product development and commercialization process.
5. The product's value proposition is compelling for customers.
6. The revenue model is transparent, profitable, and sustainable.
7. The company adopted the blue ocean strategy or positioned the product in the least crowded market.

The product development process is also a struggle between innovation and prior organizational capabilities that have successfully served the company before. It can deter the management to have an objective approach to new products (Yap and Souder 1994).

Product Development Strategic Objectives Three objectives that any knowledge-based product development team should set are as follows: (1) the minimization of product development and commercialization time, (2) maximization of market acceptability of the product by aligning product specifications with customer needs, and (3) reduction of product's cost (Schilling 1998). These three objectives sometimes conflict with each other but managing them efficiently and learn to trade-off when necessary is crucial for product development success.

Time Minimization Objective In the present economy, the lifespan of most knowledge-based products and services is relatively short due to the continuous development of newer technology and changing customer requirements. Global competition and rapid obsolescence are also making things complicated and putting intense pressure on the companies to improve their offering continuously.

Time Factor in the Product Development Stage Depends on the Following Questions How many organizational functions are embedded in the development process, how many of the activities can be performed concurrently, how quick the decision-making occurs, and how close is management's involvement in the process (Swink 2003; Sherman et al. 2000).

It is important to note that a shorter development cycle has advantages like performing a quicker revision of product version along with the technological progress and reacting to competitor's actions promptly. However, a too short period between the features' revision of a product can work against its market acceptance—buyers may hold back from purchasing knowing a new version will come out soon and the present version will become outmoded (Dhebar 1995).

The organization must incorporate time aspect to its strategic business goal pertaining the product development and rollout. To gain maximum benefits from this strategy organizations must make employees well aware of the importance of time and work on ingraining time-sensitivity in the organizational culture. A relative advantage occurs when a firm builds such expertise in the shortening of time spent on each stage of the product development.

Product's Market Fit Several factors impact the ability of the new product to penetrate the market quickly, aggressively, and generate significant revenue. The first one is the product's ability to tackle one or more customer pain points. A pain point refers to a problem customer is facing but unsatisfied with solutions available in the market. Other factors include newer features and specifications, and an attractive price.

Commercial success does not entail from improved, newer and better product features alone. Relevant here is how customers perceive benefits the product provides and its reputation. The company's market penetration strategy is also consequential in this. One example often cited to illustrate the point is Sony Betamax. Introduced in 1975, Betamax was a superior home video cassette recorder than VHS but lost the format war to it. Its failure, despite having the first mover's advantage, primarily was blamed on Sony's decision to keep the format proprietary (Cusumano et al. 1992).

Marketing can also have an impact on the product's success. Volkswagen (VW) ventured into the US luxury car market with the model Phaeton in 2002. Critics argue that VW's failure caused due to its perceived brand image by customers as a mainstream car company. Although Phaeton was comparable to Mercedes S class, brand conscious customers refused to relate VW with a luxury brand. Other companies such as Toyota, Nissan, and Honda were more successful and managed to carve out a niche within luxury segment by creating new brands of Lexus, Infiniti, and Acura accordingly while VW had to leave the lucrative luxury segment (Keller 2015).

Proper pricing strategy can improve market acceptance of the product, secure strong market position, and even create a competitive advantage for the firm. As Walmart's business model shows, pricing can be a competitive advantage if the right segment is targeted correctly.

However, more companies increasingly realize that the price of a product should be dictated by the buyer's perceived value and not just competing products, and direct or implied costs (Nimer 1975). In today's marketplace where companies can have access to massive amount of pricing data virtually real-time, one strategy getting traction is the dynamic pricing. While airlines, rental cars, and hotels have been using this approach for a long time, many other industries are also discovering value in this method (Elmaghraby and Keskinocak 2003). Uber, for example, practices a peak time price surge in addition to different pricing for different car segments. Google, Airbnb, and many others have also embraced dynamic pricing models to mitigate and exploit market inefficiency when supply and demand fluctuate significantly.

Controlling Development Cost Cost is a concern for all companies, but start-ups should be particularly cost sensitive in every area due to their resource constraints. One way of making sure that the price would be in line with the market expectation is to perform a cost analysis of the future product before starting to develop it and target an optimal cost. Firms that introduce target costing to their practices see their profitability climb. In order to achieve targeted cost, first, the company identifies what should be the selling price of the product by doing market and customer research. Next, it calculates what should be the profit margin it needs to aim. By subtracting margin from the price, it comes to the acceptable target cost (Yoshikawa et al. 1995). Once the target cost is established the company starts optimizing processes from a cost perspective and works on the key aspects such as minimizing the number of sources for materials, eliminating of excess steps in the development and manufacturing processes, and revision of logistics cost (Afonso et al. 2008).

By focusing on these three strategic objectives, companies can introduce products to the market faster and in some cases gain a first-mover advantage (Griffin 2002). First-mover advantage can facilitate attaining market dominance, imposing a higher price, and acquiring and developing a sustainable loyal customer base. It also makes competitors become followers.

First-Mover Strategy First to market is a strategy that most companies are willing to pursue as many products have shown a definitive advantage of being the first in the market which reflected in market leadership, ability to impose high switching cost on buyers, and getting control of scarce resources (Gupta and Wilemon 1990). These aspects allow the company to create significant barriers to entry for new entrants, skim maximum profits from the sales of the new product by leveraging pricing freedom and quickly establish economies of scale (Reinertsen and Smith 1991; Lieberman et al. 1988).

Shortening the product development lifecycle and bringing in products faster than competitors carry a significant market advantage. The rapid development of products, introducing them to the market and quickly refining them, keeps competitors at bay and establishes rules that the competitors become forced to comply. Notably, it occurs in knowledge sectors as Intel and Apple have been demonstrating for a considerable period. Apples' iPhone is an excellent example of such success. However, a firm can sustain the advantage for a more extended period only if it can create high barriers to entry. The possible barriers could include (Channon and Sammut-Bonnici 2014).

1. Supplying products of far superior quality with significantly lower costs.
2. Achieving high growth level which is impossible for others to capture.
3. Establishing a high-level customer loyalty and high-value brand identity.

The followers also have certain advantages. They can receive from the experience of the first-movers what customers want and avoid costly mistakes. They can also receive benefits from such strategic approaches and support their choice with added market information that market leaders produce. Market follower strategy can be rewarding considering the company does not incur costs related to innovation, customer education, and market development (Meredith 1987).

Technology Strategy For start-ups in knowledge areas, technology is instrumental to their product success. The continuous emergence of new technologies is expanding our abilities to automate processes, find new solutions to human and social problems and venturing into new areas that did not exist before. Technologies are changing how we find, obtain, absorb, and diffuse information that has created industries like social media platforms, new ways of delivering services such as financial and logistics, and retail platforms that brought shopping to kitchen tables. The supporting technologies that made these things possible are the Internet, mobile communication devices, and tools like programming, machine learning, cloud computing, and many others.

The speed of technology change is so overwhelming that it often exceeds organizations and individuals resource capacity to adopt newer products and updated versions. It is also reducing lifecycle of products, bringing new entrants to the market, and exposing the market to increased global competition. As unintended consequences of these changes, companies are forced to react aggressively to the new market conditions for survival and expedite their innovation. A positive outcome of this is that entrepreneurs are finding new opportunities to exploit. Nevertheless, it also creates a dilemma for both established organizations and start-ups in selecting the right kind of technology for their relevant purposes and not left behind from their prospective competitors. Having a prudent and systematic technology strategy and technology management skillset is crucial for companies to avoid serious mistakes related to technology choice and end up relying on soon-to-be obsolete technologies. Considering the continuous advances in technology, the possibility is realistic and many companies have learned it in a hard way.

Prototyping Whether a product is a service, a platform or an application in knowledge related arena rapid prototyping and testing are mandatory to improve the success probability of the offering (Jordan et al. 1989).

There exist many reasons why entrepreneurs and companies should opt for rapid prototyping in the new product development process. Prototype models are often built to compare and check the viability of alternative technical solutions, to verify if it works as expected, to see how cost-effective the solution would be, and to test the market. Prototyping allows to detect problems with the product, check the feasibility of the embedded features, evaluate customer acceptance of the product and its specification, and make changes as necessary (Pisano 2015).

For social entrepreneurs, early stage prototype creation and testing are an excellent way to assess how correct the primary assumptions were and if, despite having resource limitation, it is worth to continue developing the product. Before making a full commitment to the project, entrepreneurs can take advantage of customers reaction to the product by demonstrating it to the prospective customers and receiving feedback on its design, features, price, and value proposition (Upcraft and Fletcher 2003). It is a cost-effective and easy method of collecting valuable data about the product and business model.

If it is an expensive physical product, with today's technology, it is possible to create a virtual model first for testing its feasibility. For example, many medical products are presently modeled applying 3D, simulation and other technologies which save a substantial amount of time and resource (Gibson et al. 2004). Increasingly, companies are using rapid prototyping methods for manufacturing products by using tools such as CNS subtractive methods, additive manufacturing, and 3D printing.

The prototyping helps to optimize, redesign, and validate the product and its features which induce an improvement in quality. It also facilitates the elimination of additional processes and parts that increases reliability, reduces product development period, shortens time-to-market, improves product lifecycle, and satisfies customer expectation better.

In the knowledge economy, the advancement of technology is taking place in lighting speed, new competitors are emerging from new areas, and cross-industrial R&D is facilitating companies to explore new territories. An established company with a solid brand image with the reputation of high-quality product and service do have more leeway to penetrate the market with a follow-up product. However, for start-ups in this swiftly changing environment, the first strategy it should consider before even the question of launching the product to market is how to expedite the NPD process and to bring out the product quickly to the market.

Start-ups should apply approaches such as simplification, steps elimination, reductions of delays, speeding up operational processes, and maximize use of simultaneous processing through such methods as outsourcing (Milson et al. 1992).

Outsourcing In knowledge-based ventures, entrepreneurs often transfer the works related to product development and manufacturing to a subcontractor. As many of the knowledge related services are done through the Internet and many of the products and services are Internet-based, outsourcing R&D and product creation from places where the cost is relatively cheaper has become a popular strategy (Ndubisi and Umar 2018).

Simplification of the processes should be achieved by creating task clustering by grouping the product development activities following job sequence design. The focus on designing the jobs by adopting simplification as a continuous objective, the company can achieve flexibility, improved productivity, and accelerate the product development (Cusumano 1988; Heany and Vinson 1984). For example, instead of trying to introduce a platform with all its desired functionalities at the first iteration the developers can focus on only some key must-have features. Instantaneous information flow by linking all stakeholders from all relevant departments through a virtual knowledge repository and community hangout significantly improve knowledge sharing, transfer, and expedite decision-making process.

Companies need to work on accelerating decision-making process by introducing rules what type of decisions can be made by whom, designate the key individual responsible for each type of decisions and allocate strict timeframe to reduce delays. The precise formulation of processes and tasks and the adoption of a just-in-time method for task completion and delivery reduce delays (Abernathy et al. 1984). It is necessary to analyze and note which jobs, tasks, materials, and processes cause the delay in commencing each of the processes within the development process. Factors need to identify while analyzing include tasks and processes that are causing the delay if these can be accomplished separately, if not can the team optimize and streamline the tasks and processes without diminishing efficiency and productivity.

By eliminating unnecessary steps, companies can expedite the development process and product launch. The emphasis on the customer value that a process or a task carry can help identify which steps are redundant and must be eliminated. Technology is helping to reduce, streamline, and eliminate many of the processes which were vital even a few years ago. Most tasks related to approvals, data collection and updates can be automated today thanks to technologies. An early adopter of technology in process elimination was Zara, the clothing company. It managed to build a competitive advantage by eliminating warehouses and directly shipping clothes to retail stores by air from its manufacturing plant. It deployed a system that monitors in real-time how items are selling in the retail stores and replenish when necessary immediately by air shipment. By doing so, it also achieved the elimination of entire supply chain process of first sending the items to the warehouses and distributing from there which was the standard practice for most clothing retail stores. The system helps Zara to launch new seasonal items much faster than the competitors (Macchion et al. 2015).

More sophisticated technologies are continuously emerging that can optimize, automate, and speed up many of the operational processes related to product development. There are systems available for idea generation, workflow management, innovation management, marketing management, and logistics management to name a few. While earlier the stages like idea development, R&D, prototyping, and bulk production were deemed as different operations rely on the specific process-related system and segmented knowledge, increasingly the push now is for aligning and integrating these areas in order to speed up the development process. Product lifecycle management framework tied to the entire value chain related to the product and aimed at customer value creation reduces redundancy, eliminates processes, automate tasks and bring speed and cost-effectiveness for each of the development stages (Stark 2015).

Despite all efforts, a large number of new products fail to realize market potential. To understand how successful the new product was in gaining market, the start-ups like any other companies need to adopt a market performance measurement method. A broader measurement data from market interaction perspective may include quantifiable market data such as sales, market share, gross profit margin, and subjective measures such as customer satisfaction, and performance comparison with similar competitive products. The other strategic outcomes such as the creation of the brand image within a new segment of the market, new marketing, and sales relationships that were developed, and better understanding of the market and competitions are important attributes that can be beneficial for the future of the company should be assessed as well (Cooper and Kleinschmidt 1995).

Evaluation of the product development as a project entails analyzing internal aspects of the firm along with external outcomes concerning the market. Internal aspects include cost incurred by the project, time spent on the development and performance of the team. More detailed and long-term strategic analysis involve assessment of the skills and capabilities developed within the NDP process, new knowledge acquired about technology and processes, and relationships built with external partners such as suppliers, consultants, and other stakeholders. These strategic acquisitions and capability development may have farfetched benefits regardless of the commercial success of the product (Tatikonda 2007).

For knowledge-based products and platforms, two market effects contribute to a better understanding of their market success.

Bandwagon Effects It refers to the impact factor when a growing interest in a product thanks to its early licensing or market penetration result in increased support from distributors and customers which make possible the product to claim market dominance irrespective of its performance, quality or price vis-a-vis competing products (Rohlfs 2003). If the new product is a radical innovation and initial adoption rate crosses a certain threshold, many companies will try to explore the new opportunity by imitating it. Microsoft's effort to market Zune in response to Apple's highly successful iPod, a music player, is one of the examples of such imitation (Eichenwald 2012). The competitors feel the urge to introduce their version of the innovation due to the fear of losing support from stakeholders such as their customers, shareholders and partners, and in an attempt to gain market share from the rival (Ferrier et al. 2002). Companies that can manage to create a movement with their products where it deemed as cool to be a part of it by the crowd have managed to apply bandwagon effects successfully. Tesla, the electric car company, has successfully introduced models S and X. Their perceived attractiveness and value have built enough buzz that translated into the advantage of bandwagon effects with its smaller version model 3. The company managed to receive the orders of more than 400 thousand units even before the start of the commercial production of the model

(Christensen et al. 2015). Bandwagon effects work notably better if users treat a product or service as a part of a green movement or they fear being left out from something interesting and valuable. Apple's ecosystem also enjoys the bandwagon effects for many of its products. Often, bandwagon effects staying power relies on the perceived exclusivity and social value thanks to a limited number of users. Once the product goes mainstream and too many people start using the product its perceived value for some users diminish, and they abandon the network. Companies such as Apple that exploit bandwagon effects effectively continuously refine, redesign, and enhance their products to mitigate such risk.

Network Externalities The network effect is the phenomenon where an increase of the value of a product or service occurs for the existing users when an additional customer join (Katz and Shapiro 1985). Online social networks are classic examples of this effect. Products and platforms that have an intrinsic characteristic of network externalities focus more on increasing the number of users rather than extracting immediate profit. Once a base with substantial number achieved due to substantial switching cost, customers tends to stay with the network even if there is a better alternative available. Important here is the user's expectation of perceived future benefits from staying within the network (Lee and O'Connor 2003). Most Internet-based and ITC supported knowledge products and services demonstrate networks effects and their success depends on a large number of people using them. Facebook, Spotify, Airbnb, PayPal, Uber, and other platforms like these capitalize on the large number of users they possess, although the network effects are different for different types of businesses. In the social enterprise sector, Kiva and numerous other systems also fall under this category. In fact, since the emergence of the web, the overwhelming majority of value by the technology companies was created thanks to network effects.

Direct effects from a network occur when each new user by joining not just extends the network to a single node but also increases the network's usage by the new node's connections to others within the network. This phenomenon is called Metcalf's law which states that a network's value increase is equivalent to the square of the number of users of the network (Metcalf 2013). There are many types of such networks exist. Physical networks are those where the links have some level of physical connectivity such as telephone lines, cable TV, and DSL

Internet services. The high upfront cost to build such networks acts as a serious barrier to entry for others. These networks are scalable. However, due to substantial investment required at the early stage, these networks are often protected by government licenses or owned by states and demonstrate high monopolistic tendency. Protocol networks are communication or computational standard that is necessary to have linkage to a network. Ethernet is an example of such a protocol with network effects. More recently, blockchain has become the de facto protocol for virtual currencies and ledgers. The strength of such protocol is once adopted mass scale it becomes impossible to replace it even with a superior competing product.

Facebook, LinkedIn, and similar networks utilize personal connections of people and desire to connect with others and enhance their friend, social, and professional circles. A user's networked circle on these platforms usually corresponds to their offline relationships for most of the users. The added value the users bring to these networks is the user-generated content they publish regularly. There are also many peer-to-peer communication networks that work similar to telephone lines and hold similar network effects regardless of their revenue models such as Skype, WhatsApp, and Messenger.

Indirect effects from networks transpire when within the network system two or more distinct types of users participate and an addition to one type of user increases the value for the other type (Katz and Shapiro 1994). However, for the same group, a new user might not bring any value. The more sellers are there, the better for buyers on the platforms such as eBay and Etsy. For the platforms with indirect network effects, crucial for their success is to add values continuously to both types of users to deter attrition. Because users do not hold any personal attachment only professional to these networks, for them, it is easy to defect if something does not suit them. There is another group of products where indirect network effects work slightly differently. The operating systems Microsoft Windows or Apple's OS are such examples. Value of the operating system grows for a user along with the number of new applications introduced based on that operating system. In the knowledge arena, most products carry intrinsic values embodied in the product's features and functionalities as well as extrinsic values its linkage creates with other products and the user, and between users. Users subscribe to the network not just for the intrinsic value of it but also for the expectation of the increased extrinsic value that the network will bring in future.

Because of this, the success of products with network effects depends on gaining a critical mass of the user base quick enough (Kahan and Kausner 1997; Lee and O'Conner 2003).

Commercialization Process

The process of market introduction of a product or service is called commercialization which is the primary aspect of the exploitation stage of the entrepreneurship process. The approach to the commercialization and the process itself vary significantly depending on which product or service the company is planning to launch and what strategic method is designed to sell it (Rogers et al. 2004).

Commercialization of the product and service-based offering starts with the launching of the product. Whether it is a new or an established company its performance improvement, growth and even survival often depend on its ability to introduce products to the market. Even after the successful market test, there is no guarantee that the final stage when the product will be introduced to the broader market, it will be accepted by the customers as anticipated. Even an innovative product with great expected potential can fail to position itself in the market due to a poor launch strategy (Cooper 1999).

For a manufactured product, once it gets ready to launch after successfully crossing the market testing step following the business model and market strategy the company starts the process of commercialization. As a key element of a service or product launch, market strategy can have a profound impact on the success of a new venture. Because of this, knowledge entrepreneurs should have a good grasp on this.

Market Strategy A market strategy is a fundamental element in the overall business strategy of the company to penetrate the market, position its products and gain market share. Marketing, within this strategy, is an operational function which includes many processes and activities for reaching out to the target audience, converting them into the company's customers and retaining them. The strategy delineates a formula which shows how the company is planning to compete for the market share, what are the objectives and how it is planning to achieve those objectives (Jain 1993). Essential components of a market strategy are the 4Ps of a marketing plan that includes product, price, place or the distribution method, and promotion or marketing communication (Rogers

2001). Market strategy reflects the company's value proposition where the value proposition shows the competitive advantage of the firm in the marketplace. It covers both strategic product launch decisions and tactical launch decisions (Crawford and Di Benedetto 2007).

Relative Product Advantage A product is considered as having market advantages if it holds one or multiple of such characteristics as technological innovativeness, superior quality and reliability, perceived high reputation or high value by customers and in general more attractive than products available in the market (Robinson 1990). Firms generally build, in those cases, their market positioning strategy based on those advantages.

Product advantage is a vital factor that contributes to its success in market acceptance, faster adoption rate and superior performance (Green et al. 1995). If a product with network effects manages to develop strong customer pool as a first in the market offering, it can become the dominant design or market standard within its category (Anderson and Tushman 1990). When such products lock in a large enough number of followers a later entrant even with superior quality product faces difficulties in replacing its dominant status. Although IBM OS/2 was arguably a superior operating system than Windows 3, and IBM in 1994 was a behemoth in comparison to Microsoft, it failed miserably to gain any meaningful market share and was forced to discontinue. There were many reasons for OS/2's failure, but the most important among them was DOS/Window's dominant status for IBM compatible personal computers and their size of demand-side economies of scale (Besen and Farrell 1994).

Extrinsic Value Drivers

Pricing Strategy If the start-up's product is innovative and significantly differentiate from existing in the market offerings, it can position the product in the higher price segment and skim substantial initial profit. However, this pricing strategy works well in situations when the product holds unique characteristics such as it is protected with intellectual property (IP) rights that create a significant barrier for others to imitate (Dorward 1987). The aim of this strategy is to extract maximum profit before the competitors rush in. For products with networks effects, the goal is to cross the tipping point of the customer base as quickly as possible. Hence, profit is not the primary concern at the time of product introduction.

On the contrary, the company may choose to keep the price artificially low in order to gain the traction necessary to develop a large number of users. Once the product established itself as a dominant design, it may, however, set higher price with a comfortable margin. Customers receiving extrinsic value from the product's network effects will be reluctant to leave due to the high switching cost (Brynjolfsson and Kemerer 1996). Google gives away access to many of its services in order to gain market dominance. Gmail, the mail application, is an excellent example of a dominant application which is free and locks in consumers to Google's ecosystem.

Bundling Strategy Products selling in a bundle as a single package is a practice in many categories from luxury cars to fast-food chains. Many hardware is sold bundled with some software and applications. Luxury car manufacturers often price their automobiles as a base model with several different packages. Value meals are standard in most fast-food restaurants. Telecom companies bundle their cable, Internet, mobile, and landlines in different packages targeting different categories of customers. Bundling works well if there is a synergy among the products within the package and when products from the bundle also sell separately (Chuang and Sirbu 1999).

Start-ups can consider cooperating with other companies to market their products as a constituent of a package. A new product can be bundled with an existing successful product. Several new products if they are complementary can be bundled together as well (Paun 1993).

In the knowledge economy, data is a raw material, and it gets bought and sold as a commodity and as a product. IoT generated data, for example, are already getting sold either as a bundle of different types of data or combined with the data of similar companies as a single package (Niyato et al. 2015).

Targeting Strategy In its efforts in marketing a product, the company has to decide which audience to target and how.

Undifferentiated Undifferentiated targeting is a strategy that considers all potential customers as a single group and appeals to the maximum range of people from that group indiscriminately. It refers to as mass marketing. The advantage of this strategy is it does not require any comprehensive market research other than the general understanding of the consumer behavior before launching a product and achieving economic benefits through economies of scale. This strategy applies pricing, differentiation or a combination of both approaches (Kotler 1991). For products that have networks effects, the reason of deploying this strategy is to achieve a high number of users quickly so that the company can take advantage of positive feedback from network effects and increase perceived extrinsic value for users (Hill 1997). Brand reputation is crucial for achieving success in this strategy.

Differentiated Customers often demonstrate similarity in their search for a solution to a problem, service that they need, and purchases that they made. Market segmentation entails activities conducted to categorize audience per their buying preferences to some segments. The reason for creating market segments stems from the economic theory that the firm can maximize profit by differentiating products for different segments and targeting different segments with different pricing (Frank et al. 1972). The segmentation is also necessary because organizations' resources are limited, and they should be allocated judiciously. Moreover, grouping the customers allow catering them more specifically. Segmentation is a top-down approach where the market is divided into a more granular group based on predefined criteria.

Product differentiation occurs when customers can distinguish the features of the offering from similar competitive products. It can be aimed at either to mass market, a single or multiple segments. The differentiation features of the product can be physical or qualitative (Dickson and Ginter 1987).

Concentrated Niche marketing is a particular case of differentiated market strategy. Niche refers to a rather small market of a homogeneous consumer group. The niche market strategy is an attempt to carve out a portion of the market through specific specialization and creation of tailored products or services that can satisfy the unmet need of a specific group of people (Dalgic and Leeuw 1994). While by doing segmentation, the company focuses on a homogeneous group in the niche market it targets and caters individuals of a smaller group. There are varied types of specializations through which companies identify their niches:

end-user, vertical-level, service, sales channel, customer size, and several others (Kotler 1991). An excellent example of a niche social enterprise is Husk Power Systems which is a mini-grid firm that uses rice husk as raw material and converts it into energy. Combining biomass from rice husk and solar power it achieved 99 percent uptime in power supply in rural areas where there is no electricity available (Gupta et al. 2013).

Brand Reputation The brand name is an intangible asset which requires efforts to develop, promote, and manage but essential for businesses because it is a leading source of value creation (De Chernatony 1999). Start-ups should have a brand development and brand equity building strategy from the very beginning of their inception. Brand equity is the value premium that derives from the perceived reputation of the brand among customers in addition to the product's comparable price. Once recognized and valued by the customers a brand name facilitates generating extra revenue from the brand reputation. Brand reputation stems from superior product quality, reliability, recognizability, and memorability. Brand equity is related to the company name, product name, logo, symbol, and other characteristics that differs company products from competitions. It is the resource built from prior marketing and customer relationship activities. The relationship starts when the customer became aware of the available company product, tried it and liked it for its specific characteristics which may include quality, esthetic look, and universal appeal among others. Important for brand equity is customers perception when they relate the product with high value.

Brand building is a painstaking task of developing an image through marketing and other mechanisms and being consistent in products' quality, reliability, and service with the crafted reputation. Brand equity consists of such assets as name awareness, brand loyalty, quality perception, other brand associations on top of the quality factor, and brand-related intellectual properties and partnerships. Research has shown that the name recognition brings out positive emotion in people. In building a brand, thus, this should be a primary focus (Aaker 1996). Grameen Bank, the microfinance organization that Dr. Yunus built, is a classic example from the social enterprise sector in the formation of high brand equity. The name Grameen means villages and the organization positions itself as a bank for the poor, particularly women. Since its foundation, it had been consistent with its mission and the business model. Today Grameen name is used by many financial institutes around the world because Grameen brand is associated with the microloan in people's mind (Dowla 2006).

Conclusion

Knowledge-based social entrepreneurship is a complex field with a myriad of related issues, factors, and nuances. We have only explored some of those which are closely related to the entrepreneurship process and necessary to recognize while investigating it. We focused on two aspects mainly in this chapter, the product development process from the perspective of opportunity development and market strategy from the opportunity exploitation or commercialization perspective.

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CHAPTER 10

Conclusion

People from the dawn of the humankind depended on their physical abilities and animals for toiling and carrying heavy loads. A fabulous technological invention by James Watt in 1765, a steam engine with a separate condenser, made its debut and instigated the Industrial Revolution. The idea of the steam engine was remarkably simple. Water is heated by fuel to the boiling level. The steam produced from the boiling water is confined to generate pressure. This pressure is used for powering machinery. The steam engine propelled the emergence of many other inventions such as steamers and railroads and set the course that has brought dramatic economic and social advances in the world in the next couple of centuries.

One of the characteristics of the industrial economy was a greater intensification of the changes followed after each disruptive technological advancement such as railroads, electricity, radio, and telegraph. New jobs had created, and some old ones disappeared or diminished in importance. The adoption of new technologies also has forced societies to go through complex processes of restructuring.

Since the beginning of the first industrial era, there had been many amazing technological inventions. However, the convergence of some extraordinary technologies and notably the revival of AI that is already showing promising signs in imitating human cognitive capabilities and reducing workloads are creating an unprecedented foundation for the beginning of a new era. While the knowledge economy has started along

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with the mass computerization and growth of ICT, these new technologies have intensified the process and bringing even more radical social shifts.

With the exponential growth of knowledge, the increase of AI use, and rapid technological transformation, presently, we are at the crossroads of a new epoch of dramatic changes that are profoundly impacting social and economic structures. At the economic front, technology push, market demands, and competition are forcing innovation to occur in more rapid speed creating uncertainty and abrupt transitions for individuals and society as a whole.

At the firm level, globalization and competition from new entrants obliging companies to reassess their capabilities and incorporate specialized knowledge, find critical knowledge from external and internal sources and use new and valuable knowledge in the processes, routines, and procedures of the firm's innovation efforts and operations. For firms to stay competitive today means coming up with innovation continuously and quick adoption of it in the changing environment. Obviously, innovation and its adoption both require the ability to absorb and use knowledge efficiently and effectively.

The growing share of intangible assets of the firms shows the saliency of knowledge not just as a mean through which value gets created, but also as a product by its own recourse. In the knowledge economy, knowledge is not just an input for production it is also a commodity. The concept of knowledge as an economic product covers all aspects of knowledge with particular emphasis on intellectual capital, technological knowledge, and knowledge as the foundational base of innovation. New knowledge creation and diffusion of innovation are the main processes through which the economic and social development of the knowledge society takes place.

In this new social composition, entrepreneurship equipped with niche knowledge and innovation has transformed into a strong root behind wealth creation, prosperity, and success. Entrepreneurship is also now a potent tool for us against many social and environmental challenges. Today, the rising influence of social entrepreneurship in solving some of the most critical social issues is indisputable.

While knowledge-based social entrepreneurship is still an emerging concept, with the implementation of advances in technology and increasing better awareness from aspiring social entrepreneurs of the possibilities that technology and knowledge-based innovation can produce, Undoubtedly, it will soon become one of the most significant instruments against the social challenges the world still faces.

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