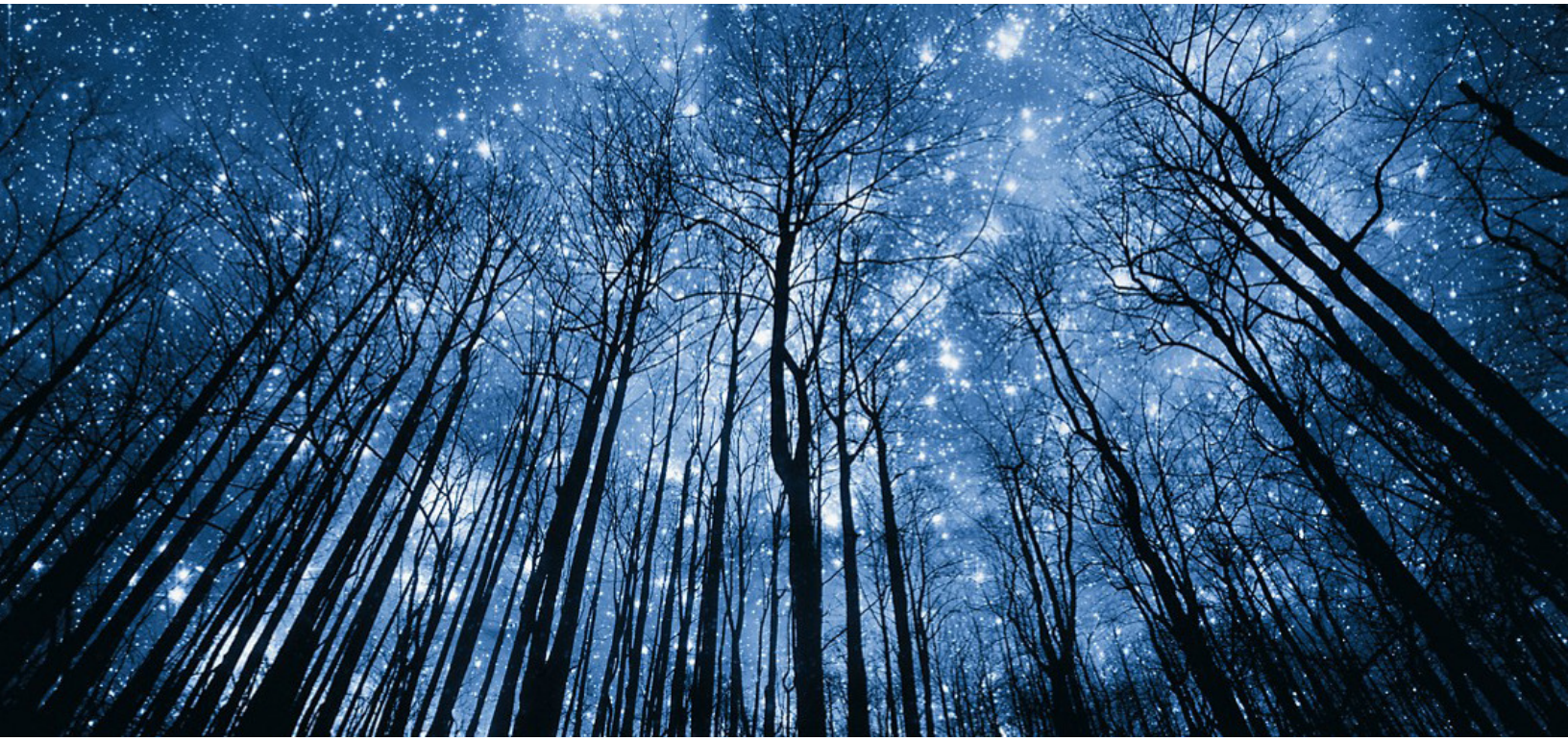
DELL Technologies

IT STRATEGY FOR A TECHNOLOGICAL WORLD



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Knowledge Sharing Article

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Introduction

Can we fathom our world without tech? The world around us is changing at a rapid speed, as is the way we engage with each other and the objects around us, making it difficult to discern between what is reality and what isn't. This shift is being facilitated by advancements in computational technology and systems. The advancement in technology includes the high-speed networking with 5G, advanced cloud offering, pervasive computing, Internet of Things (IoT), Machine Learning, Artificial Intelligence, autonomous vehicles, Robotics, better and precise sensors, low form factor micro controllers and microprocessors, enhanced deep learning models etc.

As the world transforms, technology becomes a need rather than a pleasure. Executives in the technology industry predict that in the next years, every firm, regardless of sector, will be a technology company. With this technology in place, every industry has exploited it in some manner to aid them with their company operations. Even while businesses use technology, many of them are not fully utilizing its capabilities. It's most likely related to the conventional approach in which their firms use technology and manage IT.

A proper IT strategy must be established based on the organization's people, processes, and business goals to maximize the efficient use of technology. The technological personalities that can be beneficial in that area will change depending on the sector and industry. For example, claiming that an IT strategy appropriate for the Smart Media sector sectors will also be appropriate for the Healthcare sector is incorrect. Smart Media technology personas include High Quality Video Streaming, Virtual Reality, Interactive 3D image rendering, Cloud Gaming, and so on, whereas smart Cities personas include Connected Transportation, Smart Utilities, Open Data Exchanges, and so on. This knowledge sharing articles takes an illustrative approach by using the examples of three major sectors i.e., Healthcare sector, Telecommunications sector, and Manufacturing sector to discuss how these various industries are harnessing technologies, as well as to describe the technical challenges and requirements that each of these industry sectors has, and to conclude with how an effective approach can be developed to design the right IT solution that will address these difficulties.

This article might be beneficial for IT administrators and architects, as well as anybody else who oversees developing or planning the organization's IT infrastructure and strategy.

Let’s start this discussion with healthcare sector.

Healthcare Sector

The healthcare business (commonly known as the health economy) is an economic system aggregation and integration of sectors that supply products and services to treat patients with curative, preventative, rehabilitative, and palliative care. It has emerged as one of the largest and greatest of sector both in terms of revenue and employment. As per the Global Market Report 2023 of healthcare services, the worldwide healthcare services market increased by 6.3% CAGR from $7,499.75 billion in 2022 to $7,975.87 billion in 2023 [1].

Considering recent events, healthcare providers are accelerating digital transformation and refining ways to deliver patient care safely and securely. There has been a global response and the creation of multiple governmental stimulus packages to help drive the rapid deployment of solutions to help. As the healthcare organizations are expanding and continuing their focus on road ahead, they must contend with shifting patient expectations for virtual treatment as well as new clinical and financial realities.

Healthcare providers are under the obligation to keep their clinical and administrative employees safe, restore non-urgent clinical services, and plan for emerging demands. To support new clinical workflows, healthcare management must make strategic investments that increase agility and speed digital transformation.

Healthcare organizations can undoubtedly adapt to new routines and push the boundaries of what's possible with timely, on-demand IT that flexes to meet the healthcare demands of today and tomorrow with the appropriate technology by their side and the proper plan in place.

Technology Enablers and Concerns

There are various emerging changes in the technology ecosystem that is enabling the healthcare organizations to seamlessly transform their businesses from the physical to the digital. Some of the key emerging technologies include Edge, Unified Data Management, Artificial Intelligence, The advent of 5G in healthcare, and Comprehensive Security Solutions.

As the sector becomes increasingly data-driven, a model is needed to capitalize on the possibilities that lie ahead. Businesses can develop the safe digital foundation required to be ready for what's coming by utilizing the transformational potential of technology.

Let’s look at some of these emerging technologies in a nutshell-

1. **Edge** - It radically alters how people and machines engage with digital services, advances human development, and shapes the future; from exciting new uses for AR and VR to improved healthcare efficiency, manufacturing, and automation control, among other things. The secure Edge is critical to realizing the full potential of new technologies. In the hospital, outpatient facility, or at home, computer vision utilizes a camera as a sensor. Machine learning skills that are powerful automate data analysis and pattern recognition, discover abnormalities, and trigger actions.

2. **Unified Data Management** - Organizations must gather, store, and use data in a safe, effective, and economical manner to handle the enormous and overwhelming amount of data that is available. Being business-ready sooner is crucial for expediting data mobility across the hybrid, multi-cloud world, converting insights into actions, and generating instant gratification.

3. **Artificial Intelligence (AI)** – AI is not new thing. It here, there, and everywhere. As we transition to more frequent digital encounters, data from the virtual world combines smoothly with data from the real world. A good strategic AI approach will lead any firm to a long-term competitive edge. AI and automation have already improved the overall efficiency of the healthcare ecosystem by 10% to 15%.

4. **5G** - 5G enables the linking of IT infrastructure and the transformation of it into scalable smart systems. 5G powers a world of connectivity, enabling mixed reality experiences where the physical and digital worlds converge. In healthcare, 5G technology enables quicker internet connectivity, leading in more effective remote video monitoring of patients, linked hospital wards, 5G-enabled ambulance services, and urgent healthcare. It also improves access to healthcare services for people in rural regions, makes global knowledge available in remote locales (e.g., remote surgery), and improves operational efficiencies for doctors.

5. **Security** – Although this emerging technology provides many advantages, because of the changing and hyperconnected nature of digital commerce, dangers, vulnerabilities, and repercussions are amplified. Security does not require new products; rather, it requires a new approach. One that is robust, intelligent, and automated, with security integrated in wherever your apps move, from endpoints to infrastructure to cloud deployments. All healthcare companies require full safety and security for their employees, patients, networks, endpoints, and data 24 hours a day, seven days a week, covering clinical and business activities across the whole patient care continuum.

An IT Approach

The right plan for a company depends on the size of the company, their service offerings, the way they like to engage with their various stakeholders, the type of workloads they are currently using and planning to use, etc. This article mentions just a general approach which can be useful in specific to most of the Healthcare industry.

As per a survey, Cloud management consistency is important to 84% of healthcare-life sciences enterprises. Hence, developing a cloud mindset has been a common thread in the drive to operate with speed and agility to stay up with innovation. The use of traditional data centers has given way to a hybrid cloud operating architecture. To fully utilize cloud services, IT departments must first analyze their workloads and apps to establish the optimum cloud architecture for each. To attain flexibility and give a seamless experience to providers and patients, they must also have a better awareness of where data is coming from and going to.

This transformation resulted in the distribution of data and workloads across several suppliers. Customers, regardless of provider, should ideally have the same experience throughout their whole hybrid multi-cloud system.

To accelerate the digital transformation, ensure that the IT platforms being used are digital-era ready—that is, designed on a highly secure and always-available basis that is open, adaptable, scalable, standards-based, and interoperable. When information is unlocked, it links doctors in a medical fraternity and guarantees they have access to all essential patient data during treatment, when and when they need it, which speeds up healthcare delivery and promotes patient satisfaction, compliance, and results. To allow data aggregation and seamless data access throughout the healthcare system, providers must be able to transform traditional on-premises infrastructure into a private cloud and work across multi-cloud settings.

The below figure below depicts a sample of the connected Healthcare ecosystem [2]

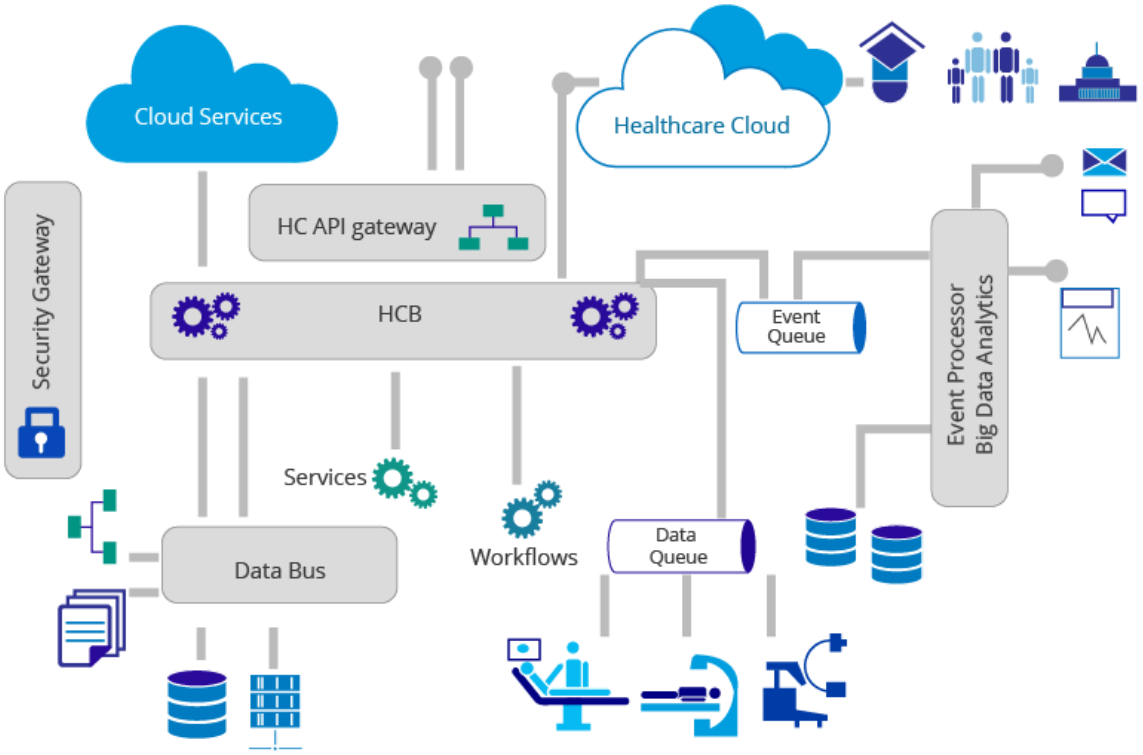

Figure 1 Connected Healthcare System

High Value Workloads - EMR

Another but one of the most important, high value and Critical workloads include EMR, Medical Imaging etc. It's crucial for the organizations to streamline these workloads and reconsider the technologies required to give caregivers on-the-go the means of providing a "single source of truth" for each patient by seamlessly connecting diagnostic, treatment, prescription, lab test, and hospital data from various sources. Enhancing productivity, availability, and performance for critical ISV applications is the goal of clinical workload optimization. Chronic illness management and treatment need a lot of imaging, which drives the demand for storage in healthcare. CT scans, MRI scans, PET scans, angiograms, and other forms of medical imaging are employed in chronic conditions such as cancer and cardiovascular disease. As our understanding of chronic illnesses and our capacity to treat them grows, so does the data available to assist patient care. Furthermore, continual monitoring and activities create data that helps physicians track progression. With new

data types and changes in healthcare brought about by COVID-19, healthcare organizations are swiftly entering a new era in which they must manage short-term surges in activity while providing continuous patient care. Healthcare companies must combine clinical goals with the resources required to create a unified medical imaging system.

Healthcare businesses must make expenses in contemporary infrastructure to allow everywhere, anytime access to EMR workloads, including:

- Patient registries
- Digital concierge: Express check-in, Mobile App, Front desk/kiosk registration, Wayfaring,
- Patient tracking, screening, and detection using biometrics.
- Desktop, Printing, Scanning, Voice Transcription, Location Services
- EMR Access (Shared WS) - SSO, User Personalization, Follow-me
- Patient monitoring dashboard
- Notification and alert control
- Mobile clinical workflow
- Point-of-care software, and
- Predictive analytics

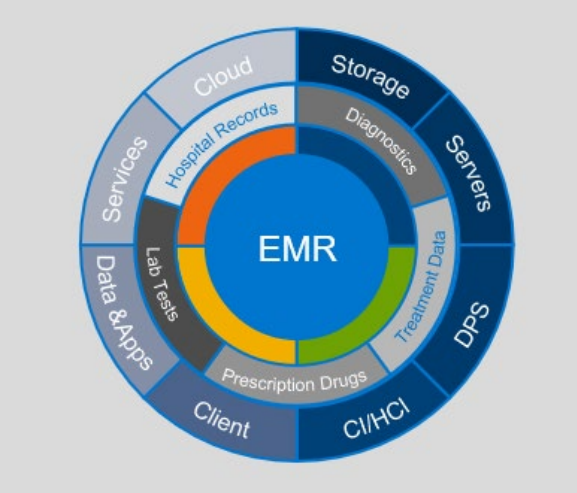

Figure 2 Electronic Medical Reports

Persona Based Technology Profiling

We can use a persona-based approach to classify the use cases or the scenarios in which technology can be useful for the diverse Healthcare workforce. By taking a persona-based approach, healthcare organizations can develop an end-to-end workforce transformation plan centered around the user experience and total cost of ownership.

The below figure shows a sample of personas that can be used for understanding specific use cases of technologies [3]

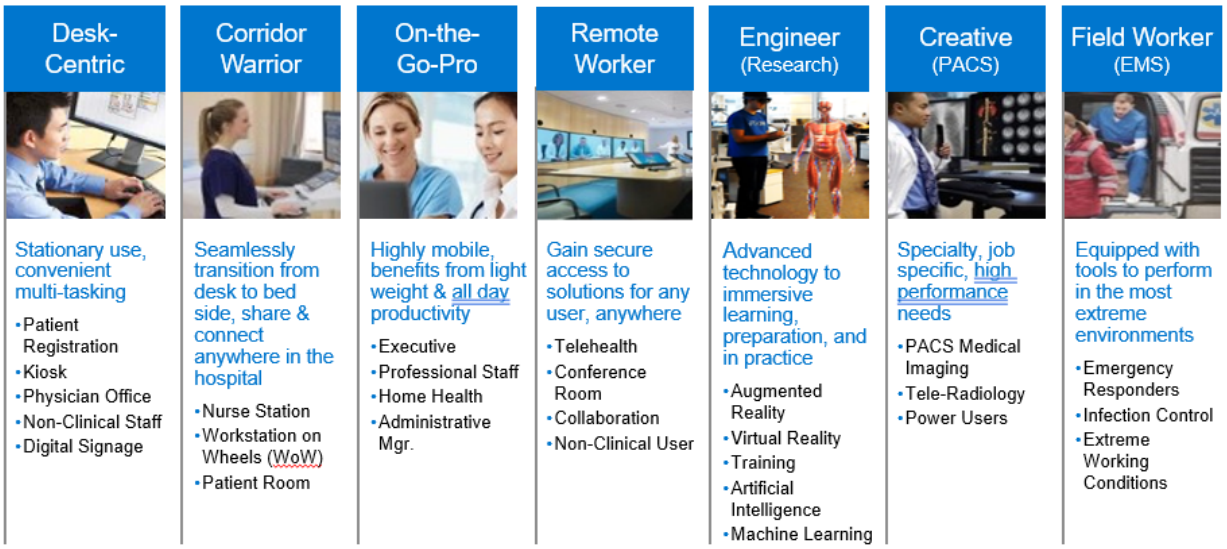

Figure 3 Healthcare Workforce Personas

The use of modern technology enables healthcare organizations to provide remote patient care to tele-ICUs and AI-assisted patient monitoring and virtual health solutions.

Virtual Care: Innovative virtual care solutions are dramatically and permanently transforming how our healthcare is provided to achieve clinical and commercial agility as we change from reaction to recovery. It improves patient outcomes, increases access to reimbursement, and lowers total healthcare costs.

TeleHealth: Patients and their relatives cherish the ability to communicate with care providers from the comfort of their own home at a time that is suitable for them, while reserving in-office visits for patient care episodes that demand it. As telehealth services evolve, providers must continue to improve interoperability across the care continuum to obtain a complete picture of the patient from all sources - EMR, AI, IoT devices, direct patient input, and more - whether the patient is chronically ill or seeking wellness advice.

Remote Patient Monitoring: Readmissions cost an average of $14,400 per person in the USA and over $60 billion per year [4], and costs continue to rise. Remote patient monitoring and virtual care technologies are helping hospitals lower readmissions through new preventative measures. With

Remote monitoring and analytics, we can get the data for waveform integration, predictive medicine, risk stratification, Tele-ICU and more.

IT- as- a Service

Another technological service that can help healthcare organization is IT-as-a-service. IT as a service is a new IT business and operating model which is about becoming IT a service provider that offers and orchestrates IT services instead of organizing around traditional technology silos. The model provides users self-service access to internal and 3rd party services through an integrated service catalog that supports consumption-based chargeback and billing. While cloud is a useful enabler of ITaaS, virtualized and even dedicated IT services can be packaged and offered up to users as well. The ITaaS model is based on the premise that IT needs to define, offer, and orchestrate services described in terms of business users, not technology silos. The specific delivery model for these services is independent of technology, and in fact may even be delivered manually. The important point is that the service is as standardized as possible, with a clear SLA and cost data.

Healthcare organizations serious about ITaaS transformation start instead with business users and services. They try to focus on answering fundamentally different questions that are out of the traditional IT comfort zone like:

- What services do our business and clinical users want and need to drive innovation?
- Is internal IT truly best positioned to deliver these services to users?
- Can our IT department deliver these services at a sustainable, market-competitive price?
- How will our processes and policies need to change to support the new services lifecycle?

Figure 4 IT-as-a-Service Structure

The answers to these questions are what then drive the development of the right delivery models and platforms. The answer may be public, hybrid cloud models, or even a virtualized or dedicated legacy environment. But it is user demand that should drive the ITaaS services train.

ITaaS embodies a new operational model that requires new skills, processes, policies, and approaches. Many healthcare CIOs will find that these challenges far more difficult to overcome than the technical hurdles associated with delivery the model.

Hence a right approach and strategy can help Healthcare organization utilize the maximum potential of technological solutions to provide diverse and varies healthcare solutions to the people.

Telecommunications Sector

The telecommunications industry is made up of enterprises that enable worldwide communication, whether through the phone or the Internet, airways or cables, wires or wirelessly. These firms built the infrastructure that allows data to be transferred anywhere in the globe in the form of words, speech, audio, or video. Telephone (both landline and wireless) operators, satellite companies, cable companies, and Internet service providers are the main corporations in the industry. [5]

As per one of the major professional services and accounting firm Deloitte –

“The telecom sector continues to be at the epicenter for growth, innovation, and disruption for virtually any industry. Mobile devices and related broadband connectivity continue to be more and more embedded in the fabric of society today and they are key in driving the momentum around some key trends such as video streaming, Internet of Things (IoT), and mobile payments.” [6]

Digital revolution has swept through the global economy in recent years, irreversibly altering sectors. Telecommunications are no exception. This shift was pushed by the industry's desire to adopt open, software-defined infrastructure. While the drive to develop and market new, over-the-top cloud services has hastened it. We can now monetize the network in ways that were before unthinkable. And 5G has reached a tipping point right now. Geopolitical pressures linked to national security concerns have necessitated the requirement for a telecom infrastructure located in the United States.

Challenges In Industry

There are various challenges in this industry. Hence not a single technological vendor is able to completely solve these challenges that exist in the industry. These challenges include-

1. The small-scale vendors have little motivation to manufacture the essential network equipment. They face the innovator's dilemma: they are dedicated to their present revenue streams and profit profiles, and they face a change-resistant culture.

2. While many new vendors are developing new software-defined network components, many lack the size and degrees of system integration to do more than offer proofs of concept and trials.

3. In terms of both software hardening and hardware price/performance, RAN disaggregation is not yet ready for primetime.

4. Continue to support Legacy Infrastructure

5. Transforming the workforce

6. Content Moving to the Edge

7. Delivering end-user Compute at the New Edge

Telco Industry Tranformations are challenged by Internal and External Threats. Edge Computing & O-RAN are the new frontiers for Telcos to Enable new Business Models. The creation of a Industry Business Ecosystem is vital to achieve the business goals. Hyperscalers @ Edge are important actors of the Industry ecosystem.

An IT Approach

To solve these issues, we require a strategy centered on a total Telco transformation, rather than simply core IT activities. Something dedicated to altering the network from core to edge, all the way out to the RAN. Technology vendors and telecommunications carriers must collaborate to invent, create, construct, and sell over-the-top services and solutions.

To do this, organizations would have to:

1. Go beyond connection to monetize your network investments with new income sources.

2. Create and manage a Telco cloud to cut expenses while boosting company agility and customer experience.

3. With the help of the expert in IT, modernize OSS/BSS with assurance and revolutionize your company.

They can deliver such services using a telecom cloud as they develop new services. The cloud will then assist you in continually improving your customers' experiences through operational and business support systems.

Let's speak about Telecom in the cloud and how to adapt cloud to meet telco criteria. BSS/OSS systems are one of the Telco workloads witnessing the most dramatic changes today. The impact on infrastructure will be severe when software changes to a microservices-based deployment strategy. IT will be handled at considerably reduced costs and with better agility thanks to component disaggregation and software-driven configuration and deployment. The software transition overlaps with developments already underway in the Telco core and services edge. As those trends reach the RAN, there is a potential to collaborate closely and innovate to disaggregate there as well.

All of this, of course, should take place on a shared infrastructure platform that can automatically deploy, configure, and monitor your infrastructure stack from bare metal to application runtime, all while being built on industry-standard computing, network, storage, and data protection gear.

One of the exciting technological innovations that can help drive the challenges in telco industry is 5G and edge computing.

Cellular Technology Evolution

Let us look at how this mobile technology has changed over time as shown in the Figure 5.

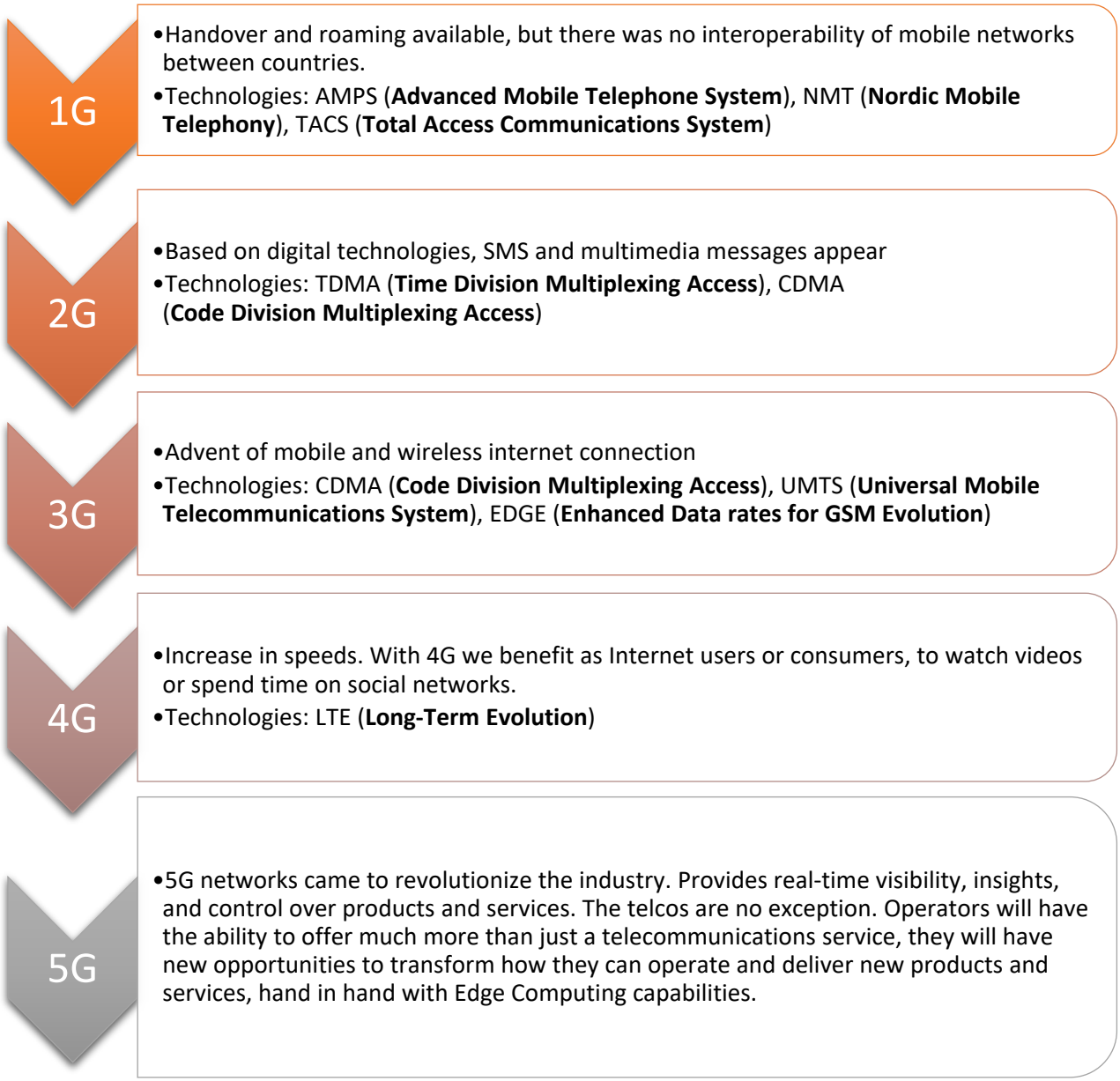

Figure 5 Mobile Network Evolution

The digital transformation megatrend has been sweeping through the global economy and clearly the telecom industry is no different.

The demand for an open, software-defined, industry-standard infrastructure is driving this shift. This is made more pressing by the ambition to develop and market new over-the-top cloud services that commercialize the network in ways that they have not previously been able to. Finally, the present tipping point of 5G is driving this haste, as is the need to negotiate geopolitical pressures connected to national security concerns and the demand for a US-based telecom infrastructure provider.

The Goal of Telco of the Future is to monetize both the Organic and Inorganic Business. Hence 5G Telco market has a huge opportunity from both the organic B2C and inorganic B2B as shown in the Figures 6 and 7.

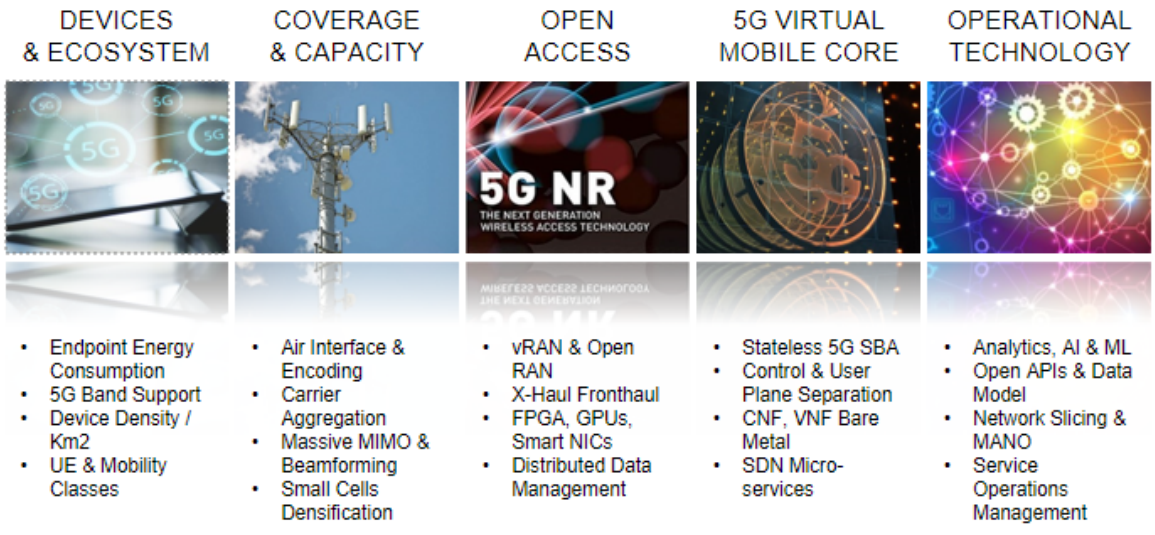

Figure 6 Organic B2C

Figure 7 Inorganic B2C

Workforce Acquisition and Transformation

Hence, Telco Industry operating model is bifurcating with one pillar in traditional business operations and another pillar in next generation technologies and partnerships. The new model must fouse on Workforce Acquisition and Transformation. This new Workforce model underpins all Strategies. They Must deploy new technologies (i.e. 5G, Open RAN and Network Automation), deliver Native Cloud Network Architectures and Partner with Public Cloud Providers and End Point Device Providers. The Multi-Sided Platform (MSP) is a flexible architecture that is adaptable to the business landscape.

Let have a look at the workstream challenges and opportunities in Telecommunications Industry.

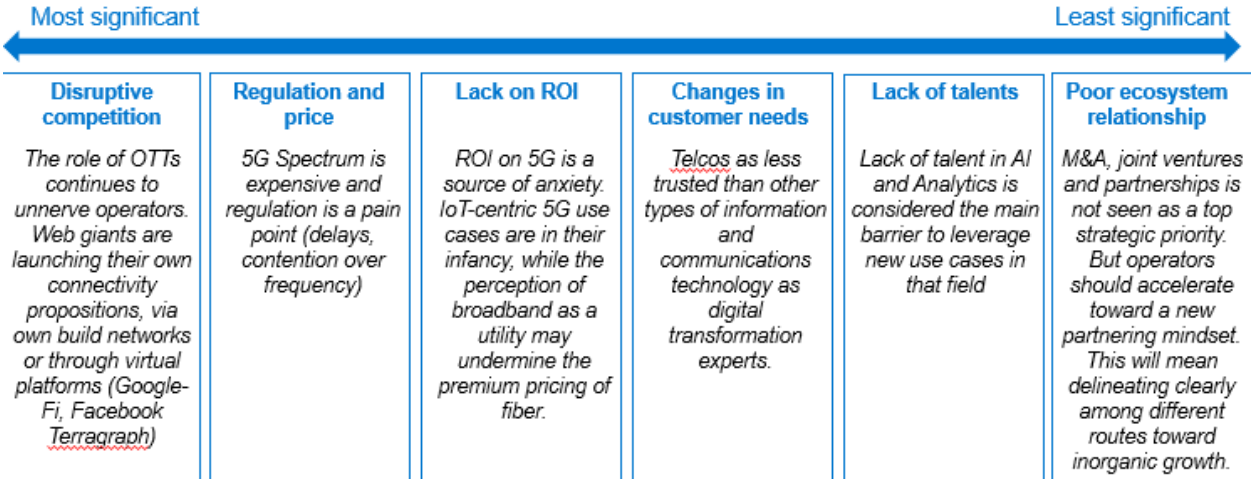

Figure 8 Telco Challenges

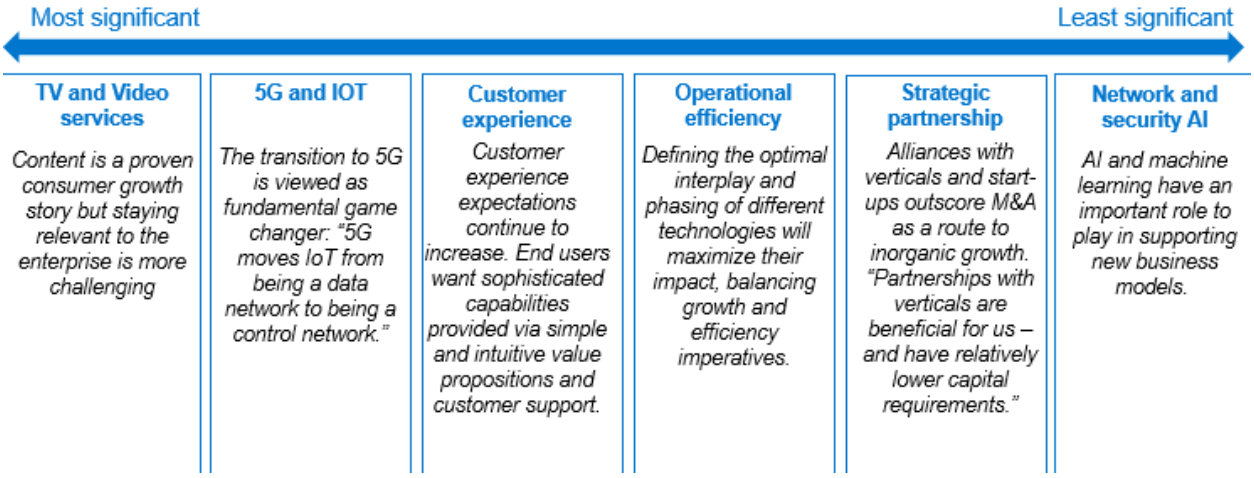

Figure 9 Telco Opportunities

Telcos Transformations

To remain relevant to both consumer and corporate clients, telcos must change. Telcos are key to digital disruption and convergence. The primary reason for AI is to improve customer experience. The transition is hampered by a lack of expertise and poor data quality.

Beyond customer service, Omnichannel engagement is seamlessly coupled with call offloading to any accessible network to give a continuum of communication-related experiences. Chatbots and virtual assistants, as well as robotic process automation (RPA), will be utilized to automate customer support platforms and manage administrative, configuration, and maintenance activities. Visual engagement and the integration of AI and human touch will help Telco overcome the disappointment of IVR and depersonalized engagements. Predictive analytics and data-driven insights will enable network performance improvement by anticipating user equipment failure and proactively correcting it, as well as feeding back coverage level needs to provisioning.

Customer Experience will make use of AI-enabled modelling of a customer digital twin with synthetic behaviour based on massive dataset learning. The consumer's digital twin may be used to evaluate engagement, campaigns, and real-time non-repeatable targeted advertising. Customers will gain power by agreeing to give up some of their privacy in exchange for selling personal data. Telcos may gain significant benefits as the first line of defence in data collecting and trading to improve Customer Experience and marketing operations in general.

Telcos account roughly for 3% of the global electricity consumption. A report, published in 2019 by Vertiv and 451 Research, estimates that network energy consumption could jump 170% by 2026. The study projects that in 2030 IT will consume one fifth of all global electricity.

Energy consumption of the telcos is important, but we should not lose sight of the larger picture of the contribution the telcos make to the sustainability: The impact of 5G will be felt not only in immediately deducible in bridging geographical divide, but also in several indirect areas such as reducing vehicle emissions, conserving water, reducing food waste, optimizing energy usage, encouraging citizen engagement with sensors, sharing economy with marketplaces, etc.

Raw data can be categorized into network-level data and app-level data, the former usually collected by the edge mobile devices, the latter throughout network infrastructure. Network operators could become overwhelmed when managing and analyzing massive amounts of heterogeneous mobile data. Deep learning is probably the most powerful methodology that can help overcoming this burden.

Representation learning for network traffic classification will be an embedded intrinsic feature of networks and inference will be performed locally at all sites to limit data traffic and allow for (near) real-time response from edge endpoints (e.g., devices) to network components, to cloud based application, across the whole Telco stack.

Although there some challenges from the technology perspective that are yet to be solved in the telecommunications industry and work is going on in that regard, but a proper IT infrastructure can be prepared and adopted by an organization, that is ready to handle the future technological evolutions solving the current telco challenges, by adopting a right technological and IT strategy approach as discussed above.

Now, let's look at another industry segment that is Manufacturing sector.

Manufacturing Sector

Manufacturing operations are those establishments that typically use electrical machinery and material handling devices. They also include organizations that modify resources or substances into new items either manufactured in their own premises from where they are sold like that of bakeries, confectionery shops etc. or can be produced in workers homes by hand. Manufacturing enterprises may process materials themselves or contract with other companies to do so on their behalf. Manufacturing includes both sorts of organizations. [7]

Industrial Evolution

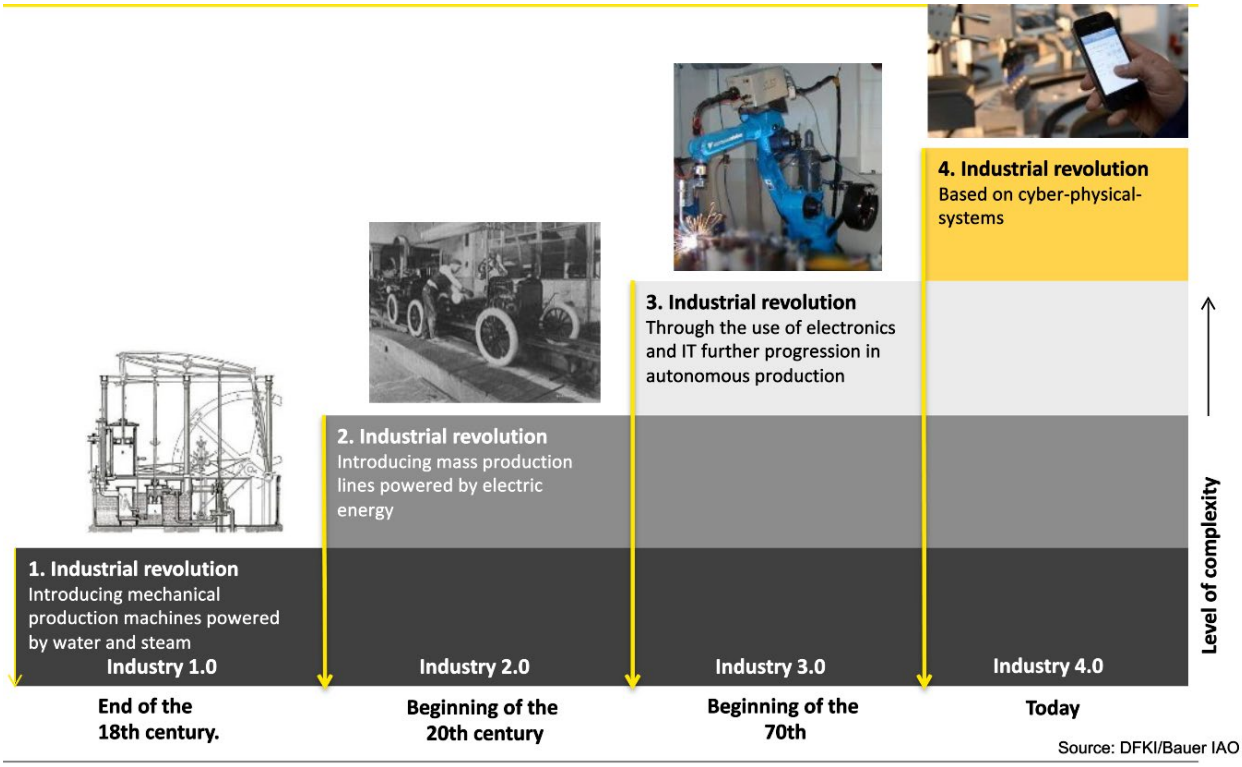

Figure 10 Industrial Evolution

1760 to 1840 – Ushered in Mechanical Production, railways, and steam engine.

1870 to 1940 – Mass Production; Electricity and assembly line

1960 to 2010 – Computers; semi-conductors, main frame computing, personal devices, internet

Industry 4.0

Industry 4.0 is the generic name for the technologies and concepts of value-creating organizations. Based on the technological concepts of Cyber-Physical Systems, Internet of Things, and Internet of Services, we realize the vision of the smart factory.

Within the modular smart factory of Industry 4.0, cyber-physical systems monitor physical processes, create virtual images of the physical world, and make decentralized decisions.

Through the Internet of Things, cyber-physical systems communicate and collaborate with each other and with people in real time [8]. Value chain participants provide and consume both internal and inter-organizational services through the Internet of Services.

What is a Cyber Physical System?

A cyber-physical system (CFS) Is a system of collaborating computational elements controlling physical entities. CPS are physical and engineered systems whose operations are monitored, coordinated, controlled, and integrated by a computing and communication core. They allow us to add capabilities to physical systems by merging computing and communication with physical processes.

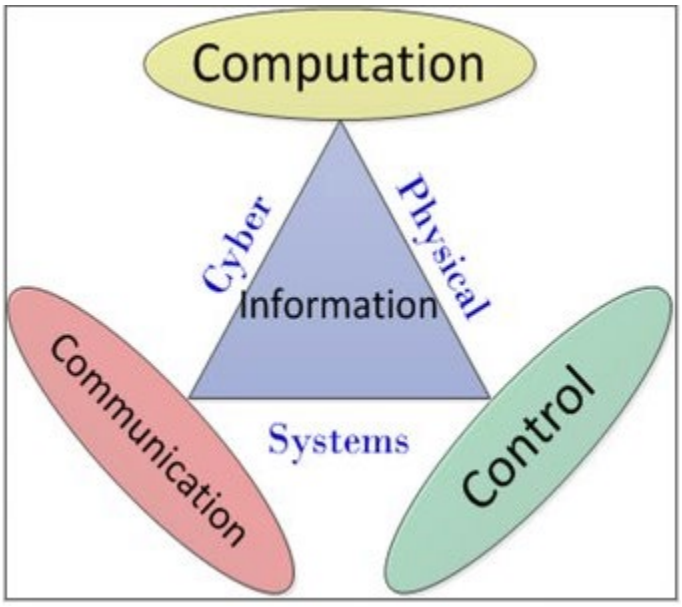

Figure 11 Cyber Physical System

Factors building Industry 4.0

As per the Smart Manufacturing Leadership Coalition, USA, the factors

- Builds on the Digital revolution.
- Ubiquitous internet

- Smaller & powerful sensors
- Artificial Intelligence (AI)
- Labor & Energy Cost
- Machine Learning

Challenges in Manufacturing Industry

Manufacturing has been the backbone of the economy ever since the industrial revolution started a century ago. Historically most of that value was created by workers manually operating tools and technologies, with very little automation. Today manufacturers in the developed world are seeing a transformative shift in the demographics of their aging global workforce. This creates a challenge for manufacturers to train inexperienced workers to rapidly learn the domain expertise of an aging and retiring workforce. On the other hand, the proliferation of sensors in today's industrial environments creates an opportunity to use this wealth of data as fuel to train modern data-driven automation through AI. Meanwhile, consumer expectations for quality, coupled with the globalization of manufacturing supply chains, is also creating new challenges for manufacturers to ensure the highest quality products, without regard to the complexities of multiple suppliers, manufacturing locations, and a diverse global workforce. Rising equipment infrastructure costs are also creating pressure for manufacturers to get the most out of their capital investments. This means dramatically cutting down on equipment downtime for both scheduled and unscheduled maintenance, which is especially challenging as manufacturers extend the operational lifetime of equipment to control capital costs. All of this is happening at a time of tremendous innovation in manufacturing techniques. Higher precision fabrication technologies along with new technologies like additive manufacturing are enabling new and differentiated product innovation. Meanwhile end-customer expectations continue to evolve towards demanding a greater levels of product customization, increasing the pressure for manufacturers to run smaller production lots efficiently and profitably. This is especially true as global markets uncover opportunities for localized product requirements in emerging economies. Finally, all these products need to be built with a sophisticated upstream global supply chain and distributed through a complex downstream distribution network. Companies are starting to differentiate from their competition through their ability to hyper optimize both their supply chain (for which Apple is a good example), as well as their distribution capabilities (for which Amazon is a good example)

The table in the Figure 12 shows the Macro trends as observed in the Manufacturing and Industrial Sector.

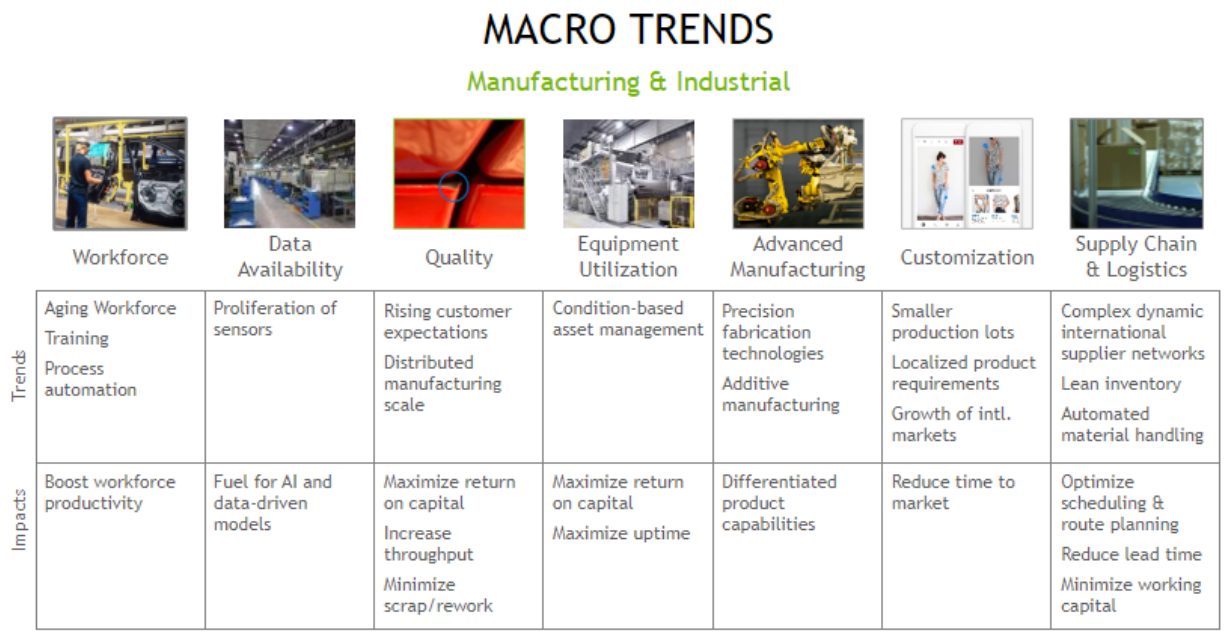

Figure 12 Macro Trends in Manufacturing and Industrial Sectors

Let's now try to understand how technology can help address these challenges.

Design Principles of Industry 4.0

- Interoperability: The ability of cyber-physical systems (i.e., work piece carriers, assembly stations and products), humans and Smart Factories to connect and communicate with each other via the Internet of Things and the Internet of Services
- Virtualization: a virtual copy of the Smart Factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models
- Decentralization: the ability of cyber-physical systems within Smart Factories to make decisions on their own
- Real-Time Capability: The capability to collect and analyze data and provide the insights immediately.
- Service Orientation: Offering of services (of cyber-physical systems, humans, and Smart Factories) via the Internet of Services
- Modularity: Flexible adaptation of Smart Factories for changing requirements of individual modules

Building Blocks of Industry 4.0

The major technological advances that are the building blocks of technology are –

1. Autonomous Robots
2. Simulation
3. Horizontal and Vertical Systems Integration
4. Industrial IoT
5. Cyber Security
6. Additive Manufacturing
7. Augmented Reality
8. Big Data Analytics
9. 5G

An IT Approach

Accelerated computing and Artificial Intelligence enables various Manufacturing and Industrial Use cases.

Manufacturing Inspection: The most common use case for AI is to improve the accuracy, consistency, and rate of throughput for quality inspection and test. AI-based inspection solutions can also save other indirect costs incurred from training and staffing manual inspection personnel, as demonstrated in the Foxconn example provided earlier.

Predictive maintenance: AI-powered predictive maintenance solutions can be used to increase the uptime of expensive and mission critical equipment, as demonstrated in the paper mill example provided earlier.

Intelligent Video Analytics (IVA): Services for inspecting industrial assets deployed in the field or in factories is another use case that's well suited for AI, as demonstrated in the Avitas Baker Hughes drone example provided earlier. You'll recall that AI models can detect faults like corrosion, cracks, leaks, and even detect safety hazards for workers.

Supply Chain and Logistics: Supply chain & logistics operations is a rapidly growing new use case for AI. These use cases include accurately reading labels and container markings for automated disposition and routing. It also includes the ability to improve the accuracy and the frequency of fine-grained forecasting of products for capacity planning, as well as for parts in maintenance services.

Conversational AI/NLP: Finally, we're seeing a massive growth in investments for building conversational AI assistants for querying service documentation describing installation, calibration, and maintenance manuals.

5G simplifies Data Access and improves Data quality. Better Data and data management leads to better AI. AI makes simulation and 3D Modelling better. Simulation and 3D Modelling make digital twins better and more valuable. Digital twins and AR/VR make smart manufacturing remarkable.

Deep learning models have exceeded human performance for many computers vision tasks since 2012. These models are now becoming practical to develop and apply in industry thanks to GPU acceleration of the intensive compute requirements. With GPUs, the models can be trained in hours or days vs weeks or months with best-in-class CPUs.

These AI breakthroughs have enabled image-based quality inspection processes to detect subtle defects on production lines at a scale and resolution not possible before. Industries are embracing this technology to automate and scale their Inspection processes to realize improved Yield, Quality, and throughput.

With GPU acceleration, compute intensive workloads such as deep learning based predictive maintenance are now feasible for industrial customers to design and implement. Models can now include the operational behavior of thousands of systems, components, and related processes. Further, these models can continuously learn from new data and re-calibrate themselves to answer meaningful business questions.

Often this representation of physical systems in the digital world is called a digital twin. Digital twins are designed to help meet business objectives. For example, they can suggest the best operating plan to meet specific production targets. Or the best operating plan based on the systems' life, the state, the modes in which it must run.

The end-to-end predictive maintenance pipeline includes:

1. Data management
2. Anomaly detection
3. Time series pattern search across fleets of machines and sites
4. A decision support portal to estimate remaining useful life under different assumptions.
5. An optimal work scope prescription module, potentially with an interface to a holistic digital twin of a system, plant or operation for analysis and scenario planning

Manufacturing Value Chain and Impact

The different aspects of the value chain of the manufacturing industry are impacted by the industry 4.0 attributes.

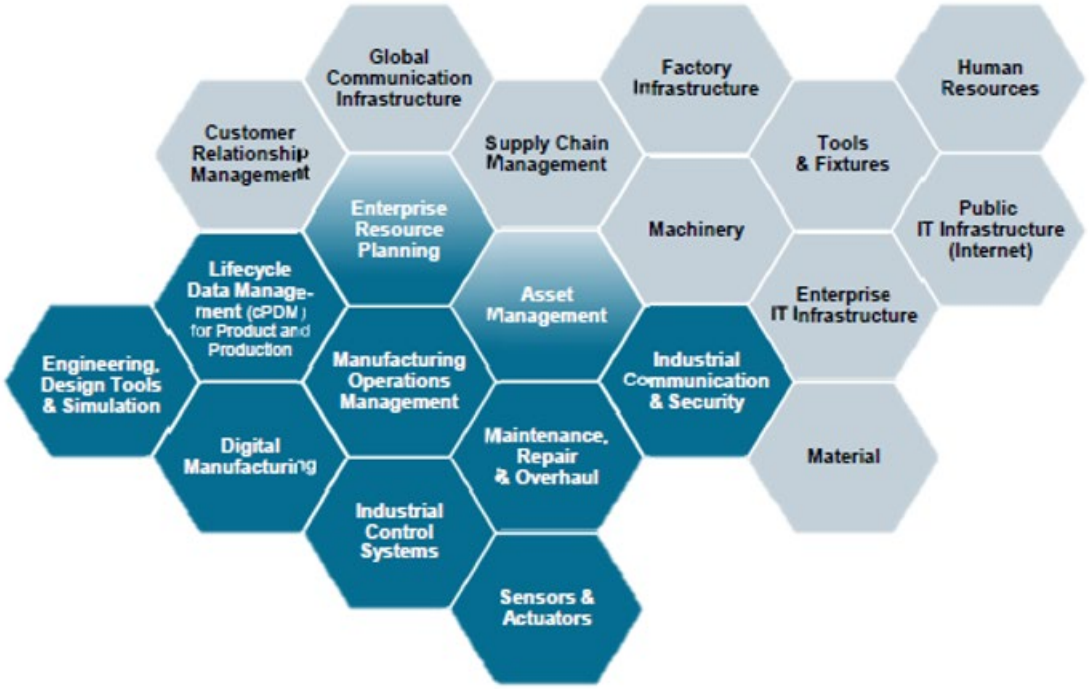

Figure 13 Aspects of a Manufacturing Value Chain

The various potential Implications of inclusion of Industry 4.0 are-

- Robot assisted Production.
- Predictive Maintenance
- Additive Manufacturing of Complex parts
- Machines as a Service
- Big Data Drive Quality Control
- Production Line Simulation
- Smart Supply Network

Hence with an apt strategy to harness the technology for the manufacturing operations and processes can be effective for the business.

Hence in this knowledge sharing article we have seen how a technological approach can help in devising a good IT strategy for Healthcare, Telecommunications and Manufacturing Industries. Hence a different industry segment/sector, have different technology personas for them and a different IT approach is required for devising a strategy for that organization.

Conclusion

We saw in this knowledge sharing piece how we need to take a different approach to IT strategy if a company is built on industry processes and sectors by utilizing examples from three key industrial sectors. Although we did not go into detail on any of them since the purpose of this post is to walk through an approach to consider when developing an IT strategy for their firm. The real IT strategy may change depending on the requirements, size, business processes, people, and technology personalities of the unique firm. One thing that must be maintained when developing any IT strategy is that its purpose is not only to positively influence the business and economy, but also to improve processes and individual value, which will aid in the growth of society and have a national and global impact.

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