CII

Confederation of Indian Industry

Data Driven Manufacturing

Driving Value by Capitalizing on Data

FEBRUARY 2018

A perspective for Chief Digital Officers and
Chief Technology Officers

HIGHLIGHTS

Industry Digital
Advancement Score

Disruptive Business
Model

Enhanced Decision
Making

Strategic Partner

gslab

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 8,500 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 200,000 enterprises from around 250 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

As a developmental institution working towards India's overall growth with a special focus on India@75 in 2022, the CII theme for 2017-18, India@75: Inclusive. Ahead. Responsible emphasizes Industry's role in partnering Government to accelerate India's growth and development. The focus will be on key enablers such as job creation; skill development and training; affirmative action; women parity; new models of development; sustainability; corporate social responsibility, governance and transparency.

With 67 offices, including 9 Centres of Excellence, in India, and 11 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Iran, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 344 counterpart organizations in 129 countries, CII serves as a reference point for Indian industry and the international business community.

Great Software Laboratory

Great Software Laboratory (GS Lab) helps clients achieve better performance through data, working together to build Data-Driven organizations and provides end-to-end support covering strategy, operations, data science, implementation, and support.

GS Lab's customer-centric engagement models range from business specific applications to full-scale analytics transformations. Team of GS Lab consultants, solution architects, data scientists and engineers work with clients to identify opportunities to capture, access, analyse available data, define solutions and develop cutting-edge algorithms to help visualise outputs and assess impacts in real-time while achieving operational excellence.

1.   Preface

Confederation of Indian Industry

Manufacturing has emerged as one of the high growth sectors in India. India is expected to become the fifth largest manufacturing country in the world by the end of year 2020. With a strong focus shown by the government towards enhancing the manufacturing sector of India, we have the opportunity to reenergize this sector, taking it to the next level of efficiency and competitiveness. India is becoming one of the most attractive destinations for investments in the manufacturing sector, thanks to the Government of India's various initiatives directed to flourish this sector. The programs of the Government like Make in India, initiatives like enhanced "Strategic Partnership" model, ease of doing business actions etc. would certainly enable the manufacturing sector to grow in the future.

We all know that the manufacturing sector has undergone a massive change. From robotics to mass automation, to the creation of the 3D Printer, innovative technologies and approaches are continually disrupting the manufacturing industry globally. And therefore, to stay competitive, manufacturers ought to be demand oriented and adapt to dynamic new business models with the aid of real-time monitoring and smart insights to optimize production.

With the emergence of digital technologies, it has become imperative for the Indian industry to invest in redesigning their processes and business models with a futuristic outlook to stay relevant in the coming years. Other business sectors have also witnessed digital disruptions and emergence of new excellence models.

As we speak of operational excellence, we are in an era where manufacturing excellence can be largely controlled by being digital. Digital revolution has led to creation of lot of data within the organization which should be put in use for improvement of the processes. The manufacturing companies can apply these data in real-time to prevailing challenges, while using the same information to make improvements. Competitive flexibility, improved profitability, reduced costs and higher customer satisfaction are some of the benefits which can be reaped using a new approach of data driven manufacturing.

I am happy to present this report that would give an understanding of data driven manufacturing and how companies here in Pune are prepared for it. I take this opportunity to thank all the companies who have submitted the surveys and helped us with their valuable inputs. I also take this opportunity to thank **Mr Alakesh Roy**, Convenor, CII Forum of Operational Excellence & Managing Director, Zamil Steel Buildings India Pvt Ltd and **Mr Abhay M Pendse**, Co-Convenor, Forum on Operational Excellence & Vice President & Head – Shindewadi works, Godrej and Boyce Mfg. Co. Ltd for their continued guidance and support for putting this document together. I also take this opportunity to thank Great Software Laboratory who have been our Strategic Partner and worked with us in consolidating this report.

I do hope all my Industry colleagues will read through this report and give us your concrete feedback and suggestions, so that it becomes meaningful and useful to take forward

Mr Nitin Chalke

Chairman, CII Pune Zonal Council &
Managing Director – India, EATON Technologies India Pvt Ltd

Great Software Laboratory

Great Software Laboratory ventured into Analytics and Connected Experience to help organizations overcome two painfully polarising operational challenges. One, help them seek greater agility under rapid market conditions and second, help them use data to navigate the internal change to involve all the right stakeholders in their processes.

Since then, data science has continued to make rapid advances, with data growing at whopping 30% year over year. Organizations today have petabytes of raw data which can be gleaned with powerful and sophisticated analytics tools to gain insights that can not only improve operational performance but also create new business / market opportunities. More profoundly, the organization's decisions no longer have to be made based on gut instinct; using big data and analytics decisions can be based on real-time situation analysis, evidence, and accurate forecasts.

As we take stock of the progress that has been made over the past several years, we now see that manufacturing companies in Pune (Maharashtra, India) are placing big bets on big data and analytics. But adapting to an era of more Data-Driven decision making has not always proven to be a simple proposition for the organization. Many companies are struggling to develop unified processes, integrate existing systems for unified view of the organization and organizational muscle to capture real value from data in real time. Developing easy to adopt data strategies to attain real and visible business value is becoming a matter of urgency, to help improve productivity, operational excellence while improving bottom line.

This research is a collaboration between Confederation of Indian Industry (CII), Pune and Great Software Laboratory (GS Lab) , building on more than three years of knowledge development in the area of analytics while working with clients across industries.

GS Lab has designed and developed a systematic methodology for Manufacturing Industry to assess their Readiness score in the Digital journey. This methodology called MIDAS (Manufacturing Industry Digital Advancement Score) maps various enablers of digital journey represented by a five-sided Transformation Polygon. The MIDAS is collective measure of scores along 5 axes (key factors): Organizational Behaviour, Data Digitization, Process Digitalization, Digital Optimization, and Digital Transformation. Using this methodology businesses can benchmark themselves to determine where they stand in the digital transformation journey.

The research aims at helping organizational leaders understand the potential impact of big data and analytics, providing greater visibility and clarity to all stakeholders on how organizations can derive value through capitalization of data.

The research was led by Mandar Garge, a GS Lab leader heading Digital arm; Neha Garg, an enthusiastic Integrated Marketing Strategist at GS Lab; Alakesh Roy, CII Pune Convenor – Manufacturing Operational Excellence; Abhay Pendse, CII Co-Convenor – Manufacturing Operational Excellence. Sincere thanks go to our colleagues at CII Operational Excellence Forum handling operations and external relations. In addition, this project benefited immensely from the many GS Lab colleagues who shared their expertise and insights.

This report contributes to GS Lab's vision of helping business and leaders solve complex un-structured business problems by understanding the technology forces transforming the industry.

This research is independent work, reflecting our own views and has not been commissioned by any business, government or other institution. We welcome your comments on the research at marketing@gslab.com.

Atul Narkhede

MD & CEO, Great Software Laboratory
Pune, India

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2. Executive Summary

In a Globalized world, Data is a matter of survival and no leader can afford to ignore it. Manufacturing industry is no exception. Data is becoming the common element in all functions of manufacturing. Data-Driven Manufacturing essentially means using the 'information' in this data wisely to make decisions that will allow organizations to orchestrate process and business optimizations (to increase the 'Bottom-line'), and to create new business offerings or value-add services for their customers (increase the 'Top-line).

Our study shows that handful of organizations today are leading the data revolution by digitally transforming themselves – so called 'Digital Leaders' to achieve higher efficiency and throughput, quantifiably outperforming their counterparts who are taking a wait-and-watch approach – so called 'Digital Laggards' (and may even become obsolete) in this rapidly digitalizing world.

The research focuses on determining the Digital Maturity of Indian Manufacturing industry

Leveraging Data and Digital Technology

The study shows that the Indian Manufacturing industry is gearing up for increasing their digital footprint to achieve higher efficiency and throughput. As of today the organizations are coping up with low data and process digitization – thus limiting their usage of digital technology to drive operational excellence.

The key findings from the report indicate that majority of the companies are not leveraging their technology investments, have inherent process inefficiencies and their ability to make processes better is driven by the sales orders or their customers' demands. Organizations today are more 'reactive' for Data-Driven decision making against being 'proactive'. Proactiveness would help them reach quicker and simpler solutions before they have a major impact on the business, improving their competitive advantage, and ultimately increasing customer satisfaction.

The study helped discover some 'Digital Leaders' who are quantifiably outperforming with the help of data and digital technologies to achieve Data Monetization. Higher organizational behaviour (strong leadership to strategize and manage digital roadmap) has helped the 'Digital Leaders' take proactive approach towards Data-Driven decision making.

This study explores what sets apart the laggards from the leaders, and describes a systematic journey from laggardness to leadership, along with a measure of 'digital maturity' to help organizations assess their position in the transition.

The Digital Journey

The digital journey can be classified in four stages, as depicted by the following diagram.
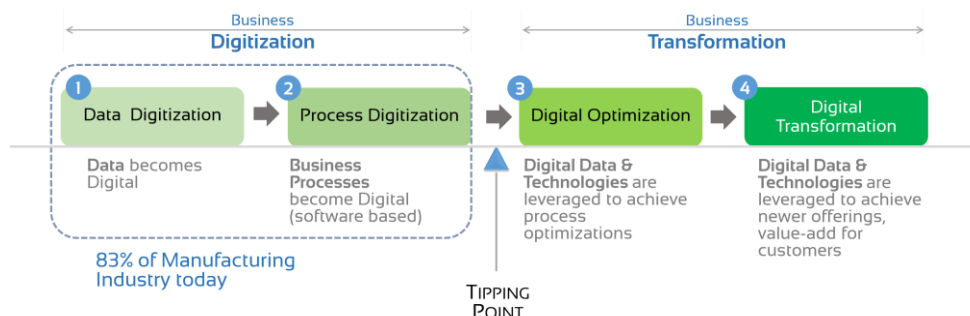
Digital Maturity of Indian Manufacturing Industry
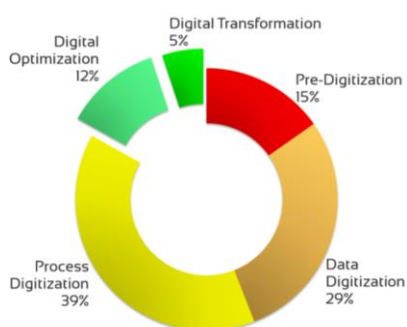
- **83%** of manufacturing industry lies in the 'Digitization' phase, and is yet to reach the 'Tipping point' for *'Digital Transformation'* – which only commences after the *Process Digitalization* stage.

- **17%** of the industry has crossed the tipping point (Of which only 5% have digitally transformed themselves, while 12 % are in the digital optimization stage

  Fact: A sizable portion of the industry is mistaking 'process digitization' as 'digital transformation'.

Benchmarking your organization in the Digital Journey

The report proposes a methodology to assess to measure the Digital Advancement of the Indian Manufacturing. It maps various enablers of digital transformation (including the Organizational Behaviour toward digitalizing its business) to a Transformation Journey represented by a polygon shown in the diagram below. Using this methodology businesses can benchmark themselves to determine where they stand in the digital transformation journey.
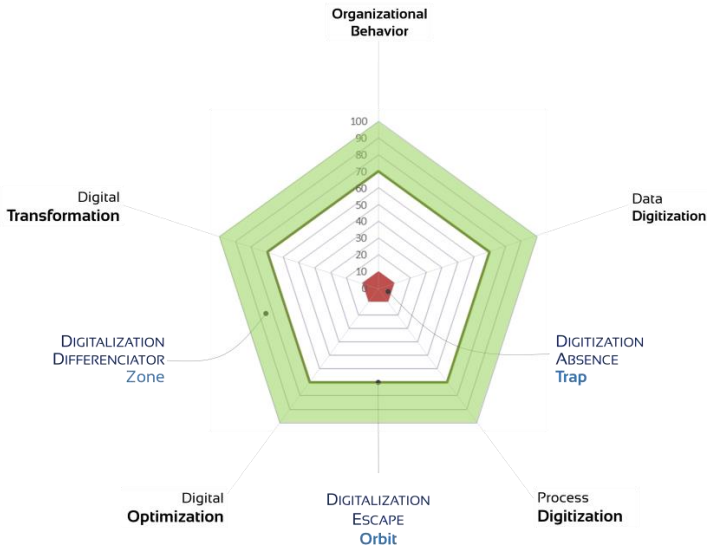
The 5 key factors that form the 5 axes of 'this Transformation Polygon are:

1. **Organizational Behaviour**: Index of an organization's readiness for digital strategy and its implementation

2. **Data Digitization**: Extent of digital data

3. **Process Digitalization**: Extent of implementing business processes using software systems

4. **Digital Optimization**: Extent of using data and technology to achieve business processes optimization

5. **Digital Transformation**: Extent of using data and technology to achieve newer business offerings or value-adds

The total score is the net effect of scores along these 5 axes.

Methodology for assessing Manufacturing Industry Digital Advancement Score

As per this study, the average Score of Indian Manufacturing Industry is best depicted by following the Transformation Polygon representation, highlighting the fact that concrete steps need to be taken by the industry toward digital transformation.
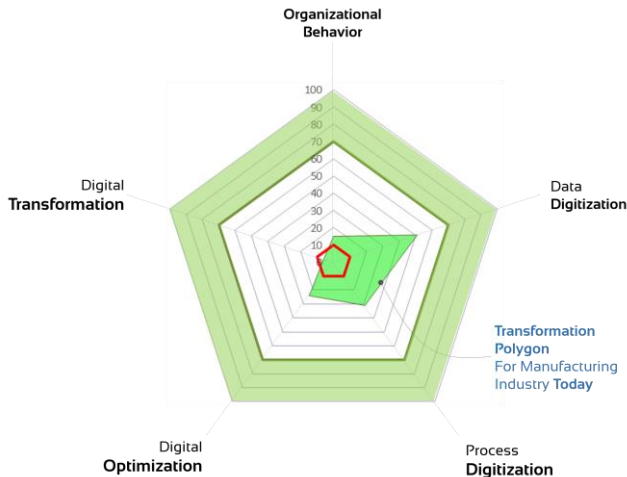
Observations:

- The average score of the industry indicates that it is in 'Business Digitization' phase.

- This means most of the organizations have not yet crossed the Tipping Point to enter into the 'Digital Transformation' Phase.

Concrete Next Steps

1. Individual organization mapping on the digital journey
2. The assessment methodology would help organizations identify concrete steps needed to accelerate digitalization effort beyond the 'Digitalization Escape Threshold' (The Recommendations section of the report lays out some concrete steps).

Key thing that the organizations must focus on – Embrace positive organizational behaviour (top to bottom approach) to benefit from Data-Driven Manufacturing.

3.   Demystifying Data-Driven Manufacturing

In such a fragmented industry, Data-Driven decision making is the key to competitive advantages. But for many though, it seems like a daunting task.

The stream and sources of data are never-ending, the complexities associated with them are many, and majority of manufacturing industry professionals still lack complete understanding of Data-Driven concepts, tools, processes and its overall benefits and impacts.

The research discovered that manufacturing industry today realizes the importance of Digitalization but harbours many myths related to Data-Driven decision making and the need to ride the digital wave. The most commonly observed myths were:

1. Digital transformation is associated only with big data / high volumes of data, and one should get to it only when data volume becomes substantial

    Many organizations have a perception that they need to think about digital transformation only when their data volume substantially increases.
    - Data-Driven manufacturing is about using every amount of data to derive meaningful information. Digitalization journey can commence even with excel, if 'information' from the data in it is used wisely.
    - Our study inferred that a small business (Revenue: 30 Cr) which had moderate amount of data was able to drive digital optimization even with that 'moderate' data, because it used that data wisely.

2. Implementing a solution for Data-Driven insights is a lengthy and complex process

    Of the surveyed participants 83% felt that integrating a solution for Data-Driven insights into their current system would be a lengthy and complex process. The remaining felt that adopting a robust Business Intelligence solution is the need of the hour and achievable with help of right partners involved.
    - Majority of the businesses already have some extent of ERP, MIS or PLM implementation in place. The data residing in these systems can be leveraged with relative ease and a solution to gain insights can be engineered on top this existing investment.
    - The reports that these tools produce can be converted to more meaningful inferences

3. Only IT teams can interpret data from complex systems in the value chain

    Of the surveyed participants 96% felt that pulling data from each system was complicated and time consuming due to the disparateness and complexity of the systems considered.
    The remaining 4% felt the amount of data generated and stored in the systems was quite high and processing it would be very time consuming and that cannot be done without IT team's intervention (and this was a natural barrier).
    - IT team can indeed be a facilitator in acquiring data from these systems, but the functional leaders need to take the first step in requesting that data and creating dashboards highlighting the key parameters.
    - Once this initial hurdle (which is often psychological) is overcome, the process can be automated with minimum effort. But once done, it will serve an important purpose and you would never look back.

4. Data-Driven solution for decision making can only come at high costs
    Of the surveyed participants majority felt that implementing digital optimization would require high investments in IT systems, software and hardware.
    - Generation of insights can indeed start by leveraging existing investments in software and hardware. Data from smaller sources like excel can also contain insights that can help decision making.
    - Making sense of the data is the key. Even if new investments have to be made, the ROI on them is guaranteed if used wisely.

4. Data Revolution Gains Momentum

Big Data | Big Challenges | Big Opportunities

The idea of data generating business value is not new to the manufacturing industry, however, the effective and creative use of data is becoming the basis of competition. The industry has always wanted to derive insights from the captured data in order to make efficient, fact-based decisions in real time. It is this demand for depth of knowledge that has fuelled the transition from data to information i.e. Industry 3.0 to Industry 4.0.

'Digital Leaders' in the Indian Manufacturing Industry are now including data from both within and outside the premise (data from value chain), including structured and unstructured data, system data, machine data, customer data available from online portals / mobile to supplement their organizational data – thus providing the basis for statistical and predictive views.

As manufacturing industry aligns itself with 'Data-Driven Manufacturing – the next wave of productivity gains and financial growth' – it is necessary to first understand how the Indian manufacturing industry itself interprets the term 'Data-Driven Manufacturing'. Based on our interaction the common interpretation is centred on creating *the next generation manufacturing by application of data made feasible by: Ubiquitous broadband, allowing high volume of data to be transmitted between people, machines and production sites; IoT and sensors, allowing real-time data collection during production processes; Big Data Analytics, allowing high volume & high frequency of data to be processed collaboratively leading to an efficient, responsive and smarter production system.*

This is right understanding, but only a part of it (and unfortunately the far-fetched one). The other part (which is most of the times overlooked, ignored or unknown) is achieving efficient and smarter manufacturing by treating each and every piece of data the organization possess, as an asset and capitalizing that data.

The Industry is Evolving: Today Data is also an Asset

'Data is the new oil and India does not need to import it. It is available in abundance. It is the oxygen of a digital economy'

> Mukesh Ambani, Sept 2017

The analogy above applies to every industry which intends to use digital data and systems. Data is an asset that lives and flows in one's organizational ecosystem and does not require importing data from external systems (value chain).

Organizations have historically managed several assets such as plants, equipment's, machines, inventory, cash and intellectual property for their competitive advantage. In today's digital world, **Data** is also an asset, more readily available and easily gathered than ever before. Data manifests itself in different ways in every step of the manufacturing value chain. Sometimes it is visual, sometime human entered in form of job cards, paper register books or in excel files and sometimes in specialized software applications.

The new digital landscape provides organizations with the ability to capture and track data at all touch points of the value chain. The *past* (historical) data, along with *current* data if viewed wisely, can help businesses explore and identify new opportunities and to leverage data for enhanced decision making.

This has spawned a new data economy to generate value via both, internal and external means.

Data has Potential for Disruptive Innovation

Data-Driven, alternatively Capitalizing data or Monetizing data, is a technique which uses every element of data available, to drive business decisions that enable achieving one or more of the following goals: increasing bottom-line (by enhancing and optimizing processes, increasing productivity, minimizing inventory, improving efficiency, supporting continuous innovation) and/or increasing top-line (improving customer success, increasing brand loyalty, creating premium service or creating new avenues of business).

Availability of Business Intelligence solutions / platforms linked with variety of data sources can help organizations make decisions based on '*facts*' rather than '*guesses*', impacting businesses positively. Allowing them to respond far more quickly to market trends and in some cases, predict these trends before they happen.

Significant business enhancements and optimization can happen if organization decides to look at its own Data Ecosystem 'closely'. All business units within the organization can have the ability to now respond to each other and to external data automatically or semi-automatically – making the value chain more efficient, intelligent and ultimately self-dependent. This allows the organizational leaders to keep better track of what is happening at multiple production facilities and across the value chain, making it possible for respective teams to intervene in processes before problems arise.

All of the above may seem like a distant future, but has been brought right around the corner with advancement in technology.

In the face of this rapid change, it is crucial that we begin with the Digital Optimization journey.

5.   Data in Manufacturing Landscape

Data, Data everywhere

Businesses should realize that data lies at every step in the value chain – Pre-Production, Production and Post-Production. Additionally, data lies on either side of the supply chain that a business is part of (Upstream and Downstream) as well as within its own systems.

A value chain can be split into primarily three areas:

Pre-Production / Upstream: Vendor management, ordering and procurement, inventory planning, production scheduling, stocking up finished goods, quality of processes, material waste management, operational and transactional data (from ERP, PLM, other systems).

Production: Production planning, production, material movement, machine changeover routines and scheduling, measuring machine and human parameters, finished goods inventory, material waste management (from ERP, MIS. MES Systems).

Post-Production / Downstream: Finished goods distribution and installation, sales and revenue data, on-field data, customer success, number of complaints received, maintenance and support.

The diagram below describes the landscape and highlights the fact that Data is available in at every step in the landscape.
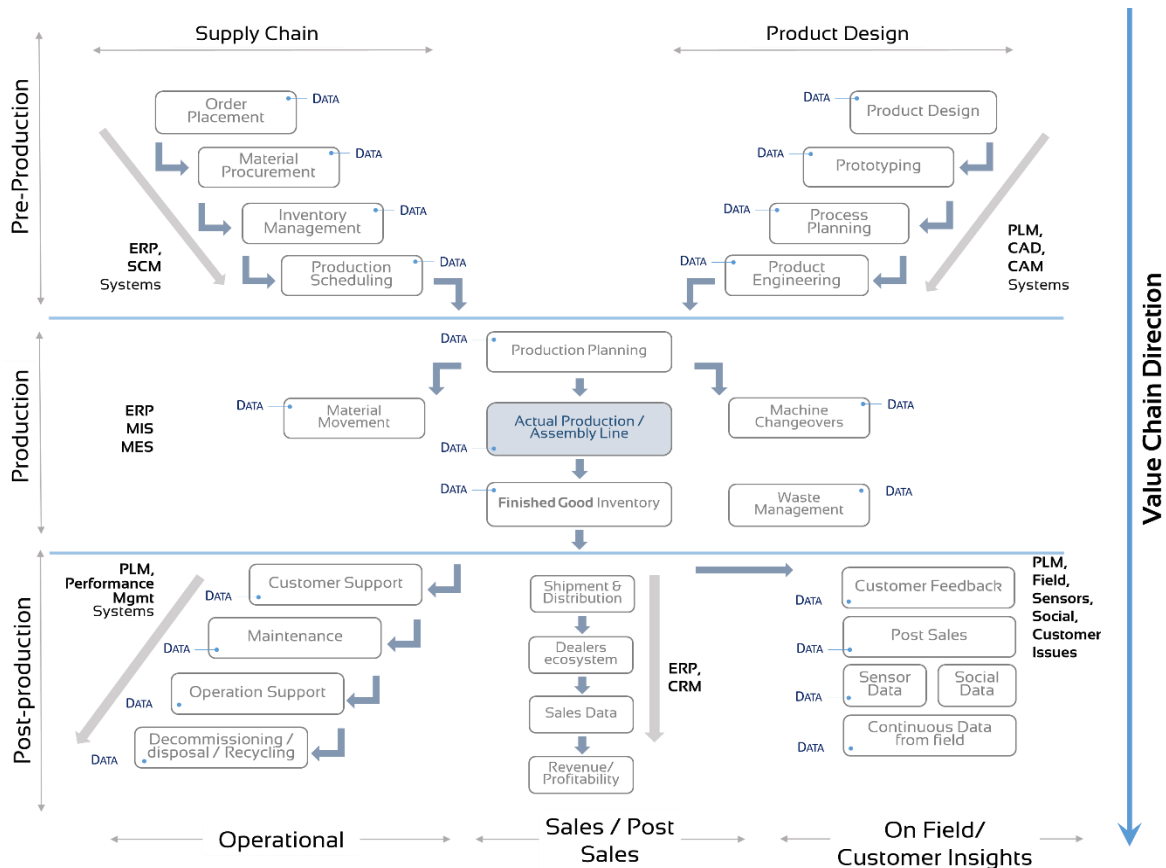
Manufacturing Landscape: The Value Chain

Organizations can monetize data. But are they aware of this fact?

As visible in the diagram above – Data is available everywhere in the Value Chain ecosystem. The truth is, data is generated (but not necessarily digitally) at every step in the value chain. Also, it is generated, but not necessarily *captured*. The real question is whether organizations are aware that they can monetize this data? It is worth realizing that significant business gains (leading to Monetization/Capitalization goals) can be achieved by leveraging the Data from all parts of the eco-system.

The Supply Chain

The Manufacturing Industry comprises of organizations that fall either under B2B (Business to Business) or B2C (Business to Consumers) category. But regardless of the high level category an organization may belong to, it is part of a much larger supply chain. It consumes raw-material from a chain of suppliers, converts it into a Finished Good (FG) and then sell it to its customers or ship it its distributors. The customers could be other business or the end consumers, or both. This report identities two types of groups:

OEMs (Original Equipment Manufacturer): This is the group which sells the 'final/finished' product to the end customer (business or consumer). E.g. an automobile, a motor, an air conditioner, a compressor, a crane etc.

Tiers: This is the group comprising of organizations that provide components or assemblies to OEMs so that OEMs can build the finished, usable product by either assembling the components or sub-assemblies together, or by fabricating a different product from the components and sub-assemblies supplied by the upstream tiers.

Tier 1 represents an organization supplying directly to an OEM, *Tier 2* is a supplier to Tier 1, and Tier 3 is a supplier to Tier 2 and so on. The following diagram represents this supply chain:
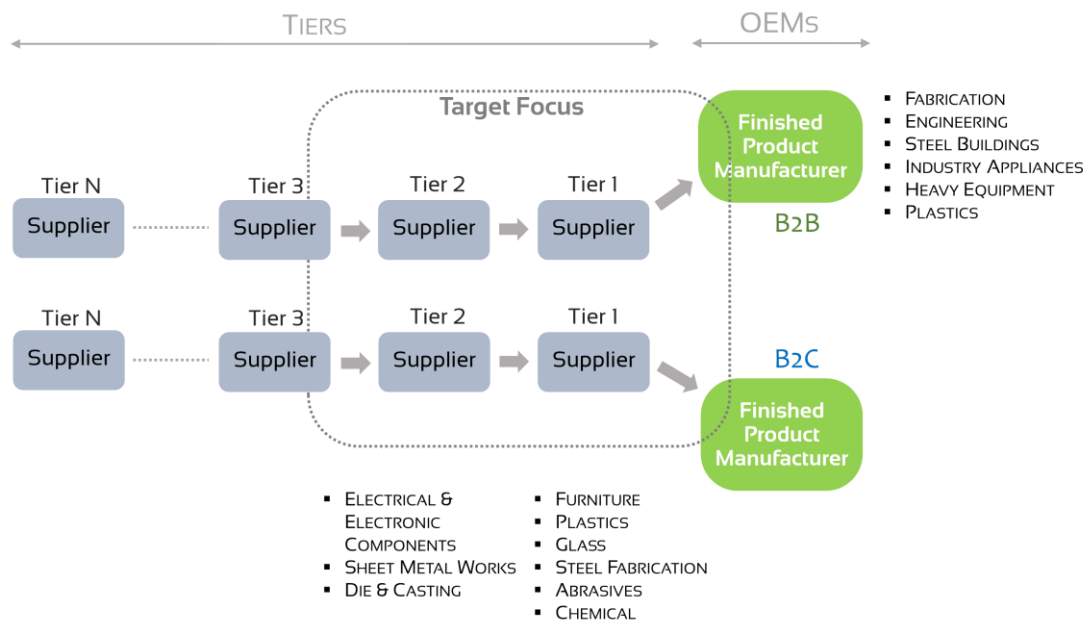
Manufacturing Landscape: The Supply Chain

6. The Tipping Point

The 'Data-Driven' tide in the manufacturing industry is moving towards the tipping point for Data Monetization.

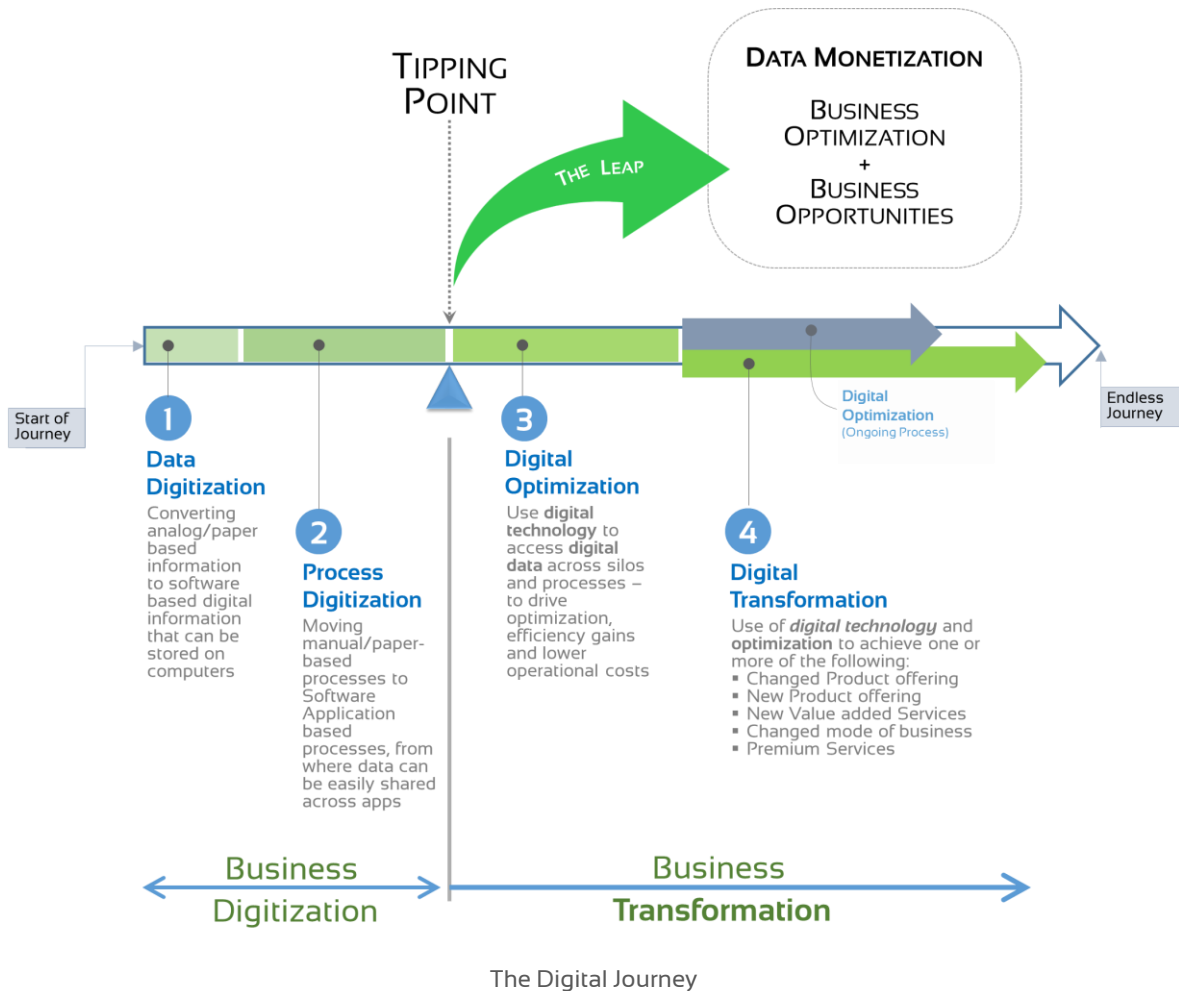The 'Data-Driven' or 'Digital' journey of an organization is determined by when and how an organization moves from Data Digitization to Process Digitization to Digital Optimization to Digital Transformation.

Enhancing the digital journey ahead for organizations requires reviewing of all current processes in order to make the necessary changes to achieve business and digital objectives. The current confusion in the industry lies in whether organizations stay in the *digitization* of business processes or are actually transitioning towards *digitalization* of business.

The Digital Journey

Aspects of Digital Journey

To understand a 'Digital Journey' of an organization, it's essential to know the current level of 'Digitization' of an organization.

1. **Data Digitization:** The process of creating a digital (bits and bytes) version of data that is originally in analog/physical form (paper documents, images, sounds etc.), so that it can be used by a computing system for processing, storing and sharing

2. **Process Digitization:** Once digitized, the advancement in the journey depends upon how much of process digitization an organization adopts. When business processes (e.g. Procurement, Inventory planning, Production Planning, Sales Order management etc.) are managed digitally by software applications, the organization has achieved process digitization.

Once digitization of many processes is done, their underlying applications make data digitally available for anyone and everyone, but data is still in silos and most of the times continues to be looked at in silos. Digitalization would commence only when you further do two things simultaneously: 1) Use digital data collectively from these *distinct* digitized *processes*; 2) Use digital technologies to achieve process improvements and optimizations.

3. **Digital Optimization:** The process of using digital technologies to access and leverage the digital information from across multiple systems and data points, in order to gain actionable insights that can lead to process optimization, productivity gains; and pave the way for the next step i.e. business transformation.

   When businesses start looking across and correlating data from different processes and systems to perform process optimizations like - reducing bottlenecks, machine downtimes, changeover times; reducing inventory, reducing material wastage; making production leaner & faster; achieving higher throughput, or reducing manufacture cycle time – they have achieved *digital optimization*.

   Only when this stage is reached, has the Digital Transformation really begun.

4. **Digital Transformation:** The process of using digital information and digital technologies to transform or innovate your business beyond digitalization, leading to modifications in business model(s), changing the value chain to create new products or services that result in enhanced value to the customer.

There is no limit to how far you can go in both phases – Digital Optimization as well as Digital Transformation. They both can co-exist. In fact they should co-exist.

7.   Methodology for assessment of Manufacturing Industry Digital Advancement

To stay competitive in a global market, Indian organizations need to strive to adjust their digital landscape to the characteristics of Data-Driven Manufacturing. This means the adaptation of a Data-Driven digital landscape which includes horizontal and vertical integration of the value chain along with management of data across the entire product life cycle.

*'Poor data quality makes effective industrial analytics hard to achieve'*

Currently organizations face two main challenges in the transformation of their digital landscape:

1. The data exists, as it has always existed - in varying formats, unlabelled due to lack of standardization across systems for same product - ending up in cold storage and remaining unavailable for broad business decisions.
2. Complexities an organization face in integrating existing systems (ERP, MIS, PLM etc.) with their other enterprise systems due to both the age of the systems, the architecture of these systems, and the need to integrate new applications and systems into the original ERP / MIS / PLM systems.

The Manufacturing Industry's Digital landscape can be mapped to a rating system. This system rates businesses on 5 key criteria:

1. Organizational Behaviour: This is the Readiness Index of an organization - a measurement of how a company leadership views 'Digital Transformation'.

    a. How willing is the leadership about steering digital transformation of the business?
    b. Is it trying to take definitive steps in that direction?
    c. Are the steps identified, actionable and measured?
    d. Is it funding the efforts?
    e. Is it assigning clear ownerships?
    f. Is it taking its wider workforce and employees 'along' in this journey?
    g. Is the workforce of the organization aligned with the leadership's readiness to advance in digital journey?
    h. Is there a mechanism to review the progress?

2. Data Digitization: The extent to which an organization undertakes 'Data Digitization' (Convert all paper, email and analog data into a data that goes into a software applications) – data become digital

3. Process Digitization: The extent to which an organization undertakes conversion of all business processes into software systems driven processes – all processes become measurable

4. Digital Optimization: The extent to which an organization undertakes the activity of gathering insights from disparate data systems of disparate processes to drive process optimizations, efficiency gains, productivity gains, improving manufacturing output - all leading to savings in operational costs (increasing the bottom-line). This is where the Data Monetization actually begins – organization starts making use of 'information' available in the data to make decisions to optimize its business

5. Digital Transformation: The extent to which an organization undertakes the activity of gathering insights from disparate systems, processes in the pre-production, production as well as post-production phases to formulate newer offerings, new business models, new premium services, higher value creation for customers – leading to higher revenues, higher brand loyalty or higher customer satisfaction – organization starts using Information available in data across all its systems to gather insights - creating newer business models and value-add business

These 5 key factors form the 5 axes of Transformation Polygon

Digital Transformation Polygon
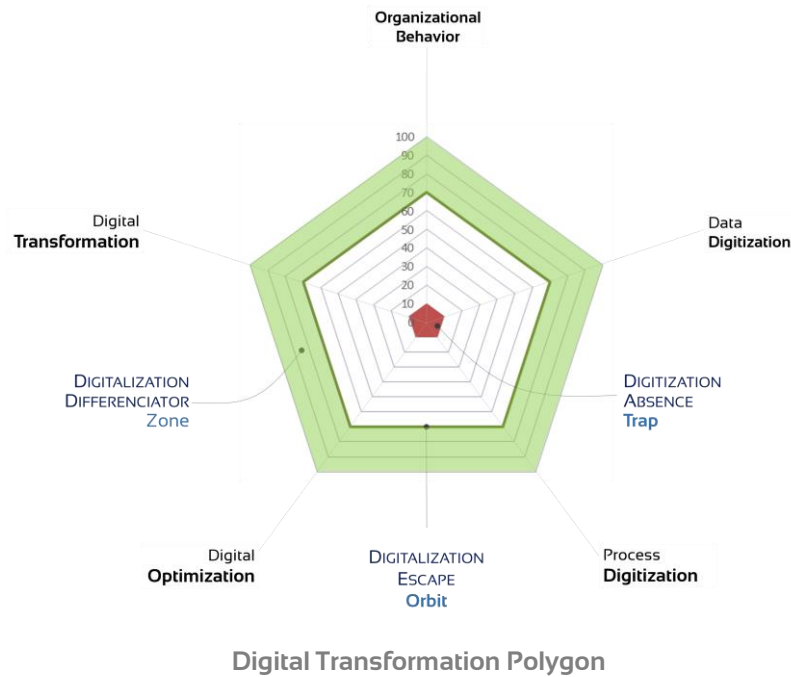
The three boundaries and areas (orbits and zones) are:

Digitization Absence Trap: This represents the *Pre-Industry-3.0* state with extremely low or no digitization at all. Businesses must watch for and avert this zone.

Digitalization Escape Orbit: This represents the outer bounds for Industry 3.0. Every business should aim for reaching this orbit/polygon as fast as they can. The zone between *Digitization Absence Trap* and *Digitalization Escape Orbit* represents 'Industry 3.0'.

Digitalization Differentiator Zone: This is the zone beyond the Digitalization Escape Orbit, a space that every organization must aim to hurl itself into. This is the 'Industry 4.0' zone. Like the open universe, this zone practically has no outer bounds and organizations can keep traveling into farther digitalization orbits.
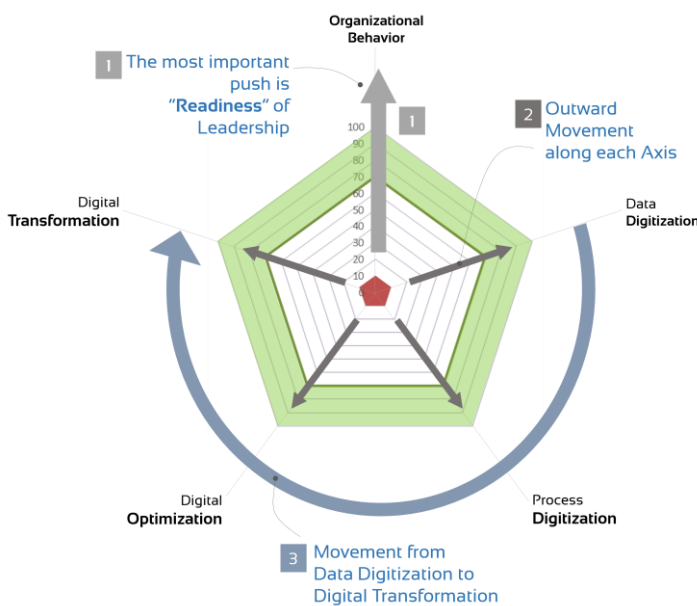
Movements

1 Organizational Behavior is the key driver and must expand outward

2 Outward expansion along other 4 axes

3 Movement from Data Digitization to Digital Transformation

The 'Findings' section will describe how the overall Indian manufacturing industry is measuring with respect to Digital Transformation

8.   Research Methodology & Demographics

As the Indian industry continues to transit towards Data-Driven Manufacturing, every decision contributes to a business decision – which is why leaders would need clear, reliable fact-based (Data-Driven) insights to help businesses achieve productivity gains, higher profits along with enhanced experience to various stakeholders.

The research process involves the use of descriptive or correlational research methodologies involving inputs from 20 different industry type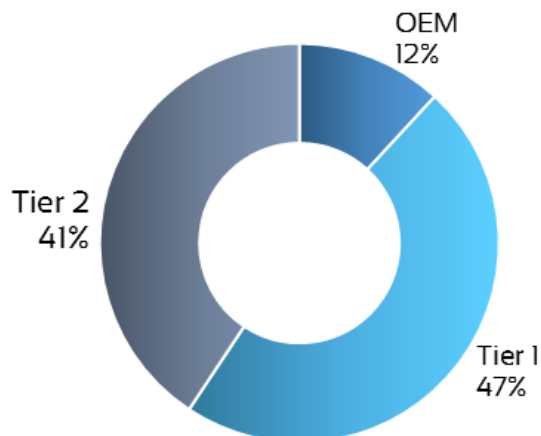s and 4 core functions within the manufacturing industry. This methodology enabled us to view the topic from every angle. The approach is designed to accommodate change while considering 10 sub-topics and 65 parameters that might not be obvious or mainstream. This allowed our research team to describe different events, experiences, or patterns and look for links between them to bring out trends.

Step	Description	Value Add
Hypothesis	We set our research hypothesis by asking questions such as, 'Is the Indian Manufacturing Industry geared to leverage Operational Data for Capitalization and Monetization Opportunities?'	Because the forum is independent and not tied to any predetermined outcome, it allows us to explore challenges that the industry / organizations might want to overcome.
Surveys & Naturalistic Observations	Once the hypothesis is defined, our research team conducts formal and informal surveys & naturalistic observation activities for decision makers of 4 core departments across 20 identified industry types within the manufacturing industry.	The Operational Excellence Forums with unmatched level of industry network and exposure offers the broadest survey base available in the Indian manufacturing industry.
Data Analysis & Pattern Recognition	Analysing the data collected through surveys against 10 broad sub-topics with 65 parameters, helps us identify emerging patterns with the market & challenges along with mapping the readiness of the industry for identified hypothesis	The research methodology and approach helps us bring out a structure and standardization – delivering clear & accurate picture
Verify	In this final step of our research, we validate our findings against multiple internal and external sources by holding intense debates and discussion over findings and conclusions.	Continual validation ensures that the insights we generate keep pace with the rapid changes in technology and business.

Demographics

Participating Supply Chain composition

OEM 12%
Tier 1 47%
Tier 2 41%

Composition by **Industry Type**

Industry Type	Value
Automotive	7
Engineering & Fabrication	8
Electrical & Electronics	7
Furniture	2
Plastics Works	3
Metal Works	6
Packaging	2
Industrial Automation	1
White Goods	3
Heavy Industry	5
Chemical Industry	1
Paints	2
Industrial Products	2
Building Accessories	1
Service Provider	1
Electrical	3
Glass Works	1
Castings & Fittings	1
Bearing and Seals	1
Steel Metal Fabrication	2

Composition by **Participation** across **Job Functions**

- Managing Director 7%
- CEO 14%
- Vice President 15%
- Director 20%
- General Manager 12%
- Head - Production 10%
- Others 22%
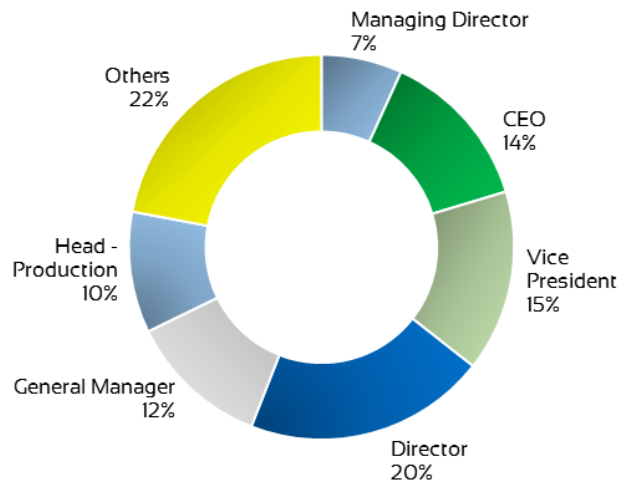
Composition by **Revenue Size** (INR in Crores)

- 0 to 100 — 51%
- 100 to 250 — 12%
- 250 to 500 — 17%
- 500 to 750 — 3%
- 750 to 1000 — 3%
- 1000 to 1500 — 5%
- 2500 to 3000 — 9%
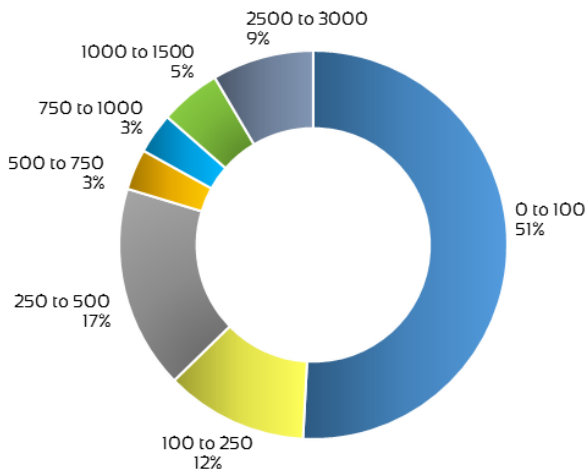
Composition by **Employee Strength**

- 0 to 250 — 59%
- 251 - 500 — 9%
- 501-750 — 9%
- 751-1000 — 8%
- 1001-1500 — 5%
- More than 1500 — 10%
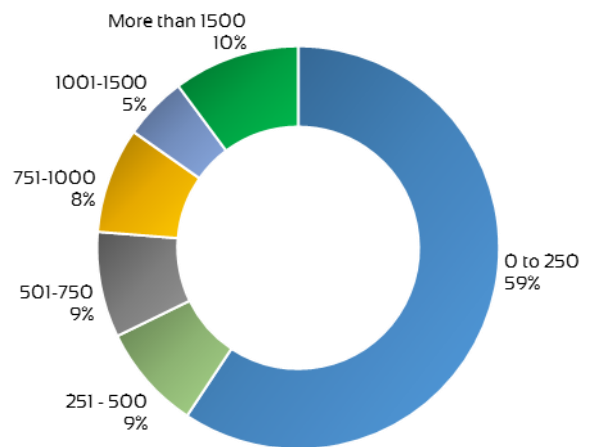
9. Digital Maturity of Indian Manufacturing Industry

As indicated in the methodology description of the research, the research was based on 65 parameters collected from participants and categorized into numerous buckets.

65 parameters were grouped under following 10 categories:

- Extent of Digitization of Data
    - Extent of Digital data vs. Non-Digital data
- Extent of Digitization of Processes
    - Are manufacturing business functions using ERP/SCM/MIS systems?
    - Are Product Engineering processes using CAD/PLM software?
    - Are Sales, Lead Generation, and Customer Management using CRM systems?
- Awareness and Ability to Measure all processes
    - Extent to which key process parameters are measured?
- Ease of Accessing Data
    - Is accessing data from systems and files easy, fast?
    - Is the process of accessing data automated / can be automated?
- Awareness and Ability to measure Data across silos
    - Systems across many functions host signification data. Are organizations looking at the data in silos?
- Importance given to Historical data analysis
    - Are organizations analysing 'historical' data regularly to identify trends and patterns?
- Planning of Inventory using data from multiple processes/systems
   - Are organizations using Sales data (current and historical) to forecast raw material inventory?
    - Are organizations using historical inventory data to plan current inventory stock-up?
- Planning of Production using data from multiple processes/systems
    - Are organizations using Sales data (current and historical) to forecast production?
    - Are organizations using historical production planning data to identify patterns in production?
- Planning of Logistics using track and trace of finished goods
    - Are organizations using systems to track finished goods and notify customers in time?
    - Are organizations using historical data to improve logistics management?
- Use of Cloud and Mobility
    - Are organizations leveraging Cloud technologies?
    - Are organizations leveraging mobile apps to make processes simpler, faster?

The goal of the research is to find whether organizations are using digital technologies and analytics to achieve:

- Digital Optimizations (process optimizations, productivity & efficiency gains, higher throughput, etc.)
- Digital Transformation (newer business models, offerings, higher customer loyalty, etc.)

9.1 How Manufacturing industry interprets 'Digitalization'?

In this section, the report identifies key patterns observed across the industry by categorizing the observations across the two identified key groups within the supply chain: OEMs and Tiers. In order to understand how the industry interprets 'Digital', here is a quick recap of different steps in a Digital Journey:
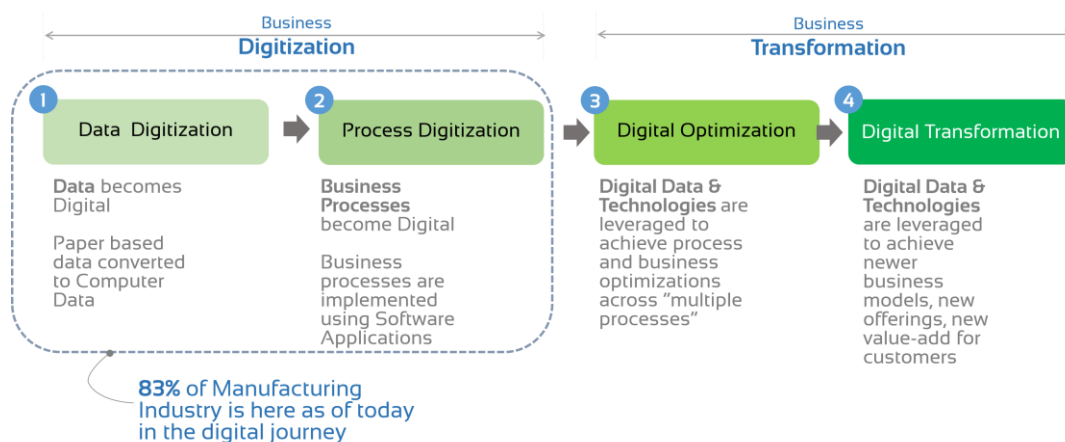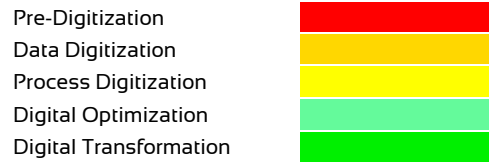

Digital Journey

Key Observations:

Legend

In this section, the graphs and charts depicting various observations are using the colours (indicated in on the right hand side) to represent different stages

Pre-Digitization
Data Digitization
Process Digitization
Digital Optimization
Digital Transformation

A. Distribution by 'Stage' in Digital Journey
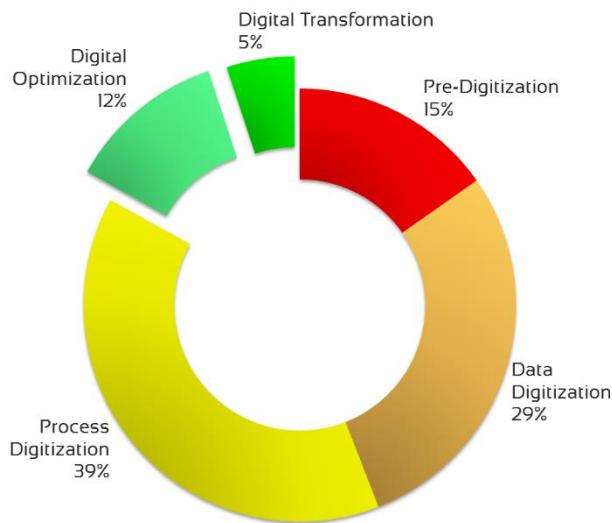
Observations:

- Only **17%** of the businesses have crossed the tipping point and have begun Business Transformation
  - 12% are performing Digital *Optimization*
  - Only 5% are actually performing *Transformation*

- Significant (39%) of the businesses are implementing some sort of **Process Digitization**

- **29%** are still stuck in **Data Digitization** phase

83% of Industry is still in **Business Digitization** (**Industry 3.0**) phase today, oblivious to real benefits of **Digital Transformation**

Majority of the organizations in the Indian Manufacturing industry are keen to analyse data for improving productivity and performance – and multiple players across the value chain see market opportunities in this explosion of demand. Typically there are many steps between raw data and insight generation along with openings to add value at various points along the way. To simplify, this research focused on three groups of organizations (OEM, Tier 1 and Tier 2) in the data ecosystem, recognizing that some players might fill more than one role.

B. Distribution by 'Stage in Digital Journey' Across Groups

Pre-Digitization Stage

Data Digitization Stage

Process Digitization Stage

Digital Optimization Stage

Digital Transformation Stage
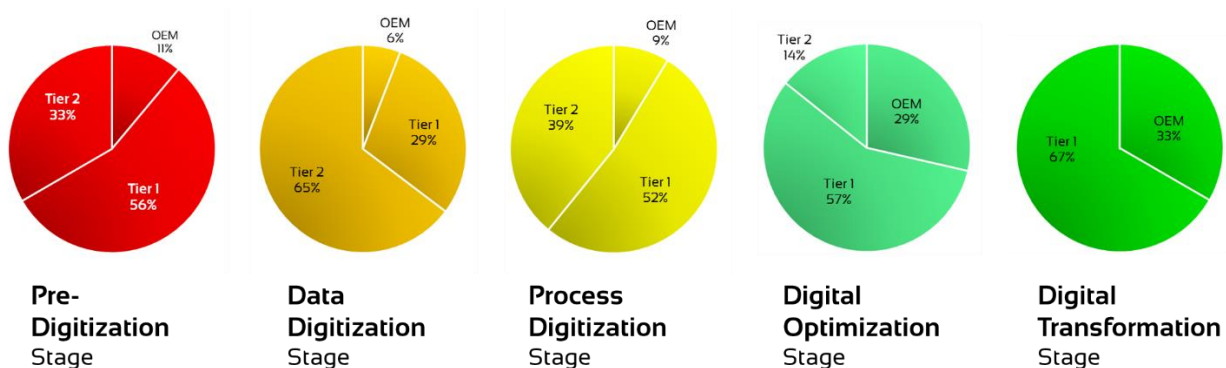
Observations:

- **OEM** organizations are leading the pack in leveraging Digital Optimization and Digital Transformation, with automobile segment leading the curve
- **Tier 1** organizations – majority lie in Process Digitization phase with remaining in Digital Optimization phase
- **Tier 2** organizations and lower – majority lie in Data Digitization stage with significant path to cover before they reap the benefits of Digitalization
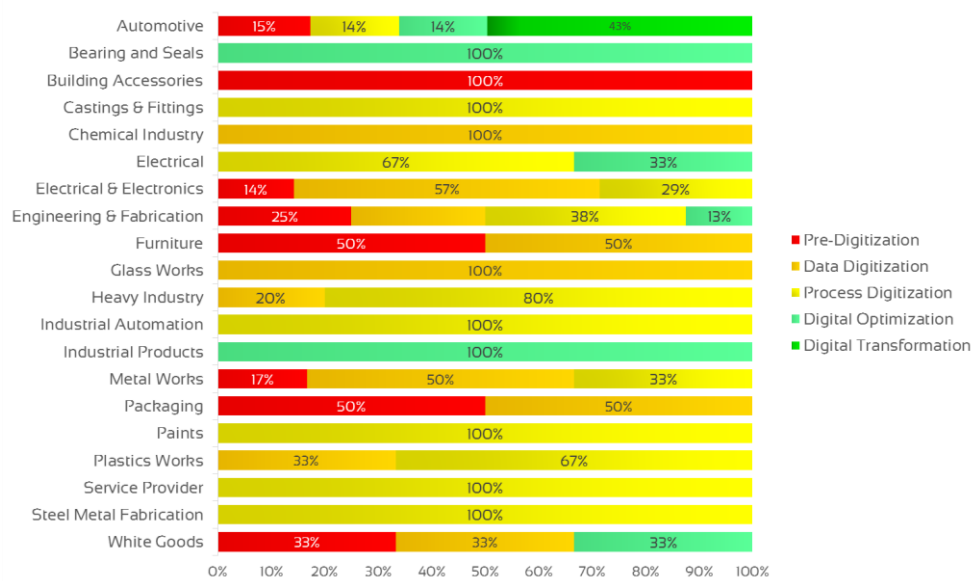
C. Distribution by 'Stage in Digital Journey' Across *Industry Types*

Industry	Pre-Digitization	Data Digitization	Process Digitization	Digital Optimization	Digital Transformation
Automotive	15%	14%		14%	43%
Bearing and Seals				100%	
Building Accessories	100%				
Castings & Fittings			100%		
Chemical Industry			100%		
Electrical			67%	33%	
Electrical & Electronics	14%	57%	29%		
Engineering & Fabrication	25%		38%	13%	
Furniture	50%	50%			
Glass Works			100%		
Heavy Industry		20%	80%		
Industrial Automation			100%		
Industrial Products				100%	
Metal Works	17%	50%	33%		
Packaging	50%	50%			
Paints			100%		
Plastics Works		33%	67%		
Service Provider			100%		
Steel Metal Fabrication			100%		
White Goods	33%	33%		33%	

Observations:

- The study highlights **Automobile** segment as 'Digital Leaders' where Digital *Transformation* is underway
- Industrial Products and Electrical segments are faring better in Digital Optimization
- Paints, Casting & Fittings, Steel Metal Fabrication and Service providers to the manufacturing industry at the tipping point of the digital journey.

10. Findings: Data is Reshaping Industry Competition

The undertaken study which was based on numerous parameters, investigated the use of data and digital technologies across core functions of the Indian manufacturing industry.

In order to achieve Data-Driven Manufacturing, it is important to investigate if the organizations are driving business decisions based on digitally data. Are they capturing digital data at every point in the value chain (from input to output) and analysing that data to gain insights (using digital technologies) to make improved decisions?

The research groups the findings and key problems faced by the industry in two buckets: The Tangible ones (those that industry is aware about and faces regularly); and the Intangible ones (those that are not easily discovered by majority of the organizations).

## 10.1 Tangible Findings: Observations and Problems

The study highlights the following top-level observations:
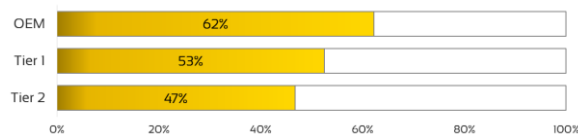
Low Extent of Data Digitization

Data Digitization being the basic and first step in the 4-step Digital Journey, the research found that significant number of organizations are yet to achieve 100% Data Digitization.

Across Groups:

Average Data Digitization — 51%
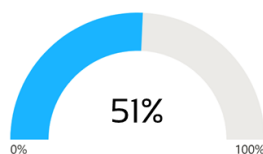
% Data Digitization

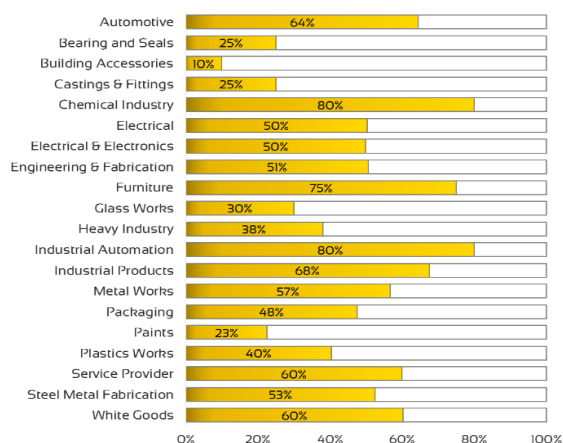|	
OEM	62%
Tier 1	53%
Tier 2	47%

Observations:

- 51% of the Indian manufacturing industry are yet to achieve 100% Data Digitization (conversion of **all** data into digital format). Large volume of data still exists as paper based forms, invoices, challans, sales orders, PDFs etc.

- OEMs on an average had 62% Data Digitization, Tier 1 and Tier 2 stood at 53% and 47% respectively

Across Industry Types:

Observations:

- Overall Data Digitization extent is very low.

- Automotive, Chemical and Industrial Automation Industry are doing better than others in 'Data Digitization' phase

% Data Digitization

|	
Automotive	64%
Bearing and Seals	25%
Building Accessories	10%
Castings & Fittings	25%
Chemical Industry	80%
Electrical	50%
Electrical & Electronics	50%
Engineering & Fabrication	51%
Furniture	75%
Glass Works	30%
Heavy Industry	38%
Industrial Automation	80%
Industrial Products	68%
Metal Works	57%
Packaging	48%
Paints	23%
Plastics Works	40%
Service Provider	60%
Steel Metal Fabrication	53%
White Goods	60%

Low Extent of Process Digitization

Process Digitization is the second step in the 4-step Digital journey. The study highlights, that although Data Digitization is on an average 51%, Process Digitization across organizations averaged at, an even lower value of 31%. However, this is a natural outcome of low level of Data Digitization. The Indian manufacturing industry needs to gear up by improving its overall Process Digitization percentage to leverage the benefits of Digital Optimization.
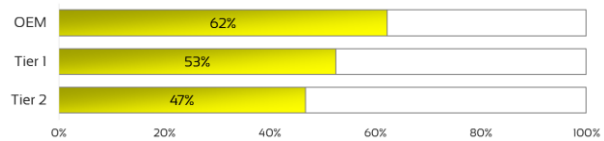
Following findings were discovered about Process Digitization:

Across Groups:

Average % Process Digitization

31%

% Process Digitization

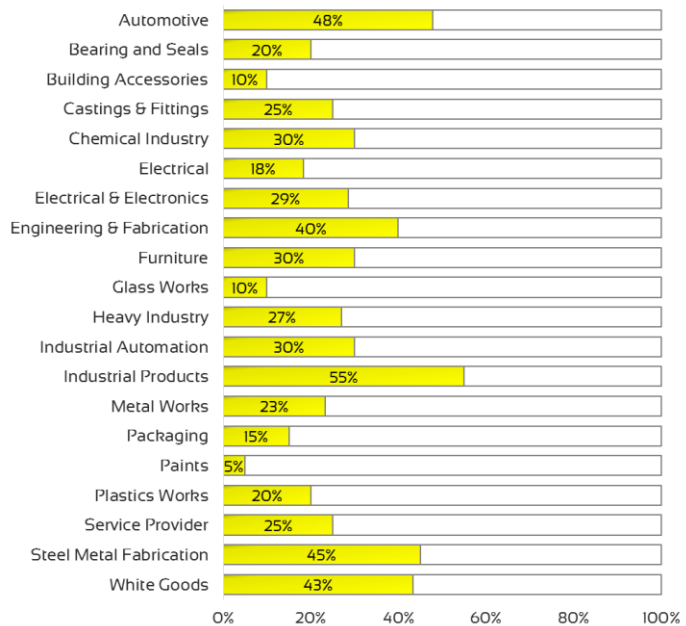|	
OEM	62%
Tier I	53%
Tier 2	47%
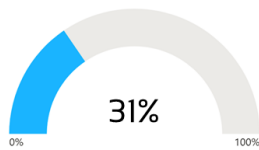
Observations:

- Majority of the upstream processes (Purchase Orders, Procurement, Raw Material Inventory management) are digitized using ERP software. Product Engineering processes use *CAD/PLM* software.

- Manufacturing/Production processes however are still under Process Digitization. They are Excel based and in some cases paper based.

Across Industry Types:

Observations:

- Automotive segment stands at 48% of Process Digitization

- OEMs are leading the space but non-OEM Automobile segment still has significant scope for improving their process digitization.

% Process Digitization

Automotive	48%
Bearing and Seals	20%
Building Accessories	10%
Castings & Fittings	25%
Chemical Industry	30%
Electrical	18%
Electrical & Electronics	29%
Engineering & Fabrication	40%
Furniture	30%
Glass Works	10%
Heavy Industry	27%
Industrial Automation	30%
Industrial Products	55%
Metal Works	23%
Packaging	15%
Paints	5%
Plastics Works	20%
Service Provider	25%
Steel Metal Fabrication	45%
White Goods	43%

## Data across Silos – Opportunity for unified view across value chain

Majority of organizations today have data stored in siloes. Over 90% of organizations are not viewing the data across siloes in a unified manner. Enormous volume of data exists across systems (ERP modules, CAD, PLM, CRM systems, Excel sheets). During the phase of the study, it was discovered that 50% of the participating organizations misunderstood the processes digitization as 'Digital Transformation'. Believing so, they continue to view Data in silos.

The reality is that 'Digital Transformation' would take off only and only when leaders start looking at data from silos in a 'unified view'.

### Across Groups:

Observations:

- OEMs are marginally better in utilizing and analysing data across silos with handful of them analysing data across silos 'proactively', while remaining using it 'reactively' (to troubleshoot after problems have occurred)
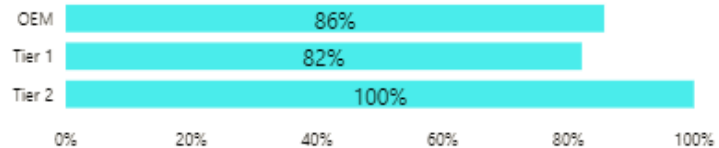
Across Manufacturing Segments:

Observations:

- Almost every industry segment is facing the problem of 'not analysing data across silos'

- Lack of realization amongst the decision makers and leaders that a unified view of data can tremendously help in making wiser decisions

- 33% of businesses are using mild correlation between data across siloes

- 20% have a 'unified view' and use dashboards to monitor key KPIs in real time

- 67% are not leveraging data from ERP systems for any decision making
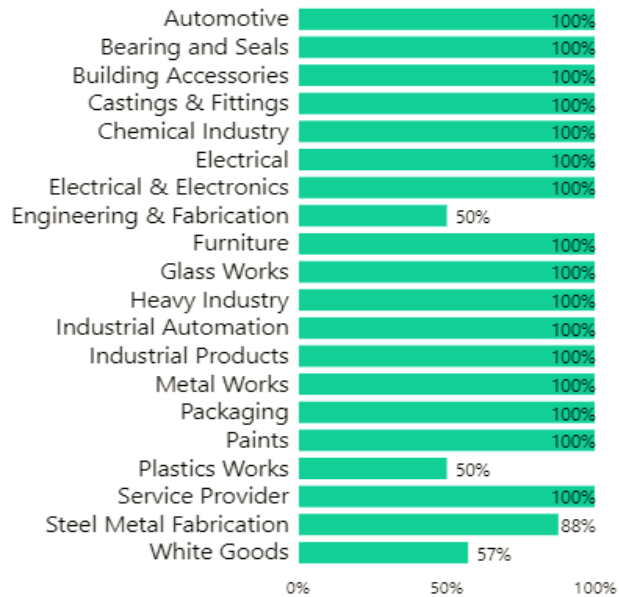
Lack of historical analysis – 'Reactive' rather than 'Proactive'

Identifying trends and patterns using historical data would help organizations in several ways – better inventory planning, production planning and logistics planning along with lowering rejection rates, etc. The study reveals that Indian manufacturing industry today is falling behind in leveraging historical data for trend analysis

- Up to 8% of organizations use historical data proactively for higher productivity gains
- 92% of businesses are analysing historical data reactively for troubleshooting to fix problems

Underutilization of investment in ERP

Majority of businesses are underutilizing their investments in ERP systems:

How does industry leverage ERP systems?

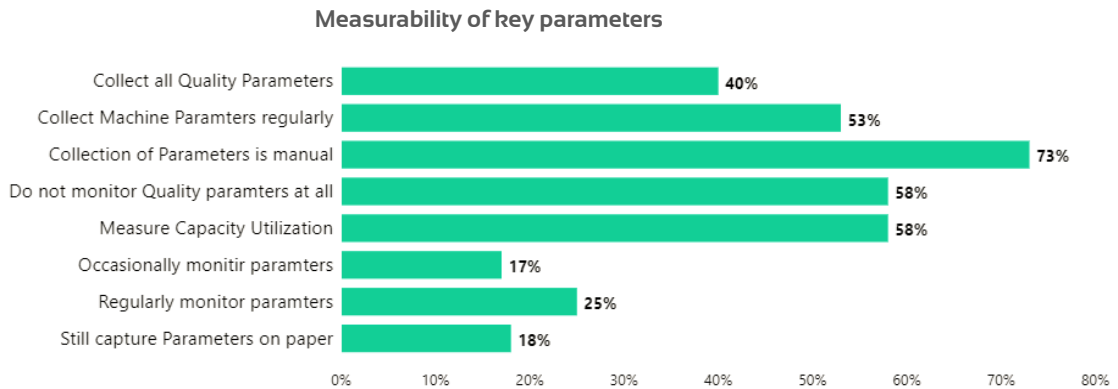| Category	Percentage
Implement ERP for Finance	66%
Implement ERP for Inventory	91%
Implement ERP for Production	13%
Implement ERP for Purchase	93%
Inconsistencies across similar ERP modules?	45%
Lack of integration between modules	94%
Not leveraging ERP completely	83%
Use some kind of ERP	85%
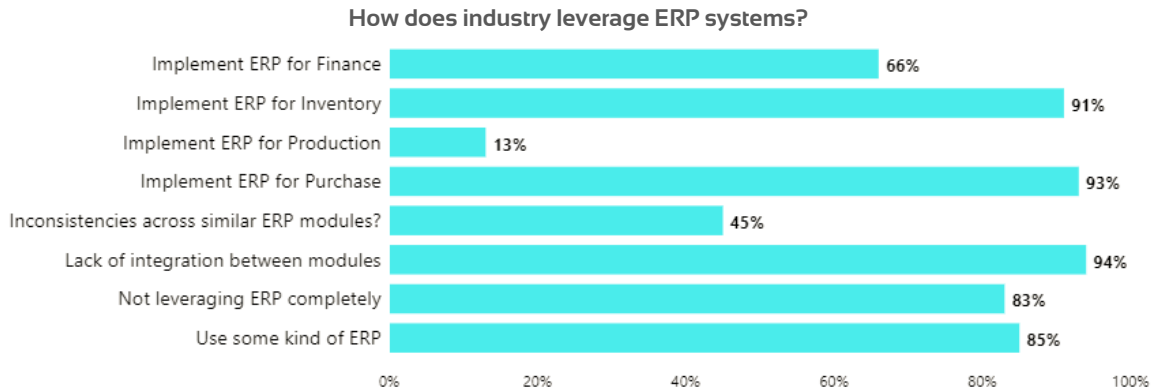
Observations:

- Organizations are facing challenges in accessing data from ERP systems. 80% of the users of ERP systems are relying on the remaining 20% for data (that too obtained through exportable reports from systems).
- API level acess to ERP systems is not leveraged. The system generated reports are manually analysed for decision makking.

Inability to measure key parameters digitally

More than 70% of organizations are monitoring only *critical* processes. Data is captured for almost all processes, but in variety of formats across multiple systems. But not all of it is being measured and monitored. Operational intelligence - which can highlight operational issues and reveal inefficiencies that otherwise won't be spotted - can only be gained if an organization leverages digital technology to analyse 'Digitized Data' and take corrective actions.

Measurability of key parameters

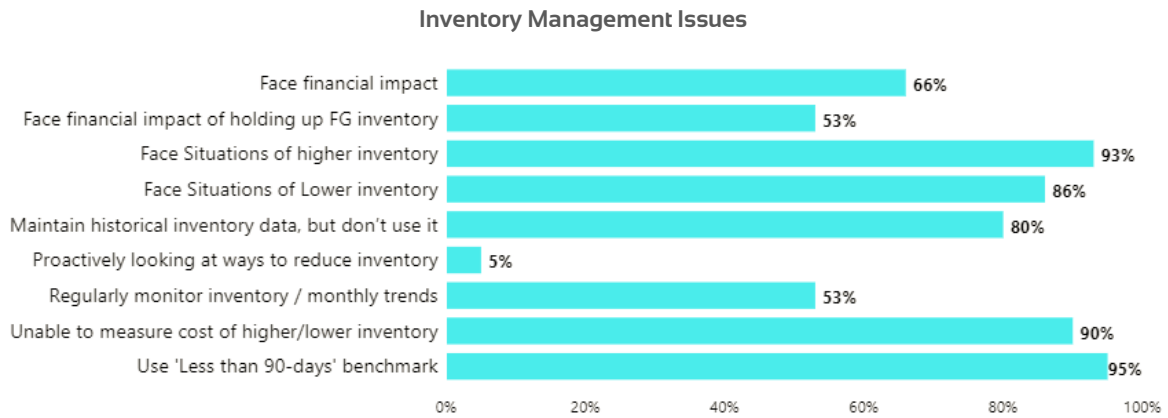| Category	Percentage
Collect all Quality Parameters	40%
Collect Machine Paramters regularly	53%
Collection of Parameters is manual	73%
Do not monitor Quality paramters at all	58%
Measure Capacity Utilization	58%
Occasionally monitir paramters	17%
Regularly monitor paramters	25%
Still capture Parameters on paper	18%

Low usage of Cloud and Mobility:

In general, the usage of cloud and mobile technologies is extremely low in the Indian manufacturing industry. Cloud can bring in significant cost savings in terms of software and hardware costs:

- Only 17% use cloud technologies (a very low extent)
- Only 26% use Mobile apps to enhance or monitor their processes

Lack of Data-Driven Inventory Planning

Inventory planning is carried out based on sales order pipeline. 90 days is the de-facto benchmark used by industry for inventory stock-up.
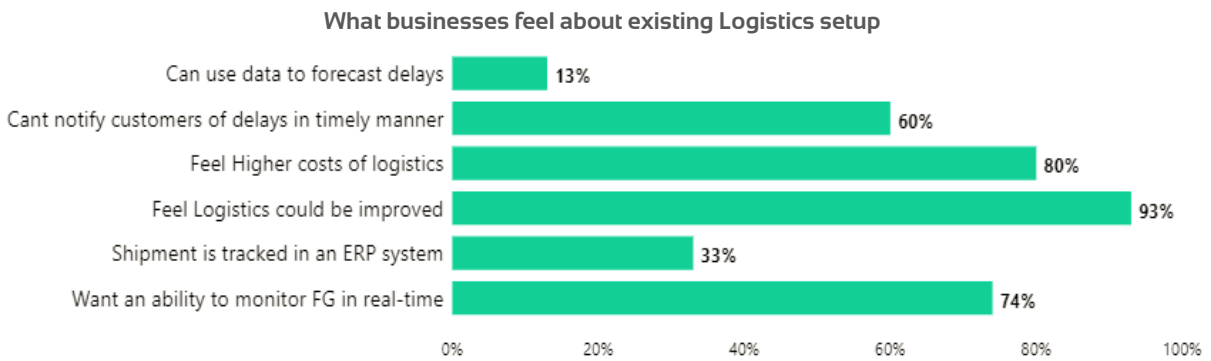
Inventory Management Issues

Category	Value
Face financial impact	66%
Face financial impact of holding up FG inventory	53%
Face Situations of higher inventory	93%
Face Situations of Lower inventory	86%
Maintain historical inventory data, but don't use it	80%
Proactively looking at ways to reduce inventory	5%
Regularly monitor inventory / monthly trends	53%
Unable to measure cost of higher/lower inventory	90%
Use 'Less than 90-days' benchmark	95%

Observations:

- Majority of the business are not using data efficiently for effect planning and management of the raw material Inventory.

Lack of ability to track Finished Goods

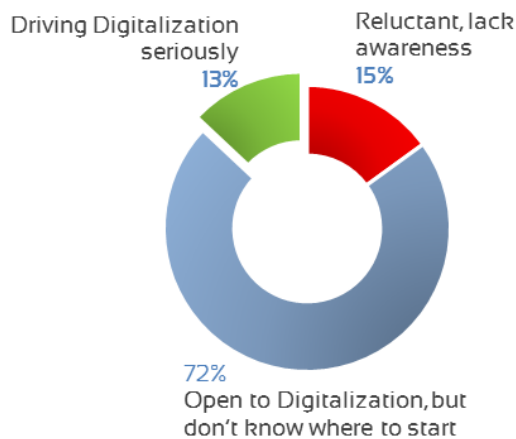More than 90% surveyed participants face the following problems further impacting their daily operations:

- Inability to track shipments in real-time
- Inability to estimate delays in order to notify customers. In case of Tier 1 suppliers further delays OEM's production and OEMs impose fines on them
- Inability to dispatch Finished Goods in time due to delays in dispatch of previous orders

What businesses feel about existing Logistics setup

Category	Value
Can use data to forecast delays	13%
Cant notify customers of delays in timely manner	60%
Feel Higher costs of logistics	80%
Feel Logistics could be improved	93%
Shipment is tracked in an ERP system	33%
Want an ability to monitor FG in real-time	74%

Digital Awareness but lack of subsequent action

The study discovered that almost 100% of the industry silently understands the benefit of digitalization.

Is Organizational Mindest inclined toward Digitalization?

Driving Digitalization seriously
13%

Reluctant, lack awareness
15%

72%
Open to Digitalization, but don't know where to start

Observations:

- Very few pursue digitalization seriously or have a strategy in place

- Majority of participants felt that they need to do digitalization, but the research identified that their real problem was not knowing what exact steps to take

10.2 Intangible Findings: Challenges that are not easily discoverable

This section of the report lists top level challenges that are intangible in nature. Intangible here, means those challenges / problems that are not easily detectable. Organizations with a strong vision and digital strategy in place, are leveraging data to overcome some of the below mentioned challenges:

Low importance to Historical Data

Organizations are logging significant historical data, but lack understanding in knowing how to extract meaningful information out of it, with no compelling need to do so.

In the Process Digitization stage, significant amount of data is stored in the databases of the ERP, MIS, PLM and similar systems. The system generated reports are always viewed from the 'current status' perspective – meaning most of the organizations extract report, look at 'how things are' and this activity repeats every month (in some cases it is based 'on demand'). Some organizations spot recurring problems through these reports. They ironically fail to realise that historical analysis of these reports can help them identify trends and patterns which can help them take right measures at right time.

Manual handshake between systems and processes

One of the commonly observed facts was that organizations are not able to realize that the handshake between two different processes is often manual.

As an example of an organization from the heavy industry segment (OEM) realized - the process of raising purchase orders with the suppliers was all 'digitized' via portals. At the organizational level the purchase function has been implemented using an ERP system. This workflow portrayed '100% Process Digitalization' to the organizational leaders. But in reality for every PO raised individually with each of the 5 or 6 suppliers (using supplier provided portals) the organization had to create a 'mapped' PO order in their ERP system by 'manually' entering data. This made it an expensive and time-consuming process. A one-time mapping effort between the internal and external databases followed by automation of creating the internal PO can allow them to save 2 person months of effort every month and repurpose those two employees. An ideal example of 'Digital Optimization'.

Digital Optimization can be easily achieved when you make systems integrate with each other either directly, or by using a third technology application. Most of the organizations have all processes implemented in ERP systems, but these systems are not integrated with each other. Every process owner follows a different methodology. This is a perfect example, where the organization leadership can play an important role by bringing in a policy proactively to make these systems integrated. The benefits are immense once you cross the barrier.

Our research identified a few companies which are digitally well optimized because they have proactively eliminating this manual handshake.

Inability to identify 'right amount' of information

Organizations lac clarification when it they look at data for insights. Those who regularly make use of reports extracted from ERP systems (and some of them look at a whole lot of reports) are spending significant time looking at a lot of data points. This is resulting in three disadvantages:

1. Organizations are not configuring their ERP systems optimally
2. Since they extract lot of reports, they are falsely believing that they are making 'effective' use of data. They fail to realize that they should formulate fewer KPIs and monitor them daily or weekly
3. They formalize this process monthly/weekly but fail to realize the process of data extraction and insight generation can me optimized or even automated

Lack of correlation of information from **different data points** of value chain in the same division

An organization starts its journey towards Business Transformation after reaching the 'Tipping Point' (Data and Process Digitization). Some of the proactive organizations are working towards formulating digital workflows (business processes) across value chain for a centralized view of data.

Unfortunately many organizations are not thinking of looking at different parameters of data from these systems in the same breath. Also, not many ERP systems are well-configured to standardize information across business functions, leading to multiple owners of different processes working in silos across the value chain.

The leadership of the organizations needs to proactively push for implementation of an overarching data visualization and management system to ensure that inefficiencies at the process intersections are ironed out.

Example 1: An organization ne revealed that due lack of overarching data analysis system, it was a challenge to calculate the overall production efficiency accurately. Based on information entered in register logs manually, the efficiency was 90%. After implementation of plan to correlate information between processes across the value chain (from raw material procurement to finished goods), the organization realized that the actual efficiency was only 70%.

This enabled the organizations to realize the immediate next steps required for improving efficiency from 70% to more than 90%. A proactive thinking, a strong willingness to analyse every bit of information made the organization improve its efficiency drastically and concentrate on using data for creating newer 'revenue' models and business offerings. It thus transited from the 'Digital Optimization' zone into the 'Digital Transformation' zone.

Example 2 Different process owners in the value chain of an OEM who were operating non-collaboratively, factored in a different rejection ratio - of 4-5% each in their production planning. The cumulative rejection ratio led to 15% overproduction instead of 5%, leading to heavy losses. Only a post-mortem revealed why this happened.

Lack of correlation of information from **similar data points** across different divisions in the value chain

Today many organizations are using data from their own processes to achieve higher level of Process Optimization in. But then they stop at that, because they mistake 'Process Optimization' for 'Digital Transformation.' In reality, they have just reached the Tipping Point at this stage.

The study explored many examples. One such example highlighted below:

Example: Two different divisions in organization implemented their raw material procurement function efficiently in ERP systems. The owners did not benchmark their own processes against each other. An investigation discovered that these two divisions purchased same raw materials from two different vendors at different prices - with one division procuring the raw material at 5% lower cost than the other division.

Looking at data from similar systems (but with physically different implementations) revealed the following two things:

1. An immediate saving of 5%
2. Additional 1%-2% possible saving in the overall process consolidation

This situation could have been averted, had the leaders looked at a unified view of the two systems.

10.3 Where does the Manufacturing Industry stand in the Transformation Polygon?

This section of the report portrays the average score of the Digital Maturity of the Indian Manufacturing industry on the rating system for assessment of Manufacturing Industry Digital Advancement (Transformation Polygon).

The section highlights two examples: One representing an organization that is still in pre-digitization stage; and second representing a 'Digitally Transforming' organization.

Average Score of the Manufacturing Industry today:
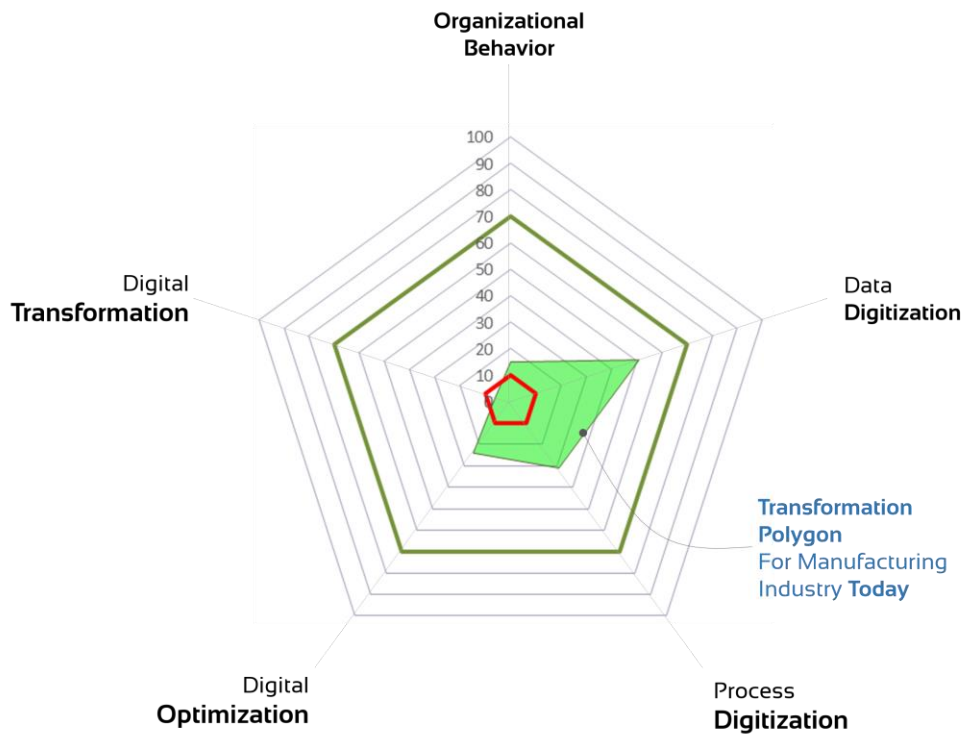
Observations:

- Majority of the industry is in the 'Business Digitization' zone. Many have not yet really ventured into optimization
- Manu among these believe that their business has been digitall transformed because they have a high degree of process digitization

Next, the report highlights two examples – both belonging to Tier 1 Automobile industry suppliers, but situated at two extreme ends of the spectrum.

Example 1– An organization in pre-digitization stage

Tier 1 | Automobile Segment | Revenue:
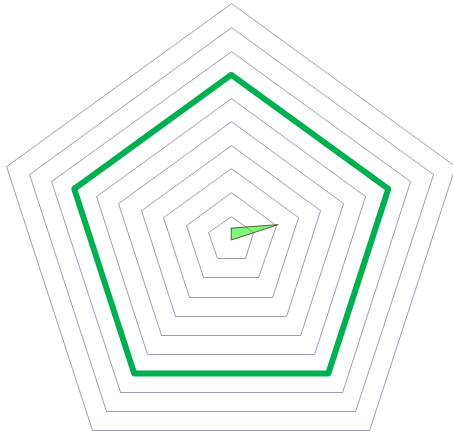
Reasons:

- Has awareness about need to go digital, but does not have a pressing need as its business is doing well
- No Digital Strategy in place
- No seriousness about Digital Transformation since they feel there is 'There is no need'
- Reactive analysis of information
- No Process Digitization. Most of the processes are manual
- Minimum Data Digitization

Example 2 – An organization in an Advanced Digital Transformation stage

Tier 1 Automobile Segment | Revenue:
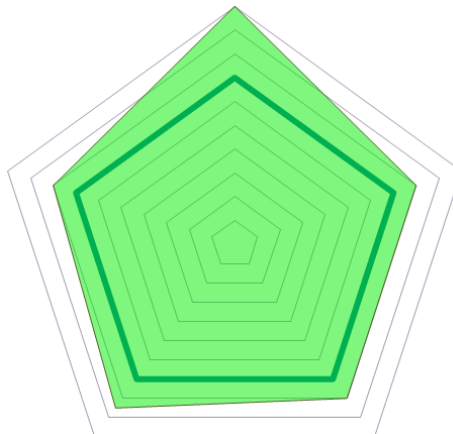
Reasons:

- Leadership that is determined to implement a serious 'Industry 4.0 Strategy'
- No pressing need to go digital since business is doing good, but *Proactive thinking* shown by the leadership is making the organization transform itself
- Highly Data-Driven decision making
- Continuous drive to improve 'Optimization'
- High bar for benchmarking of internal processes

11.   Our Recommendations

Stage 1: A small extent of data digitization

- Starts with converting paper-based data to application-stored data. E.g. Paper to MS Word or PDF.
- Driven more by necessity than vision

Recommendations to go to next stage:

- It may be hard to put a digital strategy in place. But the leadership must decide to migrate all critical and expensive processes to digitized processes.
- Investment in software applications and getting people with right skills is an important step
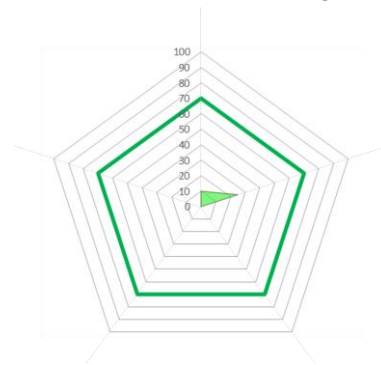
Expected Timeline: 3-6 Months

Stage 2: Intermediate Data Digitization

- More data is brought into digital form

Recommendations to go to next stage:

- Leadership needs to institute a digital charter for the organization at this stage
- Critical business processes should be digitized
- Invest in ERP systems / CAD & PLM systems

Expected Timeline: 3-6 Months

Stage 3: Process Digitization

- Increased investment in process Digitization leads to higher data digitization
- But, the decision to invest is still 'need-based'. Leadership must decide to step up the investment in digital technology

Recommendationsl to go to next stage:

- Reaching the Tipping Point should be the immediate goal
- Plan for digitizing at least 80% of business processes. Leverage ERP investments further
- Digitize your upstream and downstream facing (external facing) systems and start analyzing data from different business systems in a unified manner

Expected Timeline: 6-9 Months
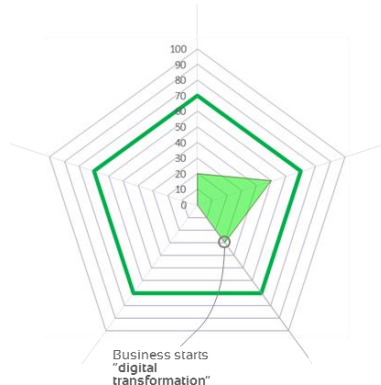
Stage 4: The TIPPING POINT

- Data from multiple systems starts providing meaningful 'information' than can enable better decision making
- Bottom-line numbers start showing improvement

Recommendations to go to next stage:

- Give your digital willingness a booster shot. Sign-up for a formal 'Industry 4.0 Strategy'
- Assign budget for Digital Transformation
- Search for opportunities for optimization and efficiency gains

Expected Timeline: 9-12 Months
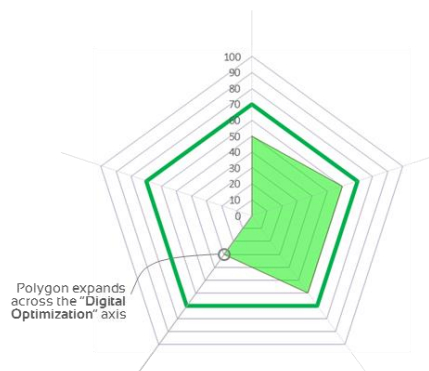
Stage 5: Crossing to the other side of the Tipping Point

- The organization now has significant amount of data at its disposal.
- Along with increasing the 'digital optimization' footprint, it is now prepared to look at ways to monetize data even further to improve the 'Top Line'

Recommendations to go to next stage:

- Take 'Digital Drive' to the next level.
- Drive higher business optimizations by establishing consistent benchmarks across all divisions of the organization
- Drive standardization across processes across all divisions

Expected Timeline: 12-18 Months
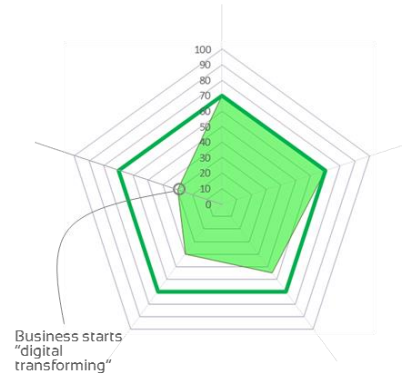
Stage 6: Expanding Optimization

- The organization at this stage has implemented substantial process optimization
- It has brought organization-wide standardization across multiple processes

Recommendations to go to next stage:

- Organization should start looking at pre-production, production and post-production data together
- Any opportunities to create new offerings, or earn higher revenue with the same business model?
- Look for ways to create new value-add services for customers

Expected Timeline: 6 - 18 Months
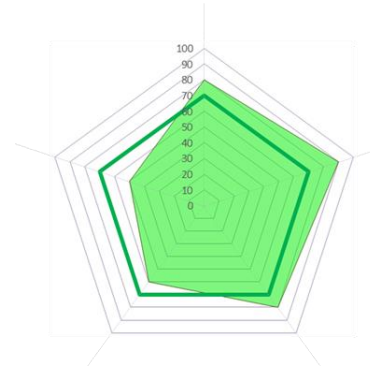
Stage 7: Crossing the 'Digitalization Escape Orbit'

- At this stage the organization is a 'digitally transforming' organization.
- Organization has changed to 'Proactive' from 'Reactive' and established high extent of measurability for all its processes and parameters

Recommendations to go to next stage:

- Use of data and digital information to create newer value-add services for your customer

Expected Timeline: Ongoing
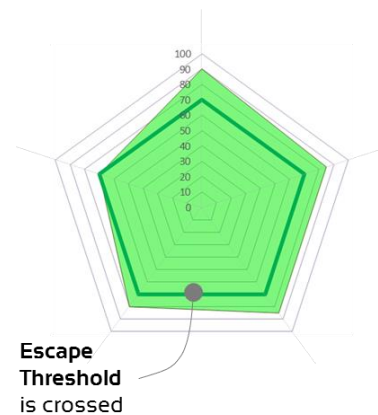
Stage 8: Into the 'Digital Differentiator Zone'

- At this stage the organization has further advanced in its digital transformation journey and is continuing to optimize processes further
- Organization has established high extent of measurability of all its processes and parameters

Recommendations:

- The aim of the organization is now to go toward the next wave of digitalization – Data driven Manufacturing based on sensors, predictions, and big data.
- There is really no outer limit in this zone. Continuous improvement becomes the way of life for the organization in this stage
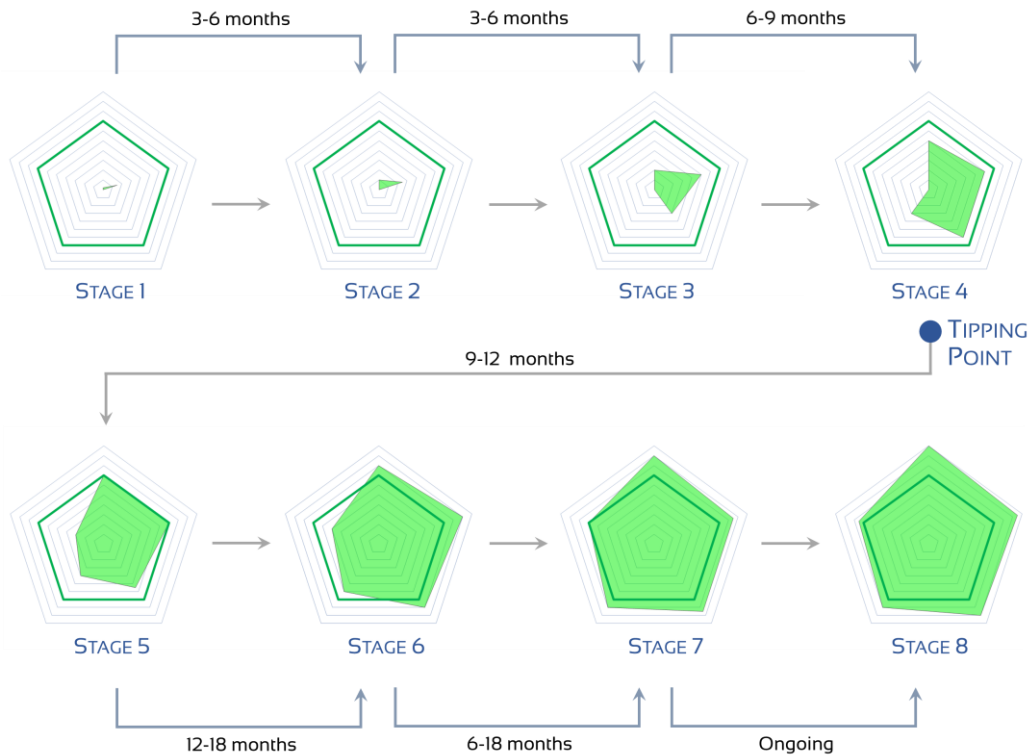
12. Recommendations to accelerate the Digital journey

12.1   High Level Recommendations

To recap, The typical Digital Transformation Journey at a glance looks like the following:

As indicated in an earlier section, majority of the Indian manufacturing industry today lie in Stage 3 of the above transition path. The aim of organizations should be to reach (and cross) Stage 7 (Digitalization Escape Orbit). The Digital push by the organizational leadership will prove to be the decisive factor in hurling the organization into the Industry 4.0 zone (Stage 8)

For this transition, the organizational leadership needs to undertake the following steps:

1. Sign up for a concrete Digital Transformation roadmap. This includes improving the organizational behaviour, cultivating openness to digitalization at all levels in the organization.
2. Transition from 'Reactive analysis' approach to a 'Proactive Analysis' approach
3. Aim to transiting 80-85% of business processes to 'Process Digitization'.
4. Establish an organizational level policy of bringing in consistency in implementation of ERP across different divisions
5. Undertake the task of 'measuring' every operational parameter to help improve operational efficiency
6. Evaluate key 'daily, weekly and monthly KPI's' to establish dashboards for automated evaluation and monitoring of the KPIs
7. Promote digital handshake to eliminate manual intervention at process boundaries. It may appear to have little ROI at face value, but once implemented, would drive bottom-line upward
8. Set up methodologies to correlate data from siloes. This activity is sure to expose issues that have stayed hidden or implicit. This will enable organizations to find Digital Optimization opportunities.
9. Develop a habit of regularly analysing historical data. This step will help discover unseen problems along with providing pointers that will lead to solving some of the recurring problems
10. Cloud and Mobility: Leverage cloud services for some of the processes and operations (OpEx as against CapEx) while continuing to leverage existing on-premise systems. Use mobile apps to get notifications of key parameters in real-time.

12.2   Other Recommendations

How can Industry Associations contribute?

Industry Associations can enable organizations to expedite their digital scores by considering the following recommendations:

1. Promote organizations to measure their Digital Advancement score, and formulate next steps toward systematic transition to a Digitally Transformed Business
2. Facilitate Organizations to assess a score on a scale of 0 to 100 for each of the four stages: Data Digitization, Process Digitization, Digital Optimization and Digital Transformation
3. Create a Digital Mandate which will contain specific guidelines. In the mandate, each of the four categories mentioned in the previous point would have a lower threshold score that each organization (that undertakes the mandate) needs to achieve:

   The Digital Mandate would be along the lines of enabling organizations to take concrete steps in following areas:

   - Configure organization-wide Digitalization Strategy (6 month / 12-month / 18-month / 24-month plans)
   - Expand Data Digitization by 'certain' level in 12 months
   - Expand Process Digitization by 'certain' level in 12 months
   - Implement five concrete steps for Digital Optimization
   - Implement 1 step for Digital Transformation

The associations should motivate maximum members to sign up for this mandate.

Standardizations: The associations should take steps in creating standardization for key parameters that form part of the standard Audit reports. With standardization, every organization in the supply chain will identify these parameters by the same name or code and will develop precisely the same understanding about them.

Standardization will also help organizations to smoothen data transactions between their own and external systems (at upstream or downstream boundaries of the business). The mapping between the internal and external parameters for an organization would also become easier. CII can play a role in enforcing these mappings.

Certification programs: Associations can create Certification programs that cater to specific topics in the Digital Transformation Journey. Some sample certification programs could be:

- Certification for Business Excellence in Process Digitization - for achieving an 'optimum' level of Process Digitization
- Certification for Business Excellence in Process Digitization - for consistent implementation of all similar business processes across different divisions
- Certification for Business Excellence in Process Optimization - for using Data-Driven decision making for optimizing inventory management and reducing inventory costs

The Associations should promote organizations to undergo a 'Discovery' exercise with the help of a combination of 'domain + technology' expertise to identify the next steps towards 'Digital Transformation':

- Defining the problem specifications
- Evaluation of Digital Advancement score
- Identifying the right balance of existing investments and new investment to advance digital footprint
- Formulate exact KPIs to monitor at a regular frequency (daily/weekly/monthly)

How can Government contribute?

'Data must be made available for research and growth so that India can lead the world in the digital revolution'

   Ravi Shankar Prasad, Union Minister for Electronics and Information Technology, Sept 2017.

Government is increasingly using data today to shape the Digital policies. It is relying heavily on manually compiled data. Today data is not easily available digitally. The second problem is that different segments within the manufacturing industry and organizations call the same data points and terms with different names or refer to them in different ways.

Standardization across data terminologies would immensely help the government to make strategic decisions. Today's inherent inconsistency in the means of gathering data can potentially deteriorate the meaningfulness of the insights which the government would like to rely on to make strategic decisions.

If standardization is established across the data systems within the manufacturing industry, then Government will find it easy to collect and collate 'meaningful' data and make more efficient digital policies.

With this study, we intend to indicate that Data Digitization and Process Digitization can drive the industry to nurture every piece of information 'Digitally'. If manufacturing organizations act on the lines of improving their 'Data Digitization' and 'Process Digitization' scores, collecting meaningful information about the digital extent of the industry becomes a more compelling case and would enable the Government to act more decisively.

The government can enforce a requirement where the IT policies of an organization would need to comply with 'standardization' requirements when storing data in its data management systems.

Contributing to Make-In-India initiative

For the success of the 'Make in India' program, it is essential that the Indian manufacturing organizations be successful in implementing their 'Digital Transformation' Programs.

The Government of India, as part of the 'Make in India' program, harbours an ambitious goal of increasing the contribution of manufacturing industry to its GDP from 16% to 25% by 2020. The findings, recommendations and suggested approaches of this research could be leveraged by the Government to facilitate Digital Transformation programs among India manufacturing organizations. Specific Recommendations to the Government are:

Creating organizational audit policies as compliance measures, to achieve benchmarks of 'optimum' levels of Digitization at each stage of Transformation journey.

- Policy to enable organizations to take one major step every quarter to improve their Process Digitization
- Policy to enable organizations to measure key parameter at each step and improve their benchmarking methodologies
- Policy to enable organizations to achieve successful migration from Process Digitization to Digital Optimization (crossing the Tipping Point), to attain following goals
  - Leaner manufacturing to achieve increased throughput
  - Reducing process and manufacturing costs
  - Reducing energy consumption

Organizations need to become highly competitive if the 'Make in India' program has to succeed. The programme will succeed only if manufacturing industry takes Digital Transformation seriously, and the Government can play an active role of facilitating this transition to Digital Transformation.

13. Conclusion

This study is based on a thorough methodology that to assess the Digital Advancement score for Indian Manufacturing Industry. It is based on information gathered through surveys & observations with participants from a broad spectrum of business functions across 59 manufacturing organizations carefully chosen from 20 different segments within the Manufacturing industry. This study presents a realistic picture of where the industry stands today with respect to Data-Driven Manufacturing.

The research concludes that the manufacturing industry in India today, barring a few outliers, stands in the Business Digitization phase. Business Digitization phase deals with Data and Process Digitization and at best represents readiness of the industry to compete with the global world under 'Industry 3.0' scenario that drove industry productivity in the past two decades. Organizations have brought data and processes into software systems, and this has helped the pace of manufacturing, however, the 'Tipping Point' which enables organizations actually to drive Process Optimizations to develop value-add for customer's remains a goal to be achieved. The study reveals that just over 17% of the Indian manufacturing industry today uses data for driving business decisions that directly affect bottom-line and generate business opportunities.

This presents a case for undertaking strategic advancement initiatives in digitalization of overall areas of the business to create a viable competitive advantage. As such, the study proposes standardizing a 'Digital Advancement score' assessment framework to develop a digitalization maturity matrix. This framework will directly support the discovery of opportunities of digitalization, and subsequently, aid in creating and importantly implementing actionable Digital Advancement plans to jump to the next stages of Digital Transformation journey.

To conclude, this study finds that Digital Transformation is inevitable and has the necessary mindshare within the Indian manufacturing Industry. The study and the report intend to provide a concrete roadmap for organizations to make Digital Transformation a practical, easy to understand journey, and understand a completely locally developed approach to enhancing competitiveness.

With Industry support to relay benefits of the approach and the Government's evolving policy framework to encourage increased Digital footprint, we expect to see the Industry develop a much needed and promising model of growth and competitiveness.