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AGING MAN_AGEMENT or millennial TECH_AGEMENT – road ahead for organizations

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ABSTRACT

Industrial Revolution, Workplace 4.0 - words sending tremors to our heart and mind. The question - will MAN_AGEMENT be put to rest leading to TECH_AGEMENT. "Techager", a role which might analyze behavioral patterns of machines or employees leading to precision decision making. An insight into the analyses of employee mindset would be innovative task in hand and challenging too.

Machines replacing humans in certain tasks would pose a different challenge. Avalanche of advances in Information Technology/Electronics – IoT, Artificial Intelligence leading to smartness in devices, applications coupled with developments in biotechnology – CRISPR technology and more; all these would change the way we work – workspace, employees, strategy, management models.

The objective of this abstract would be to decipher the role of new age 'manager' or techager who would be responsible for managing employees working in a semi-human, semi-robotic workplace 4.0.

The impact on clinical domain – would there be influx of technology based 'xyzwares' impacting the way humans work, the way humans are perceived, the way we are supposed to engage with machines; coping with an un-real workspace. Change in behavior would lead to different analysis parameters ushering in new format of 'RESOURCE MANAGEMENT'.

INTRODUCTION

Work 1.0

Industrial revolution led to significant changes in technology and in the organization of work. Work 1.0 introduced workers' organizations.

Work 2.0

Discovery of electricity and invention of conveyor belt during the end of 19th century led to second industrial revolution. These changes led to mass production based on the division of labor. Social problems increased leading to unrest in the organized workforce and led to the introduction of the first forms of social insurance in Germany. This marked the beginning of Work 2.0

Work 3.0

The onset of 'economic golden era' post the war led to consolidation of worker rights based on social market economy leading to Work 3.0. Advent and use of information technology in the workplace marked the arrival of Work 4.0.

Work 4.0

The term Industrie 4.0 was introduced in 2011 at the Hanover Fair in Germany and covers the most important activities and projects from the German government to promote computerization of the manufacturing industry (smart factory).

The fourth industrial revolution is based on the growing interconnectedness of products and processes via the internet and cloud. Like social networks, intelligent machines and components – termed 'things' exchange information between themselves and with humans to organize themselves autonomously and coordinate workflows and deadlines.

Digitalization and the digital transformation make new forms of communication, collaboration and added value possible. At the same time, these new opportunities bring new demands. Modelled on the term "Industry 4.0", these interrelationships have become known as Work 4.0.

Internet of Things, Internet of Service, Robotics, artificial intelligence has ushered in a new era and the change it signifies at its core is the marriage of physical and digital technologies. This creates digital enterprise that is not only interconnected, but also capable of more holistic, informed decision making. In a digital enterprise, data collected from physical systems are used to drive intelligent action back in the physical world. The possibilities arising from these feedback loops that generate abundant opportunities for new products and services, better ways to serve customers, new types of jobs and wholly new business models.

The digital world would further bring in challenges:

- Enhancing and augmenting the workforce
- Attracting and developing new types of talent

Organizations can no longer consider their workforces to be only the employees on their balance sheets, but must include freelancers, gig economy workers and crowd. These on- and off- balance sheet workers are being augmented with machines and software. Together, these trends will result in the redesign of almost every job, as well as a new way of thinking about workforce planning and the nature of work.

This requires adopting a human capital management approach for Industry 4.0. Many organizations still retain HR practices – from training and development to managing culture. New models are required to help leaders and organizations adapt to technology, help people adapt to new models of work and careers, and help the organization act as a positive force in society.

INDUSTRY 4.0

Technologies enabling digitization and disrupting the manufacturing value chain can be clustered as follows:

1. Data computational power and connectivity: This cluster, comprising big data, the internet of things and cloud technology is driven by significant reduction in costs making use of sensors and actuators allowing affordable yet powerful storage, transmission and processing. Connectivity is enabled by technologies that provide wireless infrastructure to connect thousand of such devices. Affordability is achieved by decrease in hardware prices per node.
2. Analytics and intelligence: Robots coupled with advances in artificial intelligence and machine learning aided by increase in the available data and improved statistical analysis methodologies, software enable digitization and automation of knowledge work and advanced analytics.
3. Human-machine interaction: Touch interfaces are ubiquitous in the consumer arena and gesture recognition layered with virtual and augmented reality devices are increasingly in use. These features are basic features in any product which is being developed in today's manufacturing environment. Also, machines and humans are working in much closer physical proximity and where machines can ease previously strenuous tasks for humans.
4. Digital-to-physical conversion: Advanced robotics, 3D printing and several cost-effective options for storing energy and harvesting energy are bringing in significant changes in artificial intelligence, machine vision and machine-to-machine communication.

Previous industrial revolutions posed the need to replace existing assets with new ones, but Industry 4.0 is all about mastering the managerial challenges posed by the disruptive technologies along three different dimensions:

1. Next horizon of operational effectiveness
2. New business models due to shifting value pools
3. Foundations for the digital transformation of the company.

Organizations are in the early stages of readying their organizations to harness the full potential of Industry 4.0. The fourth industrial revolution has the power to change many aspects across a broad spectrum – work, operations and society having its impact on:

- Social pattern
- Workforce/resource management
- Talent management
- Strategy
- Technology

The following design principles closely linked to Industry 4.0 have been proposed by Hermann et al.:

- Interoperability
- Virtualization
- Decentralization
- Real-time capability
- Service orientation
- Modularity

HEALTH 4.0

Health care is considered a “critical infrastructure” vital for the day-to-day running of any state. The protection of the functionality of health care infrastructure and the privacy of the personal data is paramount. From a Health 4.0 perspective safety, security and resilience need to be considered hard design principles to protect confidentiality and prevent all stakeholders from incalculable and unpredictable risk. Trust is one of the fundamental principles of health care and is a legal requirement anchored in national legislation and directives. While there might not be an immediate need to prioritize safety, security, and resilience as a general Industry 4.0 requirement, these topics are basic requirements in the Health 4.0 domain. CRISPR technology has also steered a revolution in disease

Health 4.0 is a strategic concept for the health domain derived from the Industry 4.0 concept. The aim of Health 4.0 is to allow for progressive virtualization to enable the personalization of healthcare. The personalization of healthcare will be achieved through the massive use of Cyber Physical Systems, Cloud computing, the Internet of Everything including things, services and people and evolving mobile communication networks (5G). With the help of cyber-physical systems, software building blocks and Big Data tools (algorithms) “objects” will be virtualized involving a spatial temporal matrix. The virtualization will enable the analysis of snapshots of the physical world in real time and proceed with diagnostics. This again will pave way for Personalized/Precision Medicine.

IMPACT ON PHARMA & LIFESCIENCE INDUSTRY

MANUFACTURING:

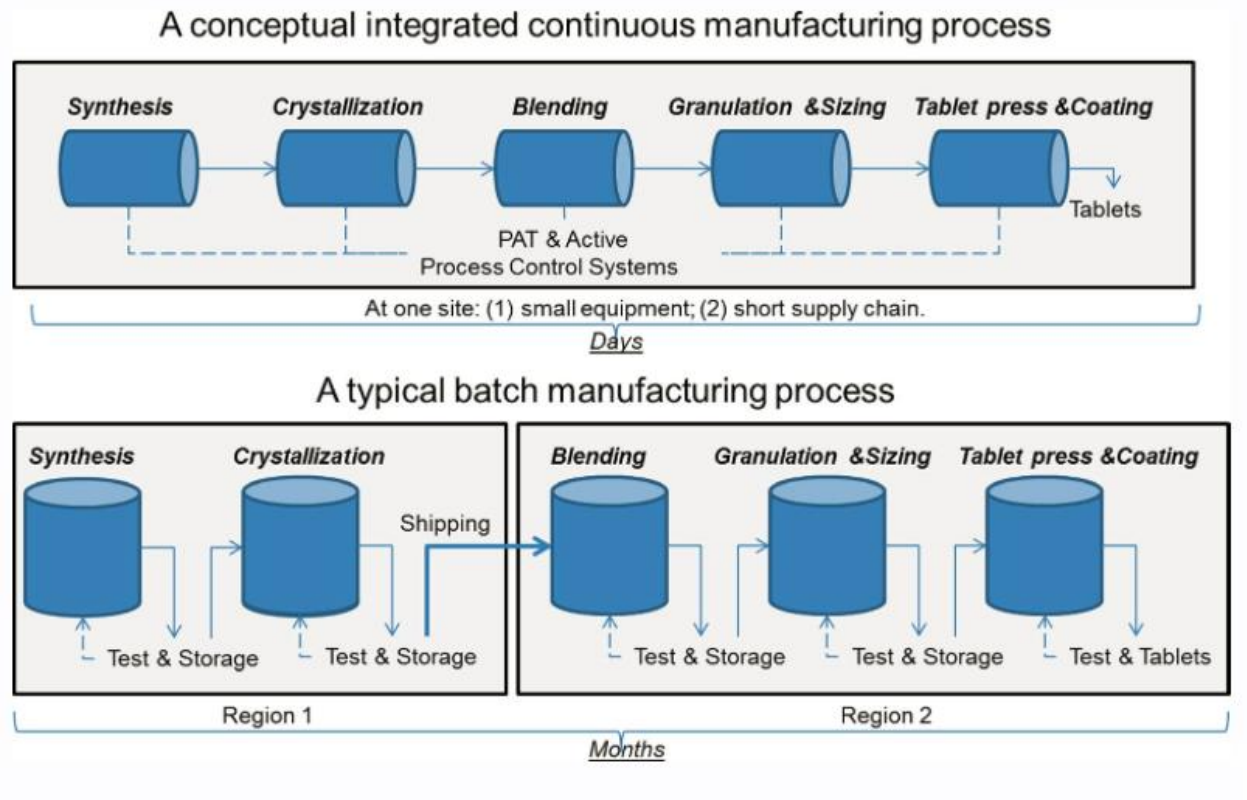
The pharma industry has started implementing Industry 4.0 technologies only in recent years, and it has been using batch manufacturing for more than 50 years. However, the traditional batch process method has been proved to be a lengthy one: after each step in the process the production is typically stopped, so that the substance could be tested for quality assurance. Sometimes during these "hold times" the material may be stored in containers or even shipped to other facilities in other countries, to complete the manufacturing process (FDA, 2017). Many companies have applied to the Emerging Technology Program regarding their interest in continuous manufacturing. The FDA document titled, “Advancement of Emerging Technology Applications to Modernize the Pharmaceutical Manufacturing Base Guidance for Industry” provides information and advice about how to work with the agency early in the development process. Each break increases lead time and may increase possibility of defects and error (FDA, 2016).

But the future of the pharma manufacturing is approaching. In 2016, the FDA has released a blog entry, stating that it is encouraging pharmaceutical manufacturers to transition from batch manufacturing to continuous manufacturing, due to its many advantages.

This encouragement also comes in a specific timing – today, we are entering an era of precision (personalize) medicine, "when drugs must be made with unique features and provided more quickly to patients in need." (FDA, 2016).

To manufacture personalized drugs, pharma factories no longer need to manufacture in big batches but in small ones, in a manner suitable to a small group of people that need a certain medicine in a certain dosage. Batch manufacturing is not the solution to these needs, but the connected, smart, flexible and precise continuous manufacturing.

Batch manufacturing vs. continuous manufacturing in pharma (source FDA 2017).



In the pharma industry, continuous manufacturing is all about moving the substances nonstop within the same facility, thus eliminating hold times between the different steps in the process; the materials are fed through an assembly line of fully integrated components. Continuous manufacturing "saves time, reduces the likelihood for human error, and can respond more nimbly to market changes. It can run for a longer period, which may reduce the likelihood of drug shortages." (FDA, 2017).

In addition to the regulator's encouragement to move on to precise medicine, the market forces also make their impact on the pharma industry, requiring it to implement the industry 4.0 technologies and continuous manufacturing: the rising competition as generic drugs enter the market; the demand for high drug quality; prolonging the shorter drug life cycle; and the need to reduce the high costs of batch manufacturing.

CONTINUOUS MANUFACTURING ADOPTION IN PHARMA

Below is the pharma industry's continuous manufacturing adoption map:

- Johnson & Johnson's Janssen drug unit has been working on its continuous manufacturing process for five years and won the FDA's approval to switch from batch to continuous manufacturing in 2016. This, to produce the HIV drug Prezista (fiercepharma.com).
- Novartis – Novartis entered a 10-year research collaboration program with the Massachusetts Institute of Technology (MIT) back in 2007 (pharmafile.com). This collaboration yielded two projects:
    - CONTINUUS Pharmaceuticals – a center of which purpose is to lead to the creation of novel continuous flow manufacturing technologies for pharmaceuticals
    - Technikum – Novartis has also initiated the technology transfer from CONTINUUS Pharmaceuticals to its novel continuous manufacturing unit, named the “Technikum”, located in Basel (continuuspharma.com), of which purpose is to experiment with new ideas and equipment (outsourcedpharma.com)
- Vertex – Vertex, the manufacturer of the cystic fibrosis drug, Orkambi, has been using the continuous manufacturing process since July 2015 (blogs.fda.gov)
- Eli Lilly – Eli Lilly's Ireland site achieved an important step, using an industry-first continuous process to make a compound for phase I and II clinical trials (chemistryworld.com)
- Glatt – Glatt’s continuous solid-dosage processing systems are operating at its Innovation Center in Binzen, Germany, which was inaugurated in November 2016 (pharmtech.com)
- Lonza – Lonza implemented continuous flow technology in its Highly Potent Active Pharmaceutical Ingredients (HPAPIs) manufacturing process (lonza.com)
- GSK – in 2014, GSK has initiated an Upper Providence continuous pilot plant (pharmaceuticalonline.com)
- Pfizer – on May 2017, Pfizer officially opened a modern, tablet production, continuous manufacturing plant in Freiburg (gesundheitsindustrie-bw.de). However, about a month later mass manufacturing was stopped due to regulators' orders (in-pharmatechnologist.com)

CLINICAL TRIALS OF THE FUTURE – VIRTUAL TRIALS

Let’s imagine this. Participating in a clinical trial does not require travel to a clinical research facility or doctor’s office. Your mobile device (maybe a phone, watch, or even your glasses) is your link to the clinical research study and how you report general information and adverse events. Wearable sensors record data such as body temperature and blood glucose levels, which are sent automatically to the study electronic data capture (EDC) record. The study personnel visit you at home for drug administration and follow-up. When a visit is approaching, your mobile device provides automated reminders, allowing you to reschedule the appointment within a time frame permitted by the study protocol. And that’s just the beginning of what the future is likely to hold for so-called virtual clinical trials.

Virtual clinical trials represent a relatively new method of collecting safety and efficacy data from clinical trial participants, from study start-up through execution to follow-up. These trials take full advantage of technologies (apps, monitoring devices, etc.) and online social engagement platforms to conduct each stage of the clinical trial from the comfort of the patient’s home--including recruitment, informed consent, patient counseling, through to measuring clinical endpoints and adverse reactions. By relying on electronic processes, many argue that virtually conducted clinical trials offer opportunities for a more patient-centered approach.

Benefits of virtual clinical trials:

- the virtual trial design maximizes patient availability and enrollment in the study. Patient recruitment and enrollment is often the longest stage of a clinical trial with almost 80% of trials failing to meet initial targets. Unlike site-based clinical trials, which require frequent visits to a

designated research facility, remote clinical trials are based from the patient's home so those with mobility issues--such as the elderly or patients who live in rural areas--are also able to participate in the trial. The convenience of a virtual methodology alone will increase numbers of patients willing and able to enroll.

- the potential to keep subjects engaged with the study is high in a virtual trial. As many as 40% of Phase III trial subjects become disengaged and drop out of the study. Some of the causes of this attrition are related to convenience--due to issues like the inconvenience of traveling to study sites, or the complexity of the trial design and data collection. Virtual clinical trials could remove the need for frequent travel to study sites and automate data collection, increasing patient engagement and retention
- Virtual trials also offer the ability to reduce risk in the drug development process. Data from remote monitoring devices could be accessed by trial investigators in real time, opening possible efficiencies in data cleaning, which could move to an on-going process rather than cyclical.
- Remote monitoring capabilities could thus facilitate an adaptive clinical trial approach, allowing improvements in trial design based on the accumulating data. Decisions to terminate a drug's development could also be made faster, improving patient safety and reducing expenditure on failed trials that have unfortunately become the norm in the drug discovery process.
- The virtual trial design may allow groups who have a vested interest in the success of the trial (including investors, physicians, government agencies, patient advocacy groups and even the patients themselves) to have more opportunities to play an active role in the study, potentially leading to better data quality and shorter timelines.

In 2011, Pfizer pioneered the virtual clinical trial model with its research On Electronic Monitoring of Overactive Bladder Treatment Experience (REMOTE) trial.

Novartis has made an additional alliance with Science 37 with which it has already initiated virtual trials for cluster headache, acne and nonalcoholic steatohepatitis (NASH).

Decentralized, or virtual, trials harness digital technology to allow some or all aspects of a clinical trial to be carried out at a participant's home or local physician's office, rather than at a central trial site such as a large hospital.

RESOURCE MANAGEMENT IN WORKPLACE 4.0

Digitization will have dramatic impact on the way work is done and delivered. Machines will substitute skilled labourers. Here is a sneak peek to the drivers of change:

1. Machines are learning to think
    a. Self-reliant interaction with the physical world
    b. Development of ability to comprehend and use speech
    c. Ability to solve problems
2. Intelligent machines become omnipresent
    a. Greater than 20 billion connected devices with data volume per minute is voluminous

ORGANIZATION's NEW LOOK – INSIGHTS:

1. FLUID work environment: Modern work environment is characterized by networks. Standardized back-end processes are shared between companies without being visible to the customer or employees. This leads to challenges in clear organizational allocation without clear origin.
2. Permanent employees: The dependency on 'permanent' employees will decrease. With global transparency of skills and the availability of highly qualified workforce results in 'hire on demand'. The employment relationship would turn to be a work assignment.

3. Software standardization: Software standardizations push the organizations to adapt to the software than to individualize to software, thus making organizational forms more homogenous.
4. Open culture: Transparency, necessity to co-create with customers leads to opening of previously closed corporate structures. Ability to scale rapidly and transparently becomes the best way forward. Thus, the crowd becomes part of the value-added chain.
5. Prosumerism: Blurred boundary between producers and consumers; voluntary services replace professional employment.
6. Workplace: Humans will tend to be machine supervisors rather than active laborers. Routine activities and strenuous tasks are automated and carried out by robots.
7. Machines as colleagues, partners and monitors: New forms of interaction between man and machine will be born. Man controlling machines, machines as colleagues or machine controlling man cannot be ruled out.
8. Cloud and Crows – working as a transitional phenomenon: Cloud/click workers provide their services as piecework.
9. Data readers/analysts: Ability to combine and interpret these in meaningful way is key and would lead to birth of new data analysis models.
10. Global workforce: Skilled workforce from around the world. Qualifications globally recognized and transparent. Work is now mobile.
11. Work life vs Private life: Virtual organizations are in vogue leading to blurred lines between work and private life. Organizing the tasks and balancing work-life would be the new challenge.
12. Non-linear thinking: Machines might not be able to perform certain creative activities. And here man plays a role.
13. Personal services: Activities involving human interactions will continue.
14. Self-management and multi-tasking: New workforce would need to be self-reliant donning several hats – project manager to task performer to quality reviewer and self-motivator too.
15. Millennials: Millennials would continue to jump the echelons of corporate world. Technical skills will determine employability in future.
16. Digital inclusion: Larger population would be seen to be part of digital inclusion.
17. Workspace: Physical offices are temporary anchor points for human interaction and work takes place everywhere. Rise of workplace which is mindful, tranquil, sublime and nurtures health and performance of mind.
18. Non-standardization: Gamification and interactive IT interfaces turns the work environment into virtual playing field. Employers will focus on integrating gaming design principles into standardized IT applications.
19. HR challenges: Employer and employee ties would loosen due to flexible form of work and co-operation among employees. Staff retention becomes difficult while job hopping would be common.
20. Culture shift: Result oriented approach – outcome-based approach associated to manage the workers. Establishing personal ties through technical channels and maintaining them.
21. Continual improvement: Exploiting the current business however ensuring constant innovation and transformation in the existing business models.
22. Staff selection: Less dependent on cultural match and more based on skills, experience and capacity.

23. Real-time data: Sensors at workplace would result in providing real-time data to both employer and employee with information regarding quality of work and potential improvements. Intelligent and intuitive workplace with introduction of self-quantification tools with the environment able to interact with employees.
24. Ageless workplace: Due to declining birth rates and greater life expectancy, age will no longer be relevant with older employees seen as just as capable as younger employees.
25. Emotion map: Artificial intelligence will convert the emotions into bytes leading to creation of emotion map of employees/workforce.

The following would augment RESOURCE MANAGEMENT efforts in workplace 4.0:

1. Culture of innovation
2. Autonomy of workplace, work hours and result-oriented culture
3. Management focus on encouragement than control
4. Autonomy of content with frequent face-to-face encounters
5. Flat network structure with integration of social media
6. Focus on creativity, non-linear thinking and ability to take risks

Future has this in store:

1. Nerds as decision makers
2. Assignment rather than employment
3. Learning to cope with VUCA (Volatility, Uncertainty, Complexity, Ambiguity)
4. Creation of digital breaks
5. Risk management
6. Learning to value failure
7. Workplace to promote discovery, co-operation and fun
8. Employee loyalty algorithm and emotion maps
9. Predictive analysis and its applications
10. Security at virtual level

INDUSTRY 4.0 - RISKS & CHALLENGES

Technical

1. Risks to data security – The ‘Internet-of-Things, services, data and people’ also opens new avenues for data theft, industrial espionage and attacks by hackers.
2. IT infrastructure – Industry 4.0 requires existing installations to be adapted and, in some cases, entirely new types of IT infrastructure. Diverse systems need to be networked and to learn to communicate with each other, and new communication networks need to be developed from scratch. A high degree of reliability and stability are needed for successful cyber-physical communication that can be difficult to achieve and maintain.
3. Maintaining the integrity of the production process with less human oversight could become a barrier

4. Talent – Digitization increases also the importance of new technical skills, notably in case of operating activities and mechanical working processes in production, purchasing and warehousing and logistics. New Process-dependent systems making greater use of technology may prove to be a major challenge for existing employees.

Policies & Management

1. Threat of losing jobs to machines
2. The lack of clarity about economic benefits is the greatest challenge for Industry 4.0.
3. Industry 4.0 comprises the digitization of horizontal and vertical value chains but will also revolutionize company product and service portfolios and lead to the implementation of new, often disruptive digital business models transforms the entire company and requires the widespread support by policy-makers

INDUSTRY 4.0 & CYBERSECURITY

The fourth industrial revolution brings with it a new operational risk for connected, smart manufacturers and digital supply networks: cyber. For cyber risk to be adequately addressed in the age of Industry 4.0, cybersecurity strategies should be secure, vigilant and resilient, as well as fully integrated into organizational and information technology strategy.

Developing an integrated strategic approach to cyber risk is fundamental to manufacturing value chains as they marry operational technology (OT) and information technology (IT). Cybersecurity should become an integral part of the strategy, design and operations considered from the beginning of any new Industry 4.0 initiative.

Industry 4.0 technologies are expected to prompt a further evolution in the traditional linear supply chain structure by introducing intelligent, connected platforms and devices across the ecosystem, resulting in a digital supply network (DSN) capable of capturing data from points across the value chain to inform each other. The increasing interconnectedness of the DSN also brings with it cyber weaknesses that should be properly reviewed and accounted for, to prevent any significant risks:

1. Data Sharing: increased access to data

Organizations should practice good hygiene techniques such as network segmentation and intermediary systems that serve as “middlemen” to gather, protect and provide information. Robust cryptologic support, hardware authentication and attestation combined with access controls, secure application points and endpoints; encryption and tokenization for data at rest and in transit to safeguard communications if they are intercepted or systems are compromised.

2. Vendor processing: Vendor acceptance in the market

Vendors/new partners coming in with their systems could also bring risks along with it. The organization’s information security and risk management teams leveraging these applications would need to develop new policies and guidelines to adequately secure themselves against fraudulent vendors, internationally sanctioned suppliers, contract research organizations and product distributors.

Organizations may need to keep evolving their risk management to preserve integrity and remain secure when transacting information or goods, as well as strengthening their monitoring capabilities.

Organizations may need to revisit the business continuity, disaster recovery and response plans to accommodate the increasingly complex and ubiquitous cyber environment. The breadth of risks requires a secure, vigilant and resilient approach to understand the dangers and address the threats.

MANAGERIAL CHALLENGES

Previous industrial revolutions posed the need to replace existing assets with new ones, but Industry 4.0 is all about mastering the managerial challenges posed by the disruptive technologies along three different dimensions:

1. Operational effectiveness

The advent of technology upsurge will bring in plethora of challenges and opportunities for a manager managing individuals. The questions posed are:

- How millennials would manage the aged team?
- Handling the transition from man-to-man interaction to 'man-to-machine' or 'machine-to-machine' interaction?

  The new co-workers' psychology will undergo dramatic changes. Expression of physical emotions might completely give way to digital emotion mapping. Employers will have to track the emotional side of each employee using wearable technology, monitoring devices, social media communication review, artificial intelligence. Gamification will add its value here in ensuring workforce involvement towards achieving company goals.

  New software would come in place which will perform further analysis of data available with respect to the employees and categorize it for better understanding and provide outputs which can be deciphered by the manager predictively.

- Manager or Techager?

  Techager who?

  Introducing the term - Techager could a millennial geek who has his expertise in technology however responsible for decision making also.

  Techager could also be a machine replacing human responsible for oversight and decision-making activities.

  - Techager - If the workforce is scattered across geographies/sites, if there is no physical presence required – can a newly configured software manage the workforce? Answer might by Yes – if the emotional touch too is converted into bytes then the machine too can analyze and decode the data with layer of artificial intelligence. It can predict breakdowns, risks and defects in advance.
    Who will own such machines/bots? Would it be the parent organization, or would it be a vendor providing contractual service? If vendor, how would the performance of the bot be evaluated, and payment/agreement terms worked out, data security be managed; impact of data security breach – these are the challenges which needs to be addressed.

  - Millennials as Techager – will be moving up the ladder very quickly due to skills and expertise; however, will have the challenging task of managing the 'aging' workforce.

    Hence the term 'MAN_AGEMENT' might not be an apt connotation for decision making body instead 'TECH_AGEMENT' would be the word to look for.

2. New business models due to shifting value pools

  - The business model mostly embraced would be 'collaboration' and 'partnership' type rather than ownership. Collaboration among producers, consumers and vendors will play a key role.
  - Lean and agile methodology will be the core of any organization. Also, special importance to information/data security as part of the process will be done.
  - Standards/guideline development to meet overall quality and customer satisfaction would be another challenge area.

- Adopting a nimble layer of processes with flexibility to change would make work-life easier
- Processes catering to the needs of vendor management and employee management – a mix of both would be required.
- IT infrastructure would undergo transformation addressing the needs of seamless connectivity and must be flexible
- Creating ancillary services and new revenue streams by taking advantage of the insights powered by analytics

3. Foundations for the digital transformation of the company.
   - Skill enhancement
   - Digital transformation roadmap
   - Financial implications
   - Upgrading IT infrastructure
   - Ensuring data security measures
   - Analysis and prediction will be the key: With huge data from every aspect either manufacturing or service or any other sector in the industry, data analytics will play a key role helping in accurate decision making and also predicting the probabilities.

CONCLUSION

Industry 4.0 will usher a new dimension in the industry making it SMART through the integration of IoT, AI-ML, cloud technology, cyber physical systems, 3D printing, blockchain etc. and will bring in radical changes in the way a task is performed. This technology avalanche would lead to transformation in every field – transportation to logistics to manufacturing including research and development.

The basic principle behind the fourth industrial revolution is that by chaining machines, intelligent devices, and systems, manufacturers are creating smart networks throughout the value chain (from materials to production) that can control each other.

Clinical domain will be at the benefiting end since the ‘time to market’ will significantly come down decreasing costs to run the trials. Embracing technology would also have the risk of data security which must be considered in the digital transition plan.

Statisticians will be omnipresent – meaning any role in the new workplace 4.0 would require statistics as a necessary skill making statisticians one of the sought after roles.

The resource management or employee satisfaction will be the keenly observed parameter due to advent of intelligent machines in the work world. The ageless workforce coupled with machines led by millennials would be an interesting workforce combination to be observed.

This would also inscribe the foreword for Industry 5.0 focusing on increased collaboration between machines and humans wherein high-speed accuracy of machines will merge with cognitive, critical thinking skills of humans.

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