Transforming Manufacturing in the Era of Industry 4.0:
A Perspective from India
Executive Summary

This paper is based on a series of roundtable discussions held with CEOs, CHROs and Operation Leaders of manufacturing organizations in India; conducted across Mumbai, Pune and New Delhi.

It took humans over two centuries to progress from the introduction of mechanization to mass production and then to automation. Today, less than 50 years from the third industrial revolution, we are already talking about the efficiencies and new business opportunities that organizations are generating from the fourth one - Industry 4.0 (I4.0), a collaboration of hardware and software to develop smart factories.

Through a series of roundtable discussions with CEOs, CHROs and operations leaders from a mix of Indian companies and MNCs with significant operations in India, we looked at transforming manufacturing in the era of I4.0. The question on everyone’s mind: Is it a necessity or a luxury? We also tried to identify some of the grassroots challenges these organizations face in implementing I4.0 in manufacturing and the implications for leadership and other organizational enablers.

Current situation

While there is no doubt that MNCs are leveraging their experiences and successes from developed markets in implementing I4.0 in their manufacturing operations in India, some of the India-based manufacturing companies have also made significant strides in adopting technology in their manufacturing processes. Companies rightly understand that investing in technology is key to their survival. In the unforgiving marketplace, successful companies are expected to control every step in the value chain. From a quality and cost perspective, they need to have connected systems to ensure consistency and responsiveness. In our discussions, the need to delight the customer was seen as the strongest business case for investing in technology.

Nevertheless, in India, many of the labor-intensive sectors, such as automotive, industrial goods and other heavy manufacturing, remain far behind in digitizing and modernizing their manufacturing facilities. Many of them still believe in exhausting low-cost options available rather than implementing high-cost technologies. In a survey conducted by RRA, over 62 percent of the organizations mentioned that they are still at the third industrial revolution in terms of technology journey in their manufacturing – and will not move to I4.0 till they exhaust the benefits from I3.0.

Trends impacting the manufacturing sector

The introduction of new technologies – IoT, AI, ML, 3D printing, etc. - is already disrupting the manufacturing industry. Irrespective of sector, customer-centricity is the need of the hour for every organization. With increase in quality consciousness, customers are making better-informed decisions, which in turn is putting the pressure on manufacturers and the larger supply chain to drive innovation. Organizations are witnessing the emergence of in-house digital analytics and innovation capabilities. Initiatives such as cloud-based planning and smart manufacturing are being implemented to create use cases for cost efficiency. The speed at which the new technologies are disrupting manufacturing pose critical questions for the today’s leaders around the right leadership competencies to drive change, and what specific skills and roles are needed to execute transformation and robust organization culture to ensure sustainable change.

We tried to understand the roadblocks associated with embracing technology in India. Some of the commonly discussed topics were:

- The paucity of talent and skill gaps
- The difference in technology adoption between vendors and manufacturers
- Complex government interfaces
- Lack of infrastructure
- Abundance of cheap labor overshadowing the cost of smart connected devices
- Cultural readiness of the organization to sustain change
Of these, **training/ knowledge gaps** and lack of the **right culture** to absorb I4.0 changes came out as the biggest hurdles for transforming manufacturing in India.

However, given the competitive dynamics, embracing technology is no longer an option, it is a necessity. Fundamentally, we believe that **technology is here to stay**, and manufacturing companies need to figure out a way to embrace this efficiently.

**Change in leadership competencies required for today’s manufacturing organizations**

The operations leader job specification has changed significantly over the recent past. Traditionally, manufacturing organizations have always looked for technical acumen in their operations leaders. Today, leading companies speak about **commercial and financial acumen** in the same breath. Organization leaders at the forefront of I4.0 are exhibiting greater openness to new ideas, and therefore an increased tolerance to failures. With the changing ecosystem, many organizations are also trying to pinpoint the broader competencies they will require of leaders in the near future.

Our research on senior operations/ supply chain leaders in manufacturing environments points to four key leadership competencies that define transformational leaders in these organizations –

- More disruptive than pragmatic when it comes to setting strategy. They are innovative and inquisitive, and challenge traditional approaches.
- Risk-taking and less conventional in execution style. Open to new ideas, take initiative, test limits and are entrepreneurial.
- Heroic as a team leader. They are optimistic, lead from the front and display perseverance in the face of challenges.
- Combination of connecting and galvanizing in stakeholder management. Serve as beacons of technology, inspire trust through compelling influence and at the same time focus on team development and empowering others.

Senior level operations roles are increasingly being seen as **industry agnostic** – and more as a combination of the above competencies. There are numerous examples of leaders coming from various backgrounds and driving transformational growth in traditional manufacturing organizations. As we define them, they could be **technologists** (R&D/ technology experts), **operation experts** (know the pulse of the shop-floor), **engineering leaders** (strong project/ change management with technology expertise) or even **commercial champions** (strong customer market orientation).

**Organizational enablers to drive change**

- **Investment in L&D at grassroot level:** Most companies that have successfully implemented I4.0 in manufacturing have established customized training through CoEs / academies combining classroom work with on-the-job live projects. Upgrading employees’ skills to match changing technology seems to be the key success factor.
- **New JDs are being written up:** Technology adoption has resulted in the creation of new roles and JDs within organizations for digital strategy formulation, program management, ecosystem management amongst others - even in traditional manufacturing spaces such as mining, chemical and industrial goods. It is critical for organizations to recognize the talent need and design the organization structure to enable them to succeed.
- **Ecosystem development:** The I4.0 journey does not have to be an independent one. The smartest companies recognize the partners in their ecosystem who can help them on this journey – be it technology partners, implementation partners or post go-live, partners for data analytics & other services.
- **Cultural sustainability:** Many organizations view the ability to sustain results into the future as the toughest challenge in completing large scale transformation. Organizations need to foster a fail fast culture to encourage new ideas.

I4.0 is a journey and not a binary switch. Organizations do not just need a grand unifying digital vision but also need a plan to address that vision through a series of actionable steps.
Transforming Manufacturing in the Era of Industry 4.0

Implications for Organizations & Leadership

The Industrial Revolutions that took place in 18th and 19th centuries marked a shift to powered, special-purpose machinery, factories and mass production. This led to an availability of increased volume and variety of manufactured goods and an improvement in economic, cultural and social conditions of people. Beginning in the 1970s, the third industrial revolution introduced a shift from analog to digital technologies, electronics and information technology led to automation of production. Each of these industrial revolutions represented profound change and major societal transformation. While it took over 100 years for the third industrial revolution to take birth, today a fourth industrial revolution – I4.0 – is underway in less than 50 years. I4.0 builds upon the automation and enhances it with smart and autonomous systems that talk to each other, fueled by data and machine learning. It includes a combination of cloud, IoT, robotics, augmented reality, additive manufacturing, big data & analytics, and cybersecurity. These new technologies that are transforming industrial production promise greater efficiencies and require a change in traditional production relationships among suppliers, producers and customers.

INDUSTRY 4.0 BEING DRIVEN ACROSS INDUSTRY/ SECTORS

TRADITIONAL MANUFACTURING SECTOR RELATIVELY LAGGING BEHIND IN INDUSTRY 4.0

While the early adopters of advanced manufacturing and AI-driven technology report positive returns and new opportunities for growth, the adoption of technology still remains low across industries and regions. According to Russell Reynolds Associates’ Global Digital Pulse Survey 2018, only 35 percent of respondents from the industrial sector and 45 percent from healthcare said their businesses have been significantly transformed by digital technology. In a similar poll of a small set of Indian leaders, 62 percent said that they have not moved beyond the third industrial revolution. The low adoption rates raise questions about what is hindering manufacturing organizations from moving into I4.0. Based on our research, a key factor appears to be, the leadership competencies at CEO/HR/Manufacturing level to drive change. In today’s world it has become imperative to understand organizational enablers including skill sets required and new roles emerging to execute such transformations. At the same time leadership needs to ensure conduciveness of the manufacturing culture to bring about a sustainable change.

Since India is home to the supply chain operations of many multinational corporations, there is an increasing interest in seeing how Indian manufacturing is able to adopt I4.0 technologies and raise their
performance standards. Plus, sitting in India, these manufacturing nodes get to see how their respective global organizations are leveraging tools to better compare production footprints, cost of delivery and raw materials across their nodes globally—hence, there is continuous competitive pressure from other geographies to be more relevant cost and quality-wise within their global supply chains. To that extent, there is an increased focus on the Indian manufacturing sector to drive transformational changes to remain competitive in the global market place.

When we surveyed a small group of CHROs and COOs across 30 different manufacturing organizations in India, around 62 percent of the companies claimed to be still at the third industrial revolution while the remaining were at different stages of their journey towards a 4.0 vision already.

**TRANSFORMATION JOURNEY OF ORGANIZATIONS IN INDIA**

**WHO ARE THE MAJOR CHANGE AGENTS DRIVING MANUFACTURING TRANSFORMATION IN YOUR ORGANIZATION?**

<table>
<thead>
<tr>
<th>Change Agent</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td>69%</td>
</tr>
<tr>
<td>COO</td>
<td>45%</td>
</tr>
<tr>
<td>CHRO</td>
<td>24%</td>
</tr>
<tr>
<td>I4.0 Leader</td>
<td>31%</td>
</tr>
<tr>
<td>Board</td>
<td>21%</td>
</tr>
</tbody>
</table>

**WHICH STAGE OF THE INDUSTRIAL REVOLUTION ARE YOU AT CURRENTLY?**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I3.0</td>
<td>62%</td>
</tr>
<tr>
<td>I4.0</td>
<td>14%</td>
</tr>
</tbody>
</table>

**WHICH IS THE MOST CHALLENGING PHASE FOR TRANSFORMATION?**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: Preparing the case for change</td>
<td>34%</td>
</tr>
<tr>
<td>Stage 2: Pilot &amp; Scale-up</td>
<td>7%</td>
</tr>
<tr>
<td>Stage 3: Sustainability of results for the future</td>
<td>59%</td>
</tr>
</tbody>
</table>
Trends impacting the manufacturing sector

The technology trends that have disrupted businesses across value chains, are now increasingly focusing on driving impact in manufacturing as well. These include the Internet of Things (the connected factory), Automation/ Artificial Intelligence (robotics), Augmented Reality (real-time information & material flows), and Additive Manufacturing (3D printing). These are further being influenced by various business model disruptions that have come into traditional manufacturing businesses. For example, today's manufacturing businesses are increasingly working backwards from their target customer markets to drive innovation. There is increasing emphasis on enterprise in-house digital analytics and innovation capabilities, enhanced cost efficiency and value achieved by initiatives such as cloud-based planning, smart manufacturing, etc. Further, there is ever-present push to accelerate globalization of manufacturing enabled by digital networks and ecosystems.

The above trends are forcing organizations to ask the following questions of their boards & CXOs –

- Building the business case – how much & when to invest?
- How best to ensure value delivery post-pilot during the implementation roll-out?
- Who would be the best partners from your ecosystem to deliver this change?
- Do we have the right roles with the required skills to drive transformation?
- How to build the right culture to ensure sustainability?

The strongest business case will come from customer demand. We already had customers asking us specific questions like where the efficiency drop is coming from, which got us thinking and now we have recruited a Chief Digital Officer who sits on the executive committee. Technology opens our eyes to what we can offer our customers but many times it is the customer who demands something beforehand. The regulatory aspect is about survival but the aspirational aspect – how do you delight your customer even before he asks – could be the strongest business case for us.

Senior HR leader, large capital equipment manufacturer

Once the finished goods leave the factory, your control reduces drastically as there are external agencies involved, e.g. transportation, distributors, retailers, etc. In these instances, introducing effective RFIDs, barcodes, etc. has helped in tracking of goods and reduction of product tampering. However, it is important that companies are able to work with their vendors & suppliers to upskill them as well on their manufacturing practices – else, all the benefits of driving manufacturing transformation will get discounted on either side of the value chain. Over the last 5-10 years, quality consciousness has increased and that should support the external ecosystem (distributors, retailers) to better incorporate technology.

Industry 4.0 leader, large chemicals player

Our emphasis has been on building future capabilities that cut across leadership, both functional acumen and core technology. A supply chain academy has been created where technologies like 3D printing, continuous manufacturing, robotics, etc. are being looked into. For example, our medical business is looking at robotics where an angioplasty can be conducted without an intervention from a doctor. These are the kind of capabilities that the organization is looking to build. Quality management is a key concern for both the pharmaceutical and FMCG industry and while technology such as QR scans, RFIDs and 2D scan codes are helpful, the level of maturity outside of the organization is primitive.

Supply chain leader, large medical equipment & pharma player
However, Indian companies – both multi-national & local companies face multiple challenges in driving this transformation in a highly labor-intensive manufacturing environment in India.

### Main Challenges for Transformation of Manufacturing in India

<table>
<thead>
<tr>
<th>Internal Influences</th>
<th>External Influences</th>
<th>Return on Investments</th>
<th>Infrastructure</th>
<th>Culture / Leadership traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill gaps / Discipline</td>
<td>Political parties/ unions sometimes tend to work with conflicting objectives when it comes to driving labor efficiencies &amp; cost improvements</td>
<td>Difficult to justify complete automation to the global leadership for a country like India where the labor is cheap; versus US/ Europe where high labor costs necessitate automation</td>
<td>Does the existing infrastructure support companies to be truly customer centric by embracing technology. For example, connected factories need access to reliable internet connectivity, which is usually rarer in non-urban industrial clusters where the bulk of the manufacturing will happen</td>
<td>Feeling between leaders that it is easier to manage people versus managing technology (the fear of the unknown)</td>
</tr>
<tr>
<td>Less educated work force</td>
<td>Furthermore vendors/ suppliers are significantly behind in the transformation journey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic backgrounds</td>
<td></td>
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</table>

We are a traditional company looking to digitalize and modernize its manufacturing capabilities. There are layers to this, one is the automation piece and the other is the synapse between people and technology. In our limited exposure to technology, the scope for automation is large but the implementation for the same is limited in India for a host of reasons – less educated work force, skill gap, unions and political influence. Automation is easier to implement as it allows you to justify your CAPEX in the long run if you cover the safety front. But the realities of India bring about unique challenges. For example, there are sensors being implemented in factories that do not work at times as the work force does not have the discipline to use them right (for e.g. using clean hands). This might not be an issue in developed markets but the social environment / exposure in India creates these unique challenges to digitalize your factory. From the human resources function therefore, in addition to traditional IR and ER, the emphasis lately has also been to work with unions on aspects such as safety and bring in higher sensitivity to quality. Essentially, work on the cultural / behavioral aspects to support the digital initiatives. Incorporation of technology is easier in a green field site as you bring in fresh people with the required education level. The reality is that most organizations have a mix of old and greenfield sites and therefore the challenges remain.

CHRO, leading battery manufacturer

<table>
<thead>
<tr>
<th>Lack of Funds</th>
<th>Paucity of talent</th>
<th>Short investment horizon</th>
<th>Socio-political environment</th>
<th>Risk appetite</th>
<th>Lack of right culture to absorb 4.0 changes</th>
<th>Knowledge gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>14%</td>
<td>24%</td>
<td>34%</td>
<td>34%</td>
<td>52%</td>
<td>66%</td>
</tr>
</tbody>
</table>
What Leadership Competencies are needed for today’s manufacturing organizations?

Given the above trends, there is a clear need to look at senior leadership in manufacturing-based businesses differently from the traditional set of competencies that are usually used to measure them. Based on some of the research that RRA has done on the cohort of senior operations/ supply chain leaders in manufacturing environments, these were some of the key leadership competencies that stood out for high-performing leaders in these organizations –

- **Disruptive**
  Creates breakthrough innovation & unique ideas, big picture thinker, challenges traditional approach, inquisitive, drives strategy emphasizing creativity & differentiation

- **Risk-taking**
  Moves purposefully and optimistically into new areas, thrives on ambiguity, enjoys complexity, remains flexible, not afraid to make mistakes while testing limits, enthusiastically seizes opportunity

- **Heroic**
  Optimistic, leads from the front, perseveres in the face of challenges, relentless commitment to higher standards, resilience and determination commands creates followership

- **Balance of Connecting & galvanizing**
  Focused on team development, empowers others and connects the team both internally & externally. Creates excitement, serves as an evangelist, inspires through influence & charisma

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**SETTING STRATEGY**

**EXECUTING FOR RESULTS**

**LEADING TEAMS**

**RELATIONSHIPS & INFLUENCE**
Financial acumen used to be a primary consideration for leaders (it is quite difficult to imagine a CEO who is not on top of his or her numbers). Today, companies give technology acumen the same weight. Today’s top performing operations leaders are no longer just “shopfloor managers”. Given the customer-centricity factor, these leaders bring strong commercial acumen with deep knowledge of end-use consumer markets. They cannot afford to be too siloed in their approach, and hence, are keen observers of their organizational capabilities internally so as to pro-actively identify gaps that need to be plugged for driving transformation. These can be either through leadership development and training for their internal teams; or alternatively by bringing the right skillsets via external technology & change partners.

This does not constrain where your future leaders might come from. There are examples of leaders coming from a variety of backgrounds and experiences to get to top leadership roles in manufacturing companies where they have delivered transformational value to their companies in the I4.0 space.

- **Technologists**
  - Come up the R&D/ technology route; bring in-depth understanding of technology use-cases & how to implement them for maximum value

- **Operations experts**
  - Come up the shopfloor route (operations/ quality); brings understanding of change management on the shopfloor; how to implement fast for quick impact

- **Engineering leaders**
  - Come up the manufacturing engineering route; good blend of understanding of technology as well as operational realities of the shopfloor; usually brings strong project management skills as well

- **Commercial champions**
  - Come up the commercial route; brings consumer insights to the table & can link back all operational decisions to what makes sense for the end-market
The change of guard: internal vs external talent?

In India, an engineering graduate in a traditional manufacturing sector would go on to become the manufacturing head. It was assumed that internal candidates knew the organization better than anyone else could; there was no concept of diversity. It was taken for granted that an external candidate does not know the ecosystem while the internal candidate would take people along.

However today, the ecosystem is changing drastically and what most clients are trying to solve for is the set of competencies that would be required in the near future versus the present. Today the walls are breaking, and companies need more networked people with exposure across functions. Competencies are not industry specific. For example, the pharma industry is very quality focused; the same is now true for F&B as well.

Some of the more mature players are no longer looking for talent from within the industry itself, even at the senior level for professionals managing sizeable revenues. The trend is to look for professionals with exposure to innovative practices and out-of-the-box thinking. The younger generation is considered to be highly networked (culturally they are more connected, know how to reach out given the benefits of technology). Such external disruptions are pushing the management to look at professionals from other sectors with greater learning agility. As a result, your leadership pipeline can come from outside your company or industry as well.

We have changed our approach over years. We identified three business scenarios - i) improving/fixing an existing business, ii) acquiring a new company that comes with legacy talent which needs transformation, and iii) creating a greenfield setup. We wanted good manufacturing talent for all these cases, but this time our approach was to find talent keeping in mind the business scenario. We kept the same in mind while writing specs for the role. Because of this, our talent hiring in the last 4-5 years has been bang on.

Senior HR leader, large international agro-commodity player

When I think of myself along the competencies required for a transformational leader in the digital era, all my existing characteristics went off the screen. Over the last 3-4 years, we have been reading about these emerging technologies of IoT, AI, etc. They forced me to think what I am doing towards these in the light of what others in the world are doing with them. We were forced to start thinking about them. Today no one has a choice. We all have problems to solve. Eventually we will not be left with much of a choice, but to implement these.

CEO, Automotive components player
Organizational enablers to drive change

New skillsets are at the center of transformation; driving alignment and collaboration across the enterprise. New job descriptions are being written across traditional manufacturing organizations, so as to introduce new skillsets into the teams that will lead the transformation.

The role of Learning & Development is equally important. The trend of investing in training is making a comeback but there is now a need for customized training to establish Centers of Excellence/ academies and build future capabilities. For example, the last technology wave saw the introduction of ERP, but it took years for organizations to learn how to fully utilize it. In this new technology wave, organizations need to develop capabilities in advance. Focusing on only technology without understanding real-world requirements and limitations will create implementation challenges. The technical and functional gap needs to be bridged.

This effort is not only internal but also involves external ecosystem partners. Over the last 5-10 years, quality consciousness has increased and that should support the external ecosystem (distributors, retailers) to better incorporate technology. For example, in the auto industry, vendor audit goes up to the tertiary level. That is enforcing some form of traceability right from the tertiary level to the final customer. Given the real time impact that technology has and the fact that informed choices are being made, pressure on suppliers would be high in terms of quality, cost efficiency and technology will only add as an enabler to meet this goal. Top companies have dedicated vendor development programs where they work with suppliers to upscale their capabilities.
Sustainable cultural change is the other major organizational enabler required for manufacturing organizations to enter I4.0. In India especially, manufacturing has traditionally been highly labor intensive, resulting in large distributed workforces – making cultural change an even larger challenge.

RESPONSIBILITIES OF LEADERS TO ENSURE SUSTAINABLE TRANSFORMATION

- **CEO & Senior Leadership**
  - Create a mission-driven transformation, and ensure that the most senior individuals embody the associated values and behaviours
  - Enable idea generation and a fail-fast mindset and ensure ideas are evaluated and processed
  - Encourage a mix of generations e.g., through "reverse mentoring" programs whereby younger employees advise senior leaders on I4.0 matters
  - Strategically partner with other players in the ecosystem to acquire readily available solutions and expertise

- **Human Resources**
  - Create "I4.0 Academies" to institutionalize continuous learning – in classrooms as well as on-the-job
  - Encourage hiring people with diversity of thought and background and foster a mindset of inclusion and acceptance
  - Create a "hero" culture, encouraging employees to be pioneers who take pride in being at the forefront of the transformation

- **Industry 4.0/Transformation Leaders**
  - Work closely with operations on "co-creation" to ensure technology changes are not created in a vacuum
  - Leverage new products and functionalities, KPIs and revenues to tell a positive story to prove the point
  - Encourage agile ways of working to create a modern, project-oriented culture
  - Be pioneers for open and transparent communication across the organization to help drive employee engagement

**Culture Champions**
- Create **bottom-up culture champions** to encourage people to contribute to the transformation
- A champion in **every location** and **within every major group**, ideally constituting 5-10% of the overall population, will create buy-in and limit resistance
Conclusions

Embracing technology is no longer an option due to the competitive forces in every industry today. Hence, it is important for leaders to assume that technology is here to stay, and to see how you are leverage it for your business needs.

Given this, we need to ask the following two questions to begin with –

- One, do we have the right leadership competencies to drive this transformation across its various stages from creating the business case to design to implementation; and
- Two, do we have the right organizational enablers to ensure this transformation succeeds & continues to add value sustainably – be it the right digital skills & competencies in the team and/or the right culture to drive adoption?
About Russell Reynolds Associates

Russell Reynolds Associates is a global leadership advisory and search firm. Our 425+ consultants in 46 offices work with public, private and nonprofit organizations across all industries and regions. We help our clients build teams of transformational leaders who can meet today’s challenges and anticipate the digital, economic and political trends that are reshaping the global business environment. From helping boards with their structure, culture and effectiveness to identifying, assessing and defining the best leadership for organizations, our teams bring their decades of expertise to help clients solve their most complex leadership issues.

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