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Leveraging Design Thinking for Value Enhancement of

Digital Transformation in Manufacturing Industry

Dr Kumudhini Ravindra & Muthukumaraswamy DPK

Innomantra Consulting

EXECUTIVE SUMMARY

Digital Transformation has been making waves and has found widespread recognition in most industries. What started as a driver of marginal efficiency is now rapidly shifting to become an enabler of fundamental innovation and disruption within an organisation. The scope and scale of digital-driven change continue to grow immensely. However, organisations are still grappling with the nuances of the journey of digital transformation implementation, its implications or its impact. Digital transformation is not about adopting technologies but having an integrated approach involving people and leadership.

This white paper presents the context of digital transformation in manufacturing organisations. It redefines the process to incorporate important aspects such as breaking the silos, rescoping the challenge/ objectives, having an iterative approach and using design thinking to better understand the value implication of such an exercise. Case studies from clients have been used to illustrate the same.

Keywords: Design Thinking, Industry 4.0, Manufacturing industries, Smart factory, Value Assessment, Digital Transformation, Value Implementation

Digital Transformation to Rethink and Reinvent Organisation

Digital transformation is a staged initiative within an organisation. It drives organisations to rethink and reinvent its people, process, tools, business model used for integrated digital technologies. It attempts to maximise the potential business contribution of digital technology and minimise uncertainties and ambiguity. This is done by enabling capture of critical and real-time data, analysis and its utilisation towards more informed decision making, effective utilisation of resources and improved value derivation within the organisation.

According to a Worldwide Semi-annual Digital Transformation Spending Guide by International Data Corporation (IDC), worldwide spending on Digital Transformation has past $1 Trillion in 2018. This will be led by the manufacturing industries. The spending is expected to increase to $5.9 trillion over the years 2018 to 2021. One can thus see why this topic continues to be a central area of business leadership thinking.

Discrete manufacturing and process manufacturing have spent more than $333 billion combined on Digital Transformation solutions in 2018. Figure 1 illustrates that nearly 30% of all Digital Transformation spending worldwide this year was in the manufacturing industry. From a technology perspective, the largest categories of spending are applications, connectivity services, and IT services as manufacturers build out their digital platforms to compete in the digital economy. (IDC, 2018)
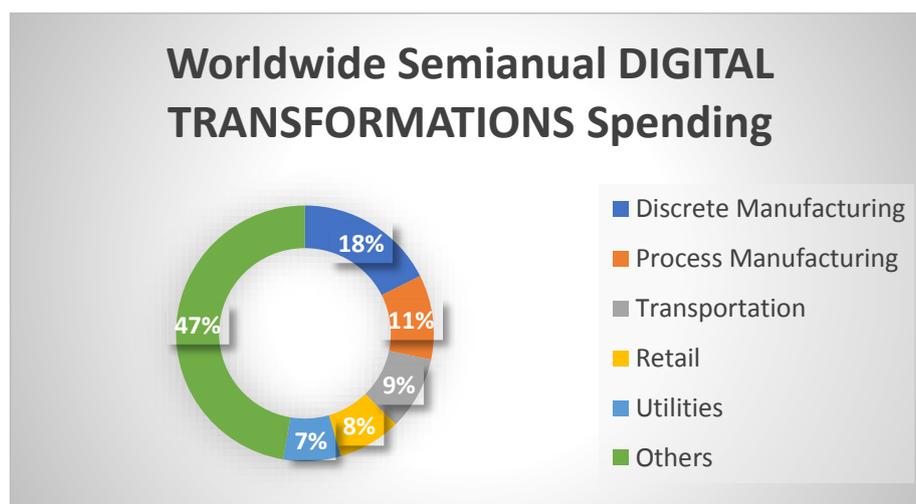

Figure 1: IDC Worldwide Semi-annual Digital Transformation Spending Guide - Technology Forecast, 2017

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The main objective and top spending priority of Digital Transformation in Discrete and Process Manufacturing industries is smart manufacturing. Organisations have invested more than $161 billion in 2018-19. This includes initiatives that focus on material optimisation, smart asset management, and autonomic operations. Both the industries are investing heavily in innovation acceleration ($33 billion) and digital supply chain optimisation ($101 billion). The strategic priorities that would receive significant funding this year include digital grid, Omni-experience engagement, omnichannel commerce, and innovation acceleration. Additionally, it has been identified that some of the strategic priority areas with lower levels of spending this year include building cognitive capabilities, data-driven services, and benefits, operationalising data and information, and digital trust and stewardship.

Digital Transformation is essentially an exercise in Change Management within the organisation and must be recognised as such.

Decoding and Decrypting Digital Transformation

Despite Digital Transformation being at the forefront of every organisation's agenda for over a decade, organisations are still experimenting with it like a crystal ball. A clear definition for Digital Transformation remains non-existent. Given this scenario, how can business leaders and organisations be expected to consistently unlock their value from digital investments in a rapidly advancing world?

The manufacturing industry has been the lagging to get on the bandwagon of Digital Transformation. Even though most of these organisations are Industry 2.0 /3.0 compliant, they are not Digital Transformation ready. Industry 4.0 as a cornerstone for Digital Transformation has been defined as the way forward for the discrete manufacturing industry to endure with competitive advantage in changing times. Thus, getting systems to capture data and making meaningful insights from it and helping in diagnostics and quicker maintenance, is of critical importance. The manufacturing process must be evolutionary to make the best of changes developing in the environment and uncertain scenarios. This brings us to a point that most of the Digital initiatives have missed to capture - the evolutionary process and the journey that must be charted to become Digital.

Manufacturing Industries are unable to unlock the value of Digital implementation, owing to the following reasons from the three key aspects:

1. *Knowledge/ Awareness* – Often, the purpose of Digital Transformation is unstated and unknown. The objective and scope are not properly and sufficiently defined.
2. *Work-Systems/ Operations* – Digital Transformation is not a standalone function; the whole ecosystem – internal and external along with the entire organisation needs to be considered. Prioritisation and phasing of the implementation are not considered and executed systematically. The adaptation of digital technology is implemented without an iterative approach to design for function, to identify the gap and iteratively work to achieve the result.
3. *People/ Leadership* – The leadership and organisational culture are seldom considered and involved in the whole process. Mindset and reskilling are key to the Digital Transformation, which is skipped in the radar of the organisation.

Design Thinking for Digital Transformation and Innovation in Manufacturing

Innomantra's experience in Innovation consulting in the Manufacturing Industry goes back close to a decade. We have experimented and co-crafted the challenges that our clients are confronted with on a day to day basis, be it operational, tactical or strategic decision making. Several of the innovation challenges identified are efficiency, zero waste, effectiveness, customisation, quick turnarounds/ lean manufacturing, process optimisation and growth with new technologies, enhanced task motivation. Traditionally manufacturing innovations have been on new materials, mechanisation, focus on reduced deviations, process optimisation and operations/logistics.

Conventional methods to address these challenges have been insufficient and not comprehensive. In several instances they miss considering the dynamics, complexity, non-deterministic nature of the challenges. These challenges require real-time data and decision making which encompasses the need for industries to embark on a digital journey.

"Once upon a time, managers thought that quality belonged to a set of experts – but TQM taught us that quality had to be everybody's job. Similarly, people felt that innovation was the Product Development Department's job. However, today there is a common language or methodology that equips non-designers / designers at all levels to learn the new ways of thinking and behaving that innovation demands. This is Design Thinking. Effectively, Design Thinking is today's TQM for Innovation" – Forbes

Presently, what is construed as Manufacturing Digital Transformation initiatives are typically:

- *Digital Leadership and New business models*

- *Digital Operating models to Amplify Efficiency*

- *Digital Talent and Skilling*

- *Digital traction metrics*

- *Building high-quotient Digital workforce*

- *Integration of automation and on-demand workers into the workforce*

However, any organisation eyeing in the direction of digital transformation must first answer three quintessential questions. Why do they need to transform digitally – what is the Purpose? Once they have clarity on the need, they should identify the right interventions to modify the existing systems – What are the systemic changes? This needs to be addressed at an organisational level and not in a siloed manner. And next, the organisation should detail out how do they transform digitally – What is the process of transformation?

> *"The structure of design thinking creates a natural flow from research to rollout. Immersion in the customer experience produces data, which is transformed into insights, which help teams agree on design criteria they use to brainstorm solutions. Assumptions about what's critical to the success of those solutions are examined and then tested with rough prototypes that help teams further develop innovations and prepare them for real-world experiments."*
>
> *– Prof.Jeanne Liedtka, Sr. Associate Dean, Degree Programmes, The University of Virginia, Darden School of Business, USA*

Applying Design Thinking to challenges can unlock the enormous value of digital initiatives. This human-centric science provides unique insights into the journey of the manufacturing organisation. This approach takes into consideration Man, Machine, Material, Method, Metrics, Compliances and Time, to arrive at the scope and opportunities of digital initiatives. This enables the organisation to define its Digital program and create a step-by-step procedure in achieving an integrated digital transformation, systematically and iteratively.

Innomantra's Design Thinking Framework helps organisations answer the mandatory Why, What, and How questions, viz.,

- *Why does an organisation need to transform digitally and how critical is it at present?*

- *What needs to be done to the existing systems within the organisation (business model, supply chain, product development, technology, marketing,*

organisation structure, and culture) and what benefits can it derive by adopting a digital model?

- *How can the organisation transform culturally, structurally and technologically?*

As described, digital transformation is not just about adopting and deploying technologies but involves leadership and people. It is essential for the Leadership to have a clear vision of how the digital transformation is going to benefit their organisation. Digital transformation must involve all the stakeholders including employees, contractors, vendors, government, society and the end clients including intermediaries. They must have a clear understanding of what digitalisation means to them and their organisation. Digital Transformation is based on Design Thinking for Growth that allows for breaking of silos by encouraging deeper conversations and discussions between stakeholders, highlighting organisational and systemic challenges. The process and solutions are unique to each organisation.

Illustrated below are three Digital Transformation Innovation cases using Innomantra's Framework. It shows how organisations derived value through our engagement and how Innomantra enabled them to successfully embark on their digital journeys.

Innovation Case 1:

Operational Excellence by Minimising Conversion Cost – Electrical & Automation Product

The Innovation challenge posed was about a high-volume product with a monthly production of 80,000-100,000 units. The manufacturing cost of this product was high which limited its competitiveness in the marketplace. The challenge was to bring down the cost of the product without any change in 'Product Design'.

The Innovation challenge as stated above is a closed problem statement or challenge with a narrow scope and opportunity for a solution. This Innovation challenge was rescoped to expand and explore more opportunities. One of these included a digital thread. It was found that components of Industrial Internet of Things (IIoT) and a digital approach could add significant value to solving their current challenge.

As the scope and opportunities of digital initiatives evolved, using Innomantra's proprietary systematic Ideation, new directions were identified for reduced waste, reduced rework, reduced inventory, traceable logistics, vendor management, and provided for variations in the product. At a systemic level, new collaborative processes and architectural transformations

had to be designed to achieve excellence in integrated business operations. New data flow of information would connect all functions and multiple areas of expertise, and drive awareness, growth and competitive success across the organisation.

Highlights: 2 days of Discovery; 25 Innovation Champions from Cross-functional team; 4 Journeys Maps; 8 Functional Diagrams; 2 days of focused Ideation using Functional Innovation Methodology with 30 innovators; 1323 Ideas which funnelled down to 169 potential Projects; Top 20 High Impact Projects Identified; total annual savings of INR 12 Crore.

Innovation Case 2:

Fabric Feeder Automation Design for Higher Productivity and Eliminate Fatigue of Operator

The Innovation challenge posed was to automate the fabric feeding process using innovative methods. The solution had to incorporate heat sealing of curved profiles and irregularly shaped panels. The quality of the joints and process cycle time had to be sustained or improved as a result of this innovation, without having a long-term impact on the total cost of the product. Additional attributes desired were flexibility, reliability, and versatility of the proposed solution.

The proposed challenge was to automate a machine process, and this had little or no scope for higher value creation or to bring in the additional attributes desired. A heterogeneous team comprising of design, operations, manufacturing, quality and adjacent departments was constituted. Along with Innomantra's subject matter experts and design thinkers, the team performed a study of the process, people, planning, and the machine of interest. By capturing the emotions of the machine, material, people, and process, journey maps were created. This activity helped them realise the value of actively transforming site-functional silos to more cross-functional operations across their enterprise. New collaborative processes and architectural transformations were defined to achieve excellence in integrated business operations.

Highlights: 8 days of Discovery; 22 Innovation Champions; 4 Journeys Maps; 8 Functional Diagrams; 2 days of focused Ideation using Functional Innovation Methodology with 22 innovation Champions; 453 Ideas which funnelled down to 25 potential Projects; Top 10 Ideas of High Impact were considered to build a new specification for amplified efficiency and increased task motivation to operator.

Innovation Case 3:

Reinventing with a Growth Mindset for Profitability and Productivity

Fifteen Innovation Champions were led by the business leaders to take on greater responsibility. Four organisation-wide challenges were provided for solving. The challenges were from different domains like manufacturing, retail, e-commerce, and product design.

DISCRETE MANUFACTURING

Innovation Challenge 1: Design and Develop autonomous vehicle software to work seamlessly with Enterprise Resource Planning systems for inventory handling
Purpose: For Amplified Productivity and efficiency improvement

RETAIL STORE

Innovation Challenge 2: increase the revenue of a Retail store to US $ 1 Million annual Sales to increase their customer footfall and increased sales with deep customer engagement
Purpose: Demographic shifts changing retail dynamics in the city

OMNICHANNEL SALES

Innovation Challenge 3: Scale-up a digital business within a quarter and put it on the path to reach a Top line of US $ 1 Million in annual sales.
Purpose: Keeping up with the times and changing customer buying patterns

WARRANTY SERVICE & CUSTOMER EXPERIENCE

Innovation Challenge 4: Exploring possible ways of preserving Battery consumption to the point of sale or extend the lifespan of batteries in a product.
Purpose: To minimise product returns, to weed out after-sales costs

The Innovation Champions and their innovator teams were from different groups within the organisation. Several Design Thinking exercises were facilitated by Innomantra's team of subject matter experts and Design Thinkers. Eight journey maps were created for the 4 challenges. Multiple lines of intervention were identified for the creation of functional diagrams and about ten functional diagrams were created for enabling the focused ideation. Eighty Five Innovators from across the value chain including shop floor employees to domain experts ideated together and arrived at over six thousand ideas which were then bucketed into twenty potential innovation projects with one Super Idea of creating a Smart Factory that tied up all the challenges into one neat solution. The organisation then decided to undertake this Super Idea/ Program of creating a smart factory, by regrouping and prioritising different activities.

Highlights: 15 days of Discovery, 15 Innovation Champions, 8 Journeys Maps, 10 Functional Diagrams, 8 days of focused Ideation using Functional Innovation Methodology with over 85 innovators, 6000+ Ideas which funnelled down to 20 high potential Innovation Projects. This programme has also helped to identify several new projects to execute through various management initiatives in the organisation.

Conclusion

The outcome from these illustrated innovation cases is that regardless of the challenge being posed, a human-centric approach enables organisations to zero in on the right pulse. Rescoping of the innovation challenges with deeper purpose enables them to derive greater value and derive multiple new opportunities. Digital Transformation emerged as an enabler in all these cases to solving critical issues. It turned out to be the common thread.

Organisations also realised the value of partnerships and collaboration across various stakeholders, in executing their digital initiatives. They recognised that on-boarding the various stakeholders from the project initiation bring in higher impact and deeper involvement in Innovation Challenge. Using Innomantra's Discover Design Thinking and Functional Innovation Framework approach enables manufacturing organisations to explore What is? (What I See?) What if? (Imagination of Future) What Wows? and What works? in the journey of Innovating and setting a corner stone for Digital transformation and truly derive amplified value and impact with enhanced task motivation of team in the organisation.

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Credits*

This whitepaper has drawn insights from experts at Innomantra Consulting.

Innomantra is a leading Digital, Innovation, and Intellectual property management consulting and services firm. It helps organisations to design and achieve their digital strategy from idea to implementation, innovation and Intellectual property goals by enhancing culture for amplified efficiency and exponential growth.Innovation3x and Discover Design Thinking describes the philosophy which it believes in, that innovative organisations must identify innovation goals that seek to achieve a 3x and beyond to boost in their performance. Innomantra's signature three-fold approach to innovation that looks at overall business strategy, people and functional systems in a digital ecosystem is globally recognised. Innomantra has a wide range of 50+ clients range from small and medium business to Fortune Global 500 organisations. It has a strategic alliance with global leaders in Digital and Innovation. Innomantra is headquartered in Bengaluru, India, and has a global presence in Colombo, Chicago. Hongkong.

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IET India

The IET is one of the world's largest engineering institutions with over 168,000 members in 150 countries. It is also the most multidisciplinary – to reflect the increasingly diverse nature of engineering in the 21st century.

The IET is working to engineer a better world by inspiring, informing and influencing our members, engineers and technicians. The Institution of Engineering and Technology – India, the IET office started operations in India in 2006, in Bangalore. Today, we have over 12,000 members and have the largest membership base for the IET outside of the UK. Given the increasing global importance of India as an engineering hub our aim is to make an impact that has relevance both locally and internationally. Our strategy is to make a meaningful impact on the overall competency and skill levels within the Indian engineering community and play an influencing role with the industry in relation to technology innovation and solving problems of public importance. We want to do this through working in partnership with industry, academia and government, focusing on the application of practical skills within both learning & career lifecycles, driving innovation and thought leadership through high impact sectors. Our volunteer led panels are means through which we deliver our strategy. The IET India IoT Panel was born out of this focus.

IET IoT Panel

IET India launched its IoT panel on February 20, 2015 with Dr Rishi Bhatnagar (President – Aeris Communication) as the Chairperson. The panel, being a first of its kind in India, focuses not only on technology but the application aspect of IoT in various segments.

The focus of the panel is to facilitate discussions that will help in making the inevitable connected world more efficient, smart, innovative and safe. It will lay emphasis on technology, security and regulatory concerns and the need for nurturing capabilities and talent for quicker adoption of IoT in all spheres.

The IET India IoT Panel aims at providing a platform for stakeholders to become an authoritative, but neutral voice for the evolving movement of IoT in India. It aims to enable all the IoT practitioners (including people from the hardware – devices, portables, sensors, software, business) and IoT enablers (including people from regulatory area, training area, investors in IoT, end users) to work together on relevant areas to make this industry efficient as well as robust. The panel envisions laying a solid foundation by supporting policy makers, industry in the next step of adoption of IoT.

The panel works through 12 Working Groups - Healthcare, Social Impact, Digital Communications, Smart Cities, Skill Development, Standards, Regulatory and Legal, Cyber Security, Utilities, Manufacturing, Ganga Rejuvenation, BFSI and Agriculture.

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