



# 4th INTERNATIONAL VISION SEMINAR 2020

## TECHNOLOGY IN MANAGEMENT IN THE AGE OF INDUSTRY 4.0



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**4<sup>th</sup> INTERNATIONAL  
VISION SEMINAR 2020**

**Technology in Management in the  
Age of Industry 4.0**

**January 30-31, 2020**



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## Patron's Message



*"Globsyn Business School was started in 2002 with a vision to create industry ready managers for the technology-driven knowledge economy. Having been promoted by Globsyn with deep roots in IT hardware, training and fulfillment, GBS uses technology-enabled platforms and systems in all its operations and processes. With Globsyn now looking at Artificial Intelligence as an area of focus, the academic fraternity associated with our B-School can only expect greater involvement in Machine Learning, Data Analytics and Internet of Things to pave the way towards improving the academic delivery system of the country. The deliberations in this edition of Vision Seminar, held on the topic 'Technology in Management in the Age of Industry 4.0' reflected the vision of the organization towards this direction."*

*Best wishes,*

**Bikram Dasgupta**

*Founder & Executive Chairman*

*Globsyn Group*

**Dr. Sujata Mangaraj**  
*President, AIMS*

As we all know Industry 4.0 is a dream of the future, the destiny of India and the spirit of new India. That can make the mountain smooth and rivers straightline. The intense technological advancements on account of a high level of digital industrial revolution is known as Industry 4.0. It has ushered in a major technological shift by a fusion of new powerful technologies, which overcomes the borders between the physical, digital and biological world. It is a combined impact of automation and data exchange in manufacturing technologies and organisational models, which includes extensive use of digitalisation, cyber physical systems, Artificial intelligence, Big Data Analytics, Robotics, the Internet of Things, Cloud Computing, Cognitive Computing, Data Analysis and The age of the network, 5th generation mobile network and data communication network technology. They all play a great role.

It affects all disciplines, economies, industries and the society at large. There arises a new world of opportunities. Industry 4.0 is certainly not a first big change in human history, but it is unprecedented with respect to the speed of transition, which is exponential, rather than linear. The pace at which technology is evolved is unheard and unseen. Indeed it will offer huge potential by connecting millions of people around the globe to digital network and provide them access to knowledge and services. It dramatically Improved the efficiency of the organisations, tremendously increase resource productivity, provide significant opportunities to small and medium enterprises and start-ups, create value proposition through new services and new form of employment and help us to respond to demographic change at the workplace. Simultaneously it has disrupted almost every industry, entire system of production, management, governance and lifestyle. The current job market is in a majority with intellectually intensive jobs, which is also impacted in a big way. In the context of this progressively volatile and heterogeneous markets and customer demands, not only the manufacturing

of the products, processes and methodologies change at a fast pace, but the business models, organisational structures, functional processes, skill requirements of the employees and everything related to the whole spectrum of activities - from production of goods and provision of services, to reaching end users will automatically change. Naturally, when the paradigm shift takes place, some skills will become obsolete and requirements of new skills emerge. This shift in technology requires a similar revolution in education, especially in management education, in order to make the needs of the industry and explore alternatives and futuristic trends. In response to the above perplexing global scenario, the stakeholders of management education, whether they are promoters, whether they are Deans or Directors, decision makers, faculty members, students, regulatory bodies, government, industry and the society to prepare the future managers and leaders to face the future challenges and complexities. The new wave of technology integration demands leaders to be critical thinkers, problem solvers and global players and therefore to be liberally educated. The impact of this emerging technology in economy and environmental terms also requires a drastic reconsideration of the curriculum in management education to enable the students not only to comprehend changing technologies, but also develop the ability to thoughtfully analyse, predict and integrate the network systems of technology with the subsystem of business.

The management education system has to be redesigned to see that we generate a large number of employment generators, not employment seekers, making it more attractive. In terms of imparting diversity of skills, ability to handle difficult situations, encouraging innovations and creativity, perseverance at work and competitive to become successful management professionals. We need to transform teaching to personalized adaptive learning. We need to revise assessment process and adopt smart approach to campus design, enabling the institutions with intelligent digital platform. Going towards a major paradigm shift of Industry 4.0 versus management education 4.0 has spearheaded. In this light you will be glad to know that All India Council of Technical Education (AICTE) has taken a multi-pronged approach to recalibrate the management education. The model curriculum designed by AICTE embraces technological integration. AICTE has embraced a lot of other areas, like live projects for the students, rural innovation projects, community development initiatives, social sensitization programmes, promoting innovation, incubation and entrepreneurship, examination reforms to ensure quality, encouraging industry-institute interface through mandatory memorandum of understanding, with five industries for each institution and should be uploaded on the portal, providing good quality self-learning content through MOOCS, both for faculties and students and recognising performance of the

students through different awards like Hackathon Award, Viswakarma Award, etc. AICTE is trying very hard to integrate management education with technology. It is hoped that this initiative of AICTE will combine the new educational policy to ensure necessary alignments in the teaching-learning process, bridge the gap between theory and practice and prepare students for innovation. On the other hand, Association of Indian Management Schools (AIMS), as a networking professional body of management education in the country, having more than 700 leading business schools of India, including IIMs, XLRI, ISB and all leading business schools, is providing platform for the last 32 years to leaders of business schools, to policy makers and to all stakeholders in the world of teaching-learning process to embrace such technological integration through its various initiatives, such as, representing AICTE, all India management board for policy advocacy, conducting leadership development programmes for Deans and Directors, case development and faculty development programmes for faculty members on contemporary issues of management, real-time simulation games for students, recognizing the talents of all stakeholders through its annual management conventions every year, providing financial assistance for conducting seminars and workshops, Deans and Directors roundtable, research project on contemporary issues, etc. This Vision Seminar aims to establish the role of management education in embracing the Industry 4.0 and will give a platform for deliberation and discussions on the futuristic demand of the changing times and highlight the research and development focus to meet the needs of the educators and learners of tomorrow. ■

## **Message**

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**Prof. Dipak C. Jain**

*Professor of Marketing, China Europe International Business School*

I am happy to know that Globsyn Business School successfully conducted its 4<sup>th</sup> International Vision Seminar on "Technology in Management in the Age of Industry 4.0" on 31<sup>st</sup> January, 2020 at The Park, Kolkata, preceded by Pre-Seminar Workshop on "Data Analytics using Python" on 30<sup>th</sup> January, 2020 at Bengal Chamber of Commerce & Industry in Globsyn Room therein.

Much I would have enjoyed addressing the audience at this International Vision Seminar as an Invitee pursuant to their hearty invitation, my recent surgery precluded me to do so.

Technology is Management is indeed a very relevant topic, more so, when we talk of Industry 4.0, entailing AI, IOT, ML, Cloud Computing, Robotics and a host of other developments. I am sure, the audience must have gained useful inputs and insights through the deliberations in the above event.

I congratulate Globsyn Business School for their endeavour on this front and would love to be a part of the panel in the next Vision Seminar.

*Best wishes,*

## Inaugural Address

### **Dr. Hari Prasad Kanoria**

*Founder Chairman & Managing Trustee, Kanoria Foundation*

Brothers, Sisters and Dear Youth.

We are manifested soul of Universal soul – God. Our soul is infinite, divine, perfect. We have infinite Knowledge being the part of Universal soul.

Spirituality awakens inner power. It is the quality of the soul. It governs one's intellect which is driven by intuitions. It gives insight, perception and intuition and unfolds new horizon. It keeps us on the right path to work with devotion without expectation of fruits. The evolution of modern world is due to spiritual consciousness, subconsciousness and super consciousness through the process of intuition and insight.

Spirituality prescribes for Yama (moral discipline), Niyama (observances), Asana (physical postures), Pranayama (breathing techniques), Pratyahara (sense withdrawal), Dharana (concentration), Dhyana (absorption or meditation), Samadhi (enlightenment or bliss) and Yoga.

By meditation one can concentrate on consciousness, sub-consciousness and super consciousness. It develops the subtle matters leading to development of technology. It develops the power of perception and knowing. Third eye located in the centre of the frontal mind between two eyebrows, it is the eye of intuition, insight and divine sight. It opens the gate to get the knowledge of cosmos, the ultimate reality. It gives ecstasy, performs peace and divine wisdom. With the divine knowledge, super intellect, one craves to contribute something for the welfare of the humanity. This leads to development of technology.

Newton had developed the law of gravitation by having a sight of falling apple. He was a spiritual person. James Watt invented the steam engine after he saw the shaking of the lid of a boiling kettle.

Steve Jobs had a bad time. His intuition and insight was awakened through spirituality in India. He made "Apple", more than 600 billion dollar company. Mark Zuckerberg, co-founder of Facebook had spiritual awakening.

Through spirituality many people have developed initial faith on God by inference and later by vigorous experiment with the help of subtle senses like mind, intelligence and various spiritual practices. Many founding fathers of Technology and Science are Newton, Einstein, Kelvin, Schrodinger, Born, Heisenberg and Plank.

Ancient Indian Scientists and Philosophers have guided humanity through the divine principle where God is accepted as the ultimate source of everything and the divine consciousness flows downward from God to every living being.

Sense perception, inference, reveals knowledge is primary factors for development of technology. One has to surrender to the Supreme God.

Charles H. Townes was working hard to get shorter wave lengths. He felt that suddenly he was inspired by God to use non – thermal molecules.

Vedic scriptures especially Bhagawad Gita gives an account of phenomenon of inspiration. According to these, the phenomenon of inspiration results from the interaction between all pervading absolute being and the localized conscious selves. Since absolute conscious being is the source of all potencies and since his unlimited potencies are available everywhere, it sometimes becomes expressed and manifested within the heart of a deserving individual localized soul, in the form of inspiration.

By the spiritual eye, Vidur was seeing what was happening in the war between Kauravas and Pandavas at Kurushetra and was narrating to King Dhritarashtra.

#### **Einstein said**

- One has to play his part in the creative world.
- He also warned people not to make intellect as their God.
- Idea comes from God.
- The true value of a human being is determined primarily by how he has attained liberation for the self.
- The ideas which have guided my way, and time after time have given me the energy to face life which have been kindness, beauty and truth.
- God does not play dice with the world.
- Cosmic consciousness is the pure essence of religion.

Swami Vivekananda said, “Manifest spirituality within you”. Mark, ‘If you give up spirituality the result will be that in three generations you will be extinct.’

*Thank you!*



**Mr. Peeyush Gupta**

*Vice President, Steel (Marketing & Sales), TATA STEEL*

With the advent of advanced technological arrangements, different sectors are seeking to accept and incorporate the technological marvel in their fields. Importance of technology in business management and operations begins with the improvement of planning and goal setting, identification of value added & non-value added activities in the business process.

The commodity sector is observing a radical change in terms of growth and utilities. Incremental, adjacent and radical innovation is critical to tide the volatilities of a typical commodity cycle.

The situation presents unique challenges of survival in the emerging markets. The challenges are as follows:

- a) Fluctuating margins and cash flows
- b) Skewed revenue to capital ratio
- c) Stressed solvency due to debt
- d) Commoditisation of technology
- e) Replication of differentiation
- f) Higher capital commitments to differentiate
- g) Long lead time for new products
- h) Untapped premium on convenience and efficiency

The challenging situation can only be hedged using innovation aided by technology by the organizations. The diagram below explains the importance of incremental, adjacent and radical innovation for the survival as well as the growth of any organization.

Tata Steel, as an organization, not only promotes the concept of incremental (product), adjacent (services) and radical (category), but also practices it over the decades. In the recent past the organization has come up with a series of innovation for the benefit of the customers. By incremental innovation we mean marking of products to meet the resonating need of authenticity and transparency.

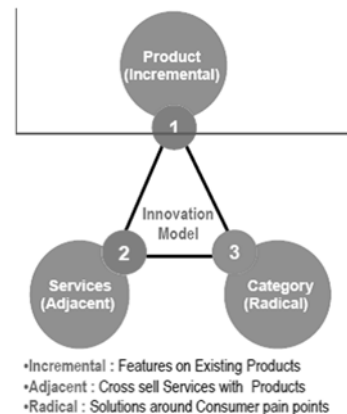
We launched TMT Rebar in 2002, which became the first rebar in the country to have source authenticity. In 2009, Galvano was launched in the market. It was zero spangle Galvanised material to have UV printed identity (Invisible to the naked eye). Another noteworthy innovation was applied in 2017 with Tata Astrum Super (Hot Rolled Coil), which became the only coil to get marked in hot condition. Therefore, with the consistent innovation, we are able to offer the customer delivered value in time.

Services innovation offers personalized and customized offerings to reduce and automate downstream activities on the construction site. Tata Steel, through the continuous innovation process is now able to successfully deliver enforcement to structures and efficiencies of space, time and cost on the project site. Some of the examples are Tiscon Superlinks and Sm@rtFab.

Through category innovation, we believe in exploring and offering superior solutions using innovation around consumer pain points, such as enhanced security for the customers, emphasizing the aesthetic nature of the offering and protection from the external environment along with the optimised view that the customers can enjoy.

As the strict adherent to the innovative superior value to the customer, the organization benefits from its innovative business models through creation of fresh, innovative ideas that support the financial stability of the organization, including its mission, and the processes for bringing those ideas to fruition. Innovation also creates an opportunity to shape the changing demands of the customers, leading to creation of a sustainable value chain.

The final fulfilment of objective comes through generating premium for convenience from consumers. The whole process of ideating and implementing innovation ultimately leads to value generation and delivery of value to the customer. As the organization, we promote technology and value addition. ■



Since the beginning of industrialization, technology has improved exponentially. Such periods of transformation are called the Industrial Revolution. The introduction of work mechanization through the use of steam engines is widely known as the first industrial revolution. The second industrial revolution increased productivity through the use of electricity and mass manufacturing methods, followed by the third industrial revolution with computer adoption and automation.

It is now the era of the fourth industrial revolution, what came to be called Industry 4.0. The era has involved the application of new technologies such as Business Analytics, Artificial Intelligence, Machine Learning, the Internet of Things, etc., thereby improving productivity and quality in terms of opportunities and threats, not only in manufacturing, but in all business processes. The convergence of cyber-physical networks, the Internet of Things and the Internet of Systems allows industry 4.0 and the so-called smart factory to become a reality.

With the advancement of Industry 4.0, computers can link and interact with each other, so that decisions can eventually be made without human involvement. As a result, the systems will be smarter as they gain access to more data, making our factories more effective and competitive and less wasteful.

Many of the emerging and challenging perspectives of Industry 4.0 were discussed in details by the speakers in the Seminar. The areas included the broad aspects of disruptive technology and digitization, focusing on how different organizations have implemented and harnessed technology in different genres, and while technology has been a vehicle for economic growth, there are contexts where it poses concerns about its negative aspects and suitability in the light of greater social responsibilities.

*Dr. Shamindra Nath Sanyal*  
*Dr. Dipak Saha*

## Special Address

**Prof. R.C.Bhattacharya**

*Vice Chairman, Globsyn Business School*

Globsyn has been a value-based Business School from the beginning, thanks to our Founder Chairman, Mr. Bikram Dasgupta.

We were always mindful that our business graduates should not only be knowledgeable in their subjects but should also be skillful enough to perform well in their respective workplaces from day one. Over and above, we wanted our youngsters to be good human beings willing to give back to society. That is why, each of our students have to work for the elderly, down-trodden and disabled and do a live project to pass the examination.

Later on, our chairman felt that apart from imparting teaching and learning to management students, we need to engage with the society in general. Hence, we started holding a yearly seminar to sensitize faculty, corporates, government employees and public in general about serious concerns of the day. We call these Vision Seminars.

The first Vision Seminar was held in 2017 on " Spirituality in Management Education"

This was followed by a second Vision Seminar in 2018 on "Women Empowerment"

The third Vision seminar was held in 2019 on "Corporate Ethics and Responsible Management"

This year, we held the fourth Vision Seminar on " Technology in Management in the age of Industry 4.0".

We strongly believe that Technology will be the game changer today. It will change the way we run our business and conduct the affairs of the society. This year's vision seminar was an International event with speakers from Bangladesh, Malaysia, Japan and USA. It was a grand success and we had around 200 participants from corporates, academicians, students and general public.

Our School management is doing a great job and I hope that they will keep the process going.

## **Data Science Using Python**

**Prof. Kaushik Ghosh**

*Faculty, Globsyn Business School*

### **Data Science – a subject for data insight**

Data science is an umbrella term that encompasses data inference, algorithm development, and technology. It is used to solve analytically complex business problems. In today's world, 2.5 quintillion bytes of data are created every single day and out of this 80-90 percent of data are unstructured.

The popular belief of “Data is power” lies in the fact that how effectively an organization is using the data to perform analysis and create predictive models that can forecast the prosperity and also the risks involved in the business, hence enabling the organization to take appropriate decisions.

As most of the data are unstructured, the traditional techniques of data handling through relational database management systems are becoming least effective. Instead, researchers, mathematicians and statistics fraternity are more relying on techniques like exploratory data analysis, data mining, data visualization, data munging, machine learning algorithms, to name a few, to extract meaningful insights from the data.

### **Python – a powerful tool in data science**

When it comes to quantitative and analytical computing, Python is the most easy-to-use tool. It also has the attribute to create predictive models. It is the most frequently used tool for data analytics for quite some time now and is used in various industries like automobiles, health care, manufacturing, oil and gas, stock market etc. Python has been used to strengthen Google's infrastructure and in building applications like YouTube.

As Python is an open-source platform, it can easily integrate with any existing infrastructure that is used to solve complex business problems.

Python provides a massive library of in-built APIs that are used for artificial intelligence and machine learning type of tasks. Some of the most popular libraries include Pandas, Scikit Learn, TensorFlow, Seaborn, Matplotlib and many more.

One of the most efficient techniques to understand the character of data is visualization. Python provides a rich set of library to visualize data through variety of charts and graphs. Whether it is linear, 2D or 3D charts, Python is capable to representing the data in all planes through its Seaborn and Matplotlib libraries.

### **How python is used in each stage of data analysis and predictive modelling?**

**Stage - I:** When data is in unstructured format, Python has objects like DataFrame which transforms the unstructured data into a shape of matrix very easily. DataFrame has in-built functionalities that help to get some understanding about the data like the shape of the data, the types of every variable under which the data were recorded, the amount of missing information etc.

**Stage - II:** All the recorded data might not be necessary always. Python has in-built statistical functionalities that can figure out the degree of importance of a particular variable like correlation matrix, chi-square, anova etc. It also in-built APIs to find the distribution of data like central tendency and variance.

**Stage - III:** In this stage, visualization or graphical representation of the data is done. It becomes difficult to drive insights when you see so many numbers on the screen. The best way to do this is by representing data in the forms of graphs, pie charts, and other formats. To perform this function the libraries of Python Seaborn and Matplotlib are used.

**Stage - IV:** In this step, predictive modelling is done through machine learning techniques. Predictive models help an organization to forecast the future business. It involves mathematics tools like probability, calculus and matrix functions of over a huge shape (rows and columns) of data. All this can be done easily through in-built library of Python, namely, Scikit Learn and TensorFlow. ■

## **Your Cognitive Future: How Artificial Intelligence Changes the Way we Live and Work**

**Dr. Sandipan Sarkar**

*IBM Distinguished Engineer*

For decades, science fiction visionaries have shared their renditions of intelligent machines and computers that could learn and function as humans. Intelligent machines have since moved beyond the lore of science fiction; today, they are a reality thanks to breakthroughs in cognitive computing. Cognitive computing is here - and this innovative capability is increasingly becoming ubiquitous in our everyday lives and fundamentally changing how we engage and interact with information and information systems (Example: intelligent speaking computer on the bridge of U.S.S. Enterprise on the television show Star Trek.)

Today, many of these capabilities are now a reality made possible through breakthroughs in cognitive computing and are being implemented by pioneering organizations around the world and across industries to help solve some of society's greatest challenges. (See pictures on right of slide which are actual representations of Watson application interfaces.)

While tremendous breakthroughs and advancement have been made over the past fifty years, we have only yet begun to scratch the surface of the potential of this innovative and exciting technology.

So what do we mean by the terms cognitive computing and cognitive systems?

We are entering into a new era of computing. The cognitive computing era follows the eras of programmable and tabulating systems and represents a huge leap forward. This is a new era because there is a fundamental difference in how these systems are built and how they interact with humans. Traditional programmable systems are fed data, knowledge, and information, and they carry out and return results of processing that is pre-programmed by humans. In the programmable systems era, humans do most of the directing.

The cognitive era on the other hand is about thinking itself – how we gather information, access it and make decisions. Cognitive-based systems learn and build knowledge, understanding natural language, and reason and interact more naturally with human beings than traditional programmable systems. While the term “reasoning” refers to how cognitive systems “reasoning” is a slippery term, we mostly mean that such systems demonstrate insights that are very human-like.

Cognitive systems are able to put content into context, providing confidence-weighted responses, with supporting evidence. They are also able to quickly find the proverbial needle in a haystack, identifying new patterns and insights. Cognitive systems extend the capabilities of humans by augmenting human decision making capacity and helping us make sense of the growing amount of data germane to a situation. Over time, cognitive systems will simulate even more closely how the brain actually works. In doing so, they could help us solve the world's most complex problems by penetrating the complexity of big data and exploiting the power of natural language processing and machine learning.

While tremendous advancements have been made over the past 50 years, cognitive computing is virtually in its infancy in terms of how this exciting technology could potentially evolve. Adopting and integrating cognitive solutions into an organization is a journey and not a destination. Therefore, organizations need to set realistic expectations and develop long-term plans with incremental milestones to benefit from the technology's future progression. Based on experience with clients and extensive research, we have identified multiple opportunities across industries for innovative application of cognitive computing today, as well as examined how the technology might evolve in the future.

However, understandably, many are sceptical of this capability and how to begin preparing their organizations to leverage this capability in their own organizations. The question remains now, how can you make it a reality for your organization?

In this study we will explore the progression path of cognitive computing – where we have been and where experts see it going in the future; what lessons can be learned from pioneering organizations that have already implemented this capability; and steps your organization can take to move forward.

(Merriam-Webster.com. 2013. Accessed August 26, 2013. <http://www.merriam-webster.com/dictionary/cognitive>

Derived from IBM Research definition and discussion with subject matter experts.)

How the three capabilities of cognitive computing evolve will depend on five important dimensions. The evolution path and rate of advancement across these dimensions will impact the robustness of future capability.

**Personalized interaction:** Current cognitive systems are predominantly passive in nature and require that human beings initiate action to generate an output or responses. Often this interaction is through text typed on a computer, mobile app or web portal. Future cognitive systems will increasingly enable more natural interaction with users including voice and visualization. Future systems will become increasingly more interactive and engaging. Significant advancements have already been made to better understand users and deliver responses fit for the user's specific locative and temporal context.

**Learning:** Current cognitive systems are not generic enough to learn and adapt to new domains on their own. Current cognitive systems are trained systems (supervised learning). These systems are reliant upon humans with domain specific subject matter expertise to train them. This process can be labor intensive and time consuming. Future cognitive systems will adopt greater unsupervised learning, which will require much less human interaction in the system training process. The research community is actively looking to make breakthroughs in this area.

**Sensing:** Current cognitive systems primarily work with natural language text and require natural language processing capability for a particular language. Natural language processing capabilities for English and Western European languages are more advanced today. Future generations of cognitive systems will accommodate a variety of media beyond text (e.g., audio, image, video). Continued advancements in this dimension will be dependent on various disciplines of computer science (e.g., speech and image processing, pattern recognition).

**Ubiquity:** Cognitive systems are increasingly being deployed to be widely available and accessible over web portals, mobile apps and cloud. In the future, as the adoption of cognitive-based systems increases, they will eventually spread to become ubiquitous. This future could include a marketplace with millions of cognitive agents or avatars, driven in part by the explosive adoption of mobile devices, the IoT and the upsurge of machine-to-machine interaction. Tomorrow's cognitive computing fabric will be interwoven into technology (such as social media), thereby touching our daily lives.

*"Right now we're focused on humans interacting with the system. In the future, systems will also communicate and ask questions of one another with no humans in the loop." – Juliane Gallina, Cognitive Computing Solution Delivery Executive, IBM Watson.*

**Scalability:** Cognitive systems will need continue to increase in scalability to support wide applicability. In 2011, the version of IBM's Watson system that beat the reigning champion on the U.S. television game show Jeopardy! required 90 IBM Power 750 servers. By January 2014, Watson was 24 times faster, had a 2,400 per cent improvement in performance and was 90 per cent smaller. In the future, cognitive systems may be offered as a fabric. IBM has already made its Watson technology available as a development platform in the cloud, which is spurring innovation and fueling a new ecosystem of entrepreneurial software application providers. WayBlazer, a travel inspiration, recommendation and planning platform that provides consumers with more personalized, relevant and valuable information, is one example of a partner realizing value in this ecosystem model. WayBlazer uses a standards-based cognitive cloud powered by IBM Watson technology to recommend targeted travel insights and commerce offers that are tailored and customized for each consumer's experience.

(Sources: "IBM Watson Group Unveils Cloud-Delivered Watson Services to Transform Industrial R&D, Visualize Big Data Insights and Fuel Analytics Exploration." IBM Press Release. January 9, 2014. <http://www-03.ibm.com/press/us/en/pressrelease/42869.wss>

"IBM Watson's Next Venture: Fueling New Era of Cognitive Apps Built in the Cloud by Developers." IBM Press Release. November 14, 2013. <http://www-03.ibm.com/press/us/en/pressrelease/42451.wss>

"Digital Travel Pioneer Terry Jones Launches WayBlazer, Powered by IBM Watson." IBM Press Release. October 7, 2014. <https://www-03.ibm.com/press/us/en/pressrelease/45024.wss>)

Six forces will affect the rate of adoption in both the public and private sectors.

*"More adopters will help shape the technology and embed it in new forms and help direct the efforts of researchers to push cognitive computing to new heights." – Brian Keith, Cognitive Computing Solution Delivery Executive, IBM Watson*

**Society:** At the societal level, there will be two opposing forces at work. One will push toward the technology, as the demand for more and more intelligent machines increases over time, and the desire to access them through personal mobile devices grows as well. This increased access and exposure to cognitive capabilities through mobile devices has the potential to increase both familiarity and comfort with the technology.

**Technology:** There is already a strong belief among subject-matter experts that we need to advance current computer architectures and programming paradigms to take cognitive computing to the next level. Technology advances, including

natural language processing, neuromorphic computers, unsupervised machine learning algorithms (i.e. deep learning) and virtual reality devices may help in this evolution. Advances in intelligent devices (e.g., mobile devices and the Internet of Things [IoT]) will enable greater understanding of entity (e.g., people and assets) context, which can contribute greatly to the robustness of available information corpora available to cognitive systems.

**Perception:** The value proposition of cognitive computing is compelling, and many pioneering organizations are already realizing economic value. However, perceptions need to be well managed and grounded in reality. Otherwise, the disparity between vastly different views combined with misinformation could lead to another “AI Winter,” which refers to a period of reduced funding and interest in artificial intelligence research. Educating the market about the realities and potential value of cognitive computing is crucial to successful perception management.

**Information:** IDC projects that the digital universe will reach 40 zettabytes (ZB) by 2020. To put this number into perspective, consider that 40 ZB is equal to 57 times the amount of all the grains of sand on all the beaches on earth. This information explosion– driven in part by the rapid growth of mobile devices and social media – has accelerated the growth and application of cognitive computing. It is now nearly humanly impossible across vocations to keep pace with the rate at which information is being made available, in size, velocity and form. As the explosion reaches increasing orders of magnitude, cognitive computing will likely be forced to evolve more rapidly. The variety and scalability of capabilities for future cognitive systems will have to advance rapidly to cope with this information exhaust.

*“The degree of data sharing will likely impact the adoption of cognitive computing solutions; however, the technical side is fascinating. Policies can clearly impact technology but the hope is that the capability will still move forward.” - Dr. Manuela Veloso, Professor of Computer Science, Carnegie Mellon University.*

**Policy:** Wider adoption of cognitive computing across domains will likely require policies to be advanced (e.g., data sharing, data security and privacy). Additionally, there may be requirements for entirely new policies in response to advancements in cognitive capabilities. For example, in the case of machine autonomous decision making (i.e., “decision” capability area), policies addressing the traceability of the decision-making process may need to be added. Additionally, in response to fear, uncertainty and doubt, authorities around the world should focus on enacting policies that responsibly progress the capability of cognitive computing while also ensuring the protection of citizens.

*"The traceability of the machine recommendations (i.e., why a recommendation was made) will be important in fostering confidence and trust." -- Dr. Francesca Rossi, Professor of Computer Science, University of Padova and Harvard University.*

**Skills:** A key challenge for the advancement of cognitive computing will be the availability of skilled humans. Advancing cognitive computing capabilities and implementing cognitive systems require unique skill sets, such as those of machine learning experts and natural language processing scientists. These skills are currently in high demand and limited supply.

*"There are concerns over another 'AI winter.' Education programs will be key to grow cognitive systems capability, and IBM is doing a significant amount of work in this area." – Dr. Jim Spohrer, Director Global University Programs, IBM Research.*

While the capabilities and limits of computing continue to evolve, many of the fundamental success factors never change. How these systems are implemented and how users interact with them is fundamentally different than traditional input/output systems. It is often a challenge for organizations to understand this fact and determine how to best apply this capability in their organization. Our interviews with SMEs that have implemented cognitive computing solutions in pioneering organizations have revealed three key factors critical to a successful cognitive computing implementation.

Let's explore these valuable lessons...

### **Find the right opportunity:**

Cognitive solutions are not necessarily the best solution fit for every business problem and use case. Organizations need to think through the problem before determining if a cognitive computing solution is right for the context of the problem.

The following key questions should be considered when evaluating potential use cases:

- Does it involve a process or function which today takes humans an inordinate amount of time to seek answers and insights various information sources (i.e., corpus) using potentially various techniques in making a decision or thinking through a problem?
- Is there a question and answer requirement, which would require users to interact and ask questions posed in natural language?
- Does it involve a process or function which requires providing transparency and supporting evidence for confidence weighted responses to questions and queries?

Ideally, use cases should also be scalable for application across the enterprise.

Define the value proposition and chart a course for cognitive:

- The differentiated value cognitive computing solutions can provide must be understood and the business value defined up front.
- A cognitive computing vision and roadmap for the organization which has executive level support is absolutely critical. Reviewing progress and this vision should be done regularly with the executive sponsor and key stakeholders at all levels.

### **Track the value:**

Use a phased rollout to confirm value. Cognitive systems are evolutionary by nature and, as such, will improve over time. This needs to be understood and accounted for in benefits realization plans. Deploying the solution to a subset of trusted users who understand the evolutionary nature of the technology is ideal. This approach can then test and verify the users are seeing and receiving benefit before deploying to a larger user group.

The opportunities for cognitive computing are compelling. In this section we'll provide guidance and recommendations on how to define and move your organization's cognitive journey forward. There are four recommended steps for moving forward based upon the valuable insights and lessons learned from pioneering organizations that have been early adopters of this capability.

It's important to remember that cognitive computing is exactly that: a journey. This is an important point to remember and needs to be a guiding principle that is constantly reinforced within the organization. Underpinning all of these steps is an active change management strategy and plan. Let's explore each step:

### **Step 1: Chart the course for your organization's cognitive journey**

Every successful journey starts with a clearly defined strategy and plan. Step 1, "Chart the Course", includes three key tasks:

Identifying candidate opportunities (use cases) for cognitive computing across mission and functional areas in your organization's enterprise. This includes identifying target processes to be disrupted with cognitive solutions. The following key questions should be considered when evaluating potential use cases:

- Does it involve a process or function which today takes humans an inordinate amount of time to seek answers and insights various information sources (i.e., corpus) using potentially various techniques in making a decision or thinking through a problem?

- Is there a question and answer requirement, which would require users to interact and ask questions posed in natural language?
- Does it involve a process or function which requires providing transparency and supporting evidence for confidence weighted responses to questions and queries?

Define the business benefits case. This includes identifying, developing and testing benefits hypotheses for various use cases selected. This also entails defining key metrics to track the value of each use case.

Develop your organization's cognitive computing roadmap. This includes a definition of the target cognitive computing solutions to address priority use cases selected and committing to a strategy.

The organization's roadmap should also include a clearly defined change management strategy addressing plans for governance, organizational communications and benefits tracking. This strategy and roadmap should also define requirements and impacts on both policies and processes as well as requirements for building required corpus. The strategy should also clearly define investments required for subject matter experts and other critical skill sets required to implement a cognitive solution

### **Step 2: Experiment to validate your organization's cognitive strategy**

Innovation requires experimentation. Step 2, "Experiment", is focused on testing and validating your organization's cognitive use cases through prototyping.

The purpose of developing a prototype is to allow users to see what the end state of their developed use case could look like using visual design treatments and focusing on the workflow for the use case scenarios.

This is a critical step in validating and refining the use case, increasing user understanding and gaining buy-in and further test the business case hypotheses.

### **Step 3: Develop your solution and train "the team"**

With a cognitive vision and strategy clearly defined and vetted with key stakeholders, it's now time to begin implementation. Step 3, "Develop and Train", is where the heavy lifting begins and where investments in human resources and the core technology are required. The focus of this step is developing the solution around the priority use cases(s) defined in Steps 1 and 2 and training both the system and the users. Investments required will be driven by the requirements and analysis conducted in these steps. As previously discussed, the system training process a ongoing process that will continue on well after the initial deployment.

**Step 4: Deploy the solution and continue to evolve your organization's cognitive capabilities**

Deployment of your organization's cognitive computing solution is just a celebratory port-of-call on your overall journey. Once the solution is deployed, even greater learning can begin – for both the system and the solution users and stakeholders. Step 4, “Deploy, Explore Evolve”, includes:

- Deploying the solution into your organization's operations;
- Continuous learning (for both the system and the system's users and stakeholders);
- Continuous improvement of the corpus;
- Further evolution of the system and domain processes; and
- Exploration of further use cases for the application of cognitive computing

As discussed previously, continuous tracking of business benefits and the accuracy levels of the solution is critical to assess and evaluate progress against the key metrics. ■

**Panorama**

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## **Universal Impact of Emerging Technologies on Management & Society**

The panel, Panorama, was chaired by Prof. Shekhar Chowdhuri, Former Director-IIM-Calcutta and other panelists included the distinguished academicians and industry resource persons like Dr. Mahendhiran Nair, Vice President (R&D) and Professor Monash University Malaysia, Mr. Debashish Bhattacharya, Dy. Director General, Broad Band India Forum, Manabu Iida, (Japan), Senior Advisor of CSM Project.

In his opening remarks, Prof. Shekhar Chowdhuri shared his view on how the new technologies, in their diverse forms, are revolutionizing the organizations function, and has become the integral elements of any business, industry and commerce throughout the world. He has explained the ongoing effects of emerging technologies on organizations as well as society. He has also described the impact of technology on leadership, management and business practices in the near future. He suggested ways in which business leaders can anticipate and plan for the effects of these new technologies on their organizations and leadership/management practices in the future. He mentioned how the rapid increase in emerging technologies have a substantial impact on the workforce and also cited how Disruptive Technological Innovations regularly force companies and entire industries to adapt emerging business models in the organization. ■

## **Vision 2020: Impact of Communications on Management & Society**

**Debashish Bhattacharya**

*Dy. Director General, Broad Band India Forum*

A stable and affordable supply of food is critical for a sustainable society. Innovations in agrarian sciences & agronomics, particularly from the 20th century helped farmers scale effectively to provide food for a booming population. Green revolution solved one of the more pressing issues in India, Pakistan, Mexico and a number of developing and densely populated nations in the world in the 1950s & 1960s. Modern agricultural crises, of which there are many, are today best addressed in part by communications & digital technologies.

Led by a combination of 5G, Artificial Intelligence and Massive IoT systems, the next transformative evolution is expected to be the game changer. 5G can carry much more data than other networks and this makes the technology ideal for transmitting information from remote sensors and drones, key tools that are being tested by farmers. By providing timely information about the monsoon, weather forecast, land quality, farmers can choose the crop accordingly and this can reduce the risks for small farmers.

The ability of farmers to grow crops with a reduced risk of failure is essential and can help save lives. Smarter farming techniques enabled by fast & reliable access and intelligent systems are poised to revolutionize farming & agriculture dramatically. The high speed, low latency features of 5G networks fit well with the requirements of such IoT systems. India has taken the lead in developing the Low Mobility Large Coverage (LMLC) standard to suit Indian requirements for slow moving traffic in a wide coverage area, especially in rural areas. LMLC Systems could render unique benefits in this regard.

Historically, a set of simple transmission decisions were sufficient for a grid that drew from a limited set of sources (mostly fossil fuels), but electrical networks today have to deal with multiple sources. Unlike computing, electrical grids do not work in a plug & play fashion. Transmission upgrades are typically a mandatory requirement when dealing with multiple sources and a modern grid

therefore needs to be intelligent & optimized - so it can be both reliable and affordably accessible. The need for this shift is rooted in some fundamental transformations currently taking place in energy generation distribution & consumption.

AI & IoT are expected to deliver immense value for in home products and services designed to make life easier. The fingerprints of such a paradigm already exist in almost every modern home. Highly subsidized access to hardware such as Amazon Alexa, Google Home and others have led to a massive rollout of the first application of a rudimentary combination of IoT & AI. In addition to such devices, many homes can now connect legacy devices to intelligent home networks. Inexpensive plugs with built-in Wi-Fi capabilities can now be procured for as little as \$15 - \$35 (~ INR 1000 - 2500) and turn any legacy appliance into a smart appliance than can be interacted with as long as the home Wi-Fi network stays on. Smart IP cameras that once required a visit from specialized CCTV engineers can now be implemented in a plug & play fashion by ordinary users. Intelligent in-home electrical and water usage powered by these technologies would allow connected residents to reduce their environmental footprint while improving on the quality of life. While the technical efficiency of 5G is undeniable, its economic efficiency is worthy of the full attention of businesses and policy makers.

In the case of the telecommunications sector, endogenous growth models, such as the seminal work by Rober J Barro and Sala-i-Martin from 1979, have emerged as an economist's favorite for studying the impact of telecommunications of the economy. A paper on the "Economic impacts of Broadband" by Qiang et al in 2009 for the world bank is perhaps among the most cited telecommunications related economic impact paper out there. Broadband emerged as a key influencer of economic activity, registering the highest quantifiable impact of a 10% increase in its penetration, in the form of a concomitant increase of 1.38% and 1.21% GDP growth for developing & developed economies respectively. In July 2017, Broadband India Forum, in collaboration with ICRIER commissioned a study to estimate the value derived from the use of "New Generation Internet Based Applications in India". The key results of the study estimated that a 10% increase in global Internet traffic, delivers on average a 1.3% increase in global GDP and a 10% increase in global mobile Internet traffic, delivers on average a 0.7% increase in global GDP. In the case of India, the estimation found that 10% increase in India's total Internet traffic, delivers on average a 3.3% increase in India's GDP, and a 10% increase in India's mobile Internet traffic, delivers on average a 1.3% increase in India's GDP.

The far-reaching influence of communication services and networks on our daily life perhaps requires an approach that is a little bit closer to consumers than a

traditional economic impact study tuned for studying effects on the gross domestic product. A consumer surplus approach, i.e. one that attempts to quantify the increased economic activities and efficiencies directly experienced by consumers would be one such alternative approach. In an effort to conduct a thorough study of the sectors impact on the Indian economy, the Broadband India Forum collaborated with the WIK institute from Germany to assess “The Economic and Societal Value of Rich Internet Applications in India”. This was the first study that focused “directly on the value added for consumers in India by Rich Interaction Applications (RIAs). The results of the consumer surplus survey and analysis show that RIA usage saves on average 803.9 minutes per week. Based on the average annual income in India (INR 94,130), this translates into an annual consumer surplus of US \$98 billion in 2017. Thus, each user of RIAs in India receives on average US \$249 of consumer surplus annually. Applied to the entire population—not just RIA users—this results in US \$74 per capita.”

Some of the immediate effects of next generation of networks and technologies would be felt in sectors ripe for a transformation. As Artificial Intelligence begins to roll out to the farm, nation should expect significant transformations in business models, market access & customer satisfaction. Smarter utilities powered by a novel combination of IoT & AI will help provide varying levels of insight into consumption metrics, both at city-scale and to individuals. Logistics, freight providers & cold chains are expected to benefit from a similar application of AI & IoT to bring the output of farms to local marketplaces with never before seen levels of efficiency. Local governments could take benefit of these emerging technologies as well, and provide a vastly improved quality of life for its citizens. The secondary effects of these technologies will be felt relatively slowly but surely, and would permeate through the socio economic machinery to enable the transition to the subsequent technological paradigms. ■

## **The ‘DNA’ of the New Economy: Key Challenges and Opportunities for Developing Countries**

**Prof. Mahendhiran S Nair**

*Vice President (R&D) – Monash University Malaysia*

*Professor – Monash University Malaysia*

Recent decades have seen a dramatically accelerating pace in the development process and adoption of new technologies, even though various gaps persist in terms of adoption of new technologies in different parts of the world, especially in the developing countries. This rapid technological change is affecting almost every area of the developing economy, society and culture. Adoption of new technologies is likely to continue in the coming years. Rapid technological change involves, among others, technologies like big data, the Internet of Things, machine learning, artificial intelligence, robotics, 3D printing, biotechnology, nanotechnology, renewable energy technologies, satellite, and drone technologies. Rapid technological change could contribute too many if not all of the Goals, especially those related to hunger, health, education, gender equality, clean energy, industry, innovation and infrastructure, sustainable cities and communities and climate change. Rapid technological change poses new challenges for policy-making in developing countries. It can outpace the capacity of governments and society to adapt to the changes that new technologies bring about, as this change can affect labor markets, perpetuate inequalities. Innovation and new technologies can contribute to eradicate poverty by raising living standards and contributing to economic diversification. Internet of Things-enabled devices and nanotechnology, for example, can be used to detect water contamination and purify water, while renewable energy technologies can provide electricity in rural areas far from the grid. More accurate weather forecasts can make smallholder farmers more resilient. Foresight techniques, such as big data analysis can help policy makers to identify trends and support urban planning, while information and communication technologies are being widely used to deliver first-response emergency aid, as well as to share information and provide early warning. In addition, frontier technologies, including big data and machine learning, can also be used to create measures, and develop and monitor the effectiveness of anti-

poverty programs and progress towards the Sustainable Development Goals more broadly. Models based on both mobile phone activity and airtime credit purchases have been shown to estimate multi-dimensional poverty indicators accurately, and machine learning to predict poverty, using publicly available and non-proprietary data. Big data, the Internet of Things, remote sensing, and artificial intelligence may catalyze precision farming, requiring fewer agrochemical inputs for existing agricultural processes that provide support to farmers to ensure crop health. Rapid technological change will have transformative and disruptive effects that both advance and frustrate sustainable development. Automation from the convergence of artificial intelligence, machine learning, and big data could impact employment, productivity, globalization, and competition in unclear and potentially negative ways. While frontier technologies can be expected to create new jobs and markets, it also has the potential to disrupt existing labor markets and productive sectors. Ultimately, the impacts of automation will vary according to a range of factors, including levels of industrialization and development, skills and capacities, labor costs, export and production structures, technological capacities, infrastructure, demography, and policies encouraging or discouraging automation. Rapid technological change also poses new challenges for policy-making, threatening to outpace the capacity of governments and society to adapt to the changes that new technologies bring about. Automation could impact employment, productivity, globalization, and competition in unclear and potentially negative ways. Rapid technological change also has the potential to perpetuate existing divides among and between countries and raise ethical issues involving privacy, security, data stewardship, and safety. ■

## Role of Visionary Leadership in Technology Management The Japanese Experience

**Manabu IIDA (Japan)**

*Senior Advisor of CSM Project*

### Visionary Leader

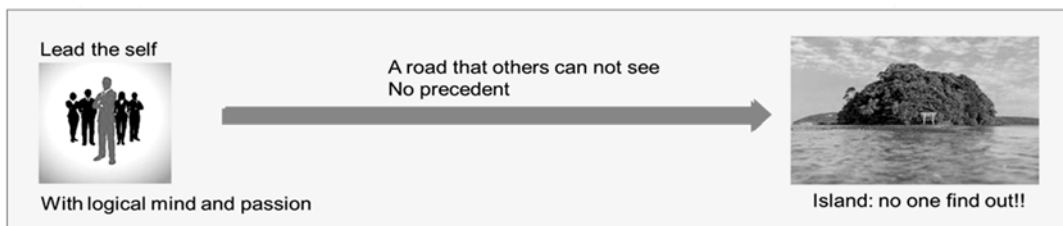
A visionary leader is an individual who sees the potential for how the world should exist and then takes steps to get there. You can achieve visionary without a leadership role—become an idea guy, for instance. And, you can successfully lead people to accomplish a course of action, while not having a vision for the change you'd like to create.

These two abilities combined—the ability to see the potential for change combined with the ability to lead others creates a visionary leader. If you want to become a visionary leader (or work for one) here are the three main characteristics you want to actively strive to develop or find.

### 1. How to Behave as a Business Person

#### Leadership 1

The journey as a leader starts with the determination of one person who finds "an invisible thing".



Leader : neither charisma nor skills. Not just a position.

Leader : is aware of something that others can not find, decides to walk towards it, and is acting.

There are many leaders who have designation but not real leaders.

## Leadership 2

The leader step-up to new phase when followers are born and moved by the leader

Lead the people

1. Started from a personal feeling, but turns into a sense of responsibility for the followers.

From selfishness to altruism

2. The subject changes from "Me" to "Us".

Start talking about your dreams as everyone's dreams.

3. Followed by the energy of the leader, followers who come into the swamp "hard environment".

Follower is a person who "thinks with his own head" and "willing to follow you".

Strong organization will be born with one and two followers who want to see the same world the leader is watching together. This is the second phase of the leadership journey.

## Leadership 3

The timing when the thought "for this world" or "for the next generation" is the driving force will come soon.

Lead the Society

The target to think from "we" to "world", "next generation"

The journey started with my own personal feelings will eventually come to the theme of "next generation".

Many leaders do not have grand feelings from the beginning.





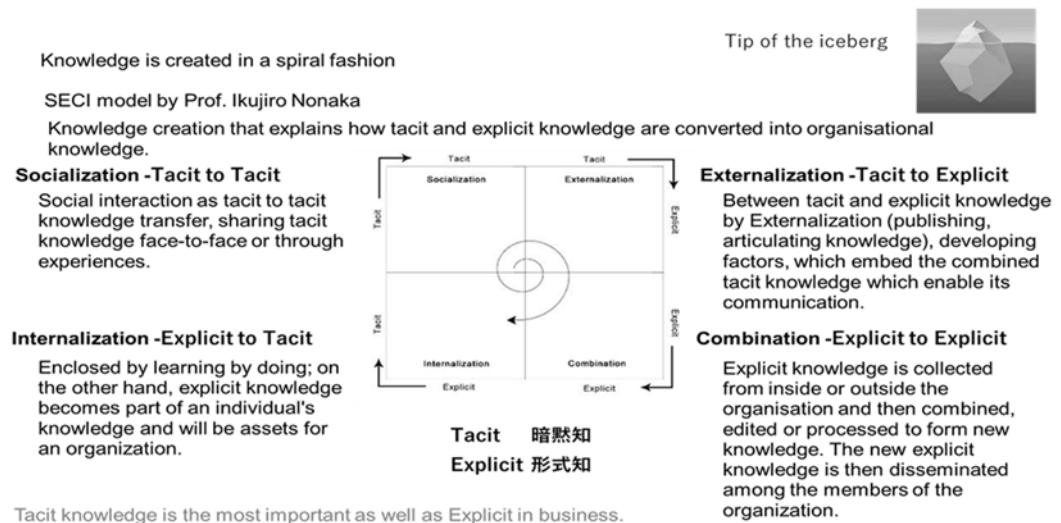
Leaders should be able to speak young people positively and freely.

## Summary

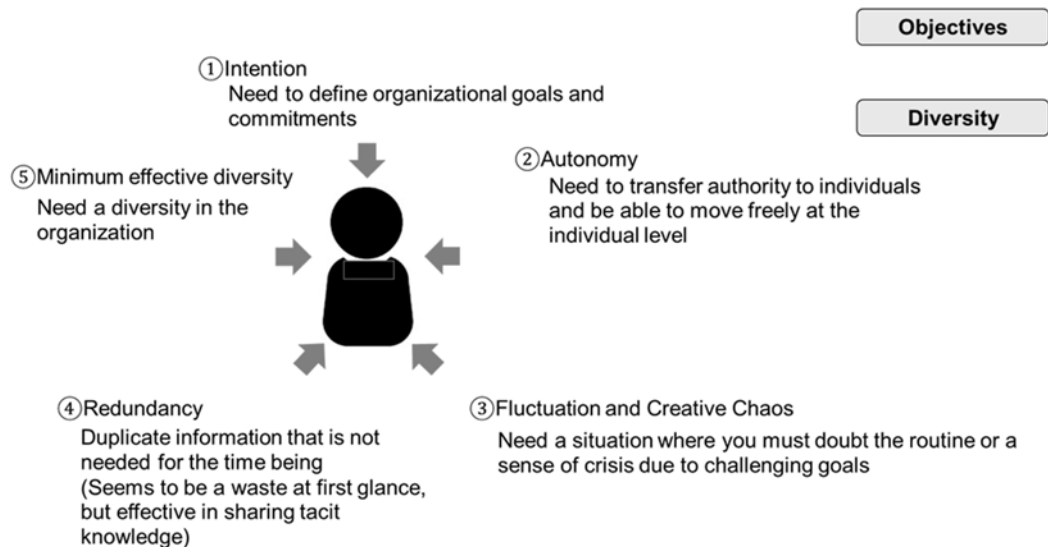
- Leaders are not natural or mere designation. Can you see something that the other people do not see?
- "Before you develop strategic thinking and communication skills, being an attractive person, it is no exaggeration to say that leadership is all about this."
- The most important thing to hone human power is "to have an understanding and dignity for human activity"
- Without that, no matter how much you learn thought and skills, it could be negative.

## 2. Knowledge Creation Company

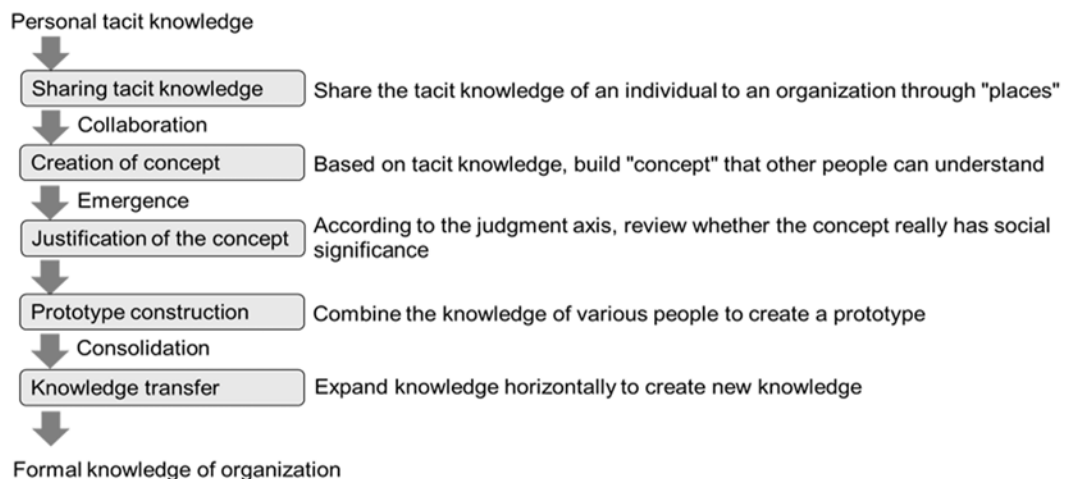
### Knowledge is created in a spiral fashion



## Assumptions for the Functioning of the SECI Model



## Knowledge Evolve through the Five Phases



## Summary

### Advantages

- Appreciates the dynamic nature of knowledge and knowledge creation.
- Provides a framework for management of the relevant processes.

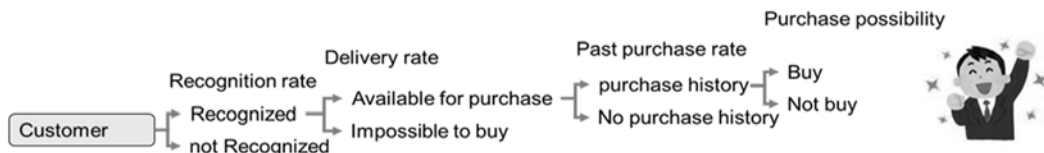
## Disadvantages

- It is based on a study of Japanese organizations, which heavily rely on tacit knowledge: employees are often with a company for life.
- The linearity of the concept: can the spiral jump steps? Can it go counter-clockwise? Since the model is bi-directional with only two nodes, the answer is yes, but so what? An example would be an elevator in a two-story building.

## 3. Strategy Theory Of Stochastic Thinking

### Those Who Win The Preference Win The Battle

Preference is the brand's Degree of favor.  
The range of influence of preferences is large.



Marketing can be broken down in detail.  
By increasing the probability of each factor, it will approach the intended outcome.  
The highest indicator must be preference.

## Preference is limited by three factors

Preference (Degree of favor)

### Brand equity

- ✓The largest factor in determining preferences. Determined by relative position with competition.
- ✓It is hard to break the brand that has once solidified. That's why it becomes equity.
- ✓Although differentiation is important, we must avoid differentiation which is the absence of consumers.

### Performance of product

There are preferences in which product performance has meaning and which does not.

Strong impact: Car, bike, medicine, electric appliance etc.

Weak impact: Drinking water, cosmetic etc. >>>Brand equity is more important

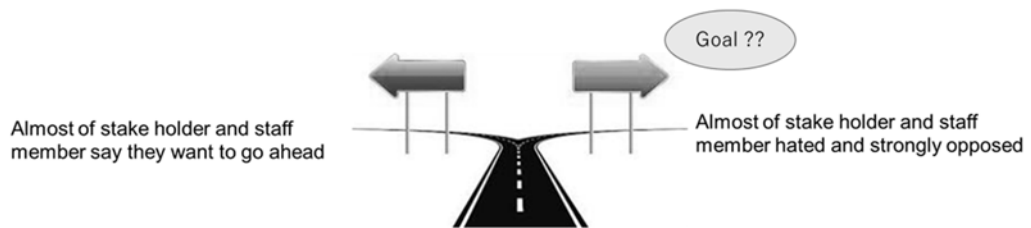
### Price of product

Generally, raising prices lowers preferences.

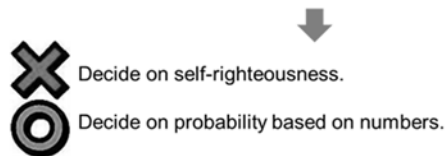
But price cuts would detract from long-term investment potential.

Pricing must be cautious and bold.

## Leaders to choose a path with high probability even if they are disliked



Everyone has emotions and it is easy to make judgments in the emotions.



### Summary

There is no need for "passion" in decision making itself. Rather, "passion" is a distraction and a source of wrong judgment. Very calmly, it is required to choose one with a purely high probability for the purpose.

After the decision, "passion" is necessary in the next stage of persuading people and leading people in performing tactics

One also needs to truncate something when making decisions. Truncating can result in significant changes. Therefore, thorough rationality is important for decision making. ■

**Propriety****Concerns and Challenges in Application of New Technologies**

**Compiled by Prof. Manas Chakravarty**

*Faculty, Globsyn Business School*

Along with highlighting opportunities that emerge from technology prowess in the era of Industry 4.0, it is important to also take cognizance of the flip side. Very appropriately therefore, an entire session of the seminar was devoted to a panel discussion on “Concerns and Challenges in Application of New Technologies.” The panel, a mix of industry and academia, was chaired by Dr. Debashish Saha, (Professor MIS, Indian Institute of Management Calcutta) and comprised Mr. Rahul Dasgupta (Trustee & Director, Globsyn Business School), Mr. Nirupam Choudhury (Regional Director – East, NASSCOM), Mr. Sandeep Sengupta (Certified Ethical Hacker & Lead Auditor), Mr. G Chandra Mouleeswaran (Head, Strategic Learning Services, SAP India) and Dr. Aditi Mitra (Sunway University, Malaysia).

As chairman, Dr. Saha opened the session by conjuring a cascade of future technology applications where salads are grown by robots, transgenic salmons much larger than the normal ones adorn market shelves, salmon salad meals are home delivered by drones which are 3D printed and even the paraplegic can pick up door delivery aided by exoskeletons.

While marveling at such a future, Dr. Saha set the ball rolling for a discussion on the challenges by referring to the Top CIO Concerns in 2019. Based on a survey by Janco Associates, Security & Hacking, Blockchain, ERP & Cloud and Staffing came out to be the first three in the list of concerns and discussion at the session revolved around them and concomitant issues.

**Security and Privacy**

To put in perspective the security vulnerability, Mr. Sengupta asked for a scenario to be considered where a driverless car gets thrown off a flyover because the program running it has been hacked. The Janco survey mentions that as more

instances of cyber-attacks are identified, CIOs are well aware that their jobs are at risk if this occurs under their watch.

Moving to what he called the deeper side of security, Dr. Saha invited Mr. Dasgupta's views on the oft heard plea that security and privacy are at odds. Dasgupta felt that privacy is about individuals' data and security about how well it is protected. Privacy is a much larger umbrella where one has to consider who has access to it, whether somebody has given consent to actually look at it or use it. In some way security is a subset of the whole privacy ecosystem which is more a legislative issue than is security. Citing a personal anecdote of rupees one lakh being withdrawn in five quick transactions at a bank ATM in India from his wife's account when she was in New York with the debit card safely with her, Mr. Dasgupta felt there should have been better practices put into the banking system to protect customers from such instances of card cloning. He said, how much of privacy is relevant could be a debate, but definitely security comes before that. One needs to find a balance to know how much is too much.

Lamenting that India does not have a culture of privacy, Mr. Sengupta said that the situation may improve when data protection statute becomes enforceable. The Personal Data Protection Bill has been introduced in the Parliament on 11 December 2019. It is expected that the law will prescribe stiff penalties and violators will burn their fingers while others hopefully learn from them.

### **Staffing**

Dr. Mitra made a point that privacy issues are not just in terms of breach but also of how much information is shared. It is to be understood how informed are the employees about the importance of data they work with. So as long as there are cyber security laws in place, a culture-wide integrated process has to ensure that employees are informed, engaged, and their malpractices are controlled.

When giving the example driverless car, Mr. Sengupta had remarked that on one side there could be people trained as drivers but without jobs and on the other a lot of demand for those with anti-hacking skills which is missing. That is where the CIOs feel concerned because they are not finding the right people who have confidence or the skills to keep the company secured, he said. To overcome this gap, he suggested that curriculum planners in academic institutions should visit job portals to discover what skills are in demand in the employment market and layout the syllabi accordingly.

### **Cloud Computing and Blockchain**

To get everybody on the same page, Mr. Mouleeswaran defined cloud computing as: anytime, anywhere computing power for humans. He said that the

introduction of new technology has three dimensions. The first is the understanding and acceptance among all stakeholders which cloud computing has well crossed. Citing the results of his organization SAP where cloud computing at Euros 8 billion accounted for 30% of the total turnover of Euros 27 billion, way up since 2009 when it was just 1%. The second dimension is at the supply side which in this case involves hardware, software and connectivity. With availability of hyper scalers like Azure, prices of devices comparatively going down, ever growing number of applications available in smart phones, and, data costs getting insignificant, the supply side issues stand sorted out.

One issue that keeps coming up is that of security which according to Mr. Mouleeswaran is never ending but it is actually a people dimension. He explained that security rings for applications are built by humans and there are other humans who try to break them and learning from the breach still others put another ring. It is like a catch-up game, the people dimension being evident. Again, a bunch of programmers may create an application and roll it out, but it is the millions of users who have to use the same to make it sustainable. Also, there is this expectation that the users will somehow by themselves learn and adapt to the numerous updates to the application which is so essential for the continued subscription of services like cloud computing. So, a basic issue is that of people.

Highlighting a concern from the enterprise perspective, Mr. Dasgupta said that while individuals like the numerous gmail users do not care where their content goes or gets stored, business organizations are circumspect and would want to know where the data resides and where is it backed up, particularly if it is personal information data. There are lot of psychological issues that enterprises are facing today to move from hardware infrastructure to cloud based and that is also a challenge that needs to be overcome.

Speaking about blockchain Mr. Sengupta made the point that its scope is much beyond cryptocurrency and would find application in areas ranging from logistics to land records. However it faces the challenge of having to be compatible with data protection laws in a manner that if a client after using blockchain based service wishes the data to be deleted, it may be difficult to do so since it is a distributed ledger.

### **Cryptocurrency**

Alluding to the US Bill titled “Crypto-Currency Act of 2020”, Dr. Saha initiated the discussion on cryptocurrency saying that it may hit a roadblock in the Congress. Mr. Dasgupta made three points why governments are wary about promoting cryptocurrency: hackable exchanges, its fictitious nature and

pseudonymous origin. However, he agreed that they are gaining popularity and cited an instance when in a coffee shop in Dubai he was asked if he wished to pay by bitcoins.

### **tinyML - Machine Learning at the Edge**

tinyML is broadly defined as machine learning architectures, devices, techniques, tools and approaches capable of performing on-device analytics for a variety of sensing modalities (vision, audio, motion, environmental, human health monitoring etc.) at mW or below power range targeting predominantly battery-operated devices.

Dr. Saha made a reference to the “tiny ML Summit 2020” (12-13 February) at San Francisco bringing together researchers from companies like Qualcomm, Google, Microsoft, Facebook and Samsung along with academicians from leading universities to discuss the challenge of bringing machine learning to the farthest edge of the network.

He felt that ML at the Edge will not only lower energy consumption and build novel applications in future generation devices but also drive better privacy practices. The data need not be sent to the cloud for analysis because the cell phone itself may have the edge device.

Mr. Sengupta struck a note of caution. Going by the casual manner in which people treat their password for mobile access to CCTVs at home, he said it is quite easy to gain unauthorized access. Under such situations, a system that is designed to ensure security may actually end up creating insecurity.

### **Deep Fake**

Mr. Dasgupta said that Deep Fake with its ramifications when deployed for manipulative political propaganda was clearly an example of AI being misused. He called it the biggest threat to any political or economic system. Mr. Mitra said that given the propensity of people to respond to social media prompts to upload personal pictures at various platforms, deep fake is a concern not only at the political level but also at the personal front.

### **Cyber-Physical World**

Dr. Saha introduced the topic of cyber-physical world citing the example of Loyal Wingman project of Royal Australian Air Force and Boeing whose prototype is expected to fly later this year. In a flight formation, wingman is a pilot whose aircraft is positioned behind and outside the leading aircraft. Loyal Wingman will be an unmanned aerial vehicle whose role will be to support the manned aircraft.

Defining the concept, Mr. Mouleeswaran said that cyber-physical world is about the physical world handshaking with the soft world of data and applications. He said such partnership is taking place at high degrees like in Loyal Wingman but also at much smaller ones in the enterprise business segments. He gave the example of smart watches that record health vitals which data in turn could be used to determine medical insurance premia. Similarly, a sensor attached to the car could provide data on driving style to determine car insurance premia or even bring about a concept of pay as you drive. Again, other entities may latch on, say a tyre manufacturer who uses the data from the same sensor to check wear and tear and suggest replacement to the customer. This way the cyber-physical world fosters a self-propagating eco-system.

The cyber-physical world has the potential to even change business models such as moving the business from capex to opex via servitization, that is, offering a product as service. Mr. Mouleeswaran recalled the example of an air compressor manufacturer in Germany who instead of proposing customers to buy their compressors requested just for space to install the unit and pay according to actual consumption.

This enabled them to gain hugely in the market. Also, because the compressor unit continued to be owned by the manufacturer, they could attach sensors to it to provide information required for predictive maintenance reducing down time which helped in cost control. While on the subject Dr. Saha made a reference to “Predix” which is GE’s software platform for collection and analysis of data from industrial machines.

### **Algorithmic Bias**

Dr. Saha opened the discussion on this topic with a reference to the paper “Dissecting racial bias in an algorithm used to manage health of populations” published in Science in October 2019. The health care system in United States uses algorithms to guide health decisions. The authors of that article find evidence of racial bias in one widely used algorithm such that Black patients assigned the same level of risk by the algorithm are actually sicker than the White patients. It has been estimated that this racial bias reduces the number of Black patients identified for extra care by more than half. The bias occurs because the algorithm wrongly uses health costs as a proxy for health needs.

Mr. Dasgupta agreed that this is a major challenge in the AI world and large companies like Google, Facebook and Amazon are grappling with it. He explained that such bias could happen if wrong input is fed in for machine learning and on a lighter vein gave his personal experience of being held back from boarding a plane at JFK which uses facial recognition because his twin had already boarded!

He said there is still the need for blending AI with physical intervention. Mr. Mouleeswaran referred to the challenges of face recognition in iPhones and Mr. Choudhury talked about the demographic bias in student loan disbursement in US. Mr. Sengupta cautioned that in India unless the fields for caste and religion is removed from the data formats, it will be unfair to question AI developed from that data.

As the authors of the article in Science caution, the choice of convenient proxies for ground truth can be an important source of algorithmic bias in many contexts.

### **Tech is Pervasive – So Are Challenges**

The session closed with Dr. Saha recapitulating major strands of the discussion which, as he put it, started from “system quality” and gradually moved towards “quality of life” touching upon the layers of the individual, the society and the polity. All through it emerged that while technology is pervasive, so are the challenges. ■

**Performance**

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**Impact of Technology on a Particular Industry in Productivity and Quality**

**Compiled by Prof. (Dr.) Debaprasad Chattopadhyay**

*Senior Professor & HOD-HR, Globsyn Business School*

In line with the idea of how different industries or organizations, new or existing, have implemented and harnessed innovations for quantum gains in development, distribution, Meditech, Edutech, Fintech, etc., the panel speakers presented their ideas and perspectives on the theme “Impact of Technology on a Particular Industry in Productivity and Quality”. The panel was a fine blend of academicians, industry people and entrepreneur. In his opening speech, the chairperson of the panel Prof. (Dr.) Sankhayan Choudhury (Professor, Department of Computer Science & Engineering, University of Calcutta), upheld the idea of the panel by stating the effect of technology in various industries, particularly in software and manufacturing sectors and reminded the audience that the impact would be a long-lasting one. Mr. Sameek Roychaudhuri (Senior VP & Head of Financial Crime Risk Analytics, HSBC Bank) spoke on Block Chain, Channel Optimization, Chat Boxes, Cloud Computing, Black-Box and emphasized Transparency, Quality, Artificial Intelligence, Ethnicity, Data/Predictive Analytics, Personalization, all to ascertain how bank employees should behave with customers. Mr. Avelo Roy (MD, Kolkata Ventures) spoke about the human angle in pitching in too much technology so that human lives, relationships are not put in jeopardy even though productivity might improve. He mentioned that over-dependence on technology may lead to family-life distress, separation and divorce. He said that in an incident wherein he infused technology for his client, 100 employees therein got fired. He attributed loneliness, unhappiness, heart and other ailments to be arising from overuse of technology. So technology should not pose a catastrophe to ecology and should ensure that the future is all about being human. Save the Planet should be the mantra of the day. Mr. Shaerul H. Joarder (Executive Director-IT, Hameem Group -Bangladesh) laid importance on the right balance between: People, Process, Quality and Technology.

He explained how technology is being effectively used in Bangladesh in the textile-industry from where he emanates. Mr. Sandip Pradhan (Chief-IT, Exide Industries) discussed about the technology disruption and digital disruption and its impact on people and organization. That disruptive innovation has changed the old, but healthy activities of human beings are a point of concern. Digital impact on the people and organization leads to a transformation from non-learning enterprise system (manual enterprise => transactional enterprise => digital enterprise) to a self-learning enterprise system (intelligent enterprise => self-running enterprise). The impact of advanced technology will definitely lead to the operational efficiency of the organizations, innovation and its impact and ultimately better customer experience.

Dr. Choudhury concluded the session by commenting that it is evident that the innovations would come, it is apparent that industries would try to utilize the opportunity to expand its business and offer the customers better facilities in offering value addition. But we should not neglect our obligations as mature people to defend our community against the unfavorable effects of technology, the price of which we have to pay for decades. ■

## Special Lecture

### Are You Relevant for Jobs of the Future? Welcome to the Age of Automation

**Avelo Roy**

*MD, Kolkata Ventures*

The future is all about being human! Everything that is associated with the left brain like our mathematical and analytical skills can be done far better by software. Hence most of those activities are getting automated. However as human beings we are Atma or spiritual beings having a human experience. A conscious being is far superior to matter and machines. That is our unique position which allows us to do far more things that an artificially intelligent software or robot can never do.

The topic of this session is about quality and productivity. In terms of productivity, human beings are far more productive today than ever before. The smart phone in my pocket is virtually my office even when I am sitting here on stage. But what are we doing with our free time? Are we happy? Is our family getting our attention? How's the quality of our lives?

Thanks to the advances in technology we can swipe right and get a date on tinder, press a button and get food on Zomato and click another button and get something else on demand. We are used to instant gratification, especially us men. Nothing wrong with efficiency. But is it changing how we think, feel and behave with others?

A recent research done on millennial men show that our generation is degrading in qualities like empathy, patience, and gratitude. Women on the other hand are getting better at being CEOs and leaders. Men are losing the qualities that make us likable, that make us a team player and even a leader.

Technology is making us productive, no doubt. But our over dependency on it is having an adverse effect on our abilities, intelligence and behavior. According to the same research, we have evolved to expect intimacy on demand in a relationship regardless of what our partner might want. Just like pressing a button and getting

an outcome. This is resulting in increased divorces, depression and people are succumbing to addictions, especially to our phones.

We need to hone our human skills if we want to be relevant in 2030. We are conscious atma and our humane qualities are our strength. Ability to inspire, entertain, empathize, innovate, think, feel and love are unique qualities ONLY conscious beings are gifted with. Our skills combined with our qualities will allow us to lord it over machines and software for millennia to come. Otherwise get ready to be consumed in a dry and mechanistic world overrun by fear.

Myhealth-tech startup in the US automated 90% of a leading healthcare billing company before getting acquired. What would take humans 7 days to do, my software does it in one sixth of a second. But guess who are the 10% people who could not be replaced? They were the relationship managers with the doctors who maintained trust and quality through personal service and effective communication.

I recently downloaded TikTok after hating it since it was born because to me it was another AI enabled time waster. I thought of giving it a try since this platform is exploding more than Facebook and Instagram. The first video was Deepika Padukone performing for 15 secs, followed by a girl living in a mud hut performing the same steps and lastly a man dressed up as a woman also dancing on the same song. I could conclude that this is the beginning of the democratization of entertainment and fame. The future stars are not going to be just a handful of Bollywood kids backed by their influential parents. Rather anyone with talent, phone and access to internet can entertain us and become famous with millions of followers. It is already happening and the major consumer brands are showering millions of dollars on these micro influencers.

We are at the brink of the technology revolution where everything we know is changing. If we do not prepare for the future and adapt to the changing scenario the probability is very high that we will be jobless, hopeless and family less.

Entrepreneurs like myself are trying to be socially responsible do our part in saving the future of the human race which is only possible by learning to be humans again and teaching our next generation to do the same!! ■

## **Valedictory Session**

### **Moderator's Address**

#### **Dr. Shamindra Nath Sanyal**

**I** will start with one phrase “transformation towards excellence, as presented by one of the speakers of the Seminar.

The adoption of new technology has raised the point where we are possibly ready for another revolutionary change in the industrial setup. We call it the digital transformation of the industry or Industry 4G or Industry 4.0. Today our topic is Technology in management in the age of Industry 4.0. While discussing the universal impact of the emerging technologies on management and society, the emphasis has been given by almost all speakers on the role of big data, but we do not know how enormous the data is, how large the data is. It is beyond our control, even beyond our imagination. The big data is such a tool that any misuse may create devastation in the society itself. The impact of technology, which is far beyond the flow in the factory, extends to business units, that is involved with the design, development, production, transportation, and of course, sales of the product. So, the traditional concept of value chain is fast getting replaced by the advanced value chain concept. Because of these inevitable changes, managers need to understand the challenges and opportunities, associated with rapid technological advancements in the Industry 4.0 regime. Now, some of the outcomes of Industry 4.0 have accelerated the outcomes of technology, mainly the greater use of robotics and also the changing language of employment. One important question is whether artificial intelligence can create a people-centric organization. Truly, we have no specific answer as to whether Industry 4.0 can create a people-centric organization, but of course, it is a great shift on the human-machine frontier. An interesting data is that as of 2020, 71% of the average task hour are done by humans and 29% by machines. An estimated task hour by 2022 will be 58% by humans and 42% by the machines. The question will be whether we are ready or not in accepting this shift in the society.

Some of the speakers highlighted that growing skills instability and need for re-skilling are some of the challenges in front of the managers. It is imperative to upskill or reskill the workers for the future endeavors.

Now, while Industry 4.0 brings about newer advantages, it must content with emerging risks and challenges associated with organizational and human factors. These emerging risks include industrial risk as well as occupational risk. Moreover, the human factor of Industry 4.0 is directly linked to industry-emerging as well as occupational-emerging risks in the context of operation. To cope with the challenges, speakers opined that they believe that it is necessary to develop newer management approaches, may be a new organizational structure. None of us is sure about the possible impact Industry 4.0 will have on the society after 5 or 10 years, but every problem has a solution. At this point, we are all novices, we do not know, we are on the threshold of a massive revolution. Time is the best quiz master to answer the unknown questions. ■

## Technology in Management in the age of I4.0

**Prodip Mukhopadhyay**

*Managing Director, WBEIDC Ltd.*

**T**echnology in business helps organizations to enhance both the efficiency and overall effectiveness of products, systems and services, thereby allowing businesses to grow rapidly and efficiently. Technology has a broad variety of possible effects on management, as well as various ways it can impact an organization's activities, competitiveness, profitability and sustainability. Modern technology provides various tools and applications, which help managers interact effectively with employees and supervise various projects.

Technology has a very powerful and sustained impact both on business management as well as business operations. More innovation in technology leads to creation of more business opportunities in various sectors. There are numerous advantages of technology both in business management and business operations. The major advantages of technology in business management are as under:

- a) Improves Quality of life & protects environment
- b) Decreasing Costs and Increasing Utility
- c) Reduces resource requirements
- d) Cloud computing makes the resources easily available
- e) Mobile solutions make the business any time anywhere
- f) Information Technology has enhanced speed of responses
- g) Technology enhances outreach - a Link to the World
- h) Technology provides competitive advantages
- i) Technology is Necessary for Business growth

**Impact of technology in business operation includes:**

- a) Improves Planning and Goal Setting,

- b) Identification of value added & non-value added activities in the business process,
- c) Reengineering the business process to increase efficiency of the processes involved and reduction of T.A.T,
- d) Improves service delivery to the customer,
- e) Improves Standardization & Quality, and
- f) Faster receipt of feedback from customers / clients for correction.

Since long, the government has started application of technology in various fields in order to enhance productivity and serve the citizens to the highest possible way. Technology is being used by the government in numerous sectors, such as

- a) Agricultural Crops / Soil Monitoring
- b) Disaster Management
- c) Solid Waste Management
- d) Helping Eradication of vector borne diseases
- e) Policy Making
- f) Budgetary Allocation
- g) Impact Analysis, and many more.

An important point to be mentioned is that the government has introduced some of the disruptive technology initiatives to get the government departments and agencies updated. The application of drones, internet of things (IoT), cyber security measures, data analytics and blockchain technology are the emerging technology areas that the government is giving relevant importance.

The convergence of operational technology (OT), such as inventory, machinery, assets and production system and information technology (IT), such as IoT, cloud computing, big data, additive manufacturing, robotics, augmented reality (AR), cyber security and M2M can lead to connected factories and as a result, the productivity of the factories are expected to enhance manifold.

The era can be called as the 4th Industrial Revolution with 3rd Digital Wave with eight disruptive technologies that changes the business scenario. They are Artificial Intelligence & Machine Learning, Blockchain Technology, Internet of Things, Virtual Reality, Augmented Reality, Drones, Robotics, and 3-D Printing. The following table will show the impact of all the eight disruptive technologies on the business world.

**Table 1:** Impact of all the eight disruptive technologies on the business world

Disruptive Technologies	Impact on the Business World	Disruptive Technologies	Impact on the Business World
Artificial Intelligence & Machine Learning	Potential GDP gain globally will reach USD 15.7 Tn by 2030.	Augmented Reality (AR)	24% will prefer to invest in AR in next 3 years.
Blockchain Technology	USD 5 Bn will be generated between 2018-23 in India.	Drones	By 2021, Global market will touch to USD 21.47 Bn & in India it will be USD 885.7 Mn.
Internet of Things (IoT)	73% companies have invested in IoT across the globe.	Robotics	Total estimated investment in 2018 was USD 3.3 Bn.
Virtual Reality (VR)	7% companies are making investment today; 15% in next 3 years.	3-D Printing	By 2022, global spending on 3-D printing will be USD 22.7 Bn.

The Cyber Security market is estimated to grow USD 170.4 Bn worldwide, while in Cloud Technology the public cloud revenue is expected to grow @ 17.5% in 2019-21.

The confluence of artificial intelligence (AI) and machine learning (ML) is showing the pathway of the emergence of AI-as-a-Service (AIaaS). The main advantages of the emergence are as follows:

- 67% of the most digitized companies have embedded AI in their standard business process and out of that 39% have integrated Machine Learning.
- AI helps to identify new opportunities - iCertis, for example, is leveraging AI to build smarter static contracts.

- c) Personalized experience to customers - AI platforms like b8ta, Amazon 4-star and AlgoFace, companies are building personalized offerings to their customer's need
- d) Predictive analysis for market research – 90% of the organization believes predictive analysis will be important for their future success.

The AI-ML twin shows three important value delivery areas, such as, empowering data, layering insights for better outcomes and assisting humans instantaneously.

The Blockchain technology is going to revolutionize the market. Blockchain market is estimated to grow from USD 218 million in 2019 to USD 1,285 million by 2024, with a CAGR of 42.5% from 2019 to 2024. The important business applications using Blockchain technology are:

- a) Secure sharing of medical data
- b) Smart Contract
- c) Cross-border payments
- d) Real-time IoT operating systems
- e) Personal identity security
- f) Anti-money laundering tracking system
- g) Supply chain and logistics monitoring
- h) Advertising insights
- i) Original content creation

The Internet of Technology (IoT), i.e. the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data sector, is another area that is creating a big expectation. It is estimated that there will be 500 Billion connected devices by 2030, 44 zettabytes (a trillion Gigabytes) of data to be generated by 2020 and USD 41 Trillion funding for infrastructural upgrade over next 20 years. The business transformation due to IoT will be as under:

- a) Improved business insights and customer experience
- b) Cost and Downtime Reduction
- c) Efficiency and Productivity Gains
- d) Asset Tracking and Waste Reduction
- e) Service Transformation

- f) Device Life Cycle Management
- g) Security by Design
- h) New Business Model

The augment and virtual reality (AR/VR) is another segment that is growing sharply with all their advantages and benefits. The virtual and augmented reality will become a USD 80 million market by 2025, by transforming the hypothetical to real-world training. They will also enable human resources to find the right fit and carefully address the ever-changing customer demand. The impact of AR/VR on the business segments will be manifold, such as

- a) Computer-generated ball-tracing graphics in Sports Industry
- b) Use of Smartglasses in factories & plants
- c) Augmented interior design and Virtual Do It Yourself (DIY) Interior Design
- d) From 2D to 3D in the hospital - improve research, education, training and the patient experience.

There is a whole range of potential drone uses between the central and local governments. They may be using drones to test facilities. They may be using them to provide relief to victims of disasters. They could send them out to spray pesticide on mosquitoes. The Total market value of drone-powered solutions at over USD 127 Bn. The impact of drones on the business segments are as follows:

- a) Asset Management and maintenance monitoring of operator's infrastructure
- b) Improve safety and efficiency
- c) Optimising annual operational and safety inspections
- d) Optical Fibre Network Planning and Optimisation
- e) Identifying Telecom network congestion
- f) Leveraging data analytics and AI to deliver predictive insights and support autonomy
- g) Flight control systems and solutions across multiple industries

The Robotic Process Automation (RPM) is known to be the next wave of innovation. It is a simple, yet powerful business process automation software. Robotic process automation helps the company to build its own software robots with tools to automate any business operation. The RPM bots are configurable software to carry out the tasks assigned by the managers. These bots can learn and they can also be cloned. Major benefits of the Robotic Process Automation are as under:

- a) Decrease operational cost
- b) Reduce errors and increase accuracy
- c) Revenue enhancement
- d) 24 x 7 operations
- e) Speed to implement
- f) Employee and customer satisfaction
- g) Scalability
- h) Shift to innovation
- i) Better control on processes

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file. The global 3D printing market was valued at USD 8.08 Billion in 2017 and is projected to reach USD 49.74 Billion by 2025. As it progresses, 3D printing technology is meant to turn almost every major industry and change our way of living, working and playing in the future. The utilities of 3D printing in business are as under:

- a) On-demand manufacturing
- b) Supply chain consolidation
- c) Manufacturing as a Service (MaaS).
- d) Mass customisation
- e) Direct-to-Consumer (D2C) strategy

Manufacturing as a Service (MaaS) is the integration of a few important factors. We can write down:

Industrial IoT (IIoT)+Cyber-Physical Systems (CPS)+Manufacturing Data Management Solutions+ the Cloud = Manufacturing-as-a Service(MaaS).

Cloud computing is the provision of on-demand computing resources-from software to storage and processing power-usually via the internet and on a pay-per-use basis. Instead of having their own computer systems or data centres, businesses can rent access to anything from applications to storage from a cloud service provider. The Cloud is undoubtedly the connective tissue of Industries 4.0. The business benefits of cloud computing are as follows:

- a) Cloud adoption helps the industries to world-class technology
- b) Cloud enables complete visibility & control over data

- c) Cloud infrastructure can help with loss prevention
- d) Resources in the cloud can be easily stored, retrieved, recovered, or processed
- e) Cloud based solutions are ideal for businesses with growing or fluctuating bandwidth demands
- f) Offers many advanced security features
- g) Low Opex and reduce costs related to downtime.

The role of technology in business has led to an enormous increase in trade and trade. With the advent of various layers of technology, business ideas and models have been revolutionized. This is because technology has created a fresh and improved solution on how to grow with business. It provides a faster, more convenient and more effective way of conducting business transactions that lead to consistent business growth and improvement of the human race. ■

## **Industry 4.0 as a Value Creation Accelerator - Merging Technology with Strategy**

**Dr. Harwindar Singh**

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### **Introduction**

In the world of business reporting, a revolution is taking place as an increasing number of companies are adopting the Integrated Reporting Framework (IRF) when preparing their Annual Reports for consumption of shareholders and stakeholders. In India, a joint study was carried out by the Bombay Chamber of Commerce and Industry and PwC in May 2018 which covered respondents from various functional areas of finance, corporate communications and investor relations of top Indian companies. The survey showed that most people believed that the framework would improve understanding of how companies create value and such a reporting framework would strengthen relationships with external stakeholders while inculcating a culture of sustainability within the organisation (PwC;BCCI, 2018). This is a framework that, in essence, allows companies to view their business in a more wholesome and integrated manner - including information about strategic, environmental, risk and human factors.

Then, in the world of technology, we are amazed by how Industry 4.0 (IR4.0) initiatives are creating new value for business each day, as we discover new methods to apply the new disruptive technologies to automate, learn and analyse business data at amazing speeds and increase revenues while reducing costs. Industry 4.0, a term coined by Bosch of Germany is now understood to be the name for cyber-physical systems, Internet of Things, cloud and cognitive computing (definition adapted from Forbes). The Boston Consulting group has

identified nine pillars of Industry 4.0 for manufacturing. At the heart of the pillars, the engine to drive value is often seen as IoT – the Internet of things. Dr. Tom Bradicich, GM & VP, Servers & IoT Systems of Hewlett Packard Enterprise presented "The 7 Principles of the Industrial IoT" at Bosch Connected World Chicago 2016. These principles are in fact relevant to IR4.0 generally and are used as a basis for discussion in this paper.

The starting point of these disruptive technologies is the ability to capture and analyse large volumes of data. This paper suggests that the Integrated Reporting Framework (IRF) could become the canvas for determining what data needs to be captured, analysed and used to power the cyber-physical systems of IR 4.0. It also shows that although much of the technological revolution has been developed around manufacturing processes, we have only started scratching the surface of how these new technologies can be applied to non-manufacturing businesses and organisations.

### **1.1 Profits to Value Creation**

Ask any business owner, especially a SME (small medium sized enterprise) owner about their objective of being in business and they will quite likely say something like “to make money”. This is of course to suggest that every business is in existence primarily to generate surplus income or “profit”. However, a closer study profit will yield many different definitions - most of them suggesting that profit is the historic result of business activities over a period of time. Although it has been used as one of the main yardsticks of business performance (for Annual Reports of business entities), it only provides information that is static – i.e. without any indication of future potential of the business entity to repeat the performance or better it (Welsch, Hilton, & Gordon, 1988).

One way to overcome this traditionally has been to analyse the information in the annual reports using ratio analysis. In this regard, profitability ratios have been used to give a sense of business sustainability. For example, the common ones are Asset Utilisation (rate of generating revenues per dollar of assets invested in the business); Margins which express profits in terms of Sales and the ROA, the return on Assets which defines the rate of profits generated for every dollar invested in the business assets. If one was to include such ratios in the annual report (as they often are) this would represent an improvement in the quality of the information being shared. However, it does not still give an indication of the business's potential to continue generating income, and as a result profits (surplus income), in the future.

In the current business climate around the world, the level of uncertainty and competitiveness has increased multi-fold. To ensure business sustainability,

business will need more in-depth information at a faster rate. This has become both feasible and desirable as the fourth industrial revolution (IR 4.0) is providing businesses involved in manufacturing and other industries amazing opportunities to transform the business for profitability and sustainability.

## **1.2 Pillars of Industry 4.0**

At the current phase of discussions, IR4.0 is being discussed and implemented in terms of pillars.<sup>1</sup> The Boston Consulting Group's IR 4.0 pillars or enablers (modified a little for our discussion here) include:

- Big Data and Analytics (e.g. Hadoop software)
- Simulation and Augmented Reality
- Vertical and Horizontal Integration with end to end digitisation
- The Internet of Things
- Cybersecurity
- Artificial Intelligence
- Machine Learning to enhance existing Robotics

The BCG classification focuses on manufacturing, but at the time of writing of this paper, all of these pillars are being applied aggressively to non-manufacturing environments as well. Digitising the service driven organisations (from airlines to hospitals) with Industry 4.0 tools may be referred to broadly as Digital Servitization.

This would be an extension of the existing definition of the word "Servitization" which in current literature refers to adding the service element to manufacturing to enhance value (Coreynen, Matthyssens, & Bockhaven, 2016).

In this paper we suggest that business entities must first adopt an Integrated Reporting Framework for Value Creation (IRF-VC) in order to optimise decisions on technology adoption, especially game changing initiatives such as IR4.0. A conceptual framework is presented which will:

1. Allow business owners to understand the benefits of adopting the value creation framework based on Integrated Reporting

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<sup>1</sup> In Malaysia for example, some regulators have suggested the use of eleven pillars, others just five. Our reference is to the Boston Consulting Group's (BCG) seven pillars for analysis as they are balanced and yet comprehensive enough to provide a roadmap for implementation of new information technologies. That said, The BCG model is focused purely on manufacturing environment whereas this paper has a broader perspective.

2. Describe the enabling principles of IR4.0 and integrate them into the Value Creation model
3. Provide starting points for business adopt these new technologies of reporting and value capture.

## **2.0 The Integrated Reporting Framework leads to Value Creation**

The Integrated Reporting Framework (IRF) is more than just a reporting tool. It is in fact a generic roadmap for business entities to design their strategies so that they will create value not just for the shareholders but in fact for a broader group of stakeholders. Financial reporting is therefore now moving from a phase of reporting the past (which is done mainly to serve compliance needs of Corporate Governance) to a phase where stakeholders would require, He explained how technology is being effectively used in Bangladesh in the textile-industry from where he emanates. Mr. Sandip Pradhan (Chief-IT, Exide Industries) and indeed demand, forward looking information that would allow them to make intelligent decisions. As an example, a university should start reporting the intellectual capital as part of its annual accounting report (Córcoles, Peñalver, & Ponce, 2011). It need not stop there – it could show how it is a centre of learning that celebrates human development, creates collaborations with society and industry and cares for the environment. If this sounds a little idealistic, the good news is that leading companies around the world have already started doing this.

To this end, the integrated reporting framework is a good starting point. It emphasises on conciseness, strategic focus and future orientation and the connectivity of information. The six “capitals” identified in the model show the ability of an organization to create value not only in the short term, but also in the medium and long term.

### **2.1 A closer look at the Six Capitals Value Creation Framework**

A popular way to show the six capitals, as adapted from the IIRC Council's Reporting Framework (IIRC Council, December 2013) is to analyse and show how value is created in the areas of:

1. Financial capital – which is the long term money required to sustain the business
2. Manufactured capital – which essentially relates to choices the business makes in the acquisition and use of its physical assets
3. Intellectual Capital - which may be referred to as the decision making skills that the management has acquired over time resulting in better decisions based

on well-structured internal reports. This is an area where Big Data methodology and tools will bring about great improvements and cost savings. It is also a precursor to implementation of IR4.0 tools.

4. Human Capital – for which the definitions are many, but for our purpose may be taken to mean staff competencies which comprise the three well known elements of a positive attitude, a strong skill set and broad knowledge of the tasks that they are supposed to perform. With implementation of IR4.0 discussed in the next part, a robust training program would need to be implemented such as the one being promoted by International Telecommunications Union (ITU)<sup>2</sup>. In Malaysia for example, the Malaysia University of Science and Technology has been designated as one of the Centres of Expertise for IoT and IPV6 (Internet protocol v.6). Staff will need to re-skill and re-tool themselves to prepare for the future.
5. Social and Relationship Capital – is of course the value of a company's networking and established business relationships. Social and relationship capital when discussed from the inside out will show a company's culture as an explanation of its philosophy of how it deals with partners, collaborators, customers and pretty much everyone in the external environment. It captures the sentiment of Peter Drucker who declared "Culture eats strategy for breakfast". This will now become an essential component of the connectivity that will enhance value through the IR4.0 universe.
6. Natural capital – is the description of the natural ecosystem within which an organisation operates. Interestingly, business and other entities may even benefit from natural capital without actually having ownership of some parts of it. For example, a company may own the plantation, but it does not own the fresh air and environment that will help the plantation to flourish. But once again, using Artificial Intelligence (AI) tools, several farm equipment can link into GPS and other weather monitoring systems and assist in better management of the plantation. Natural capital links directly to sustainability. In fact it has been shown that the seventeen SDG (Sustainable Development Goals) can be linked back to this Framework seamlessly. Monitoring and reporting these six capital makes the organisation ready to adopt the game changing impact of Industry 4.0 in general and IoT specifically. In this paper, we integrate seven principles of IoT that can be superimposed on this model to create incredible value on all six fronts.

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<sup>2</sup> ITU is based in Geneva, Switzerland and is a member of the United Nations Development Group, promoting connectivity around the world through its 12 centres around the world.

### **3.0 Industry 4.0 and The Internet of Things (IoT)**

Perhaps it may be instructive to understand what we mean by “Things”. A thing here is any physical object that can measure or be measured, has a unique identification and is interactive with cyber physical systems (software driven hardwares).

The driving principles of IoT, which are generally applicable to all IR4.0 initiatives (as adapted from the Bosch Connected World Conference 2016) may be summarised as follows:

1. For IoT to work, we must have capacity to capture and process Big Data. This may relate to value creation as follows:
  - a. For financial capital, we will need data related to cash inflows and outflows and analytical capacity to work out margins and other performance data for individual products or profit centres.
  - b. Both the Six capitals value creation model and IoT would need data relating to the business environment, risk factors, strategies and the value chain.
  - c. Businesses must get used to managing terrabytes of data. If this task is left to the Chief Information Officer (CIO) without input from other functional managers, the IoT output will not be optimised.
2. We must also ensure perpetual connectivity (through internet or other means). This will put us in constant touch with information related to our products, processes, costs and even customers so that we can monitor the results to either maintain a status quo or monetize a potential opportunity. This will enhance value creation in the area of Social and Relationship capital of the firm.
3. Implementation of IR4.0 initiatives will allow you to work in “real time” meaning the feedback loop is instantaneous. This can be achieved with end to end digitisation of your business processes. For example the steps below describe how it may actually work with IoT being the driver:
  - a. “Things” - which are the primary sources of analog data could be data from devices, machines, people, households, business units, cars, animals, items of apparel, agricultural products, commodities, environment, business assets and so on. These can relate to one or more of the six capitals to show value creation through a positive change in the status of the capital.
  - b. Sensors and actuators can count or measure changes in these things. The sensors could in fact be wired or work in a wireless mode. Companies like Festo<sup>3</sup> are working in focus groups to standardise communication protocols.

- c. The data will be acquired and analysed, then transmitted through Internet gateways and other access portals that can be used for data aggregation, measurement and control.
  - d. At this phase, some systems will create a digital version of the things and or the environment so that digital visualisation can be achieved. This is essentially Simulation based on Artificial Intelligence where a duplicate scenario or “thing” can be created in the digital realm
  - e. This allows your digital system to conduct analytics, create profiles and scenarios and effectively feedback decisions and actions. The hardware to be used would have to be an integrated connectivity hardware such as HMS<sup>4</sup>.
  - f. All of this information may be stored in a data centre or “the cloud” for a better data recovery plan.
- 4. In order to get valuable insights (the spectrum of value), you will need multidisciplinary teams. IT professionals working in isolation will not be able to provide you the solutions you want. These insights may be
    - a. Business insights - what is the optimal mix of marketing channels to get the right push factor for our product or service or optimal scheduling of business activities. These may cover service industries from airlines to hospitals, centres of learning and F&B, retailing, banking and many more.
    - b. Engineering or Technical insights which include insights for optimising product deliveries, machine configuration and such insights which will allow real time decisions.
  - 5. As with other information models, there will be a trade-off between “Time to insight” vs “Depth of Insight”. The greater the achievement rate of insights, better will be the quality of the Integrated Report resulting in decisions that create true value across the six capitals.
  - 6. As we progress along the development of IoT competency, visibility of processing Big Data will become more important. Traditionally back end functions will become front line

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<sup>3</sup> Festo is a German company supplies drive control technology but we include it here for its active role in discussions of IR4.0 focus groups and its contributions to standardising connectivity

<sup>4</sup> HMS has become one of the leading vendors specialising in IoT connectivity. Of course, the big players such as Microsoft and Siemens will also be there. However, open source systems can often give these systems a fair challenge providing the business has strong in-house IT talent, as we explain later.

7. We are seeing integration of the hardware used for IR4.0, just like the mobile phone is an integration of many different devices. When a business is considering implementation of IR4.0 they would be well advised to work with firms doing work as systems integrators so that they they optimise their ROI and streamline the technology with the business strategy.

#### **4.0 Bringing it together**

As recorded above, we have put together the value creation parameters of the IR Framework and the technology enablers of IR 4.0 to provide a starting guide to how practically any business entity or indeed any organisation that intends to create value will need to consider. Here we propose a checklist of how value creation initiatives may be undertaken using the best of what IR4.0 has to offer;

##### **4.1 Getting the strategy right**

The starting point for value creation has to be a clear strategic focus with strong buy-in support from the senior management of the business organisation. This will help the implementing teams to focus on reliable starting points and next steps.

##### **4.2 Shifting the culture**

As suggested earlier, there will be a need to get an organisation wide shift in culture to embrace a value creation culture – an understanding that value is created in not only financial terms but also in terms of innovation, people and nature. There must also be a general acceptance that the way forward is to adopt the new technologies. This would obviously involve re-skilling and re-tooling which will be a continuous process rather than a one-off initiative. In fact, by the time this paper is presented, there will already be some new things to learn – but the core principles that should drive the culture are stable enough.

##### **4.3 Government Support**

It is seen that areas where the government is providing real support beyond lip service are progressing faster. Much needs to be done though to bring about an understanding of value identification, value capture and value creation and the IR Framework provides a strong starting point.

##### **4.4 Commitment**

As with most things, some organisations may experience a slow start due to a host of factors. Genuine commitment will be required to ensure that the business transformation exercise is a success. To blend a strategy of sustainable value creation with enablers of new disruptive technologies will need change management

skills to avoid or at least reduce the roadblocks along the way so that a fairly seamless transition is achieved.

#### **4.5 Intelligence is everything**

The importance of market and business intelligence cannot be overemphasised. While business managers would be doing their own research and groundwork, it would be wise to talk to consultants in business transformation and plan the knowledge route along side the technology route.

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