Innovation and Technology studies

What is innovation?

There are many definitions of innovation depending on the field of study and the context within which it is to be applied. In the literature on entrepreneurship, innovation is defined as the action or process of coming up with a new product, service or process that can make an impact or create significant change in people's lives. In general business language however, innovation is viewed as the action or process of translating an idea or invention into a good or service that creates value for which people are willing to pay. Others have defined it simply as a 'new idea commercially applied' or more effective devices or processes of doing things. At the core of these definitions is the idea that a new invention, creation or even new product can only be called an innovation when it is successfully commercialized.

Elsewhere in the contemporary world, innovation has been defined as the successful exploitation of ideas, or turning ideas into profitable products, processes, services or business practices. But central to the concept of innovation is doing something exceptional that has not been done before, and therefore dealing with uncertainty and risk. Innovation takes many forms, but the three forms that have received the greatest attention are new products, services and new processes.

The business dictionary.com notes that to be called an innovation; an idea must be replicable at an economical cost and must satisfy a **specific** need. It defines innovation as the deliberate application of information, imagination and initiative in deriving greater or different values from resources, and includes all processes by which new ideas are generated and converted into useful products

In all these definitions, innovation is viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs and is generally considered to be the

result of a process that brings together various novel ideas in a way that they have an impact on society.

Innovation can be divided into two broad categories:

1. Evolutionary innovations (can also be termed as continuous or dynamic innovation) are brought about by many incremental additions or advances in technology or processes that already exist. These are usually the common types of innovations seen especially in developing countries e.g. Mpesa came about as a result of various adaptations on the mobile telephone system that was already an existing technology.

2. Revolutionary innovations (also called discontinuous innovations) which are often disruptive and completely new to the world. These are usually are as a result of years of basic R&D processes in hi-tech labs and therefore more commonly associated with advanced economies in the developing world. Such kind of innovations are the radical types that result in big changes in the society or market structure eg the invention of the aircraft or the electric train or even such persuasive medical discoveries like the DNA techniques.

Technological innovations

Scholars note that today, unlike in previous eras, the wealth of nations is driven not so much by their possession of raw material resources, but by how they or the firms within their borders translate those resources into superior products and services through technological innovations.

Unfortunately less developed countries still do not have adequate capabilities for innovation or effective policies in place to guide the process of innovation and such they still end up exporting most of their raw materials to developed countries. The later employs advanced technology to turn these raw materials into valuable products that are immediately exported back to the original countries at exorbitant cost, at times100 times the original price. Examples are cocoa from West Africa, cotton growing countries in Africa and even crude oil exported by countries that cannot refine their own oil and end up importing oil. Refined oil at very high prices. Technology is thus important for the survival, growth, and success of nations through wealth creation. It also makes great improvement in consumers' living standards, which is what development is all about .

At the firm level, organizations that innovate grow to dominate their markets. On the other hand firms that do not engage in innovation face the danger of decline and extinction. The force that facilitates this change is technological innovations. Thus, technological innovation is today a critical driver in the growth of the firm. Understanding innovation is of great importance because of its huge impact at these three levels of consumers, firms, and nations.

Importance of innovation

Innovation is viewed as the principal catalyst for growth in business and economic studies. For example with the rapid advancements in transportation and communications technologies in the past few decades; the old concepts of factor endowments and comparative advantage which focused on a regions unique resources as their main advantages are seen as outdated in today globalised world. In the current global competitive landscape, economist Joseph Schumpeter, argues that all organizations must learn to innovate so as to come up with better or more effective products, services or processes to not only be competitive but to survive .

The scholar famously asserted that "creative destruction is the essential fact about capitalism"(Schumpeter, 1934) and therefore entrepreneurs, and even larger organizations and entire nations must continuously look for better ways to satisfy their customers with improved quality, durability, service, and price, a process which can only come to fruition with innovation.

Innovation and business growth

It is impossible to overstate the importance of innovation in a business context. It is one of the key drivers of productivity and growth. Innovation can help businesses improve the way products and services are made and delivered to customers or introduce entirely new ones that are more likely to be popular with customers. It can reduce costs by increasing efficiencies within the production and delivery systems. Evidence shows that innovating companies sustain a higher performance and grow faster than non-innovators which make them more competitive. Innovation is also seen a source of real competitive advantage for individual businesses. For the economy as a whole, it is central to the prospects for sustained prosperity, new innovative firms have been seen to inject new ideas through innovations in the local innovation system which often spurs large incumbents to step up their operations or face being put out of business by the small more innovative firms in a process known as creative destruction. Seen all the firms become more innovative and competitive which increases factor productivity and the overall growth of the economy.

The link between an idea, an invention, creativity and innovation

What is an idea?

Ideas are usually construed as mental representational images or concepts of some object. A thought or collection of thoughts that generate in the mind. An impression or notion that tries to portray the overarching scope or outline of something. The capacity to create and understand the meaning of ideas is considered to be an essential and defining feature of human beings. In most cases, an idea arises in a reflexive, spontaneous manner, even without thinking or serious

reflection, but can also be a result of deliberate efforts like brainstorming to reach a consensus. A new or original idea can often lead to innovation

A successful company always starts with a compelling business idea. It is the precursor to successful innovation since as seen before innovations are ideas that have been implemented with commercial success. A viable idea is the first milestone in the process of setting up and growing a company. However before an idea can be implemented, it has to be thoroughly analysed for viability, which involves undertaking a feasibility study on it. The characteristics of a promising business idea are:

1. Fulfills a customer need – will solve a problem
2. Innovative
3. Unique
4. Clear focus on a market/ Who has that need
5. Profitable in the long term

1. **Solves a customer need/ problem** – *What is the customer benefit, what problem will be solved?*
   Scholar note that the key to marketing success of a business is not superb products – it's satisfied customers. Customers buy to satisfy a need, or to solve a problem, e.g., food and drink will solve a hunger problem or something that makes work easier, to enhance their wellbeing or self-esteem which is currently not being offered by existing solution providers. The first principle of a successful business idea is, therefore, that it clearly describes the need that will be satisfied and in which form (product, service, process).

2. **Market** – *Who will it serve?*
   A business idea only has commercial value when the "market" accepts it. The

second principle of a successful business idea, therefore, is that it shows how large the market is for the product or service offered, for which target group(s) it is meant and how it differentiates itself from the competition.

3. Innovative/ unique: What will the idea offer different from what competitors currently offer and that will make the new business acquire a sizeable market share. In this context, marketing practitioners refer to as offering a “Unique Selling Proposition”.

4. **Revenue mechanism** – *How is the money to be earned/ commercial potential?* A business must be profitable in the long term. The third principle of a successful business idea is, therefore, that it shows how money can be earned from it and how much within what timeframe.

Each idea, no matter how brilliant, initially has no commercial value. A plausibility/ feasibility check gives more information about an idea’s chances in the marketplace and helps to check its feasibility and innovative content that will ensure it survives the rigors of the business environment.

What is an invention?

An invention is a unique or novel device, method, composition or process. The word can also mean the action of coming up with something useful that has not been seen before; typically a process or device. For example the invention of printing machines in the 15th century was a novel invention never seen before or the creation of the telescope. Therefore an invention is the "creation of a new product or introduction of a new process for the first time." Thomas Edison was an inventor who came up with the light bulb after many trails and failures. An invention that achieves a completely unique function or result may be a radical breakthrough that can lead to innovation. Such works are often novel and not obvious to others skilled in the same field.

An inventor needs to patent their inventions as their intellectual property (IP) so as to gain full benefits of it in the future . A patent legally protects the intellectual property rights of the inventor and legally recognizes that a claimed invention is actually an ‘invention’. The rules and requirements for patenting an invention vary from country to country, and the process is often expensive but quite necessary .To be patentable, an invention must be **novel**, have **utility**, and be **non-obvious**. To be called an invention, an idea only needs to be proven as **workable,** but to be called an innovation, it must also be replicable at an economical cost, and must satisfy a specific need in the market place (must be commercialized). That is why only a few inventions eventually lead to innovations, because not all of them are economically feasible. There are many inventions that are not commercially utilized e.g. digital technology was actually invented by Kodak, but they did not commercialize not patent it and have greatly suffered the consequences.

Creativity and Invention

Inventors are thought to be some of the most creative individuals. The inventiveness, originality, creativity, imagination, inspiration of an individual is what leads to new inventions. An open and curious mind often allows an inventor to see beyond what is known or available at present. Seeing a new possibility, making connections in several ideas, or relationships is the creativity that can spark an invention. Inventive thinking frequently involves combining concepts or elements from different realms that would not normally be put together to come up with a new creation. Sometimes inventors disregard the boundaries between distinctly separate territories or fields to come up with their creation despite all the challenges they may face.

Sources of innovations

Previous discussions indicate that innovations are products of ideas that are successfully implemented with commercial success. The truth of the matter is that business ideas and opportunities abound everywhere. Business ideas can come from;

1. Within oneself: depending on one's true passion, skills or talent or ones previous experiences including where they have been, what they have seen and what they have done.
2. The environment: ideas can also come from within ones surrounding environment. There are a lot of things happening in ones environment including problems that can trigger ideas for innovation. This also includes exposure to various media like the internet, television and radio or visiting exhibitions, trade fairs and other business forums where different ideas are displayed.
3. Education and training: Formal institutions can bring about creative individuals who can generate ideas for innovations that solve everyday human problems. These also give room for brainstorming.
4. Market research: Some of these business ideas that can lead to successful innovations emanate from deliberate analysis of market and consumer needs in the market place so as to come up with what is truly lacking or needed.
5. R&D: Other idea emanate from a long research process that can involve large R&D labs and technologies that generate novel ideas leading to revolutionary innovations.

Defining Innovations

Innovation is a diverse activity that can take place anywhere. It can occur in laboratories and factory floors, in the universities and coffee shops, or even over a beer after work with friends are sussing out better ways to do things. There is no monopoly on creative thoughts.

However, there's a big difference between a random brainstorm and a concerted effort to solve a defined problem. Innovation as an organized practice falls into four main categories:

1. **Basic Research/ innovation:** occurs as a result of work done at universities or some corporate R&D labs where there is no clearly defined outcome. The objective is to

discover more about how things work and in the process stumble upon some epic solutions to existing problems. Because of this, some believe that basic research isn't innovation, because it does not necessarily result in a new product or service, however many revolutionary innovations have been as a result of this process.

People like Einstein or Watson and Crick revolutionized their fields through this process. Moreover, basic research pays huge dividends in the long term..

2. **Sustaining Innovation:** This is the type of innovation that companies like Apple excels at, where there is a clearly defined problem and a reasonably good understanding of how this problem can be solved without spending too much on research. For example when Steve Jobs first envisioned the iPod, it was simply a device that allowed people to put "1000 songs in your pocket." That meant that one needed to have a certain amount of memory fit into certain dimensions. Those were difficult problems that took a few years to solve, but it was pretty clear what problem was involved and who was capable of solving them.
3. **Disruptive Innovation**: When Clayton Christensen introduced the concept of disruptive innovation in his classic book 'The Innovator's Dilemma' it was to be a revolution in innovation studies. Disruptive innovations tend to be new approaches to old products and service solutions that completely disrupt the way things are done in the marketplace. A disruptive innovation is defined as an innovation that transforms a market or creates a new one through simplicity, convenience, affordability or accessibility and has the ability to change the market dynamics to replace market leaders.

4. **Breakthrough Innovations**: Thomas Kuhn called this "revolutionary science" because it involves a paradigm shift. In this case, the problem is well defined, but the path to the solution is unclear, usually because those involved in the domain have hit a wall. This happened in the case of the transistors and the discovery of the structure of DNA which both were breakthrough innovations that took time to be realized.

Technology and the Global Business Environment

In 2010, the global financial system remained fragile, but economies around the world began moving toward recovery. Some especially those in emerging markets and developing countries hardly broke stride, continuing their rapid growth. What could be the explanation for this?

The report, tracking global trends, looks at six broad, long-term developments that are shaping our world today that that have consequences for the competitiveness and the wealth of nations. Most of these trends have an aspect of technology and entrepreneurship

1. Emerging markets increase their global power and presence e.g. the Asian tigers.... India, china , Taiwan

2. Cleantech becomes a competitive advantage – due to climate change worries

3. Global banking seeks recovery through transformation – a formerly bureaucratic field that has been forced to embracing change or die off eg opening hours, having branches in far flung areas etc.

4. Governments enhance ties with the private sector- innovative partnerships for impact

5. Rapid technology innovation creates a smart, mobile, interconnected world

6. Demographic shifts transform the global workforce- global mobility, rapidly expanding middle class that is more consumerist, rapid expanding youth population in developing countries versus a rapidly expanding old population in developed economies brought about by improved family planning, improved health systems and work dynamics.

Today global economies are so tightly interconnected that companies, governments and industries will soon be forced to cooperate in ways they could not have imagined just a few years ago. In fact, Ernst & Young believes the six trends are themselves connected by three underlying drivers that have helped establish each trend and perpetuate it.

1. Demographic shifts. Population growth, increased urbanization, a widening divide between countries with youthful and quickly aging populations and a rapidly growing middle class are reshaping not only the business world, but also society as a whole.

2. Reshaped global power structure. As the world recovers from the worst recession in decades, the rise of relationships between the public and private sectors has shifted the balance of global power faster than most could have imagined just a few years ago.

3. Disruptive innovation. Innovations in technology continue to have massive effects on established business and society. We're now seeing emerging markets become hotbeds of innovation, especially in efforts to reach the growing middle class and low-income consumers around the globe.

Six global trends, interconnected by three key drivers of change

Winner and losers

As these trends change the ways in which businesses operate, grow and compete; winners and losers inevitably will emerge. The winners will be easy to spot:

1. They will be the organizations that constantly monitor broad trends in the external environment, embrace technology and look for talent everywhere, especially among previously neglected segments of the workforce such as women, minorities and older workers.

2. Regardless of what industry they are in or where they are headquartered, these organizations are looking outward. In so doing, they are navigating multiple jurisdictions and regulatory frameworks while adapting to local environments and attempting to create global workforces.

3. They are modifying supply chains to leverage shifting labor cost structures and mitigate raw materials' price fluctuations.

4. They are figuring out how cleantech fits into their growth plans and making it an integral part of their future strategy.

5. National governments, meanwhile, are seeking ways to meet growth agendas while reducing cost structures and future debt obligations.

Shaping the future

As businesses and governments look to the future, they would do well to remember that executing on their existing strategy may no longer be good enough. They must think more deeply about the opportunities and risks presented by the evolving trends, and the driving forces behind them, especially as the world shuttles towards the 4th industrial revolution.

With a different mindset, they can re-imagine what is possible, discovering what they can do that is new, and how best to do it. Those that succeed may find themselves not just navigating tomorrow’s global trends, but actually shaping them.

Innovation, Technology and Knowledge transfer

Where do innovations come from?

In general, out of the entrepreneurship field, innovation arises from organizing circles of knowledge exchange; where information/ knowledge is not just accumulated or stored by an individual or organization, but is continuously created and transferred. Innovation is fed by information gathered from a variety of sources;

-from new connections and interactions with others,

- From insights gained by journeys into other disciplines or places,

- from research, both in university libraries and basic research in high tech R&D labs as seen in most developed countries

- From active social networks and fluid open boundaries of businesses and countries which encourage free flow of people and information.

-Learning: education and training among others.

Thus in order to stimulate innovation, intensive interaction is desirable between various actors such as businesses, the academic institutions, research institutes and availability of other factors like technological infrastructure and human capabilities, technological knowhow etc. . Therefore the main ingredient for innovation is new knowledge.

The process of innovation is seen as a systematic and managed process that is focused on the ability to learn and adapt to new changes and find new solution to existing human problems. The fact that innovation depends on acquisition and effective assimilation of new knowledge is the reason why regions that are more innovative like the western economies are often involved in large scale basic research in large R& D labs to come up with new knowledge that often leads to more radical, cutting edge innovations. However, the poorer nations in sub Saharan Africa are more likely to undertake adaptive/ incremental innovations that build upon ideas already established in the west due to lack of resources and technological skills. They often depend on knowledge transfer/ technology transfer from developed countries that are able to create the Knowledge.

Importance of knowledge transfer

Knowledge transfer is the process of by which knowledge is transferred from one part of the organization to another or from one individual, organization or region to another. The process of knowledge transfer distributes knowledge to ensure its availability for use by those who require it. Knowledge has been found to have different properties than other economic goods:

- It is subject to increasing returns, unlike all other goods that are subject to diminishing returns. This means that the value of knowledge increases with its use rather than diminish. knowledge can be infinitely reused at zero marginal cost

- It a non- rival product. Having an additional consumer of knowledge deprive others of its value.

- Non excludable — Its use by one individual / organization or entity does not limit its use by another. No one can exclude others from using it once it is in the public domain(Hence the rise in the use of intellectual property rights).

However knowledge transfer is itself a complex process since knowledge often resides in organizational members, tools, tasks, and their sub networks and thus can often only be transferred with the physical movement of people or the tools, machines and artifacts. Secondly, more useful knowledge is often tacit or hard to articulate as compared to explicit knowledge.

Knowledge innovation and growth

The ability to grow the economy by increasing knowledge rather than labor or capital creates opportunities for nearly boundless growth in the world of today; be it at individual, corporate or national and even global level. The individual or organization utilizes the new knowledge acquired for creation of useful new product, services of new processes (innovation) for a ready market, which increases its economic value, resulting in growth. And because knowledge can be infinitely reused at zero marginal cost, firms that use knowledge in production processes can earn quasi-monopoly profits, which further increase their economic value. All forms of knowledge, from big science to better ways to sew a shirt exhibit these properties and contribute to growth of individuals, firms or nations. This is thought to be the main reason for China's rapid economic growth in recent years. For those who have less capabilities for creation of new knowledge e.g. through science or basic research, the only way is to acquire knowledge from others through knowledge transfer.

ADVANCES IN TECHNOLOGY

Technology is dynamic; it keeps on changing and improving from one era to another because the human needs and demands to be addressed also keep on changing. For example initially just

having fire to cook food was enough for human beings, however today the sources of the fire mater more like charcoal, gas or electricity. These changes are due to issues to do with changing customer preferences, changing technology in building and even contemporary issues to do with pollution and environmental degradation such as carbon footprint. The world has moved from the industrial age (industrial revolution) where industries were the drivers of economic growth to the knowledge based economy or an information age where having new/ novel knowledge is your competitive advantage. During the industrial age, companies with large sums of capital had the potential of employing expensive technological tools to gain competitive advantage; small businesses had less potential because they could not afford expensive manufacturing or processing technological tools. But, the advancement in technology has created a new economic environment which depends on information or knowledge as the main differentiator giver has helped small businesses gain position in highly competitive markets.