# Smart Factory

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1. Digital Disruption

With the emergence of a connected world, there is a huge disruption taking place that is re-defining business & operating models within the corporate world. Boundaries between industries and sectors are becoming fuzzy in today's digital world. Termed as Digital Disruption or Industry 4.0, it is forcing businesses to rethink around five core themes –

- ***Digital Enterprise Strategy*** – Rethink business strategy and operating model for a digital age
- ***Incubation & Innovation*** – for Incubating new ideas and business models
- ***Continuous Experience Implementation*** - Analyse the world of the customer, then design and implement new experiences
- ***Digital Operations*** - Align, enhance and automate operations and supply chain to deliver on the promise of digital
- ***Digital Trust*** - Scan the digital data horizon, to safeguard data and secure communications
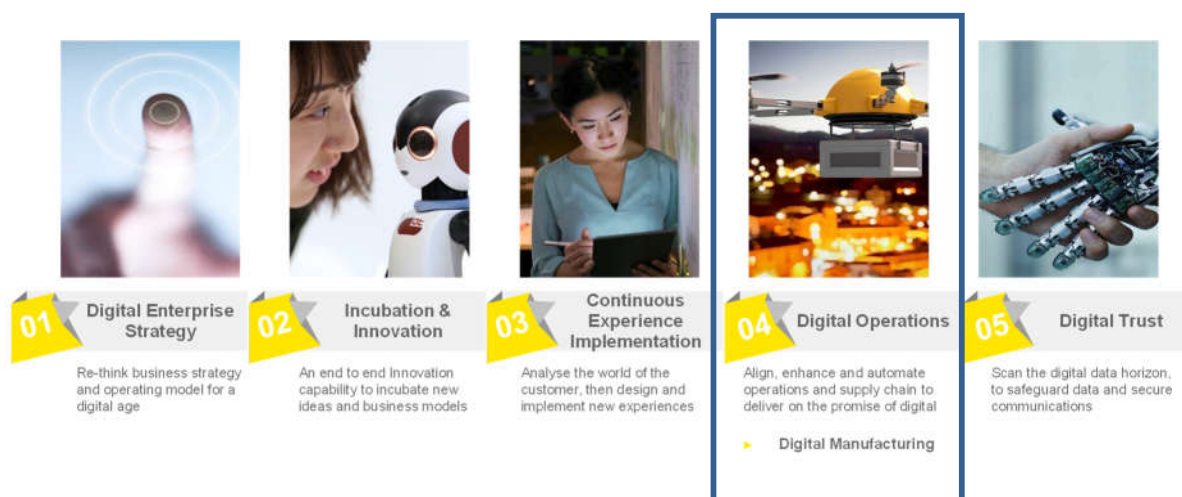
While there are many angles to the Digital Enterprise, in particular, within Operations, Digital is forcing a revolution termed as the 4th Industrial revolution, which is both a threat and an opportunity for Operations and in particular Manufacturing. Technology is bringing significant opportunities but the challenge for Manufacturers is where to start and external forces are shaping the contours of the "Factory of the Future".

2. Background & Context

Manufacturing systems in the last few decades have been subjected to pressures from all sides – internal and external and the response has not really kept pace with the demands of being faster, better and cheaper in all activities within the shop-floor.

Current factories are characterised with fragmented systems – Planning & Scheduling, Point Solutions, No end to end ERPs, Islands of data, Little alignment between Operational Excellence and IT applications, Lots of spreadsheet and manual data entries, no real time information, visualisation for operators, mostly manual paper based QMS etc. The complexity involved in managing a dynamic product mix, requirements to comply with the regulatory framework, policies and procedures, today's manufacturing environment is fraught with different kind of losses with respect to machine and manpower performance.

In a typical plant, the OEE (Overall Equipment Effectiveness) is around 50-60% (using the stringent definition) whereas worker engagement levels are around 30-40%. Value Added activities are in general only 10-15% of the total lead

time. Therefore, there is a huge scope for improvement and manufacturers have used various methodologies, tools and techniques to address these losses – Kaizen, Quality Circles, Structured Problem Solving, Lean, SPC/SQC, Six Sigma etc. – that are part of a thought out Operational Excellence program.

In fact, a successful and efficient World Class Manufacturing system is characterised by a strong Operational Excellence program that forms the base for performance improvement. While the above methodologies have helped in improving performance but there is also a tapering off of benefits, due to the kind of discipline, rigor, data maturity/reliability and investment of time involved in successfully applying these techniques.

3. Advances in Technology

Over the last few decades, Information Technology and Operations Technology (IT and OT) have made rapid strides and addressed the most common bane of operational excellence frameworks – absence of reliable data. With new and emerging technologies machine operating data very easily in real time. Coupled with that advances in analytical techniques based on statistical modelling and now machine learning algorithms, there is renewed interest and confidence in targeting very high levels of operational performance. With all these advances the future of a factory is bound to change drastically.

4. Smart Factory Vision

Based on an inter-connected world and increased data mining and analysis capability, the vision of Smart Factory provides an opportunity that can help manufacturers leap frog and bridge the gap that has been created. The term Smart Factory describes an environment that leverages new emerging and disruptive technologies to achieve unprecedented levels of operational performance that symbolises "Zero Losses".

Factory Ecosystem would change with advances in technology and inter-connectivity
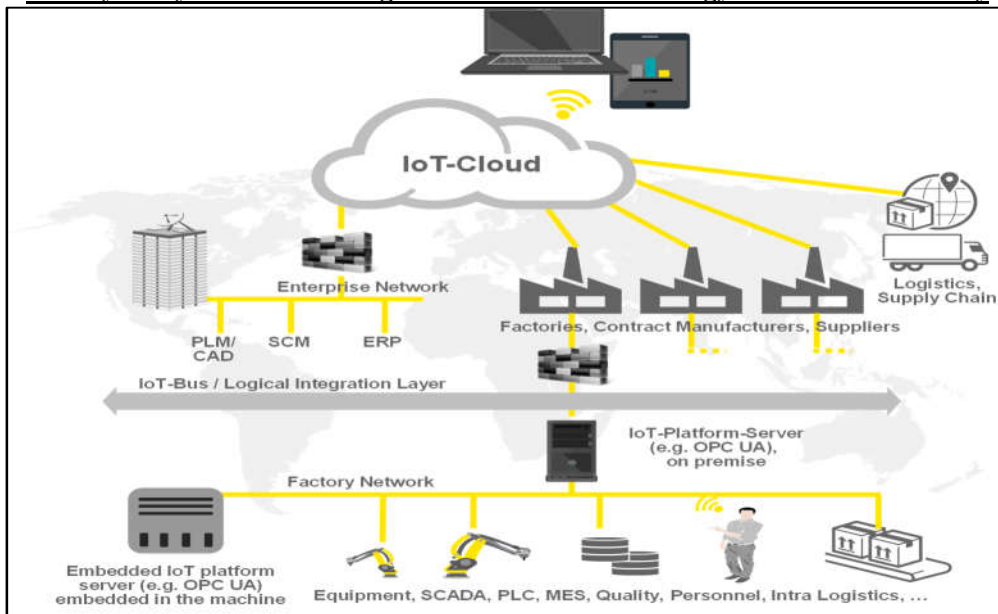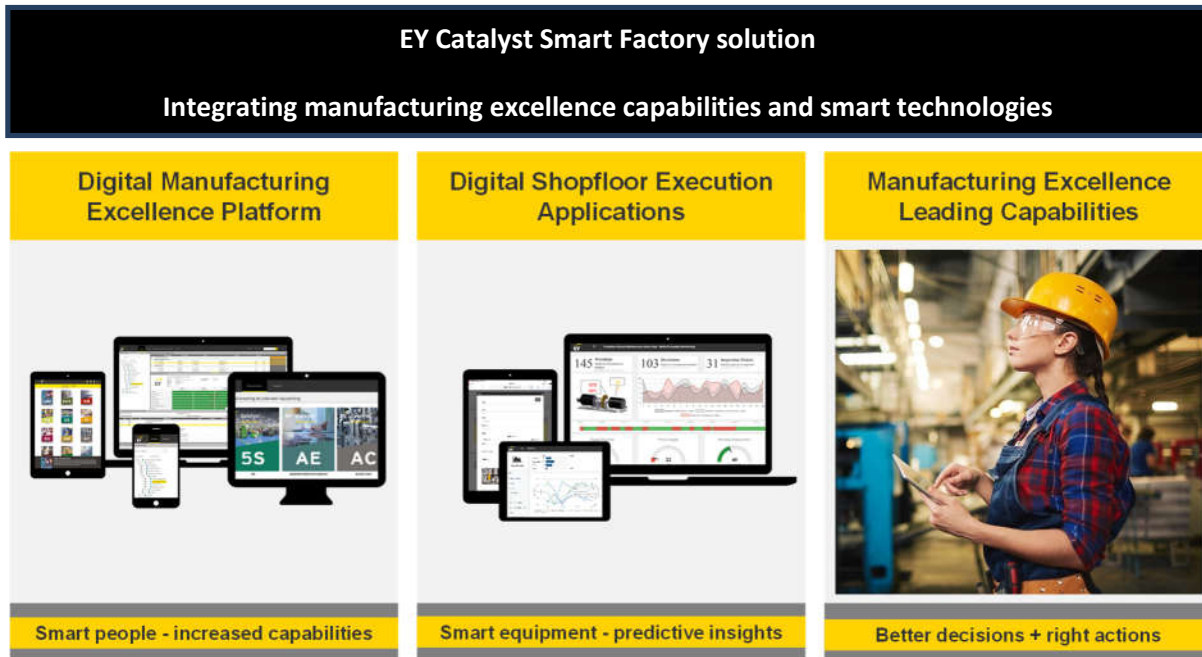

5. EY's Approach to Smart Factory

EY's approach to Smart Factory solution uniquely brings together Operational Excellence leading practice with Manufacturing 4.0 disruptive technologies. The Operational Excellence platform automates the improvement journey and is capable of providing customised plans down to the line level. Whereas a host of Manufacturing Excellence Apps create an inter-connected system that enables insights into the data being collected and harnessed for better decisions to manage the shop-floor.

6. Components of Smart Factory

The smart factory concept is based on two broad pillars –
- Digital Operational Excellence Platform (EY Catalyst)
- Digital Manufacturing Excellence Apps

The Operational Excellence platform is focussed on building capabilities within the workforce whereas the Manufacturing Excellence Apps are centred on obtaining better insights through data collection and analysis.

EY Catalyst Smart Factory solution

Integrating manufacturing excellence capabilities and smart technologies

Digital Manufacturing Excellence Platform	Digital Shopfloor Execution Applications	Manufacturing Excellence Leading Capabilities
Smart people - increased capabilities	Smart equipment - predictive insights	Better decisions + right actions

Digital Operational Excellence - EY Catalyst (Holding Opex in the Palm of your Hand)

Operational Excellence, sometimes also referred as Execution Excellence enables companies to execute their processes in a more efficient and effective manner that result in increased customer satisfaction and superior operational performance manifested through Enhanced Revenues from existing infrastructure, cost efficiency and ultimately better financial performance. While many companies have embarked on a variety of Operational Excellence programs, the promise has not been realised.

Holding Opex in the Palm

The reasons for underperformance are largely due to –

- Support from the top management to make the program successful
- Misplaced expectations from leadership on the investments and returns
- Integration of the Program with the strategic objectives of the company
- Capability of key people managing the program
- Knowledge about the program, tools and techniques is difficult to build and be accessible to employees
- Sustenance, Scalability and Standardisation is a long term game

EY Catalyst is a cloud based Digital Operational Excellence platform that helps companies improve performance through an Assess, Plan, Execute cycle. It is based on a 5 step maturity model on important elements (called Pathways) within the Manufacturing setup. Assessment phase helps in identifying the maturity on various themes within the Pathway. Once the existing maturity is understood, a planner helps in freezing a target state. EY Catalyst is then able to provide a step by step guide to the Pathway champion on improving the maturity.

Digital Manufacturing Excellence Applications
The manufacturing excellence applications are based on systematic collection of data, having the analytical power to generate predictive insights into the operations of the machine. These Apps are accessible through hand help devices and empowers a manufacturing personnel on the shop floor to record, analyse and take decisions that address performance gaps.

EY's Digital Shop Floor execution applications are linked directly to operational excellence
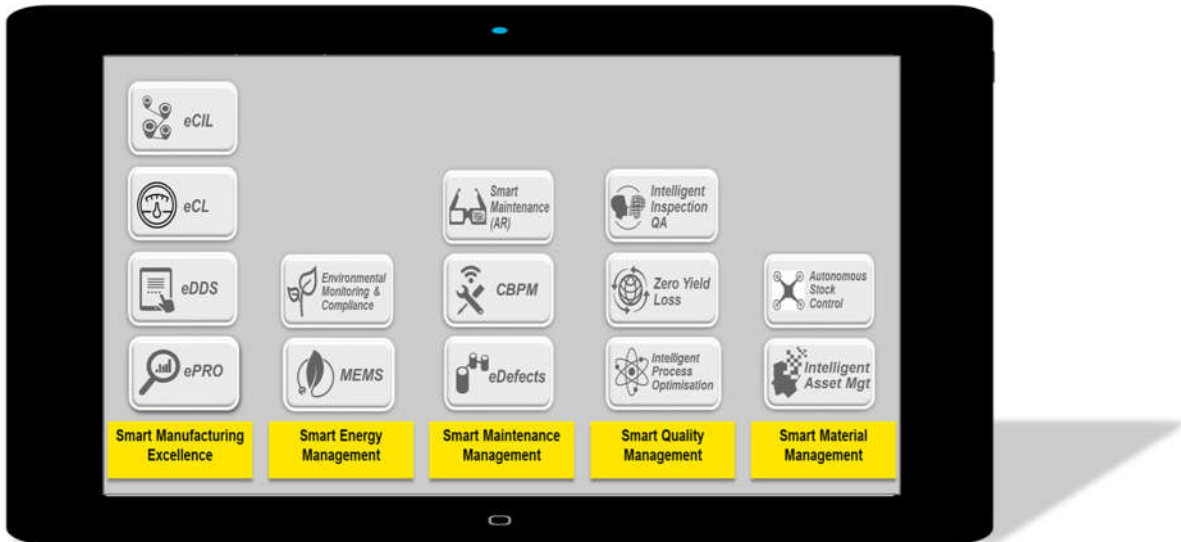
The App Store comprises clusters of inter-related and inter-connected applications. For example, once cluster of Apps helps in co-relating machine settings, status of preventive maintenance, equipment defect logging on the machine performance that is seamlessly reviewed through the Digital Shofloor meeting application. Similarly, there could be other clusters that address Quality Management, Materials Management, Energy Management etc. The entire setup is modular in nature and clusters can be added.

With the power of IoT and other emerging technologies - Robotics, Machine Learning, Augmented Reality etc. these Apps can be linked to the analytical platforms that provide the predictive insights.

Both components of the Smart Factory help people to take "better decisions" and the "right action" to push up the performance on the shop floor.

7.   Challenges associated with Smart Factory

A Smart Factory however needs careful planning and a robust implementation in order to be successful in achieving the promise it holds. However, to get the benefits from this evolved ecosystem, companies would have to focus on –

- *Interconnections with Suppliers and Customers* – the technologies and benefits associated with Smart Factory extend beyond just manufacturing into other associated functions – product development, planning, procurement, and material movement in a seamless connected manner. For reaping the benefits, supply chains and other systems have to connect with those of Supplier and Customers
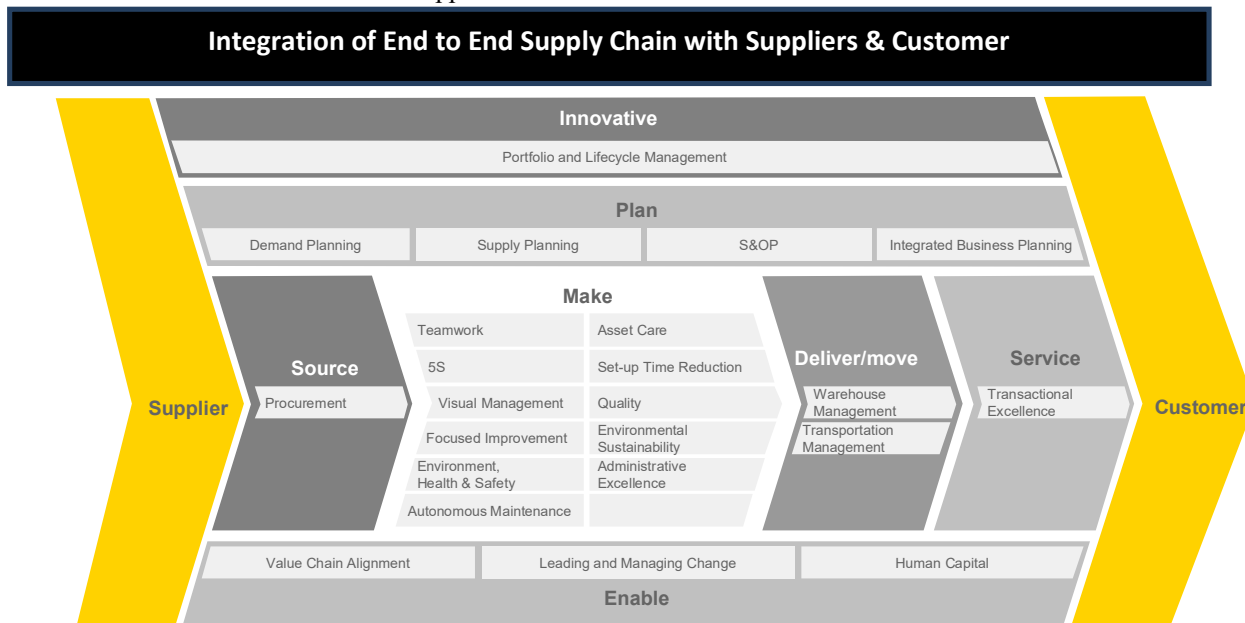
- *Integration of IT, OT and Digital Platform* – Companies would need to work out the compatibility and integration of Information Technology, Operations Technology and the Analytics platform for a successful implementation of Smart Factory

- ***Capability Building within the Workforce*** - The focus of Smart Factory is not only on machines but also on building capability within the workforce at all levels to be able to push the boundaries of operational performance. Usually the human aspect is getting ignored in the pursuit of technological revolution that later manifests in sub-optimal results. Companies need to invest on up skilling and cross skilling the workforce.

Future worker would need to be able to inter-relate data, analyse trends, develop insights and take right decisions. The worker of tomorrow on the shop-floor would need to be vastly different in terms of skills that he possesses, the equipment that is assigned to him, the communication mode/channels that he uses to carry out the tasks and activities that he is required to perform.

Digital Security - Finally, cyber security would play an important as Digital technologies get rolled out within businesses. With the increased risk of cyber-attacks that cripple systems or compromise on sensitive information, companies need to safeguard against technological breaches in security.