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Cultivating Technological Innovation in the Mind

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ABSTRACT: *Cultivating innovation in the mind is imperative to successfully move technology to the next level. Technology is growing rapidly in developed countries and has almost reached its peak. Developing countries and continents like Africa on the other hand are now seen as a breeding ground to explore in technological innovation. Researchers and entrepreneurs are shifting base to Africa where they can achieve maximum profit resulting from under development of the continent. Reefs, city and web are used to explain the best way to cultivate innovation. The city and web are such engines of new innovation because both environments are powerfully suited for the creation, diffusion and adoption of good ideas. The seven keys of cultivating innovation include tropical humidity, illiteracy, poor power surge of electronic use for research, good concept of the liquid networks, slow hunches, serendipity, acceptance of error in cultivating innovation, Exaptation, coffee breaks, application of programming interface and the use of quadrant as a tool. These keys are recommended to be put to use by every individual who has the mindset of driving technological innovation to the next level.*

Keywords: *Innovation, Technology, Hunches, Serendipity, Creation, Coral Reefs, Exaptation, Quadrant, Networking, Programming Interface, Squelch, City and Web*

I. INTRODUCTION

One of the age-old great questions of life is where do good things come from? This is a pivotal question that demands accurate and intelligent answer. The necessity that is embedded in the answer to this very important question resulted to this distinctive school of thought. [1] proposed a framework for answering these questions. The goal of this research in view of proffering solution to this question is to elucidation on how to cultivate technological innovation. Good things come from innovation and our ability to cultivate it is a panacea to the question. There are suggested ways to live, interact and work that can promote innovation. A walk during leisure time, developing hunches, writing down dreams and aspiration as soon as they are conceded, effective documentation and management, making serendipity a habit, manage generative mistakes, embracing multiple hobbies, attending to innovative brain storming in coffee houses and frequenting other liquid networks, following links, developing good ideas, borrowing, recycle and re-inventing ideas are possible ways to effectively cultivate innovation. Also, in the light of this fact, we shall consider the fundamental drivers of innovation. Where good things come from: the natural history of innovation is divided into seven sections with each addressing the fundamental factor that facilitates innovation.

Again, the research is about the space of innovation. The African institutions and some other environments squelch new ideas while other environments seem to breed them effortlessly. Greater percent of the environment in the universe do not welcome new ideas. They are generally opposed to change. They are entangled with fear to develop new idea and prefer to religiously work based on people's ideas. This attitude is traditionally induced in them because of the method of education. From primary to tertiary school they are groomed on studying peoples thought and opinion and they stick to it. They do not have the drive to develop new idea because they believe that they are not ripe, fit or have the ability to do so. They criticize, discourage and possibly kill fresh ideas. Most tertiary institution in developed countries like the US, United Kingdom, China, Japan, and other environment has undying drive to develop fresh idea. They have the will power to develop the creative ingenuity in them. They believe in the intent to create, which vibrates like an electron in its energized and excited state ready to move from the present energy level to the next energy level. This can be seen as little as in those primary schools where children are encouraged to come up with creative works as craft for continuous assessment.

II. LETERATURE REVIEW

The argument of this study is that a series of shared properties and patterns reoccur again and again in unusually fertile environment. This is so because they are innovatively unproductive. They can not or do not know how to cultivate innovation in their productive environments. They are left with no option than to repeat ideas. They invent same thing year in and out because there is no fresh idea. A typical example is found in most final year thesis in tertiary institutions in Africa, same business ideas in a competitive business environment and use of same curriculum for a program for years without any modification or yearly review. This condition does not occur in an environment where fresh ideas are their watch ward. In innovative environments new properties and patterns are galvanized in their product. A good example can be drawn from good product developed in some Asian countries like Japan, China, and other countries like the United States of America and the United Kingdom [2].

However, the more we embrace these patterns of breeding new innovative ideas effortlessly in our private work habits and hobbies, in our office environment, in the design of new software tools the better we will be at tapping our extraordinary capacity for innovative thinking. The creative ingenuity in an individual can not be discovered if no attempt in developing innovative habit and hobbies is made. We should allow it flow naturally in us and make it a culture. [3] discussed how to cultivate innovation in real time. If we allow innovative thinking to be induced in us then the ability to discover and produce new good product continuously will become a culture. We should be innovative in our office environment. Think of simpler method of executing tedious jobs; develop machines and equipment that will enable us carry out our duties ergonomically, and economically. Occupational health and Safety should be introduced in our work places. It is said that health is wealth. New software tool should be developed to ease the work we are doing since we are in computer jet age. For instance Computer aided design (Cad) software for civil engineering structural analysis, design, drafting and detailing can be used to execute job to reduce job duration from one year to less that a month. Soft ware programs eases and reduces the duration of executing jobs effectively and efficiently [4].

Reefs, city and web may be used to explain further the best way to cultivate innovation. [5] ideas show that the coral reefs create an environment where biological innovation can flourish. [6] dwelled so much on biological innovation. He explored the anatomy of living organism where He pictured that the existence of animals begins from plants. He invented good ideas that open the minds of medical practitioners. Today his coral reefs have created a fertile environment for biological innovation to flourish. Scientific reasoning is sharpened by his ideas. His ideas were pivotal to the successes recorded by great philosopher and scientists in the medical profession.

The world is now a global village through advent of the computer. The internet is an interface that links the City and web. The city and web have been great tools of innovation because both environments are powerfully suited for the creation, diffusion and adoption of good ideas. The problems generated by activities of people, economic and financial challenges, growing population, poor technology, and unhealthy environment can be solve through innovative ideas. These ideas can be savaged by exploring the web where you can rub minds and integrate thought and opinions of great people that have ever lived. It is not a bad idea to compare several thought and opinion of great minds. It will spore the individual to be innovative and prepare a platform that can result into refined and better ideas. The problems associated with developing the city can be solved by extracting good ideas from the web. This is why [7] inferred that the city and the web have been such engines of innovation because both environments are powerfully suited for progressive creation, diffusion and adoption of good ideas. This is exactly where good things come from [8].

Consequently, [9] law proposed that as a city gets bigger, they generate ideas as a faster clip. This is because the growth of a city is a factor of the growing population, possible land mass, increased financial challenge, economic problem, health challenge, waste management system issues, transportation problem, information and communication lacuna, education challenge, and many more. All these challenges put together can be solved by generating good ideas. As the city gets bigger, the need and want of the people get bigger leaving us with the opportunity to hastily solve them with good ideas. For instance, if one power generating set can serve a business organization as it grows and expand its business activities the need to improve the power system becomes necessary. The organization may deem it fit to buy another one to support the initial one to save the life of the power generating set. Another good example is the family. As newly wedded couple a one room apartment bungalow can accommodate them but with the passage of time when they start producing children they will be forced to acquire a larger flat. If they keep multiplying like a typical African to twelve children or more then their current accommodation will not serve them. They may need even larger flat. Also, as the children grow up to maturity, they will be forced to go and build their own home. Thus good ideas must be introduced to increase the health, solve health problem that must creep in from time to time, cloth, feed, educate them and so on. The larger the family, the more the need to generate good ideas to satisfy their unlimited wants. [2] discussed the seven all-time greatest ideation techniques.

Hence, something about the environment of a big city makes its residents significantly more innovative than residents of smaller towns. Bigger cities are faced with more challenge than smaller ones. The unlimited needs and want of the people become more insatiable demanding. The solution of their problems lies solely on good ideas. More innovations are needed to contain the problem. Bigger city with improved innovation grows faster in wealth than smaller ones. This is the reason great nations like china take solace on innovations. They have one of the largest populations in the world with less natural resource yet one of the best economies in the world because of improved innovative ideas. They believe that if you have good thinking, it will result to good ideas and the result will be good product. "Good thinking, good product". Smaller cities are faced with less challenge in their environment that leaves greater percent of such city less innovative except those that want to develop there economy. Unlocking talent is a key to organizational agility and Innovation [2].

III. METHOD

In this research seven keys of cultivating innovation shall be considered. The seven keys shall be used to exhaustively explain how to cultivate innovation in the mind. The methods in development of the mind to come out with useful innovations are tropical humidity, illiteracy and poor power surge, concept of liquid networks, slow hunch, serendipity, error in cultivating innovation, coffee breaks, and application programming interface platform. Each of the methods will be discussed.

IV. ANALYSIS

Firstly, tropical humidity, illiteracy, poor power surge are inhibitors to cultivating innovation and illustrate the adjacent possible. Ninety five percent of medical technology exported to developing countries breakdown easily with the first five years of use. This is as a result of power surges, tropical humidity, and hospital staff inability to read the repair manual. The power ratings of most electrical appliance are not the same. They vary from one hundred and ten to four hundred and above. Some do not have good power surge control system that protects them during fluctuation. Users may be required to buy protective devices due to their fragile nature to power fluctuations. Because most hospital staff is not trained in the use of such equipment, the equipment gets easily malfunctioned and packs up. Most machine malfunctions in developing countries are caused by power surge. The malfunctioning of these machines inhibits research and development which don't provide good breading ground to cultivate innovation.

The weather is another factor that discourages the advancement of innovations. The tropical humidity of most developing countries is not compactable to most of those by the foremost inventors. Most medical machines are supposedly manufactured for use in cold environment. The use of such machine in a very hot climate results in over heat that affects their mother boards, power packs and fragile integrated circuits. They generate much heat and ought to be used in cold environment to reduce the heat. In hot environment the temperature increases beyond the maximum temperature to which they are configured to operate hence the consequent of blow up the machine or alternatively of the results obtained from them. This is the reason most of the machines that work do not give accurate results.

Unfortunately, illiteracy plaques the proper use of some of the hospital machines. Most hospital staff can not read the English repair manual. This is why some machine that can be put to use are not used at their maximum capacity. The repair manual that should guide them on how to refurbish and put them to effective usage are thrown away or stocked in shelves and drawers as a result of illiteracy.

Consequently, as an example of good ideas, MIT professor Timothy Presero and Boston Doctor Jonathan Rosen created an incubator built out of automobile part because steady supply of spare part or trained repair technicians in the developing world can not be guaranteed. The incubator is called the NeoNurture device. The external part of the device looks like an incubator while the interior is made up of automobile parts. The interior has an automobile headlight that supplies the warmth, dash board fan that provides air circulation and door chimes that Arthur provides sound alarms. The reason why the automobile parts are used as component of the machine is because the part can be easily found and replaced when it goes bad. The machine produced is an example of good ideas and technological innovation.

The second key used to cultivate innovation explains the concept of the liquid networks. A good idea is a network. [10] in one of his book titled the act of creation stipulates that the act of creation is something that happens exclusively in the mind. Creation is conceived in the mind in the form of idea; built up gradually by furnishing several considerations that will enable it yield success. It will remain pregnant in the mind until it is delivered. At the delivery stage the consideration will be dramatized in action. The action is the production stage where the product can be manufactured in large quantities and patented.

More over, on a base level, it is true that ideas happen inside of the mind but those minds are invariably connected to external network that shape the flow of information and inspiration. The external networks are good ideas from people that will help to encourage and support the safe landing of such idea. Good ideas survive easily in the mist of experienced people that are ready to join hands and work to ensure that innovative dreams come through [11]. Sometimes it might not be through personal interactions and intense brain storming, it can be through the web, twitter, and other social media. Therefore, it is not the network itself that is smart but it is the individuals that get smarter because they are connected to the network. The network itself catalyzes the individual to work harder, brainstorm until dream comes through. The individual in cause of intensive research on the work acquire adequate insight on the subject area that makes him more knowledgeable and smatter. This is because they stay connected to the network. The network is the source of information. Information is the key to the success of good ideas. Just as a tree with the longest tap root will look greener than others because they feed better so also will any individual with innovative acumen and closer to the network achieve greater success. Also a tree planted by the river side will be greener and bear much fruit in season and out of season because it is close to the source of water and other nutrient. A good inventor must stay close to the network.

The third key exposes us to the concept of the slow hunch. A new idea is a new perspective on a problem or a recognition hat has gone unexplored to date. A new idea demand new approach, laws, theory, principle, methods and system of resolving a problem. Isaac Newton introduced the laws of motion and called it Newton's law of motion. As at that time it was a new Idea. Thomas Edison discovered the incandescent bulb. It was a new idea. Breakthroughs are called slow hunches because they usually take time to develop. Good ideas like pregnancy develop gradually from one stage to the other until it matures. The development processes takes a very long time and are vigorous and rigorous to achieve. Hence, when the ideas metamorphose into innovation it is called breakthrough. A successful breakthrough is regarded as a hunch.

The long incubation period of hunches is also their strength, because true insight requires you to think out something that no one has thought out before in quit the same way. Breakthrough takes long time to actualize because it demands thinking and brainstorming in view of the fact that new innovation is meant to be established. It is stressful because sometimes new ideas can be established from an existing one. This is the reason why in mathematics a problem can be solved in different ways. Different formula can be use to solve one problem. This long incubation period is the strength of the hunch. The longer period used to achieve a breakthrough exposes the individual to much details on the idea he is developing. This will give him the opportunity to make several errors and correct them, polish his work beautifully. Bharat, a principal scientist at Google, created a software tool that organizes and clusters news items. Google new story went from a hunch in Bharat's mind to a shipping product in one year [12].

The fourth key to cultivating innovation is serendipity. It is the occurrence and development of events by chance in a happy or beneficial way. It is the faculty or phenomenon of finding valuable or agreeable things not sought for. Serendipity is the luck that takes the form of finding valuable or pleasant things that are not looked for. A hunch is a simple network of cells firing in side the brain in an organized pattern. For that hunch to blossom into something more substantial, it has to connect with other ideas. The hunch requires an environment where surprising new connections can forge. Good inspiration is best conceived when the mind and the brain connect well without friction or interference. This is why it is very important that the environment be such that it can welcome more inspiration. Calm and reserve environment are places where resources and information can be easily reached. Environment where connecting the network of great ideas will not be an issue. Ultimately, the neurons and synapses of the brain itself are large cultural environment that the brain occupies. Specifically, serendipity is built out of happy accidents, to be sure, but what makes them happy is the fact that the discovery you have made is meaningful to you. There is great immeasurable joy that exist the moment a hunch is achieved. The individual becomes extra ordinary happy for the fact that the discovery materialized to a meaningful idea. It was this joy that made a famous scientist Archimedes to run out naked from his house shouting "eureka" meaning I have found it. This occurred during one of his discovery which he used to propound the Archimedes principle. Hence, serendipity completes a hunch, or opens up a door in the adjacent possible that you have overlooked. Good ideas occurred to people while they are out on a stroll. For instance when going for a walk or taking a long shower. Inspiration most often comes during our leisure time. The brain allows good ideas to flow when it is relaxed. If you have such inspiration at such time it is necessary to vent immediately [13].

Accordingly, the secret to organizational inspiration is to build information networks that allow hunches to persist, disperse and recombine. For instance, Google has a company e-mail list where employees can suggest new product. Information networks tap both individual and collective intelligence. These systems create architecture for organizational serendipity [14].

Furthermore, the fifth key to cultivate innovation effectively explains the importance of error in cultivating innovation. Good ideas are more likely to emerge in environments that contain a certain amount of noise and error. The noise enables the individual to increase concentration and focus on the goal at hand while the error expands ones knowledge in it. It is important that we are not discouraged by the number of error encountered in the cause of developing good ideas. Each error encountered should be seen as discovering a way of not doing it. Thomas Edison the inventor of the incandescent bulb conducted the experiment nine hundred and ninety nine times. He did not allow the failure to kill the dream rather each time he failed, he said he has found one way of not doing it.. He finally succeeded in the one thousandth attempt.

Hence, mistakes are an inevitable step on the part to true innovation. It is said that to err is human. This is true because mistake is natural and inevitable step that leads us to serendipity. The history of spectacularly right has a much longer history of being spectacularly wrong, again and again. Experience shows that any knowledge acquired at a stretch does not last in the memory but the one that goes through much vigor and rigor looms large in the screen of our memory and lasts longer. Our mistakes make us perfect. Benjamin Franklin said that the history of error of mankind is more valuable and interesting than that of their discoveries. The truth is that it is easy to remember solution that is refined from much error. The errors are regarded more valuable and interesting because it emphasizes the number of ways of not getting at the solution.

Notwithstanding, it is important to emphasize on exaptation. Exaptation is a kind of borrowing. [15] once used this to explain the concept of exaptation. He said an organization develops a trait optimized for a specific use, but then the trait gets hijacked for a completely different function. If a good idea is developed for a particular purpose and later it is hijacked for another purpose then that is exaptation. The story of the World Wide Web is a story of continuous exaptation. Tim Berner-Lee created a platform adapted for scholarship that was exaptated for shopping, and sharing photos, and watching video-along with a thousand other uses that would have astounded Berner-Lee when he created his first HTM-based directories in the early nineties.

Importantly, the sixth key to effectively cultivate innovation is the coffee breaks. The coffee breaks are pivotal concept that aids effective cultivation of innovation. This is the reason why APPLE is consistently ranked as the most innovative company in the world. Apple development circle looks more like a coffee house than an assembly line. All the groups ranging from design, manufacturing, engineering, sales, and other departments meet continuously through the product-development circle, brainstorming trading ideas and solutions, strategizing over the most pressing issues, and generally keeping the conversation open to divers group of perspectives. Many of history's great innovators managed to build a cross-disciplinary coffeehouse environment within their own private work routines.

Tool seven explains much more on the platforms to cultivate innovation. An open platform in software is often called an API, which stands for application programming interface. An API is a kind of lingua franca that software applications can use reliably to communicate with each other. A set of standardized rule and definitions that allow programmers to build new tools on top of another platform or to weave together information from multiple platforms. When WEB users make geographical mashups using Google Maps, they write programs that communicate with Google geographic data using their mapping API. Again, in this section twitter is considered a good factor that bates cultivation of innovation. In the online world, the most celebrated case study in innovative power of staked platforms has been the rapid evolution of the social networking service twitter. You write a tweet about what you had for lunch and within minutes that information is being harnessed to assist a number of different tasks. The information is not only flowing in the system, it is being recycled and put to new uses.

Let us consider the tool that this paper classified as the fourth quadrant. The quadrant is classified into four sections. The first section of the quadrant is called the market/ individual. This is a small, coordinated team, single inventor who planned to capitalize directly from the sale or licensing of their invention. A good example is a printing press. The second quadrant is called the marketing/ network. It is large number of groups working on the same program. Multiple private firms interact and plan to capitalize directly from the sale or licensing of their invention. Example is an airplane. The third quadrant is called the non-marketing / individual. It is the amateur scientist or hobbyist who shares his or her ideas freely. Example of this quadrant is X-rays. The fourth quadrant is called the non-marketing/network. It is an open source or academic environment where ideas can be built upon in large, collaborative network. An example is the Microscope.

Hence, since innovation is subject to historical changes, the fourth quadrant distinguishes shapes at different historical period. The forth quadrant should be a reminder that more than one formula exists for innovation. The wonders of modern life did not emerge exclusively from the proprietary clash between private firms. They also emerged from open networks.

V. CONCLUSION

You may not be able to turn your government into a coral reef, but you can create comparable environments on the scale of everyday life. They can be done in the workplace if you exhibit the attitude of developing new ideas, work tirelessly to actualize you dream by using the seven keys of cultivating innovation. In these ways you consume media to get desired information and augment your memory with new ideas that can be cultivated to innovation. You can create leisure time. Go for a walk, cultivate hunches, write everything down, but gather and store your data well. Embrace serendipity, manage generative mistakes, take on multiple hobbies, frequent coffee houses and liquid network, follow the links, let other built on your ideas, borrow, recycle and re-invent.

RECOMMENDATION

We strongly recommend that institutions should include this concept in their curriculum. The method of teaching should be practically and innovatively driven. Student should be trained to believe that they can develop new ideas and not to always use borrowed ideas without contributing to knowledge. They should be exposed to the seven keys of cultivation of ideas so that it will become a habit to develop new ideas.

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