

Need for Ambidexterity for Business Transformation in HAL – An Empirical Analysis

(8074 words)

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Abstract—The current business environment is a ‘VUCA’ one that is very dynamic with a high degree of unpredictability. The Aerospace industry is no exception as most manufacturers are facing varying levels of uncertainty. Globalization and open international market has forced most of the Aerospace and Defence organisations to look for opportunities to sustain their market presence in the wake of intense competition, few buyers and diminishing margins. Also, the industry faces constraints from supply chain, budget limitations, need for sustaining high technological expertise, talent management, speed of technology change and obsolescence of technologies at a faster rate than ever before. Then what needs to be done which will promise sustainable business growth in the VUCA environment and transform a company into a leader? As per the analysis and deliberations carried out, it emerges that the need of the hour is for organisations to be ‘ambidextrous’ by exploiting the old, existing systems or ways of doing business and at the same time exploring the new business frontiers through breakthrough innovation.

Ambidextrous organizations innovate successfully both in case of evolutionary and revolutionary change.

In this current ever evolving business scenario, many companies are looking for opportunities to shore up their revenues, either by establishing a stronger presence in new markets or by adapting their current product and service lines to adjacent industry sectors. This is far too easier in private industry than in a Public sector undertaking which has its challenges in the form of systems, procedures and policies.

This paper explores the strategies adopted by Hindustan Aeronautics Limited (HAL), a defence Public Sector Undertaking in aerospace domain, in adopting the concepts of ‘ambidexterity’ and ‘Leading the VUCA’ powered by a Project management approach for thriving in this ever changing Aerospace ecosystem. Strategies to counter VUCA, concepts of innovation for achieving evolutionary and revolutionary change, exploring new avenues for business diversification and embracing operational and process excellence as well as adapting current products in military domain to emerging requirements in the civil sector are examined. The paper elaborates on the challenges posed by the changing world, strategic approach to project management and some of the measures taken by HAL to lead VUCA through ambidexterity and offers suggestions on the strategic front and operations front. The paper surmises that HAL with its highly skilled manpower and a huge formidable infrastructure catering to all segments of aerospace - civil, defence and space from civilian aircrafts to military helicopters to satellite launch vehicles stands to gain if it embraces the ‘ambidextrous’ business transformation approach.

Index Terms—Organisational Ambidexterity, VUCA, Disruptive innovation, Project management approach, Make in India.

I. INTRODUCTION

Aerospace manufacturing is a high technology industry that produces "aircraft, space vehicles, aircraft engines, propulsion units, and related parts". Its value chain is characterized by a long project life cycle spanning R&D, engineering design, manufacturing, assembly, maintenance, repair and overhaul. Intensive technology and safety requirements mandate significant investments in R&D and quality control (Report of working group on Aerospace sector, 2013). It also necessitates the need for effective supply chain management with early stakeholder engagement and trained manpower, coupled with effective project/program management, being the key to unlock the burgeoning potential of this fast-growing sector.

The Indian aerospace industry is one of the fastest-growing aerospace markets in the world. The PricewaterhouseCoopers report entitled *Changing Dynamics—India’s Aerospace Industry* indicates that the rapid growth of this industry has attracted major global aerospace companies to India and has incentivized domestic aerospace players to increase and deepen operations. All segments in the aerospace industry, including civil and defence aviation and space research, are showing a significant level of growth. (Report of working group on Aerospace sector, 2013). Bangalore is a major centre of the aerospace industry - an ‘aerospace hub’, with Hindustan Aeronautics Limited (HAL), the National Aerospace Laboratories and the Indian Space Research Organisation.

HAL as the pioneer in the country’s Aerospace industry has contributed immensely to the mission of self-reliance and earned the reputation of being the “Force behind the forces”. The volatile and changing business environment offers HAL an opportunity to review its strategy and re-jig itself as the leader in developing a sustained Aerospace ecosystem in the country and harness the benefits of the VUCA environment.

II. LITERATURE REVIEW

The changing dynamics of the global economic and the geo-political scenario of the world is a major VUCA (Smadja, C., 2016). According to the author, most governments and business leaders still rely on conventional wisdom and classic patterns of responses to new challenges which could result in inability to cope with unprecedented levels of uncertainty and ambiguity or ‘black swan’ occurrences. The key abilities that leaders need in foreseeable future would be the ability to make sense of chaotic situations, to connect the dots and organize contradictory priorities. The managers and leaders need to lay emphasis on thinking out of the box and concentrating on low probability but high impact scenarios in scenario planning exercises to effectively counter VUCA.

The incessant need to innovate is stressed in the paper (Tushman, M. L. and O’Reilly, C. A., 2004). A study on the structure and results of the breakthrough projects and their impact on the operations and performance of the traditional businesses have been made by the authors. According to their conclusions, in order to compete, companies must continually pursue many types of innovation—incremental, architectural, and discontinuous—aimed at existing and new customers.

The groundbreaking paper (Tushman, M. L. and O’Reilly, C. A., 1996) deliberates on the need for organizations to embrace both evolutionary and revolutionary changes and keep re-inventing themselves to rise to the next performance level better suited for next wave of competition or technology. Inertia to change and dynamic conservatism coupled with are more likely to lead to long-term failures. In a business environment mired with uncertainty characterized by changes in technology, regulation or competition, there is a need to balance the short-term demands of increasing congruence or alignment to business strategy and bolstering the organizational culture and also the periodic need to transform the organization and re-create their culture. This is the biggest challenge of ambidextrous organizations and those organizations that have learnt from the Darwinian concept of variation, selection and retention, invariably succeed in the face of formidable challenges in the business environment.

The paper (Tushman, M. L. and O’Reilly, C. A., 2013) discusses the current state of research on the topic of Ambidexterity and the plausible new areas of research in this field of organizational science. It also emerges from the research done till date that different organizational forms are associated with different strategies and environmental conditions (Lawrence & Lorsch, 1967; Woodward, 1965).

According to the A&D outlook by Pricewaterhouse Coopers for the year 2017, the following are the observations:

1. Upwardly revised defence budget (closer to 3% of GDP) and higher utilisation: Due to procedural and capability related delays, the Armed forces have been unable to utilize the allocated budgets as per historical data (Dr. Kumar Behera, L., 2015), though there always exists a need to bridge mission critical asset gaps that necessitates significant increase in the budgetary allocation towards capital procurement and more importantly, higher usage of the allocated amount
2. Closer ties with the US and US companies towards greater industrial cooperation on ground: The 'India Amendment' in US National Defence Authorization Act 2017 will accord the 'Major Defence Partner' status unique to India (non-NATO ally), which will take Indo-US relationship beyond major FMS deals (C-17, C-130J, P-8I, Apache, Chinook, M777) & Logistics Exchange Memorandum of Agreement (LEMOA) signed recently - towards greater technology partnership. This will give an added impetus to the ‘Make in India’ initiative, leading to increased sourcing from India for global operations for better cost competitiveness of OEMs / Tier-1s and offsets become the new industry norm.
3. Announcement of 'Strategic Partnerships' framework and emergence of large private sector companies in Tier-1 to 3 roles

4. Make in India fighter jet deal will progress fast: There is a huge gap in India's fighter jet capability due to ageing fleet which is being upgraded to enhance life / relevance (Mirage, Jaguar), impending retirement of major platforms (MiG 21, MiG 27) and lower operational availability of our mainstream fighters (Su-30, MiG 29K).
5. Emergence of A&D Hubs in India: Existing ecosystems around Defence PSUs will grow steadily with DPSUs incrementally outsourcing to private sector companies. Contracts which involve manufacturing / upgrades in India and development of infrastructural facilities for MRO (Maintenance repair and Overhaul) of various aircraft programs may enjoy policy changes.

The first strategic insight any Industry needs to develop is foresight of the trends in the market needs, technological changes and competitive forces. Scenario building and extrapolating forecasting approaches are used to map the future landscape.

Some of the public sectors believed that they would continue to be the lead drivers and mould the industry in their segment and downplayed the impact of the market forces as well as the technological changes happening in the environment. The systems and structure of the Public sector encouraged this status-quoist approach with small fine tuning here and there.

Hence when the changes came in a wave, these organisations were not prepared to meet the onslaught. By the time they realised and began the change process, it was too late or just getting late. ITI and HMT could not catch up with the VUCA environment, while BSNL is struggling to stay afloat and hopefully emerge and survive.

On the other hand, some of the other public sector undertakings foresaw the unfolding scenario and did major re-jigging of their strategies to sustain and grow in a competitive environment even when they do not have full and undisputed control over the market or the business. Some companies diversified making 'Collaborative' efforts including joint ventures and joint marketing in areas where the public undertakings do not possess adequate penetration that enables them to position themselves in the global industry. In order to achieve that, the issues to be addressed are operational efficiencies, quality and customer support imperatives adopted by PSUs like ONGC and BHEL.

The future is bright for those PSUs which have already initiated such strategic transformation and for those which are yet to, time is running out. However, they continue to be restrained by the organisational cultural backpack, structural rigidities and the procedural complexities characteristic of a Public enterprise. These issues pose a challenge to these undertakings to sustain their strategic relevance in the national economy. (Sharma,S., 2015)

One of the classical examples of leading Aerospace companies deeply affected by VUCA factors like uncertainty regarding defence spending, government regulations, high competition from international defense players, is Lockheed Martin, a major US defence contractor. The U.S. government is Lockheed Martin's (LMT) major customer. With almost 82% of its revenues from the U.S. government, LMT highly depends on the government. In fact, in 2013, the company's revenue declined due to the \$37 billion cuts in defense spending due to sequestration.

Also, the US government regulations require that the company has to ensure that it fulfills the requirements of the government before it can export to other countries. For example, the company wasn't allowed to export its F-22 aircraft in the past due to U.S. government restrictions.

With the U.S. government's defense spending being uncertain, Lockheed Martin's management has started looking for different sources of revenue. International sales is a promising area, however, the company faces stiff competition from international defence players like BAE Systems and Airbus. One of the major disadvantages Lockheed Martin has over these players is that the technology transfer isn't restricted by their respective governments. As a result, Lockheed Martin may lose out on major defence contracts. (Schmidt, A., 2014)

The reviews of most of the papers cited as references provide a starking revelation of the need to evolve and innovate creating disruptive transformations in organizations to effectively counter the unpredictable VUCA business environment. This paper is an attempt to analyse inherent strategies of HAL, best practices in the field of project management and suggest embracing 'ambidexterity' as a panache to create a better response to VUCA. This empirical analysis is an amalgamation of the lessons learnt from past experience or historical information, organizational process assets, enterprise environmental factors and the current trends in the Aerospace industry.

III. METHODOLOGY

This paper explores the strategies adopted by Hindustan Aeronautics Limited (HAL), a defence Public Sector Undertaking in aerospace domain, in adopting the concept of 'ambidexterity' for thriving in this ever changing Aerospace ecosystem. The paper elaborates on the challenges posed by the changing world, strategic approach to project management and some of the measures taken by HAL to lead VUCA through ambidexterity and offers suggestions on the strategic front and operations front.

An empirical analysis has been carried out and major observations have been discussed while empirical data has not been included in the paper in view of confidentiality of the same.

The methodology of the empirical analysis carried out includes:

- (i) Analysis of the Indian Aerospace industry
- (ii) Business scenario analysis in a VUCA world
- (iii) VUCA in Aerospace and Defence industry
- (iv) Strategising in a VUCA world – HAL’s perspective
- (v) Discovering what the ambidextrous organizations do differently
- (vi) Project management approach to develop ambidexterity

A case study on implementing strategic project management practices and ambidexterity in development of indigenous trainer aircraft has also been discussed.

IV. ANALYSIS OF THE INDIAN AEROSPACE INDUSTRY

Aerospace manufacturing has traditionally not been able to mature as a stronghold in India. However, the Indian Aerospace ecosystem is witnessing a paradigm shift owing to the recent changes in Defence Procurement Policy that has opened up the defense market in India bringing in new players in the form of global and local private sector players who have begun to make a foray into this growing field of aerospace. The evolution of aerospace industry is expressed in Fig 1.

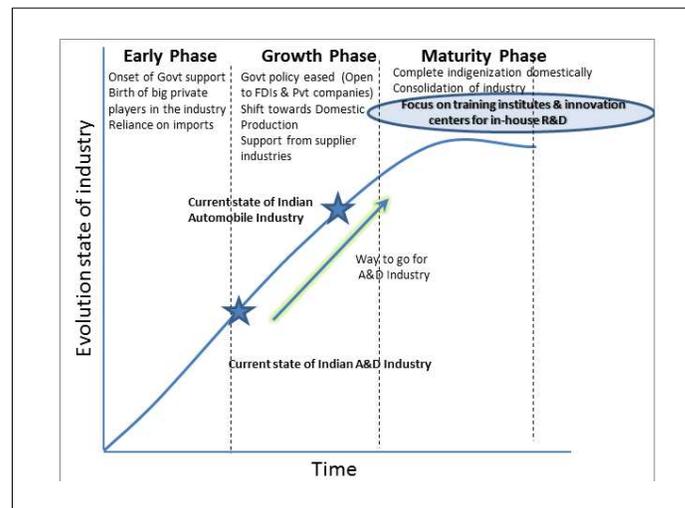


Fig. 1. Stages of evolution of aerospace industry - Source: Adapted from KPMG study

Traditionally, PSUs like HAL and BEL have been the leaders in this sector. HAL has manufactured 12 types of aircraft with in-house R&D and 14 under license. Some of the private entrants in this sector include Dynamics Aerospace, Taneja Aerospace & Aviation Limited (TAAL) and Tata Advanced Systems Ltd (TASL) (Report by CII & KPMG, 2011). A few foreign OEMs have begun to establish ground in collaboration with Indian partners.

The strengths of this industry are mainly:

A. Manufacturing Base:

India offers cost advantages and the cost savings could range between 15 to 25 percent in manufacturing, depending on the type of components. Indian industry today has the technological capabilities to undertake complex manufacturing required for the sector. (Report by CII & KPMG, 2011) (Report of working group on Aerospace sector, 2013)

B. Trained Manpower:

An important enabler for any successful industry is enriched manpower base. It becomes even more indispensable in Aerospace and Defence owing to its dependence on highly skilled human resources. India has the largest pool of English speaking scientists

and engineers in the world. With over 380 universities, 11,200 colleges and 1,500 research institutions, India has the second largest pool of scientists and engineers in the world. Every year, over 2.5 million graduates are added to the workforce, including 300,000 engineers and 150,000 IT professionals. Mastery over quantitative concepts coupled with English proficiency has resulted in a skill set that has enabled India to reap the benefits of the current international demand for IT. This human resource pool can give an advantage in this sector. (Report of working group on Aerospace sector, 2013)

Some of the areas in A&D industry that need improvement include:

A. Lack of Collaborative Supply Chain

In recent times, aerospace industry has become more collaborative which allows to have shared objective still having individual targets. Outsourcing at Boeing for Dreamliner 787, ADS SC21 (The SC21 program is a key industry venture for Aerospace, Defense, Security and Space and is overseen, governed and managed by ADS on behalf of UK industry) are two important examples of collaborative supply chain. In India, the supply chain is still in the infancy and needs extensive handholding and guidance to reach a level of maturity for sustained growth.

B. Gap In Technical Capability And Current R&D Situation

There exists a large gap in India's technical capability for catering to demands of indigenous production in Aerospace and Defence sector. Indian manufacturing needs to upgrade capabilities in precision engineering, micro engineering and production and quality enhancing technologies to take a big leap into the Aerospace and Defence sector (Report by CII & KPMG, 2011). With regard to research in this sector, the R&D focus has remained largely in the public domain with government institutions like Hindustan Aeronautics Limited (HAL), National Aerospace Laboratories (NAL), Defence and Research & Development Organisation (DRDO), Indian Space Research Organisation (ISRO) and Council of Scientific and Industrial Research (CSIR). The capability to leverage is present and so is a strong market, but the question that remains to be answered is: are we doing enough to explore how technology could be developed and nurtured for Indian Aerospace and Defence? (Report by CII & KPMG, 2011).

C. Poor Stakeholder Management

The stake holders are disparate group of interests and there is a need to align the interests of the disparate groups to achieve stability and growth in the Aerospace sector. Whether the Industry will take up the cudgels or the Military system or the Government is the matter of discussion. The onus for management of all stakeholders is not defined; hence there is no addressing of all the concerns of the stakeholders of the aerospace industry. (Kavitha, G. 2015)

D. Less Synergy between Industry and Academia

The Working Group on Aerospace sector had advised the formation of a National Aeronautics Commission, and as per their report, there are a number of aeronautics organisations like HAL, NAL, DRDO laboratories, ADA, ADE, GTRE, IISc, IITs etc. in the country. All the knowledge residing in these entities can be synergistically harnessed if a National Aeronautics Commission is created. The commission should map indigenous capabilities, identify knowledge gaps, direct resources efficiently to address critical technology gaps through active engagement of stakeholders to formulate a national aeronautics policy to strengthen the aerospace industry. There has been a new development in this area with the maiden meeting of the newly constituted CII's-National Committee on Aerospace in Sep 2016 wherein the pressing need for developing a culture of investing more in R&D and innovation to bolster more employment opportunities was deliberated upon. There has always been a pressing need for a wider industry-academia interface for continual knowledge sharing including transfer of experience and technology in order that industry benefits from the latest cutting edge research work while academia is benefitted out of practical and need based contextual research which is translational in nature. The reciprocal partnership between the two should be intensified for ensuring sustained growth, ushering culture of innovation at low cost and knowledge repository enrichment besides fulfilling the common objective of providing service to the nation. HAL could provide a strong foundation to the students by exposing them to practices and challenges faced by the industry. The Graduate Apprenticeship program of HAL is a continuing endeavor in this regard. (Kavitha, G. 2015)

E. Absence Of Training and Innovation centres

There is a focus on the development of primary skills through training but product specific/ relevant skills demand an enhanced focussed approach between the government, industry and academic institutions to integrate their objectives together. There have been global instances where the private sector has taken the lead on working independently or in partnership with the government on setting up infrastructure for providing the necessary skills for the Aerospace and Defence sector. There are a few Indian examples which also come to mind, however, some serious effort still needs to be made by the respective stakeholders to develop an organized framework (Report by CII & KPMG, 2011). The conspicuous absence of such established training and innovation centres is an opportunity for HAL to utilize and materialize. (Kavitha, G. 2015)

V. BUSINESS SCENARIO ANALYSIS SCENARIO ANALYSIS IN A VUCA WORLD

The new world of business is becoming more and more complex and uncertain characterized by what are known as ‘VUCA’ factors as explained in Fig 2. VUCA is the term coined by the Military to describe the operational environment they are operating in.

	DRIVERS	EFFECTS	DEMANDS
Volatility	<ul style="list-style-type: none"> Change nature Change dynamics Change rate and speed 	<ul style="list-style-type: none"> Risk Instability Flux 	VISION <ul style="list-style-type: none"> Take actions Probe changes
Uncertainty	<ul style="list-style-type: none"> Unpredictability Potential surprises Unpredictable outcomes 	<ul style="list-style-type: none"> Direction paralysis due to information overload 	UNDERSTANDING <ul style="list-style-type: none"> Wider understanding Different perspectives
Complexity	<ul style="list-style-type: none"> Task co-relation Multifaceted effects Influencers 	<ul style="list-style-type: none"> Unproductive Dualities 	CLARITY <ul style="list-style-type: none"> Key focus Flexible Creative
Ambiguity	<ul style="list-style-type: none"> Ideal vs actual Misinterpretation 	<ul style="list-style-type: none"> Induce doubt and distrust Lapses in decision making Hurt innovations 	AGILITY <ul style="list-style-type: none"> Decision making Innovation

Fig. 2. VUCA World - Source: Startups in the VUCA world (Kabhammettu, V., 2014).

The four characteristics of this changing business environment are:

1. **Volatility** – Refers to the nature, speed, volume and magnitude of change in the business environment. The pace of change is so rapid and unannounced that they cannot be predicted accurately. Volatility causes risk aversion and back to basics approach which may sometime be counterproductive in a changing world.
2. **Uncertainty**– Refers to the direction of change when the change is most likely to happen and Black swan events (sudden unpredictable changes) (Nicolas Taleb, N., 2007) are more in this environment. These uncertainties make it difficult for leaders to extrapolate based on previous events or issues to predict future outcomes thereby impeding any forecasting or decision-making.
3. **Complexity**– Refers to the multitude of forces entwining with each other that are at play in a Business scenario that create chaos and confusion marring decision making.
4. **Ambiguity** – Refers to the lack of clarity about the meaning of an event – the ‘who, what, where, how and why’ behind occurrences that are hard to ascertain. As a result, organisations are not able to find the meaning of developments unfolding, catching them off-guard disabling accurate conceptualization of threats and opportunities before they unleash their imminent danger. (Sharma,S.G., 2015)

In this current ever evolving business scenario, many companies are looking for opportunities to shore up their revenues, either by establishing a stronger presence in new markets or by adapting their current product and service lines to adjacent industry sectors (Report by CII & KPMG, 2011). This is far too easier in private industry than in a Public sector undertaking which has its challenges in the form of transparency and accountability focused systems, procedures and policies. While in an IT or FMCG industry, the availability of resources and agility are a given with the process of responding to situations during the course of project execution, it is unlike so in a PSU in the aerospace industry characterized largely by ‘change-driven projects’ and increased scope changes to incorporate technology upgradation and tackle ‘obsolescence’. Programs/projects in this industry have long gestational periods spanning maybe even more than 50 years wherein the decisions cannot be taken ‘on the fly’, unlike the IT/FMCG industry, since in Aerospace industry decisions taken today have ramifications at a much later date.

A VUCA world of business needs a VUCA strategic approach, to meet the various combinations of unpredictability and malleability. It is also a means to analyse the ‘Opportunities’ and ‘Threats’ prevalent in the industry. The VUCA in the world of manufacturing and design and more particular, in aerospace industry, is characterized by the following:

- Changing customer preferences
- Technology complexity, quantum leaps in technology and Product Innovations

- Competition from other players in the industry and new entrants
- Dynamic Supply chain and its uncertainty
- Skills ambiguity necessitating constant updating and development of skills and expertise with changing trends
- Less flexible Organisational architecture

VI. VUCA IN AEROSPACE AND DEFENCE INDUSTRY

The VUCA factors in Aerospace and defence industry have been categorized using the PESTLE analysis – which is an analytical tool for strategic business planning for understanding external influences on a business. It provides answers to the following key questions:

- Political - What are the political factors that are likely to affect the business?
- Economic - What are the economic factors that will affect the business?
- Sociological - What cultural aspects likely to affect the business?
- Technological - What technological changes that may affect the business?
- Legal - What current and impending legislation that will affect the business?
- Environmental- What are the environmental considerations that may affect the business?

The VUCA in this industry as per the PESTLE analysis include (Report of PricewaterhouseCoopers, 2016) (Dr. Kumar Behera, L., 2015):

1. *Political :*

- Uncertainties in Government policies - Shifting preferences of defense departments from pure-play defense contractors to new-age technology firms
- Change in Procurement policies – Recent changes to Defence procurement policies has opened up the market to private players. Also increasing offsets in licence production aircraft programs to create wider aerospace ecosystem promoting ‘Make in India’ and MSMEs.
- Changes to delivery terms, lead times and probable delays characterize long-term defense contracts
- Global threats from terrorism and the technology to be developed to counter those threats

2. *Economic*

- Unexpected competitive pressures from other players in the industry and new-age technology firms
- Globalization and open international market
- Changing strategies of established A&D firms – strategy to conserve their capital and returning cash to shareholders in the form of dividends and buybacks — rather than pursuing aggressive innovation - embarking on improving internal capabilities to better navigate shifting industry conditions much against shareholder and customer sentiments
- Change in business dynamics - Increased operating costs and diminishing margins
- Uncertainty of budget
- Sporadic industrial growth
- Dynamic Supply chain and its uncertainty

3. *Social:*

- Changing customer base and business landscape - More frugal customer base
- Changing customer preferences - Uncertain and dynamic military needs.
- Less flexible Organisational architecture
- A&D companies have limited experience with this unprecedented era of internal or cultural change
- Complacency and unpredictable responses of established players – Competitors adopt aggressive, collaborative, and creative attitudes while the same has begun to wane in the larger organizations. A&D companies should consider utilizing their partnerships developed with commercial technology firms imbibe critical aspects of their innovation culture, an essential capability for A&D firms facing a period of flux

4. *Technological:*

- Technology complexity, quantum leaps in technology and Product Innovations
- Skills ambiguity necessitating constant updating and development of skills and expertise with changing trends
- Need for sustaining high technological expertise and attrition which necessitates talent management

5. Legal:
 - Changes in intellectual property rules
 - Simultaneous technology and product developments that may lead to patent infringements
 - Regulatory changes such as modifications to accommodate advanced features in view of increased emphasis on safety of aircraft and passenger safety
 - Legal arbitrations and contractual obligations
6. Environmental:
 - Changing Environmental and ecological regulations
 - Sustainable development requirements with pressure to reduce carbon footprints

VII. STRATEGISING IN A VUCA WORLD – HAL’S PERSPECTIVE

Strategy is an integrated and deliberate set of choices planned and implemented to develop sustained competitive advantage to meet the business objectives in line with the mission which also forms the basis for allocation of capital funds and resources. Organisations generally develop strategies for a period of 4-5 years with mid-term reviews based on the dynamics of the environment. Classical strategizing tools include SWOT analysis, PESTLE analysis, scenario analysis, force field analysis etc. It makes two assumptions:

- Environment is a given
- Future is predictable

But the VUCA world is more malleable and the future is less predictable than we think it is which pre-empts any reasonable long term forecasting wherein classical strategizing will fail. Hence a VUCA world of business needs a VUCA strategic approach, to meet the various combinations of unpredictability and malleability. This approach consists of four strategic frameworks: Visionary, Unifying, Classical and Adaptive strategies (VUCA strategies) (Sharma,S.G., 2015). The first strategic insight the Industry needs to develop is foresight of the trends in market needs, technological changes and competitive forces.

There could be three major approaches as explained in Fig 3:

- (i) Anticipatory
- (ii) Collaborative
- (iii) Adaptive

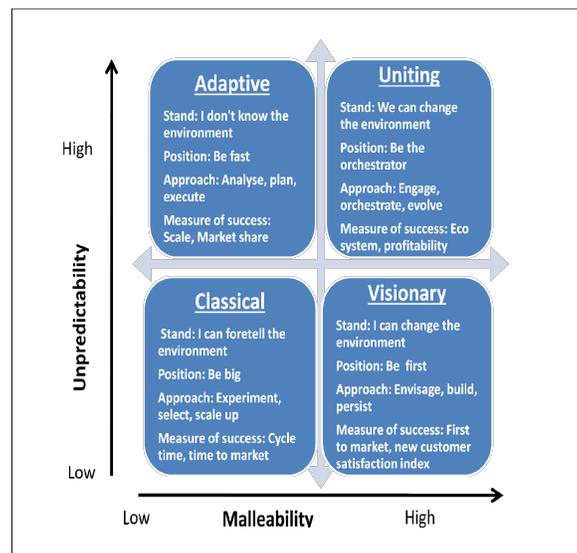


Fig3: Strategizing in a VUCA World- Source: Sharma,S.G., (2015)

A. Anticipatory approach:

The ability to be responsive to the changes with agility coupled with a consolidation of capabilities to influence the environment is the key requirement to sustain in the Aerospace industry as agile management alone would not work for a PSU setup. There is a huge gap between action and response in this industry, a delayed impact of 'VUCA' factors and a delayed impact of mitigation plans.

B. Collaborative approach:

This is a kind of ‘Uniting/Shaping’ strategy to counter VUCA, wherein companies engage with other stakeholders and create a joint vision, build platforms through which they can exercise influence and orchestrate the collaboration. In this inclusive approach, catalysis replaces control and collaboration replaces competition. The PSUs can no longer influence the industry in the wake of other serious players in the arena. However, wherever there are complementary public undertakings in the industry, they need to network and synergise their respective strengths rather than having an adversarial relationship. This collaborative approach helps in sharing of their respective market penetration and specialized product segment to enlarge their presence as well as their product portfolio. (Sharma,S.G., 2015)

C. Adaptive approach:

This approach involves believing that the organisations would continue to be the lead drivers and be able to mould the industry in their segment downplaying the impact of market forces as well as technological changes happening in the environment. The danger of this status quo approach is very high as it can transform a once ‘market leader’ from ‘now here’ to ‘nowhere’. Unfortunately, the systems and structure of the Public sector encourage this approach to continue to be restrained by the organisational cultural backpack, structural rigidities and procedural complexities. The challenge lies in breaking this mould to bring about a complete transformation in the way the business is done in Public enterprises paving the way for sustaining their strategic relevance in the national economy. (Sharma,S.G., 2015)

So faster response or agility to changing and dynamic situations is not the ultimate solution but anticipating the stimulus or the ‘black swan event’ (Nicolas Taleb, N., 2007) itself is the breakthrough strategy to be adopted. The solution lies not in responding to the ‘VUCA’ but predicting the ‘VUCA’ and leading the ‘VUCA’ to take effective mitigatory action.

VIII. WHAT AMBIDEXTROUS ORGANISATIONS DO DIFFERENTLY?

Ambidextrous organizations innovate successfully both in case of evolutionary and revolutionary change (Tushman, M. L. and O’Reilly, C. A. 1996). However, putting together in one organization the required characteristics of structure and culture for both types of change is a challenging task, because they are the elements of contradictory organizational architectures (Tushman et al., 1997). Incremental change occurs in centralized structures with highly standardized processes (Abernathy and Utterback, 1978). Semi-structures, sequential steps through experimentation and links in time encourage continuous incremental change in high-velocity markets (Brown and Eisenhardt, 1997). Radical innovation must be performed in a separate unit, which is not burdened by the path dependencies of old structures and ways of doing things, and must be later integrated to replace the obsolete traditional businesses (Christensen and Bower, 1996; Christensen and Overdorf, 2000; Gilbert and Christensen, 2002).

Ambidextrous companies are capable of achieving efficiency in their existing business while at the same time having the strategic foresight to innovate and explore new businesses. They are also characterized by their ability to achieve decentralization and centralized control. (Markides, C., and Chu,W., 2009)

Exploitation of existing business can be done based on the organisation’s core competencies while exploration of new businesses requires innovations backed by research to invest in products of the future. Such an ambidexterity is essential to effectively utilize VUCA opportunities thrown in by the ‘Black swan’ events and gain a competitive edge in the long term. Organizations could achieve ambidexterity through structural changes or non-structural elements such as change in culture, values, incentives, mindsets and strategic foresight (e.g. Adler, Goldoftas and Levine, 1999; Ahuja and Lampert, 2001; Costanzo, 2004; Eisenhardt and Martin, 2000; Gibson and Birkinshaw, 2004; MacKay and McKiernan, 2004; Siggelkow and Levinthal, 2003; Siggelkow and Rivkin, 2005; Volberda, 1996). (Markides, C., and Chu,W., 2009)

These ambidextrous organizations continually re-invent themselves. They pursue many types of innovation—incremental, architectural, and discontinuous—aimed at existing and new customers. (Tushman, M. L. and O’Reilly, C. A., 2004) [Fig 4]

The strategic foresight and project management approach to achieve ambidexterity is the most viable option for established organisations with structural rigidities like PSUs.

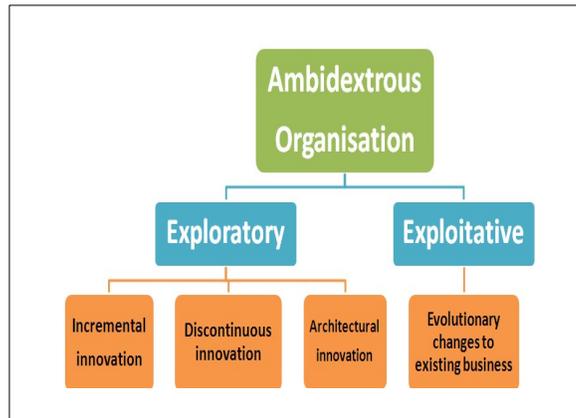


Fig4: Ambidextrous organisation- Source: Adapted from Tushman, M. L. and O'Reilly, C. A. (2004)

IX. PROJECT MANAGEMENT APPROACH TO DEVELOP AMBIDEXTERITY

There is a growing need for PSUs to take the lead in propelling the volatile aerospace environment to contribute to the growth of the economy and technological capabilities by adopting ambidextrous practices in Project management. This can be achieved by strengthening the business process through comprehensive scenario analysis and ‘predictive planning’ approach with alternative action plans and ‘anticipatory’ responses to challenges and situations.

It is suggested that such a transformation could be characterized by adopting the ‘Anticipatory’ and ‘Collaborative’ approaches that would propel a Public enterprise like HAL to harness the opportunity and evolve a robust aerospace ecosystem in the country.

There is a need for a shift in strategic outlook of HAL to be more adaptive and collaborative, effectively tackling the challenge of speed in decision making within the realms of public accountability and probity. Increased autonomy of decision making both at the organizational level and the operating level, effective change management and ‘proactive business approach in the areas of business scenario analysis, contingency planning, and risk management at all levels of management would create an environment conducive to radical and disruptive innovations at HAL. Refer fig 5.

Some of the Project Management techniques that can be adopted by HAL to respond to the VUCA environment include:



Fig5: VUCA in HAL- Source: Empirical Analysis of HAL

A. Early and Deep stakeholder engagement

- Supply chain uncertainty:

In order to tackle the uncertainty in the supply chain, HAL is in the process of converting from a vertically integrated organisation to a lead integrator. Another measure to counter this VUCA involves developing supply chain especially the Tier-II & Tier-III suppliers and MSMEs for prospective products and in the process assuming the role of system integrator to build capabilities more than ramping up capacity.

- **Technology complexity:**

The plan of action for dealing with technological complexity and obsolescence would be the development of incubation centres for futuristic technologies in collaborative mode. HAL and BEL have jointly initiated the formation of Defence Innovation and Research Institute (DIRI) which is a major step in this regard. Also, HAL and BEL had signed an umbrella MoU in May 2016 that includes sharing of expertise in design, development, engineering and manufacturing between HAL and BEL to develop and produce advanced airborne communication, electronic warfare systems etc. and such efforts will lead to greater indigenization and self-reliance in defence technologies. This collaboration will support the 'Make in India' mission.

- **Industry-academia collaboration:**

Establishment of joint chairs with leading technological institutes like IITs ensuring sustained growth, ushering culture of innovation at low cost and knowledge repository enrichment besides fulfilling the common objective of providing service to the nation.

- **Skills ambiguity :**

As the aerospace industry is growing, there will be huge shortfall in skilled manpower in terms of industry-ready technicians, engineers and managers. As more private players are entering this industry and trying to carve a niche for themselves, they will lack the most important resource – trained and skilled human resources. Hence, updating and development of skills and expertise with changing trends becomes a necessity and a VUCA opportunity. Development of Aviation Skill sector council (ASSC) has been initiated by HAL wherein around 60 skills specific to aerospace have been identified for designing and conducting training programmes on skill development for diploma trainees for absorption into the industry. The Graduate Apprenticeship program is another step taken by HAL to impart training to engineering graduates and make them industry-ready.

- **Competitor uncertainty :**

Competition from other players in the industry and new entrants is rising by the day and it can be handled effectively by the establishment of JVs with competitors to convert competition to collaboration.

B. Strategic risk Management

- **Market risk mitigation :**

- (i) Investing in multiple question marks in the BCG portfolio matrix that HAL would be doing in Unmanned aerial vehicle (UAV), Naval rotary unmanned aerial vehicle (NRUAV), Unmanned combat aerial vehicle (UCAV) projects which have potential to herald a leap in the Aerospace capabilities of the country.
- (ii) Scenario analysis and back casting –It is a potent tool to envisage the future and plan since Aerospace has high gestation period. (Examples include Indian multi-role helicopter IMRH, 25 KN engine, Sukhoi fighter aircraft)

- **Technology risk mitigation :**

- (i) Embracing Open system architecture in new product development such as Mission computers in order to have the technological agility to respond to changes in engineering.
- (ii) Investing in products of the future – this is required for developing technology today for products of tomorrow (Examples include Cryogenic engine, 25 KN engine, UAV, UCAVs)

C. Scope management and assumptions analysis

Scope management is a critical parameter wherein understanding the customer requirements and the scope of deliverables is vital. It should involve questioning the assumptions which is essential to remove the impediments put forth by the tripe constraints. There is a need to make implicit assumptions into explicit ones and reviewing all listed assumptions. Clarity of assumptions in the early stage of the project leads to lesser uncertainty during execution stage.

D. Robust Change management processes:

While a fully defined scope is desirable in any project, the evolving technology and changing requirements of military applications necessitate changes during all phases of the project. This is all the more amplified by the fact that Aerospace projects being of a long duration type, technologies and scope envisaged during the beginning of the project undergo multiple changes during execution stage and a robust change control mechanism enables successful completion of projects. The response to VUCA should be built into the processes.

E. HR management:

The success of this 'ambidextrous' approach is dependent on the creation of a 'Learning organisation' nurturing new and expansive patterns of thinking by effective knowledge management, talent management and HR management including formation of cross-functional teams fostering innovation (Senge, P.M., 2006). Companies at the top of the scale need to continuously adapt themselves to changing leadership and talent needs (Bhalla, V., 2015). The BCG Global Leadership and Talent Index (GLTI), a study of more than 1200 global executives shows that leadership and talent management have a strong correlation with financial performance with companies rated strongest on leadership and talent capabilities increased their revenues 2.2 times faster and their profits 1.5 times faster than the companies that rated themselves the weakest. (Bhalla, V., 2015)

With respect to HAL, the management academy of HAL through customized 'Learning and development' initiatives could provide required impetus to establish a culture of people and leadership development. Such initiatives could ***make HAL a 'learning organisation' that would encourage personal mastery and radical thinking among individual employees enabling seamless integration of creativity*** in a conventional hierarchical organisation and ***encourage co-existence of 'exploitation' and 'exploration' business models.***

X. SUCCESS STORY OF IMPLEMENTING STRATEGIC PROJECT MANAGEMENT PRACTICES: DEVELOPMENT OF INDIGENOUS TRAINER AIRCRAFT

The programmes involving the development of HTT-40 and the LUH have followed a 'project organisation structure' with a 'functional organisation structure' with great success. The inaugural flight of India's own indigenous HTT 40 (Basic Trainer Aircraft - BTA) (refer fig 6) designed and developed by HAL happened on June 17, 2016 at HAL airport Bengaluru in the presence of Defence Minister Shri Manohar Parrikar. The Minister congratulated team HAL and had appreciated that the young team had taken a calculated risk and they had flown the aircraft within one year and had kept their assurance.



Fig6: HTT 40 (Basic Trainer Aircraft - BTA)- Source: HAL Connect, internal magazine

The role of private players and MSMEs has been significant in the production of parts. HAL launched the detail design of the aircraft by earmarking its internal resources in August 2013. The detailed design phase was completed in May 2015 and from there it has taken only one year to fly the first prototype. The project includes many first time initiatives such as Digital Mock Up (DMU), real time systems clash analyses, laser tracking of assembly jigs, six degree of freedom, mathematical model, complete glass cockpit etc. HTT-40 has been designed not only to meet the current requirement of the Indian Air Force but also it has provision for role expansion to include weapons for the trainer aircraft. ***This underlines the effectiveness of leading the VUCA, embracing ambidexterity by weaving projectised approach within a functional organisation, successfully imbibing structural, cultural and strategic changes, within the ambit of a Public enterprise.***

XI. IMPLEMENTING AMBIDEXTERITY STRATEGIES IN HTT-40

The indigenous HTT 40 (Basic Trainer Aircraft - BTA) designed and developed by HAL, has been successfully progressing through various phases which has demonstrated the impact of implementing ambidexterity strategies. The process of conducting contingency planning by Industry determines their ability to handle VUCA. Analysis and preparation for low probability high impact scenarios are required for Industry (Smadja, C., 2016). The HTT-40 scenario planning did precisely this when it had a contingency plan of using second hand engines for test flights to reduce the impact of engine readiness on the program.

A. Early and Deep stakeholder engagement

- Supply chain uncertainty:

The project HTT-40 had systems and sub-systems common to other platforms like LCA (Light combat Aircraft). This paved the way in streamlining the supply chain and order simultaneously for several platforms reducing uncertainty in and supply chain and procurements effectively mitigating risks of higher costs, delays and late deliveries.

- Technology complexity:

The team had the requisite experience as the team members were chosen from the established aircraft programs and projects. This enabled greater technology absorption and better change management and implementation of various improvements during the design and development phase.

- Industry-academia collaboration:

HAL has established joint chairs with leading technological institutes like IITs in key technologies ensuring sustained collaboration and useful in several projects like the HTT-40.

- Skills ambiguity :

The team members have been well trained and chosen from established projects like fighter jets and trainer aircrafts. The project manager is a PMI certified Project manager which has contributed immensely to the enhanced performance of this project and the successful flight of the first prototype. The detailed design phase was completed in May 2015 and from there it has taken only one year to fly the first prototype which is remarkable given the rigorous testing and standards required to be maintained and the supply chain challenges.

- Competitor uncertainty :

Competition from the Pilatus aircraft was prevalent; however, HAL had taken a calculated risk in deciding the specification of the trainer HTT-40 on their own and flight testing the prototype in a very short span compelling the Government to take notice. The trainer is a great boost to the 'Make in India' initiative and is bound to be great basic trainer aircraft for the Indian air force (IAF).

B. Strategic risk Management

- Market risk mitigation :

As a breakaway from tradition, HAL decided the specification of the trainer aircraft instead of designing an aircraft to the specifications outlined by customer or complying with the specifications of customers. This gave HAL the impetus and confidence to go ahead and market a self-designed product. Scenario analysis and back casting tool has been utilized to envisage the future and plan for the risks and uncertainties that may arise in the various phases of the trainer project.

- Technology risk mitigation :

When the project faced uncertainty with regard to the powerplant or engine, CAT-B engines were used for test flight to reduce the impact of engine readiness on the program. This is the norm worldwide for prototype test flights and this was one of the best risk mitigatory measures on part of the HTT-40 team to shave off considerable delay in anticipation of a brand new engine. As the project phase progresses, the new engines will be incorporated in the trainer platforms replacing old engines in the prototype used solely for initial tests. In order to counter technology obsolescence, Open system architecture in new product development such as Mission computers was followed which will effectively mitigate the technological risks.

C. Scope management and assumptions analysis

As the broad specifications to detailed specifications has been decided by HAL, the scope management and change management has been under control. The assumptions analysis and stakeholder analysis have been done keeping in mind the fact that this trainer follows a made-to-market model.

D. HR management:

The team has been handpicked by top executives of HAL in a bid to ensure that all team members have the right mix of skills and the relevant experience in similar projects like LCA and IJT (Intermediate jet trainer). Also to build the team camaraderie it has been made sure that the average age of the group remained below 35 years. Also, it has been made sure that the project team was headed by a PMI-certified Project management professional.

XII. DISCUSSIONS

Based on the empirical studies of various programs, projects, industry analysis, SWOT analysis, VUCA studies and analysis of the specific case study of HTT-40 trainer project of HAL, it can be surmised that there exists a strong possibility of incorporating an ‘ambidextrous’ framework even in a hierarchically-structured PSU like HAL.

There is a point encountered in every business wherein occurs a time for a radical business transformation and if it is missed or delayed, the opportunity is lost forever and may also lead to a ‘fall back’ situation in business threatening growth. Also, the increasing unpredictability of the business environment where disruptive change is the ‘new normal’, there is a growing imperative to adopt new strategies to counter VUCA. Then what needs to be done which will promise sustainable growth in the VUCA environment and transform a company into a leader?

The need of the hour is for organisations to be ‘ambidextrous’ by exploiting the old, existing systems or ways of doing business and at the same time exploring the new business frontiers through breakthrough innovation. This underlines the effectiveness of leading the VUCA, embracing ambidexterity by weaving projectised approach within a functional organisation, successfully imbuing structural, cultural and strategic changes, within the ambit of a Public enterprise like HAL.

XIII. CONCEPTS AND LESSONS FOR THE FUTURE

It can be surmised that faster response or agility to changing and dynamic situations is not the ultimate solution but anticipating the stimulus or the ‘black swan event’ (Nicolas Taleb, N., 2007) itself is the breakthrough strategy to be adopted. The solution lies not in responding to the ‘VUCA’ but predicting the ‘VUCA’ and leading the ‘VUCA’ to take effective mitigatory action. There are some challenges posed by the industry and changing geo-political dynamics for HAL that necessitate a drastic business transformation, slightly more on the exploratory aspects like focusing more on new products and tapping adjacent alternate markets. HAL needs to focus on tackling technology obsolescence that is accelerating at a much faster pace that our products may not meet the requirements of prevalent and future warfare scenarios. The need for fighter jets by the forces is more increasingly taken over by unmanned aerial vehicles to save lives, save time, carry out surveys and reconnaissance activities without detection and to have the benefit of surprise during planned attacks. This underlines the need to revamp the product portfolios of HAL.

The proposed *strategic foresight and project management approach could be the most effective method in the direction of employing ambidexterity for bringing about a business transformation in HAL*. There are a few issues to be addressed to ensure success in this transition specifically on the perspectives of strategic human resource management and keeping up with the pace of rapid technology advancement (Pan. 2010). It is suggested to go in for further empirical research to take this initial proposal forward for implementation.

XIV. CONCLUSION

While there are a host of critical success factors that drive sustainable business development for a PSU in the aerospace industry, there is also little doubt about the indispensable role that accelerated project management initiatives perform in their implementation.

Therefore, the key to sustenance in the VUCA world for an aerospace organisation like HAL, is the need for *leading the VUCA, encouraging ‘Ambidextrous’, ‘Collaborative’ and ‘Anticipatory’ attitudes to be built into the business strategy as well as in the process of managing portfolios/projects to deal with unpredictable situations and create a ‘Learning organisation’* that offer a truly sustainable competitive advantage.

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