

# Case Study on The Semiconductor Conundrum and TATA

Kshitij  
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Case  
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# Agenda

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# Overview and Objectives

The semiconductor industry serves as a vital pillar of the global economy. It underpins the production of a wide array of electronic devices and systems, proving its pivotal role across diverse sectors. India, in its nascent stage within this industry, is seeking every avenue to foster its growth in this sector. TATA, a dominant force in the business landscape, has embraced the challenge to inaugurate this industry in India.

This case study focuses on guiding TATA in evaluating potential strategies for their entry into the semiconductor industry, and assists in crafting a comprehensive business plan to this end. The study entails a detailed roadmap outlining TATA's potential trajectory in the semiconductor industry, accompanied by a robust strategy analysis to steer the company's future actions.

To formulate this strategy, various potential business models for TATA's foray into the semiconductor industry are examined. These include operating as a semiconductor manufacturing center for its subsidiaries, establishing itself as a premier semiconductor supplier for both the Indian and international markets, and considering strategic partnerships or acquisitions. Moreover, this study contemplates the financial and operational feasibility of manufacturing a specific range of chip sizes. It also examines the technological prerequisites and availability of raw materials necessary for producing these chips. Furthermore, an in-depth assessment of the sourcing strategy for raw materials essential for semiconductor manufacturing is provided.

# Challenges and Hindrances

Finance	Reliance	Wait time	Other
<p>There are several significant challenges associated with entering the semiconductor industry. The cost of production is exceptionally high, primarily due to the advanced nature of the technology involved, and the necessity for substantial investment in testing and packaging facilities. Moreover, the workforce needed to drive such an operation must be highly skilled and well-versed in intricate processes, creating another layer of complexity and expense.</p> <p>Simultaneously, the semiconductor industry is characterized by an escalating demand for increasingly advanced and sophisticated chips. Keeping pace with this demand necessitates continuous investment in research and development. This continuous push for innovation is essential to maintain a competitive edge in an industry that is perpetually advancing.</p>	<p>No single organization in the semiconductor industry can operate in isolation; it relies on the broader ecosystem and requires enduring political support from the host country to flourish. The target market, with its multifaceted product dependence, can't be satisfied by a facility exclusively dedicated to mass production of a single chip type. A diversity in production is critical to meet the varying demands of the market.</p>	<p>The semiconductor manufacturing process involves a certain period of delay from the time raw materials are acquired to when the final product reaches the market. This delay is primarily due to necessary testing and packaging procedures. As a result, the company may encounter an accumulation of inventory, and this period represents capital that is tied up in products that are not yet generating returns. Consequently, this could potentially impact the company's immediate capacity to reinvest in additional raw materials.</p>	<p>During the company's operational phase, the establishment of its market presence is often hindered by geopolitical dynamics and intense competition from leading industry players.</p>

# Analysis of Pre Case and Background information

India's semiconductor manufacturing industry is still in its nascent stage, with domestic companies primarily focusing on chip design.

The demand for semiconductor products across various industries in the country, including TATA's subsidiaries, is currently being met through outsourcing contracts.

TATA Motors, in particular, has a burgeoning demand for semiconductors in line with the rise in electric vehicle (EV) production. As mentioned by the CEO, PB Balaji, this need is only set to amplify with every passing month, especially given the apparent global slowdown in demand for white goods and mobile phones.

An electric vehicle, on average, requires more than 3000 chips of diverse sizes to function. These are integral to various safety features within the vehicle such as airbags, seatbelt tensioners, anti-lock braking systems (ABS), and stabilization systems. Consequently, there is a significant demand for an array of chips varying in size from over 250nm to less than 10nm.

In the semiconductor industry, one of the primary challenges faced is the considerable cost of production. This challenge disproportionately affects smaller firms, placing them at a disadvantage when competing with larger, established players in the market. Natarajan Chandrasekaran, Chairperson of the TATA Group, noted, "Semiconductor manufacturing, which includes the construction of chipsets among other components, requires substantial investment, and as of now, India lacks such facilities."

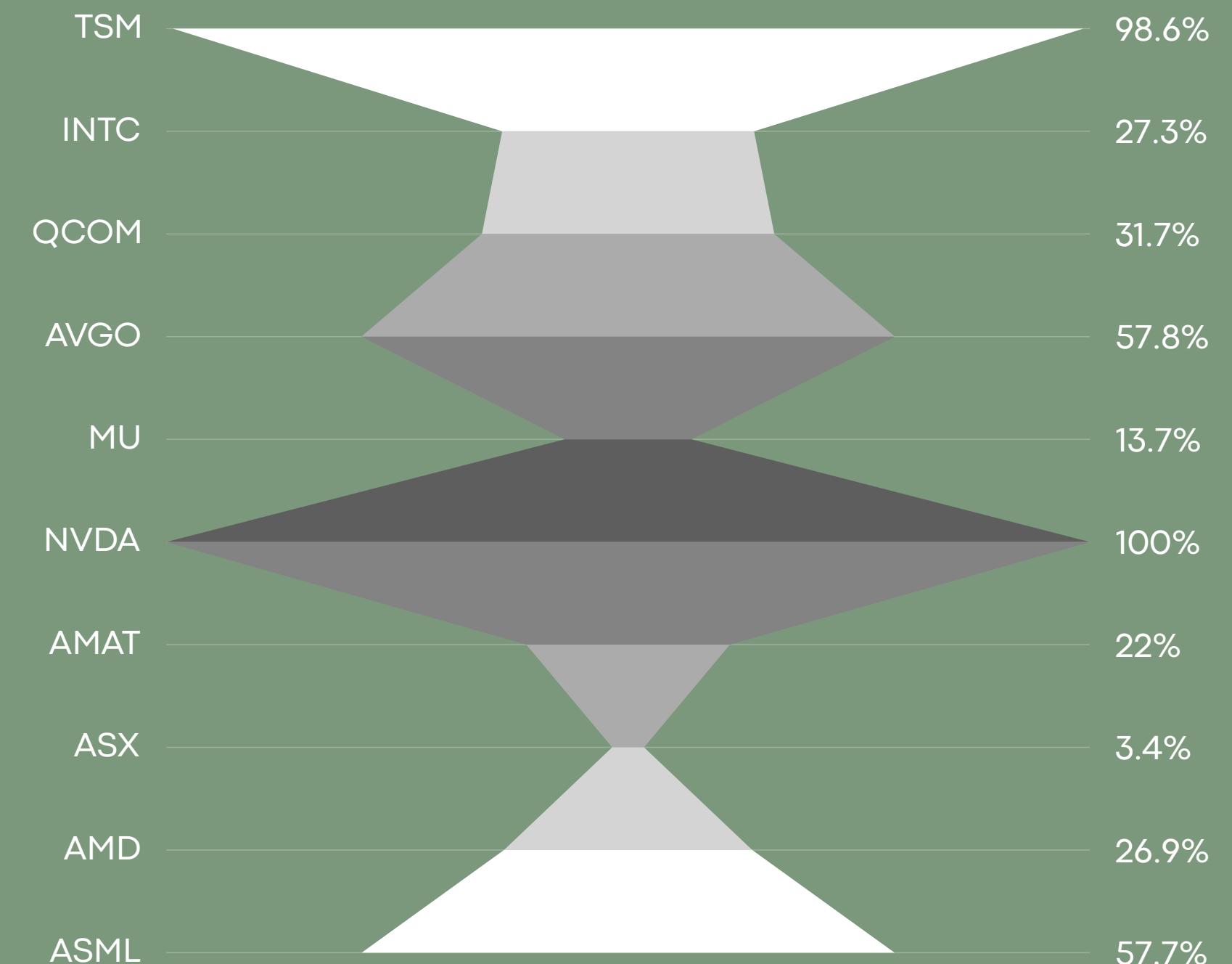
Another significant hurdle is the escalating demand for increasingly advanced and sophisticated chips. Meeting this demand necessitates continual investment in research and development to maintain a competitive edge. Prof. A. Paulraj, Emeritus Professor at Stanford University and Distinguished Chair Professor at IIT Madras, addressed this in a talk titled "Global Semiconductor Industry – History, Technology, Competition, and Geopolitics." He articulated that the industry should allocate at least 300 billion dollars solely for research and development, acknowledging the considerable entry barriers that exist.

Furthermore, Prof. Paulraj underscored the complexity of achieving self-reliance in this industry, suggesting that success is likely only with sustained political commitment and strategic counsel from those with existing market experience. He emphasized the inherent risks of entering the industry, stating that it would necessitate significant sacrifices. However, he also proposed a potential solution: inviting fabless companies to India. By attracting these firms, regardless of their country of origin, India could stimulate the development of its desired semiconductor industry.

# Significant Stakeholder Analysis

To the right, you will find a graphical representation that meticulously describes the market capitalization of potential contracts for the global expansion of TATA's operations in the semiconductor industry. This chart provides a visual analysis of the projected financial value and the scope of these contracts, thereby offering crucial insights into the potential growth avenues for TATA. The graph offers a strategic perspective on the potential global markets TATA could tap into, paving the way for a comprehensive understanding of the expansion opportunities at its disposal.

- **TSM**- Taiwan Semiconductor Manufacturing Co. Ltd.
- **INTC**- Intel Corp.
- **QCOM**- Qualcomm Inc.
- **AVGO**- Broadcom Inc.
- **MU**- Micron Technology Inc,
- **NVDA**- Nvidia Corp.
- **AMAT**- Applied Materials, Inc.
- **ASX**- ASE Technology Holding Co. Ltd.
- **AMD**- Advanced Micro Devices, Inc.
- **ASML**- ASML Holding N.V



# Proposed Business Model

TATA's initial foray into semiconductor manufacturing should be concentrated on fulfilling the requirements of its subsidiaries exclusively. By doing so, the firm can establish cutting-edge semiconductor manufacturing facilities that will serve to provide its subsidiaries with a significant competitive edge in their respective markets.

In conjunction with this approach, it would be prudent for TATA to cultivate strategic alliances with key suppliers and partners, further bolstering its operational capabilities.

The benefits reaped from this strategy are multifaceted. First, TATA's semiconductor ventures would garner global recognition, thus helping establish its presence in this new industry. Second, by focusing on serving its subsidiaries, TATA will have an opportunity to accumulate valuable experience in research and development within the semiconductor sector. Lastly, this approach facilitates the building of robust relationships and instills trust with essential suppliers, laying the foundation for a reliable supply chain.

This strategy will ultimately lead to the establishment of advanced semiconductor manufacturing facilities. As part of a long-term vision, TATA should contemplate extending its reach beyond servicing its own subsidiaries, venturing into the wider semiconductor market. The company has the potential to position itself as a primary supplier for both the Indian and international markets. This expansion could be facilitated by exploring a variety of opportunities, including the integration of various chip designs, enhancing assembly processes, increasing manufacturing flexibility, and pioneering new transistor technologies to diversify chip production under a range of contracts.

Achieving this will necessitate forging strong relationships with key customers and strategic partners. Additionally, to maintain a competitive edge, continual investment in research and development will be crucial, ensuring TATA remains at the forefront of technological advancements within the industry.

## How will TATA establish itself in the industry?

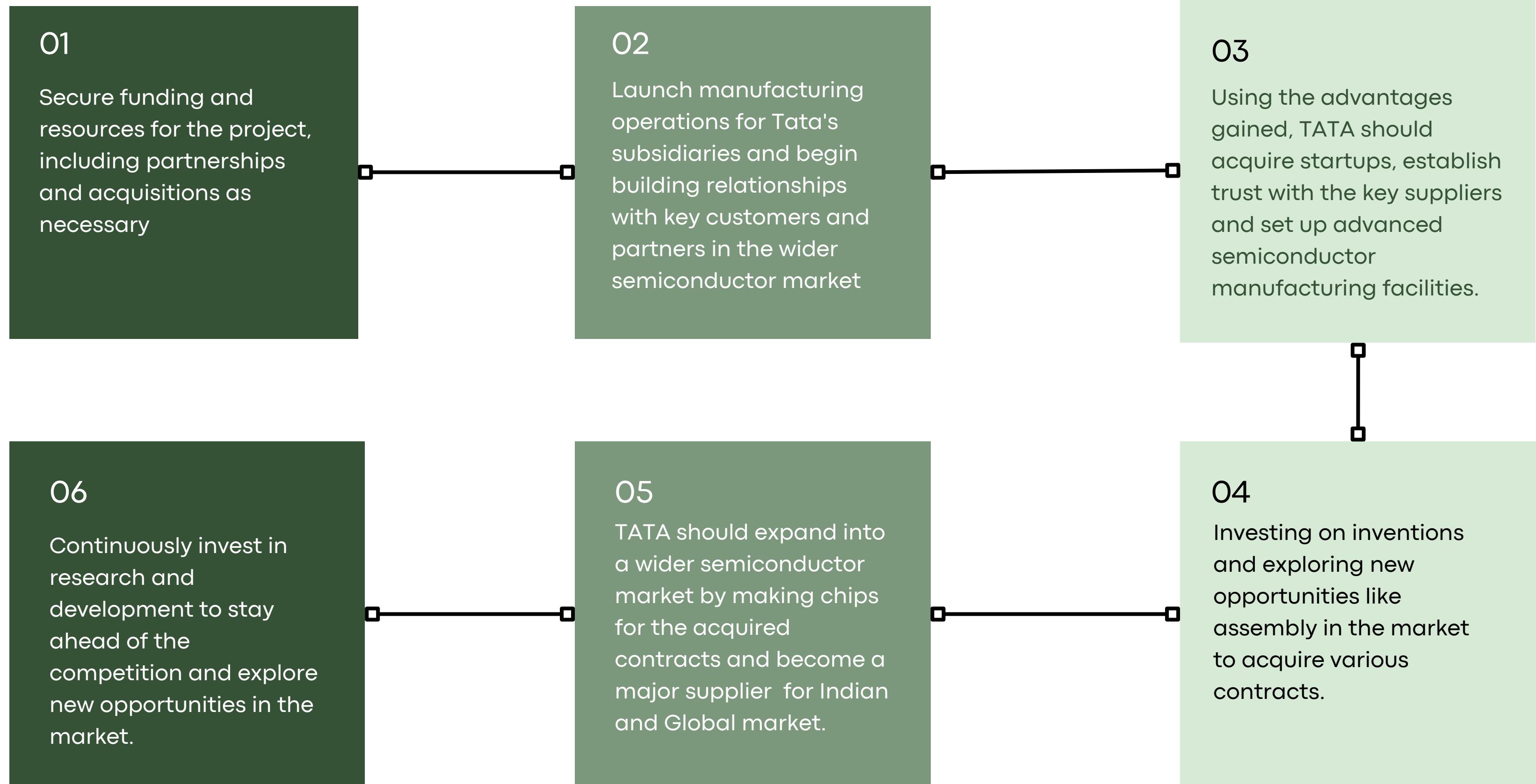
To establish a robust presence in the semiconductor industry, it is recommended that TATA embarks on a strategic initiative to acquire promising startups, particularly those focusing on foundry operations. Many Indian startups in this space struggle to progress due to various challenges, providing an opportunity for a large conglomerate like TATA to step in, forming mutually beneficial partnerships. These partnerships will serve as a positive indicator for the future of India's semiconductor industry. Moreover, the foundry companies would gain a significant advantage as they could put their designs into production, leveraging TATA's manufacturing capabilities.

At the national level, TATA should actively cultivate and harness talent for the innovation, development, and manufacturing of semiconductors. This strategic approach will help boost the company's political standing in the country and ensure continued support for its endeavors in the semiconductor industry.

TATA should also invest in initiatives that promote semiconductor production and foster collaborative business practices. These initiatives will help the company form partnerships for sourcing raw materials from multiple suppliers, thereby diversifying its supply chain and reducing potential risks.

Furthermore, TATA Group can leverage its diverse business portfolio to source raw materials from companies within its network that produce these materials as a byproduct of other manufacturing processes. This approach will give TATA an upper hand in managing the lead time associated with the production and testing phase in the semiconductor manufacturing process.

# Roadmap to the industry



# What type of chips should TATA produce?

**Financial Feasibility:** The manufacturing of medium to large chip sizes presents a more financially feasible opportunity for Tata. This is due to their generally lower capital intensity and less complex technological requirements compared to smaller chips. Furthermore, the demand for these larger chip sizes is higher in specific industries. This demand could help to compensate for any potential decrease in premium prices.

**Operational Feasibility:** From an operational perspective, producing medium to large chip sizes is also more feasible for Tata. These larger chip sizes typically require fewer raw materials and impose fewer technological demands. Additionally, Tata may be able to find a manufacturing location particularly well-suited to the production of these larger chips, thereby reducing costs and enhancing operational efficiency.

**Target Market and Positioning:** Tata should use market research to identify its target market and define its industry positioning. For instance, Tata could focus on specific applications or end-markets, such as consumer electronics or automotive. Alternatively, Tata could aim to offer a diverse range of semiconductor products to cater to a broad customer base.

**Other Analyses:** Tata should also assess market demand for medium to large chip sizes. In addition, it is important for Tata to understand and consider any regulatory requirements or incentives that may be relevant to their operations. By meticulously analyzing these factors, Tata can ensure a successful entry into the semiconductor market while meeting the needs of both its internal and external customers.

# Sourcing Strategy

When selecting a sourcing strategy for raw materials like UPW and silicon, TATA should consider a number of evaluation criteria, including:

## Cost

The cost of sourcing raw materials should be taken into account, as this will impact the overall profitability of the semiconductor manufacturing operation.

## Quality

The quality of the raw materials should be a top priority, as this will have a direct impact on the quality of the finished semiconductor products.

## Availability

The availability of raw materials should also be considered, as shortages or disruptions in supply could negatively impact production.

## Risk

Tata should also consider the risks associated with each sourcing strategy, including financial, operational, and reputational risks.

Based on the identified evaluation criteria, TATA has the potential to devise an optimal sourcing strategy.

**Recommended Sourcing Strategy:** In light of the aforementioned criteria, it is suggested that Tata ought to consider a blend of strategic partnerships and the capitalization of its existing production capabilities as its primary sourcing strategy for raw materials. This dual-pronged approach would enable Tata to procure high-quality raw materials at competitive prices, all while reducing associated risks.

When considering strategic partnerships, Tata should explore opportunities for collaboration with companies that either possess ready access to critical raw materials or specialize in sourcing these materials. This would grant Tata the ability to tap into these resources, potentially resulting in cost reductions.

Regarding the leveraging of existing production capabilities, Tata might consider utilizing its own facilities or resources to generate raw materials in-house. This could involve an investment in the requisite equipment and infrastructure to produce Ultra Pure Water (UPW) and silicon. By doing so, Tata could potentially minimize costs and enhance operational efficiency.

Collectively, this strategy of forming strategic partnerships and capitalizing on existing production capabilities would empower Tata to secure a dependable and cost-effective supply of raw materials. This not only minimizes risks but also ensures adherence to quality standards.

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