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**SCHOOL OF MANAGEMENT**

**kontempore**



# Executive Report

## THOUGHT RAMP SMART MANUFACTURING: Cultural Imperative

**Date:** 24<sup>th</sup> January, 2020

**Venue:** The Pride, Shivajinagar, Pune

## Insights from Manufacturing ThoughtKamp: An Executive Report

The future of manufacturing will revolve around the way companies will embrace change, especially how they will leverage constantly developing digital technologies. As industrial manufacturers continue to expand their use of intelligent systems and platforms that securely gather and enable data; they will optimize business processes, reduce supply chain and manufacturing costs and ultimately drive improved profitability and productivity.

### Event Overview

The 4th Industrial Revolution has arrived, ushering in unprecedented changes along with profound opportunities. Digital technologies associated with Industry 4.0 are driving tangible results as they are faster, cheaper and more affordable, e.g. AI-ML, IOT, IIOT, AR-VR, 3D Printing, Generative Design, Big Data, Cloud Technology etc are accelerating the sector growth. Additionally, the right working environment along with enabling employee support system is a crucial step in transitioning to smart manufacturing. Engineers who have been trained in the conventional manufacturing systems considers such re-skilling initiatives a daunting task. But, the ability to experiment with such new tools to experience their capabilities and limitations, will ultimately help encourage the new ways of thinking. It's absolutely factual that if manufacturers are given access to the right tools and employees are also inspired to find creative solutions to business challenges, there will be countless ways to unlock new business opportunities.

Industry 4.0 also requires new skills and new ways of working. It requires new investments, organizational change and employee upskilling. But keeping pace with Industry 4.0 is a necessity in growing customer relationships and attracting new business. For example, some of the key capabilities of an effective Industry 4.0 Manufacturing Supply Chain are:

- Greater Customization through Additive Manufacturing (3D Printing)
- Full Integration of Advanced Analytics & Big Data
- Beyond Post-modern ERP Mindset for Unprecedented Integration
- Incorporation of IOT for Networked Machines & Sensors
- Increased Application of Cloud Technology
- Development of Autonomous & Cooperative Robots
- Enhanced Robust Cybersecurity

Let's take the 1st key capability as an example, i.e. 3D printing. This technology is upending the manufacturing sector as it allows manufacturers to add and bond layers of material to form a fully-functional part. This shift has tremendous impact on the manufacturing process and what it can deliver. Thus, it is driving manufacturing efficiency by shortening the design cycles including time between production and delivery along with lowering the overall production costs. It also creates opportunity for designers to incorporate new technologies into their day-to-day work via generative design and ML. Designers can today review thousands of AI-generated design options and choose the one that meets their most important criteria. Also, as raw 3D design files are linked directly to the 3D printers, this facilitates rapid prototyping with precise amounts of material to avoid wastage.

Thus, Industry 4.0 has more nuanced impact by changing the ways designers, manufacturers, engineers and managers use to work, the technologies they use and the training they require in future. As engineering and design activities are inextricably becoming inter-linked; it is absolutely prevailing for the next generation of technocrats to learn and master the related hybrid tertiary courses. These courses fuse design thinking with engineering knowledge and practice to give graduates the skills required to contribute to the growth of smart manufacturing. To cater to such needs, interactive discussion forums like Kontempore is required wherein practicing engineers and academicians can come together to brainstorm and suggest future course of actions to create a win-win-win situation for all stakeholders (Industry-Institutions-Learners).

## Genesis Exposition

Kontemporeis a convocation of industry thought leaders wherein a discussion forum is enabled to identify and tackle the challenges being faced by the specific industry segments. As a part of ThoughtKamp series; round table discussions and interactive sessions on the topics of contemporary interest to industry practitioners are periodically organized. The present event is an attempt in the same direction where select senior professionals from the manufacturing sector were invited to share their ideas, experiences and views.

Few sub-themes (but not limited to) were identified for the discussions as mentioned below:

- Manufacturing Excellence and Total Quality
- Talent Value Proposition and Socio-Political Transformation
- Demand for Customization and Sustainable Production
- Robotics and Automation
- Understanding Smart Machines
- Industrial IoT and Manufacturing
- AI and Autonomous Vehicles

Event's 'Guest-of-Honor', Mr. Sharad Gangal, Executive VP (HR, Admin & IR), Thermax Global, Pune presented the context of 'ThoughtKamp' theme to the audience and its relevance in the present VUCA times. The main abstract of his speech was the creation of an effective 'Synchronized Production Systems' within the manufacturing organizations wherein all the activities including movement of information, materials and other resources (along with human resources) through all the stages of manufacturing processes should be completely harmonized in order to achieve higher productivity of the entire supply chain. He emphasized that a complete in-sync manufacturing is better equipped to embrace any change with respect to Industry 4.0 requirements.



The table proceedings were captured by the repertoire which is presented below:

## Collation of Table Discussions

IDEAS	ACTIONS
<b>'PEOPLE' TABLE</b>	
<b>Question-1:</b> What kind of workforce would succeed in the era of Smart Manufacturing?	
<p>Adaptable and agile workforce</p> <p>Adequately qualified and digital-aligned</p> <p>Enterprising and risk-taking</p> <p>Flexible and open-minded (across domains and skill-sets)</p> <p>Loyal, young and dynamic workforce</p> <p>Multi-skilled mixed workforce (including Gen-X, Gen-Y and Gen-Z categories)</p> <p>One who can contribute through original innovative ideas (smart workers)</p> <p>Self-driven and self-managed teams (under a democratic leadership)</p>	<p>Advocate cultural 'Change Programs'</p> <p>Awareness to welcome and adopt new technologies</p> <p>Build a culture for innovation within the organization</p> <p>Conduct related technical activities</p> <p>Create workplace for future skills, i.e. through competency development centers</p> <p>Cross-pollinate talent across organizations and industries</p> <p>Ensure mix of 30-40% Gen-Y and Gen-Z in the workforce</p> <p>Imbibe up-skilling strategy for niche technologies</p>
<b>Question-2:</b> How do you strategize & meet talent requirement for Smart Manufacturing?	
<p>Clear short-term plans aligned to strategic planning which include:</p> <ul style="list-style-type: none"> <li>• Diversity &amp; inclusion</li> <li>• Hire for altitude</li> <li>• Hire &amp; build</li> <li>• Visionary-leadership</li> </ul> <p>Continuous exploration of customer requirements</p> <p>Driving customer centricity across the organizational</p> <p>Employee Branding aligned to EVP (Employee Value Proposition)</p> <p>Strategic workforce planning</p>	<p>Adopt capability planning aligned to business horizon (min 5 years term)</p> <p>Collate and customize needs of customers</p> <p>Create workforce with solid domain expertise which are risk-takers and have entrepreneurial competence</p> <p>Initiate 'Early Career Talent' initiatives &amp; build a culture of an innovative organization</p> <p>Prepare clear vision on Short-Range (SRP) and Long-Range Plans (LRP)</p> <p>Strong academic and business partnerships</p> <p>Practice virtual on-the-job training of employees</p>

IDEAS	ACTIONS
<p><b>Question-3:</b> How do you build Industry 4.0 capability for a future ready organization?</p>	
<p>Create an environment for achieving objectives of Smart manufacturing</p> <p>Cultural shift from working in silos mindset to agile workforce</p> <p>Define productivity and efficiency w.r.t. Industry 4.0 requirements</p> <p>Encourage enterprising mindset</p> <p>Establish forum of least investment on time, money and energy keeping of course innovation, digitalization in mind</p>	<p>Align performance evaluation matrix with smart manufacturing goals</p> <p>Create in-house training centers</p> <p>Cultivate 'Shift-Left' culture internally</p> <p>Establish technology partnerships</p> <p>Establish transparency in communication within the organization</p> <p>Imbibe 'Walk-the-Talk' culture</p> <p>Properly align vision of the company with priorities of the employees</p> <p>Take advantage of Tech-savviness of the millennial workforce</p>
<p><b>Question-4:</b> What cultural changes you foresee with implantation of Smart Manufacturing?</p>	
<p>Align organizational current processes with global ERP (Enterprise Resource Planning) system</p> <p>Higher productivity and efficiency of the workforce</p> <p>Creation of self-driven entrepreneurial millennial workforce with conconvation of performance</p> <p>Vision policy of the company in-line with smart manufacturing goals</p>	<p>Adequate train for specific products and technology</p> <p>Create passion for 'Cultural Change' because 'Carat &amp; Stick' approach will not work</p> <p>Ensure democratic leadership with collaborative approach for work</p> <p>Establish data-driven design thinking approach, i.e. fail fast - learn fast</p>
<p><b>Question-5:</b> How do we build change champion to make organization change ready?</p>	
<p>Advocate role modeling approach imbided with organizational core values</p> <p>Appoint change agents in every sphere of the organization</p> <p>Introduce 'Emotional Intelligence' among working groups</p> <p>Establish 'Be-the-Change' philosophy</p>	<p>Involve people through the change process rather than being top-to-down approach, i.e. change should not threaten people but rather should be adored</p> <p>Motivate employees to be the change champions (Employees should ask themselves what's in it for me?)</p> <p>Seniors to display high-quality performance to act as role models</p>

IDEAS	ACTIONS
<b>'PEOPLE' TABLE</b>	
<b>Question-1: What kind of process brings productive output in the era of Smart Manufacturing?</b>	
<p>Adopt 'Manufacturing Excellence Model'</p> <p>Adopt lean and integrated manufacturing Processes</p> <p>Apply traceability for the process improvements</p> <p>Contract and toll manufacturing</p> <p>Efficient manufacturing data storage</p> <p>Flexibility in product range and product localization</p> <p>Flexible manufacturing set-up</p> <p>Implement 'Zero Defect' policy</p> <p>Implement automation, i.e. manufacturing processes with less manual work and maintenance</p> <p>Improving OEE (Overall Equipment Effectiveness)</p>	<p>Develop employee ownership of the QIP (Quality Improvement Process) and motivate to follow QMS standards</p> <p>Implement and advocate CIP (Competitiveness &amp; Innovation Framework Programme)</p> <p>Implement SOP / EOP plans</p> <p>Implement various competitive LEAN manufacturing strategies, e.g. PDCA (Plan, Do, Check, Act), VSM (Value Stream Mapping) &amp; SMED (Single Minute Exchange of Dies), Poka– Yoke (Error Proofing), Chaku-Chaku, SMART Goals, RCA (Root Cause Analysis) etc</p> <p>Perform data analytics to predict and take appropriate correct actions</p> <p>Assign complex work to machines and automate</p>
<b>Question-2: How customer expectations are changing the Manufacturing Industry?</b>	
<p>Fast product service with right quality and low operational cost</p> <p>Increased variables and demand flexibility at lesser fixed cost</p> <p>Shift in customer expectation from mass production to customization</p>	<p>Industries need to be more competitive w.r.t. go-to-market strategy</p> <p>Introduce new standards to accommodate frequent design changes</p> <p>Introduce flexibility in mass production</p> <p>Understand market, market and customer requirements</p>
<b>Question-3: What steps you take to improve on Industry 4.0 changing product life cycles?</b>	
<p>Application of IOT, IIOT, smart machines, Poka-Yoke etc</p> <p>Shortening of the validation cycles along with continuous improvement, e.g. Pharmaceutical industry runs on batch manufacturing concepts leading to longer lead times but as the product life-cycle is shrinking appropriate changes must be adopted</p>	<p>Adopt 'Cyber-Physical Systems'</p> <p>Create 'extension' strategies for product lifecycle which may include rebranding, price discounting and seeking new emerging markets</p> <p>Move towards small batch sizes to create flexibility in manufacturing</p> <p>Implement FMS (Flexible Manufacturing Systems)</p>

IDEAS	ACTIONS
<p><b>Question-4:</b> How are you automating your operations using data analytics to improve overall manufacturing performance?</p>	
<p>Connecting machines with ERP / SAP for first level of analysis</p> <p>Process automation prediction via patterns using historical data</p> <p>Using smart sensors and control systems enabling communication among the equipment</p>	<p>Collect data from control system for the machine self-diagnostics</p> <p>Create complex data structures by using big data analytics to optimizing OEE (Overall Equipment Effectiveness)</p> <p>Create standards for set-ups &amp; machines</p>

<p><b>Question-5:</b> How are you handling change management processes, culturally and technically?</p>	
<p>Create awareness on Industry 4.0, i.e. making benefits visible, training and up-skilling / re-skilling</p> <p>Create 'Show-Station', i.e. benefits of 'Smart' need to the Understood by the customers and manufacturers</p>	<p>Consolidate assist lines and equipment for multiple customers</p> <p>Multi-skilling of employees by giving exposure to different customers</p> <p>Use exhibition platforms like a small model smart factory</p> <p>Understand and incorporate customer requirements during design stage itself</p>

**'TECHNOLOGY' TABLE**

<p><b>Question-1:</b> What are the new cutting edge technologies required for Smart Manufacturing?</p>	
<p>3D Modelling and Printing</p> <p>AI-based machines, robots, e-commerce and manufacturing processes</p> <p>AI-based monitoring, distribution &amp; collection processes</p> <p>App-based models for data capturing</p> <p>Applications for machine engineering</p> <p>Implement 'Make-to-Order' concept</p>	<p>Adopt end-to-end e-commerce coupled with manufacturing and distribution systems</p> <p>Adopt high-end ERP systems (Supply Chain)</p> <p>Apply graded versions of SAP, SCADA, ANDON etc</p> <p>Implement electronic KANBAN Systems</p> <p>Implement strong ERP systems coupled with SCADA</p>

IDEAS	ACTIONS
<p><b>Question-2: Who owns technology within the organization?</b></p>	
<p>Chief Digital Officer or identify appropriate skilled person (New Role) R&amp;D Team Data analytics group Top leadership (with adequate support from HR and researchers who can get market needs for the technology implementation)</p>	<p>Involve core team during implementation of new processes Work with 'Bottom-Up' approach with ideas on niche technologies Link special task force of researchers, business analytics and developers directly to the end-users</p>
<p><b>Question-3: How are you ensuring the smooth digital transition with regards to Industry 4.0?</b></p>	
<p>By CIP (Continuous Improvement Process) approach Adopting e-commerce tools to ensure pro-active investments Eliminating fear of unknown by ensuring product viability in a highly volatile consumer-driven market Adopting online remote monitoring tools for effective process control Ensuring pro-active Communication within business Identification of sustainable technology &amp; supporting tools</p>	<p>Adopt capability building approach, i.e. create capable and faster after-market response technical teams Ensure core team is part of the new manufacturing process implementation plan Form Mechatronics engineers group to undertake the task Identify the opportunities by making customer aware about the time transformation and associated benefits Adopt 'Frugal' approach for manufacturing under 'Value Engg' umbrella</p>
<p><b>Question-4: What could be possible Industry - Institute technology collaboration for a future ready manufacturing workforce?</b></p>	
<p>Creating courses for Industry 4.0 manufacturing areas like 3D modelling / printing and robotic setc Creating online web-based live sessions, webcasts, webinars by industry professionals Designing structured student internship programs, e.g. sandwich programs inbuilt with min one year OJT Provision for faculty sabbaticals</p>	<p>Help Academia introduce Industry-Driven curriculum (basis current industry requirements) Provision for appropriate training within educational institutions Utilize mobiles, cloud technology for larger global connects Provision for 'Capstone' projects for students within academia Allow sabbatical for faculty to do live training at companies sites</p>



IDEAS	ACTIONS
<p><b>Question-5:</b> Augmented Reality/ Virtual Reality (AR-VR) is changing the industry. How would it be a game changer for improving the manufacturing productivity?</p>	
<p>AR-VR reduce equipment downtime and brings in accuracy during manufacturing</p> <p>Helps improve speed and quality of data for process control</p> <p>Favors easy and cost-effective prototyping / modeling</p> <p>Leads to less logistics challenges and product failures</p>	<p>Connect with modern ERP systems to effective exaction of data to manufacture with priority</p> <p>Use sophisticated tools to visualize and predict the diagnosis rather than trial &amp; error method, e.g. 3D Printing, sensors for electric and autonomous vehicles</p> <p>Adopt for employee training especially for operations involving high-risk for accidents</p>

## List of Participants

Guest Name	Company Name	Designation
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