Towards Digital Lean Systems with Modeling in our Organization

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***Abstract*— The revolution in digital age of the 21st century with customer orientation made organization more imperative towards various digital wastes in cyber world, needing new approach/ techniques to enhance their digital capabilities with embedded systems to make a successful lean digital enterprise to meet their customer and stakeholders needs.**

***Index Terms*— Lean Manufacturing, Industry 4.0, Digital Lean Manufacturing, Digital Systems.**

I. INTRODUCTION

Lean Digital Transformation Principles' support companies in defining and implementing successful Lean digital agendas for substantial improvement in user experience and their engagement with initiatives harnesses three complementary domains: digital process-centric technologies, design thinking methods both removing traditional and digital waste from their processes, organization, products, and services, to radically improve the experience of their ecosystems.

The Organization need to integrate above lean principles into digital transformation in a highly effective way by radical simplification/ re engineering of process, to get most effective leverage during the digital journey proactively. Adoptability for DIGITAL LEAN SYSTEMS success is necessary as environment is ever uncertain and making decision making a challenge on aspects of resources, customer requirement, market sustainability, supply chain management, so strong link between people and technology with real time understanding with support will help to manage risk efficiently.

II PAST KNOWLEDGE GLANCE

Unlike past lean always drive performances with single piece manufacture, cello type layout , to plan and meet customer requirements with fever inventories either for raw material , in process or finished goods as such and waste reduction , but principle still hold strong roots during next advancement towards lean digital platform 4. Change the modus operandi of manufacturing processes. The IT tools transform products into complex systems that combine hardware, software, sensors, microprocessors, databases, and connectivity, forcing companies to rethink how they do everything internally to face new threats and opportunities (Porter and Heppelmann, 2014). In the scope of operational excellence practices, it is expected that the integration of I4.0 technologies will optimize the collection and analysis of data from manufacturing processes with high accuracy and speed, increasing the possibilities for improving business performance (Agarwal and Brem, 2015; Tamás et al., 2016).

III NEED FOR DIGITAL LEAN SYSTEM

The revolution of the digital age of the 21st century is that customer orientation is more imperative -- the era of Data Analysis, Artificial Intelligence, Robotics, and process automation with new data acquisition, data integration, and data processing and data visualization capabilities. So traditional lean Design/methodology/approach operating without adequate data leads to process inefficiencies and poor decision-making which affects every component of a company’s operation ranging from significant downtime to production losses. Lean Digital is sure way to remove digital waste in systems and developing their lean capabilities and embedding technological building blocks into their value streams. Lean Digital focused on the end customer, and Lean principles that focus on agility,

3.1 WHAT IS DIGITAL WASTE

There are two types of digital waste: (i) passive digital waste due to missing digital opportunities to unlock the power of (existing) data, and (ii) active digital waste as a result of a data rich manufacturing environment that lacks from the proper information management approaches to derive the right amount of information to be provided at the right time to the right person, machine or information system for decision-making (knowledge)

3.2 PLANING FOR DIGITAL LEAN SYSTEMS

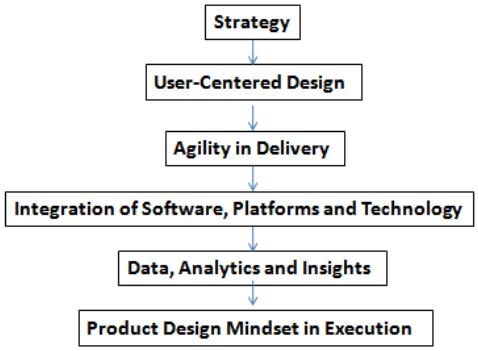

Fig 1 Model for Digital Lean Transformation

a) DIGITAL STRATEGY

A successful Lean Digital transformation must be based on an appropriate digital strategy, focused on making wise investment choices, maximizing return and value, and implementing with discipline.

b) DIGITAL INSIGHTS

This is the discovery phase which allows you to probe elements of your digital strategy in greater detail and develop a clearer view of the future digital experiences you are looking to develop.

c) DIGITAL PLATFORM

This is the delivery phase which focuses on enabling the digital capabilities and services (platforms, tools, workforce, and integrations) to realize your digital strategy.

d) DIGITAL GOVERNANCE

This critical element ensures the right focus in areas such as digital leadership, culture, metrics, reporting, value realization, change management, delivery and budget.

3.3 MODELLING FOR VALUE CREATION AND SELF ASSESSESMENT

How this design thinking, agile, growth hacking, and lean work together to unlock the true value for customer needs and market needs. e tracking of operators' movements in order to build spaghetti chart in real-time and provide motion optimization functionality as well as support for better ergonomic postures and movements to avoid injury.

The improvement mindset taking form of scientific methodology approach through integration between information technologies (IT) and industrial automation (IA) at levels with clear understanding application scenario with details on

Who - Current scenario

Why - Root causes and new goals /solutions

How –Run Experiments with learning and relearning in processes along with manifestation of new visual techniques with conducts of physical events/experiments as dynamics of work design.

Design thinking lead deep understanding of end user and real market /problems underlining with true psychology during quantitative techniques and hypothesis testing to provide contextualized solution to working requirements.

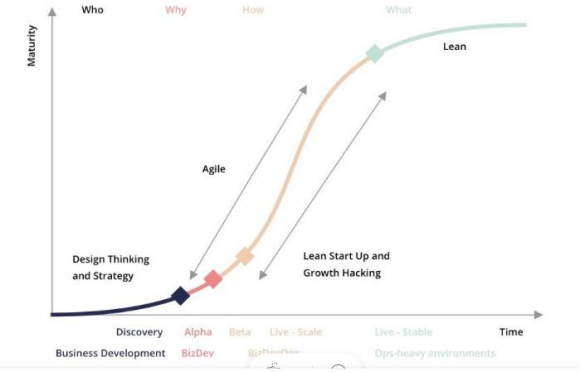

Fig 2 .Value Creation Feasibility Study

If Hypothesis done properly using data from user and their after optimize the process further with data from Google, customer feedback, market feedback.etc

Focus – Deliver consistent results output

The Smart Factory must deal with the complexities of the production environment using decentralized communication and information structures, with the following specificities (Lucke et al., 2008):

3.4. LINK BETWEEN TRADITIONAL LEAN AND DIGITAL LEAN SYSTEMS

- Digital Value Stream Mapping
- Real Performance Measurement through CPS and Big Data
- Predictive Maintenance using Big Data and CPS
- Pull System aided by Digital Controls (eKanbans)
- Corrective Actions Using CPS and Andons
- Inspection and Mistake Proofing with advanced Robotics and CPS
- Reduction of Setup time with aid of CPS and Big Data Analytics
- Waste Elimination through Addictive Manufacturing
- e-Maintenance Activities
- Standardized Results to Reality
- Digitalization of Supply Chain Activities (Logistics)

3.5 DATA COLLECTION PROCESS

The data collection was aimed at the manufacturing process of structural components of each process with the highest adherence to I4.0 technologies. This process covers several activities, such as cutting, forming tooling charge, and assembly. To make the collected data actionable, and IT infrastructure is needed that allows structuring and analyzing the data. It is important to not only display the insights on a data dashboard but directly trigger corrective actions. The combination of data analytics and workflow management ensures work coordination in real-time.

With embedded smart sensors collect data around the shop floor including quality data, part counts, machine utilization, and other key data and metrics World is changing ever with automation in processes for hyper speed with embedded artificial intelligence thus making rapid changes in way, we work in advanced manufacturing setup with decision making with data to match zero error, sustainable, fever resources and digit monitoring with fever human intervention. Digital lean uses Industry 4.0 and other digital tools to provide more accurate, precise, and timely information about operations. It not only helps realize lean principles but also increases the impact of core lean tools, such as kanban.

- It starts with data IOT platform for production optimization
- Human worker are critical to make things happen.
- Learning and Re Learning
- Engagement in Real Time via Gadgets
- Information sharing, action in real time
- Built real time lean workflows
- Deliver optimized processes
- Powerful embedded analytics
- System to track any bottlenecks.
- Process excellence to core

3.6 DIGITAL CHANGE MANAGEMENT

a) Feasibility study to understand the type of technology, infrastructure, software, trainings, platform, and support to match existing product/service based on market survey, benchmarking with best and also getting expert advice.
b) Study of risk involved for business goals at 360 degree including stakeholders and existing brand value.
c) Survey on Human aspects to prepare their involvement with proper mindset via training , transfer, delegation , new recruitments and existing staff terminations ...etc
d) Establishing the central office to coordinate the process of digital transformation with due governance and support of funds/approvals.
e) Plan the Top management meeting to ensure vision, mission, objectives and KPI are established for each level, and change agents activated.
f) Training, Retraining and unlearning are initiated to overcome any resistance and make digital journey meet the business goals to stakeholder satisfaction.
g) Core points in Process stream of supply chain, their data management communication and related KPI with due responsibility and authority.
h) Pilot study of digital platform with 100 percent communication network to ensure clear understanding, session on doubts, verification, clarification and solution for any problems to make things user friendly with clarity.

i) Get data on gaps, training needs, failures, and data output, communication, network problem to ensure the setup is corrected and stabilized for match initial blue print established.

IV IMPLEMENTATION OF DIGITAL LEAN 4

But in this world of data analysis and AI automation have make and on systems more viable on decision making during production run successfully with true reporting as speeds from edge computing are fast enough to stop machines immediately if a safety hazard is sensed, and speeds are largely indiscernible from real-time to humans on real hidden problems on any variations to work and fix to ensure the continuity and sustainability of commitment in real platform.

a) DIGITAL ANDON SYSTEM

A digital Andon system enables real-time collaboration across functions such as maintenance, logistics, and quality. With digital workflows, the Andon alarm becomes a dynamic alarm: alarms are enhanced with additional metadata and can be assigned to the right person at the right time based on configurable business rules. This improves the availability of the whole line and allows smaller buffers in cycle times, reduced costs of rework, and more stable operations.

b) DIGITAL KANBAN

RFID embedded kanban system can be used to track unit-level material consumption in real-time and automatically trigger replenishment to worker tablet to ensure kanban bin replenishment faster due to artificial intelligence to gauge the events with deep algorithm analysis platform.

Digital Boards are made available with large touch screen, So that team input are automatically updated with due marked responsibility for active follow up via mobile app with responsibility as well as for team transparency by improving team collaboration.

c) PRODUCTION LEVELLING

Synchronization between production and (raw) materials demand (of a specific item, in specific quantities, to be delivered to a specific location (e.g. smart bin or smart dashboard)) at a smart workstation, or even forecast such demand need by means of advanced data analytics, to optimize material handling and transport time as well as the time and effort needed for (e-)Kanban cards handling thanks to electronic real-time communication (viz. faster signals transfer) through e-messaging and e-alerting (sub-) systems between the workstation and its supplier(s).

With knowledge bank of previous production history on production runs of complex mix of products during digit lean production scheduling , this will generate optimized schedules based on machine availability, change-over times, process quality and workforce utilization by combining this data with data from shift planning allows manufacturers to optimize planning.

d).SMED

Real time for each machine set up data matrix need to be generated and be it part of Dynamic production planning with due emphases after standardization of time and method study on each operator tasks for real time efficiency in entire production line.

e) PROBLEM SOLVING

AI-powered vision systems can report what's happening at all stations concurrently and let a human know within seconds whether a process was outside of acceptable bounds. More time can then be spent solving the issue and knowing that the team is solving the correct problem real ROI on the bottom line but ultimately give more time for leaders to focus on solving the real issues

f) PROCESS MINING FOR CONTINUOUS IMPROVEMENTS

Process mining can be used for further improvements via event log data from process execution on the shop floor

- Collecting process data with event logs in information systems
- Process discovery and Conformance checking to identify optimization potential
- Process model enhancement to define the target process model and how to reach it
- Implementation of the identified process improvements
- Continuous improvements: collecting data from the new process implementation

Prioritize, assign and implement the most valuable improvements.

Get insight from automatic statistics and ROI reporting by is to detect, fix, predict and prevent unstable process parameters and/or avoid quality issues inside defined tolerance ranges.

V. ANALYSIS OF DIGITAL LEAN IMPLEMENTATION MODEL OUTCOME

a) Performance exploration is crucial stage to ensure model is perfectly adhered and implementation to reach capability of absorbing digital aspects of lean as intended.

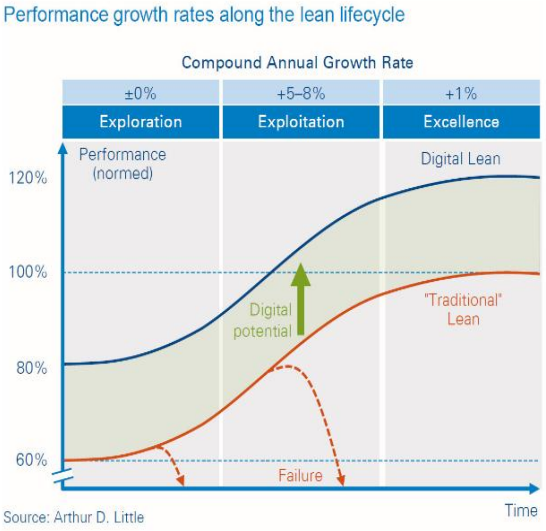

Fig 3 Performance during Digital Lean Journey

b) Performance exploitation of up to 8 percent can be expected during the Lean Exploration phase. This decreases as performance improves, and tends to stabilize at around 1 percent

c) Digital technologies have the potential to make a further step-change improvement across all phases until excellence is reached to above 100 percent mark

5.1 .CHALLENGES DURING JOURNEY TOWARDS DIGITAL LEAN SYSTEMS.

The technology market is evolving quickly and the project remains vigilant, looking out for accelerators and/or disruptors

- Traditional process do not support the digital transformation
- Short term benefit to be ignored , only for long term
- Platform used if not be compatible to organization need, may lose the market share.
- Learning and unlearning at employee levels.
- Investment in resources costly affair
- Traditional process may act as bottleneck du e to compatible need of new digital technology
- Change management and investment of resources on technology
- Short time sustainability
- Learning and unlearning by people working
- Network and relation management.
- Supply chain Management with stakeholders

5.2. RESULTS OF DIGITAL LEAN 4

Digital LEAN boards are live system constantly being fed with the latest updates on activities; KPI's, fed directly through the tools, automatically generated or pulled from integrated third party systems.

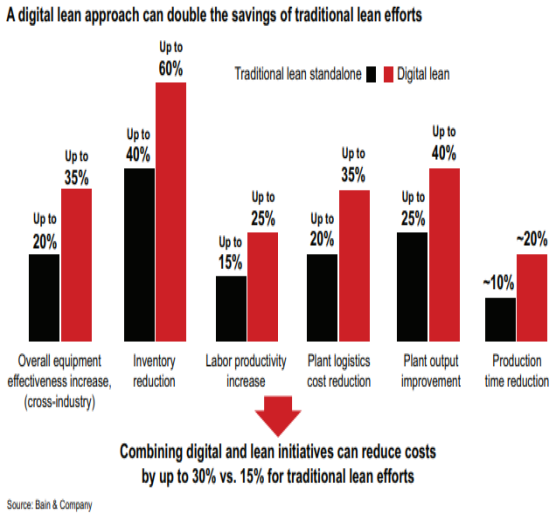

Fig 4 Results Impact due to Digital Lean Systems

5.3 BENEFIT OF DIGITAL LEAN SYSTEMS

Strengthen your lean culture and get the best of your team. Solve common challenges across functions and locations.

- Save time on manual updates
- Identify and implement the best improvements
- Remove bottlenecks
- Make smarter decisions
- Increase return of lean investment

Fig 5. Benefits of Digital Lean Systems

V. CONCLUSION

Industry 4.0 is unleashing a variety of technology that is spurring a leaner manufacturing industry. The core of these solutions involves extracting data from operations and using it to drive better, faster decision-making across the business, to drive immediate value from systems, whether one is in charge of maintenance, quality, production, or the entire plant. Starting with the basics and focusing on the heart of the operation (the machines and people on the shop floor) will help build the foundation for a smarter, connected lean operation.

But finally A successful Lean Digital transformation must be based on an appropriate digital strategy, focused on making wise investment choices, maximizing return and value, and implementing with discipline, please also take word of caution that effective digitalization of business can make you a business leader; however, if not executed accurately, it can destroy your business too. Around 70 per cent of digital transformation projects have been failing. Even successful digitalization projects have become white elephants or expensive during the operations phase

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