

IGNITING INNOVATION

The TATA Way

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HARPER BUSINESS

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There is innovation, there is a fence
the other side is boring immense

I dedicate this book to YOU
for the innovation sport that you brew
and for encouraging innovators in your crew
Keeping yourself afloat in the midst of the grind,
you created the credo – 'luck favours the ignited mind'

I also dedicate this book to my two chance encounters
One, with the subject of innovation that put so much on my counter
Two, with the sudden growth of spinal disc C6-C7
which made yoga and writing my go-to safe haven

♦ Contents ♦

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♦ INTRODUCTION ♦

Assuming this is not the first piece you are reading on innovation, I would like you to recall any speech that you may have heard or any article or book that you may have read on innovation. It is likely that the one thing you might still remember is the amount of stress the speaker or author had put on the importance of 'culture for innovation'. You might also recall a few attributes of this culture, examples being 'a culture that allows people to experiment without fear of failure' and 'a culture that encourages people to share their ideas fearlessly'. But do you recall reading about or listening to *how* these attributes get constructed or created?

After spending a considerable amount of time in our respective organizations, many of us form an opinion on how prevalent these attributes are in our teams. We may also have anecdotes to support our opinion. How helpless do we feel when actions are needed to strengthen these attributes? The creation of a culture in an organization is a perpetual process. Depending on the size, age and spread of the organization, it may take several years or decades for a cultural attribute to manifest. The majority of the cultural attributes get created unconsciously, and sometimes consciously, only when the organization follows a set of practices rigorously or experiences consistent and prolonged leadership behaviour.

In 2005, Tata group's leaders began to rediscover their innovation capability. At that time, there were no ways and means to measure and compare the performance of companies on innovation. Ratan Tata, chairman of Tata Sons (also referred to as group chairman) realized the critical role that innovation would play in the twenty-first century. He believed that in a large group – around 100 companies and about 250,000 employees – the only way to bring in innovation was to first create a 'culture of innovation'.

This book highlights the key attributes of the innovation culture and explains how these can be created and disseminated by any organization. The book draws lessons from real innovative endeavours in Tata companies. The results are similar across the companies, regardless of size, age, industry, and geographical location, indicating that the lessons would be useful for any organization.

Chapter 1 charts the antecedents of the interesting events that transformed the Tata group at several points in time. The group started as an 'Unconscious Innovator' and remained so for several decades until Indian independence (for example, the setting up of Tata Steel in 1907, Tata Power in 1940). Unfortunately, innovations got throttled once independent India adopted socialism as the guiding principle for nation building post-1947. The quality of Indian products suffered substantially in this period. Further, the import curbs left customers with very limited choice.

Things took a turn for the better in 1991, when the Indian economy opened up to global market. There was some trepidation on the entry of global companies. Ratan Tata fiercely drove Tata companies to achieve a high level of competitiveness. Using the Tata Business Excellence model, he transformed the group into 'Consciously Improving'. Consequently, improvement orientation gradually became the ethos of business operations over the next decade and a half, which helped companies improve their performance substantially. This period segued smoothly into the next phase in which companies started 'Unconsciously Improving'.

While 'Unconscious Improvement' proved to be a useful phase in companies meeting targets and making a mark for themselves, it got characterized by a widespread organizational unwillingness to try something new.

Ratan Tata was quick to sense the lacunae in the DNA of 'Unconsciously Improving' and by 2006 started exhorting his leadership team to embrace and drive innovation. While addressing his managers, he made it clear that 'To be leaders, we need to innovate. We need to bring out the creative strengths of our people and create an environment where we do things differently and do things others have not done.' This laid the foundation of the all-important phase of 'Consciously Innovating'.

With Ratan Tata continuing to impress on the need to inculcate the culture of innovation, Tata InnoVista was created inviting employees to present their innovations to the Tata leadership and win the awards. A study of more than 2,000 employees pointed to low self-confidence of employees arising from lack of knowledge about the innovations in their own companies and a perception that others are better. Chapter 1 also describes how the seeds of Tata InnoVista programme were quietly sown and how, in a few years, it became a movement. It has ignited and infused self-confidence among thousands of employees every year and created a common language – all of which could be construed as innovation culture.

Why is football the most popular global sport? The main reason is its simplicity and inclusiveness – one just needs a ball and a ground of any size on which it can be played under any weather condition. It needs no protective gears; it has very simple rules; it is a high-intensity, short-duration game; it emotionally involves the audience; and importantly it is one of the least expensive games. With InnoVista, our idea was very similar – create a movement involving all stakeholders and make innovation a simple, engaging, and emotionally-rewarding sport for all employees.

As the innovation journey recommenced after being stymied for forty-five years post-Independence, the next important step was to encourage employees to be bold and try new things. Chapter 2 expounds on this spirit of innovation kindled through two new awards introduced on experimental basis – one was started with apprehension but turned out to be a success and the other was started with conviction but failed. The first one, called 'Dare to Try', faced a lot of scepticism and had to undergo several tests to prove its value to the employees and the leaders. It recognizes people who started with an exemplary intent for innovation and made an exemplary effort to achieve the intent but failed to achieve the intended results as the teams stumbled and hit the end of the exploratory path. It is awarded only if the teams made an exemplary withdrawal from their project which had induced exemplary reactions from the management. This award symbolizes a safety net that Tata provides to its people to fearlessly take intelligent risks.

The intent and spirit behind this award has resulted in a high level of acceptance internally, and its execution has endeared it to external

management experts. Since there is always a risk in encouraging people to be audacious – in that it might be misconstrued as encouraging failure – the award has been nurtured with a lot of caution. The Corporate Executive Board (CEB), a subsidiary of Gartner Inc., independently studied this award and reported that the definition and the evaluation criteria used for this award addressed this risk effectively. In 2015, Prof. Phanish Puranam of INSEAD and Associate Prof. Reddi Kotha of SMU analysed the data of 7,642 successfully completed innovation projects and 801 'Dare to Try' projects and reported that the award only worked as a painkiller and did not make failure more attractive. The analysis also indicated that participation in 'Dare to Try' not only increased the chances of an employee's participation in the successfully completed innovations by 36 per cent, it also increased their chances of delivering high-impact innovations by 21 per cent. These studies put the trepidation around this award to rest.

Unlike the first, the second award, called 'The Leading Edge', was initiated with a lot of hope, fanfare and confidence. It recognized people for their unique business ideas that could either be useful to an existing company or lead to formation of a new company. Even after several attempts to modify, plug the deficiencies, and make it relevant for all stakeholders, the award failed to deliver and was shelved after a few years. The lesson? One should not award ideas in a manner that is similar to awarding innovations. The best award for ideas is to incubate them. Both awards were bold attempts in the given context – to encourage and foster innovation and build the momentum for the movement.

A common theme in all successful movements is clarity and simplicity of goals. A large number of people find it easier to relate to simple themes like that of Mahatma Gandhi's protest against the salt tax and to the simple rules of playing football. Chapters 3 and 4 consider innovation as an organizational sport and highlight the importance of making the participation simpler for employees, enticing them to practise it more often than before. These chapters detail the concepts, vocabulary, and architecture of the Tata InnoVista programme along with case studies.

As children, we struggled to string together words to make sentences to communicate with our parents, friends and teachers. We were taught new

words and accents and we gradually learnt the grammar and grew our vocabulary by using the language.

As we built the grammar of innovation, we consistently reminded ourselves to 'keep it simple' and 'inclusive'. Chapter 3 explains the three words introduced early in the journey and form the core of our innovation vocabulary:

a. Uniqueness: Uniqueness is the single most important factor that decides if the innovation is incremental or breakthrough. Measuring and assessing uniqueness of an innovation has always been a challenge. There is no well-defined metric or a standard to assess uniqueness which is applicable to all types of innovations. We assess uniqueness using the lens of *newness* of the outcome. Newness is evaluated from two perspectives: (1) the creators or producers of innovation, and (2) the consumers of the innovation. Situations in which newness is difficult to assess due to lack of reliable information available, a combination of the next two lenses – obviousness of the problem and obviousness of the solution – is used.
b. Impact: A new product or a new process is considered innovative only if it has either achieved a high impact and/or proves its ability to create a larger impact in future. This chapter explains the three difficulties we all face in measuring the impact objectively.

   The first is our ability to define the beneficiary of the impact. This could be the client, the end customer, the company, the community or a combination of all these. Most innovators find it difficult to quantify the benefit of their innovation to their own company.

   The second challenge is in deciding the scale or metric on which the impact of innovation is measured. As managers, we have learnt to think of revenue, cost and market share to measure the success of innovation. The impact of all innovations cannot be measured using financial metrics but could be easily measured using environmental or social metrics. For example, reduction of pollution from manufacturing operations or increased employability of people from the nearby communities. Further, there are innovations that have measurable impact but cannot be converted to any of the three – financial, social or environmental

measures. An example is an innovation that increases employee or customer satisfaction by 25 per cent. Giving equal weightage to the various types of impact has encouraged all employees to take up innovation projects that may not necessarily have a financial impact.

The third problem arises because it takes time for innovations to achieve the outcomes that were originally projected. How do we assess the impact of innovation that has been commercialized only recently and a much larger impact is expected in future? Past impact is usually small and easy to measure and assess. Future impact is assessed by verifying the appropriateness of assumptions made to estimate the projected outcomes and the strength of enablers in achieving the outcomes.

c. Replication: It is generally accepted by managers globally that the longer we can hold off the competition from copying or cloning the innovation, the longer, and hence higher, would be the benefit from it. Patents are considered to be the only way of stopping competition from copying the innovation. The chapter discusses a few new ways of discouraging competitors from replicating the innovation.

Coming back to the movement, clarity and simplicity of goal is critical but its communication to all target participants is equally imperative for the movement to create the desired effect. The communication of our innovation vocabulary to a large number of people is achieved through various mediums, e.g., roadshows, evaluation criteria and the nomination form meant for various awards.

Chapter 4 details the architecture (Figure 4.2) of these innovation awards that have been structured around the vocabulary explained in Chapter 3. The awards have been constructed so that the programme is inclusive and provides a level playing field for all the employees, encouraging them to participate and join the movement.

Often, we consider new product and R&D teams to be those that deliver innovations. To make the awards inclusive and provide equal opportunity to all functions, a few mutually exclusive categories or families of innovation have been defined. For example, the Support Process Innovation family gives opportunities to employees working in human resources, marketing, sales,

branding, logistics, and other support functions to present their innovations without feeling disadvantaged in comparison to the teams that can create an impact of millions of dollars by innovating around the core processes (e.g., the manufacturing process). Another interesting family is Enabling Customer's Innovation. This gives an opportunity to companies that provide cutting-edge knowledge services to their clients in accomplishing their innovations.

The family of New Service Innovations threw a few interesting patterns. One would think that these innovations are meant for service organizations. It was counter-intuitive to not only see product companies use the layer of innovative services to differentiate their physical products and also monetize the service by charging either a premium or a separate fee.

Design Honour award recognizes people for their design- thinking skills. This award supports in making the overall programme inclusive as it invites interesting, enticing, intuitive renditions of designs in several forms along with design thinking in processes, products, services and business models.

Finally, the bottom section of the figure depicts the Dare to Try award that has been explained in detail in Chapter 2.

The success of the above awards in eliciting senior management's interest and achieving participation from a large number of employees has gradually made this programme an effective medium to engage employees on topics that have been identified as important for future success. For instance, a special award has been created on Open Innovation to encourage companies to experiment and embrace this concept to accelerate their innovations. It is interesting to note that while the phrase of Open Innovation was coined by Dr Henry Chesbrough in the early twenty-first century, Jamsetji Tata used the same concept as early as the late nineteenth century to solve the problem of using inferior coal for steel making.

Within a few years of its inception, the programme attracted over 30,000 participants from all functions from thirty countries in Asia, Europe, the United States, South America, Australia and Africa. To make a movement successful, effectiveness is an important dimension that needs to be immediately focused on as soon as the movement shows signs of gathering momentum. The richness of data and information that the programme

captured helped us develop new measures and extract actionable insights to make the programme more strategic in bringing out the transformation envisioned by Ratan Tata. Chapter 5 delves deep into such measures and insights.

One such measure is the Organizational Innovation Quotient (OIQ). In simple words, it is a measure that enables a company to track its year-on-year progress on innovativeness and compare it with its peers or with its own past performance. It nudges companies to develop an innovation portfolio on which they would like to invest in the next few years.

With the help of information available in our database and some additional research on innovation projects, we observed that *retaining* the uniqueness of an innovation is critical to meet or exceed its predicted impact. The analysis also established that the best way to drive the subject of innovation is to have a hybrid approach – top down for some high-impact projects that need top management attention for a longer period (defined as gestation period) and bottom up for the larger number of projects, which embed the culture of innovation deep in the organization.

Our research indicated the importance of senior leaders in driving innovation projects. Data indicated that innovation projects with longer gestation periods performed better, but they needed a senior leader as a mentor who could assure continuity of resources beyond the annual plan. Examples of Tata Consultancy Services (TCS), Jaguar Land Rover (JLR), and Tata Motors, all of whom created the near replicas of Tata InnoVista internally to increase the reach and depth, substantiate the value of this programme in making the innovation movement successful.

Chapter 6 takes a step back and answers the following questions: What makes some people innovators? Who enables and influences them the most? Why do innovators participate in a programme like InnoVista? Finally, why do companies encourage their people to participate in InnoVista?

The answers to these questions were drawn from a research conducted on three distinct sets of people. The first set comprised serial innovators who were defined as:

1. Anyone who had participated in InnoVista for seven or more years in the first ten years.
2. Anyone else who had participated for five or six years but delivered better quality of innovations (more unique and higher impact).

After applying the above filter on around 30,000 people, we identified ninety-two serial innovators out which sixty-one participated in our survey. While these innovators gave us insights on the commonalties among the serial and successful innovators, we also wanted to know if any of these commonalities were specific to serial innovators. We identified a second set of people who were not innovators in our database and used them as the comparison set and ran the same survey. The third set of people comprised 333 top-level officers (CxOs) of companies (and those reporting to them) who were contacted to find their perceptions about the programme and also about their people who participated in the programme. The analyses of all three research groups were followed by a discussion with some of them to draw deeper insights and supporting stories and incidents. The insights drawn from this research could be summarized as below:

1. *Some myths about innovations that are not true*: The data clearly proves that the myths such as 'Only youngsters are prolific innovators'; 'Innovation is the realm of R&D'; 'People innovate for material gains'; and 'To be a successful innovator one needs to have the skill of navigating through corporate bureaucracy' are not true.
2. *Factors internal to people that make them serial innovators*: Innovators thrive on new problems and have a high level of obsession and determination to realize their ideas.
3. *External factors that make people serial innovators*: The analysis shows an interesting insight that innovators thrive if their bosses throw challenges at them and give them the freedom to experiment. Innovators favour bosses who are inspirational and help them in navigating through the roadblocks.
4. *Innovators hunt in pairs*: The research shows that a large number of innovators worked on innovation projects in pairs and with the same partner on several occasions.

5. *They are hungry for recognition*: The only reason employees participate in awards programme is the associated recognition. There are no material benefits in participating and winning in Tata InnoVista. Receiving the award from the chairman in the presence of other senior leaders is a moment that people cherish for long. A few teams also got an opportunity to present their innovation to the media, which too was considered a lifetime experience for innovators.
6. *Value to companies*: Movements are successful only if they inspire change through influencing others. The discussions with CxOs and serial innovators who are business leaders reveal a few insights about the value companies received when their people participated in such a programme:
    i. It ignites more innovations: The pride associated with the programme inspires people and makes them explore more problems and opportunities for innovation projects.
    ii. It accelerates execution of innovation projects: The programme demands the teams to show evidence of the impact their innovation has created during a minimum stipulated period. This creates a sense of urgency within the teams to complete the project as soon as possible. Innovation projects typically have a long tail; hence this external pressure for completing the project is found to be very useful by business leaders.
    iii. It stimulates intellectually: The questions asked in the participation form, the evaluation criteria, the pitch preparation made by the team and the questions raised by the judges – all have been found very stimulating by the teams. Some companies have started using the awards framework as an awareness programme on innovation.

Finally, the last chapter, Chapter 7, comprises four case studies that highlight and explain various concepts explained in earlier chapters. It also reinforces the transformational value that such a programme can deliver to organizations.

The case of Tata Steel explains how their product Tata TISCON, which belongs to a category that is 'the most difficult to differentiate' in steel business, has been reinvented continuously by various teams working in new

product development, R&D, marketing, sales, manufacturing, IT and HR. The returns from these innovations are evident in the premium that Tata Steel enjoys on this product.

The case of jewellery business of Titan explains the advantages of institutionalizing a few processes to drive innovation, led by a passionate leader. The Innovation School of Management is one such process that delivered several innovations for Tanishq at a time when the business was under pressure, to the extent that it was recommended for closure. The case also highlights how Tanishq had a noteworthy share in the Organizational Innovation Quotient (OIQ) and has emerged as the largest business unit of Titan in terms of revenue and profit.

It was easier for me to write a case on TCS explaining all their product platforms and services it has created for their customers. Some of these projects have won them several awards. I chose a completely different aspect – people. For a company like TCS, it is most crucial for them to spot, hire, develop and retain the best talent. The winner in this business of IT services largely depends upon the talent that the company can spot, garner and engage. The case highlights how TCS had worked continuously on some cutting-edge innovations in HR, a function that is hardly considered amenable for innovation. These innovations ranged from developing interest in IT among school students to promoting programming proficiency among engineering scholars in India and other countries and finally identifying, attracting and engaging talent.

The last case is of Jaguar Land Rover (JLR), which joined the Tata family as a result of an acquisition. Not only did JLR leverage the InnoVista programme with high energy, they found so much value that, within three years, they decided to replicate InnoVista internally. This helped them engage with a larger number of people and change the trajectory of their innovation curve radically. We applied the lens of Digital Innovations on JLR to select the innovations that had impacted not only their products but also their processes.

I am delighted that you have decided to accelerate the innovation journey in your team. The concepts, thoughts and ideas presented in this book have been tested in several companies in all possible situations and have achieved

appreciable improvements. I think you will feel knowledgeable and empowered to take concrete actions on how to make the culture more conducive for people to willingly play the innovation sport more often.

♦ 1 ♦

THE UNCONSCIOUS INNOVATOR

'When you have to give the lead in action, in ideas – a lead which does not fit in with the very climate of opinion – that is true courage, physical or mental or spiritual, call it what you like, and it is this type of courage and vision that Jamsetji Tata showed. It is right that we should honour his memory and remember him as one of the big founders of modern India.'

Jawaharlal Nehru
Prime Minister of India
1 March 1958, at Jamshedpur

THE TATA GROUP'S INNOVATION JOURNEY

A carriage with rubber tyres was a novelty for nineteenth-century Bombay (now Mumbai). Whichever street it passed through, people stopped and stared. They turned even more wide-eyed when they saw the city's first motor car drive in and out of a house that was lit by electricity – another first for the city. Jamsetji Nusserwanji Tata (Jamsetji), founder of the Tata group, owned all of these. Jamsetji's love for trying out new things made experimentation the cornerstone of his fledgling enterprise's business philosophy.

After Jamsetji, his son, Sir Dorabji Tata, took over the reins of the Tata group and gave shape to his father's vision by constructing India's first steel plant between 1907 and 1912 at Jamshedpur. Tata Steel not only built the steel plant, it also introduced new facilities in the area around the plant – it built dwellings for employees of the plant, provided free water and electricity, and constructed roads. Other denizens were also provided with drainage systems, schools, burial grounds, churches, entertainment centres, a dairy

farm (to keep the price of milk low), a soda factory, and hospitals with free medical facilities for everyone. All this was achieved and managed without a municipality and without citizens having to pay taxes. Germans, Englishmen, Americans, Austrians, Italians, Swiss, Chinese, Bengalis, and Parsees all worked and lived together. A jungle-like area was gradually transformed into a thriving town. In the years that followed, the Tata group achieved several of India's firsts unconsciously, without labelling them as innovations.

By the beginning of the twenty-first century, the picture had changed. The growth in innovation had turned sluggish; attempts at bold trials also became fewer. This indicated that the spirit of Unconscious Innovation exhibited by the founders did not penetrate deep enough in the companies. It remained, perhaps, confined to the founding members and their associates.

Responding to a question on his greatest disappointment, Ratan Tata, chairman during 1991–2012, said, 'The most disappointing thing over the last ten years has been the fact that a great deal of energy is spent in telling why something cannot be done. If half that energy was spent in trying to figure out how to do something that was different, that was new, that perhaps is a little bold and risky, we would be leaders in some of the fields where we were in.' It was clear that though during the early twentieth century the Tata group delivered many innovations, it could not institutionalize a system or a culture through which its employees could continue delivering innovations with the same gusto.

Ratan Tata recognized that Tata companies had to change their ethos and mindset to allow people to express creative ideas and inculcate innovation, without forfeiting the trait of improvement and integration that had been learnt in the late twentieth century.

The catalyst for this change was a seismic event in India – the economic liberalization which began in 1991. But let's begin at the beginning.

FROM FOUNDING TILL INDEPENDENCE OF INDIA

A Period of Unconscious Innovation

The Tata group was founded in 1868 in British India. Tata Sons, the

company that has the majority holding as a single investor in all Tata companies, is now two-thirds owned by a group of charitable trusts that invest the profits in building the nation and in social causes. The organizational structure of the Tata group which took shape between the late nineteenth century and the mid-twentieth century is, in itself, very innovative. The parent company, Tata Sons, is held privately which helps it take a long-term view of the businesses, i.e., the Tata companies, in which it invests. Many of these Tata companies are publicly listed, which makes them sensitive and responsive to their customers, shareholders, and the community.

There is no doubt that enterprises cannot survive for decades without differentiating themselves from competitors. This act of differentiation that adds value in the minds of its target audience, i.e., customers, shareholders, government and society, is referred to as innovation in common parlance. In the years following its founding, the Tata companies fervently pursued innovation but this was essentially by the founder and his close associates. They never termed their work as innovative. I call this period as the phase of being *unconsciously innovative*.

Innovations realized from the beginning till 1947, when India gained independence, can be classified as:

1. Pioneering new businesses supported by innovations
2. Social innovations

Pioneering New Businesses Supported by Innovations

The Tata group launched companies such as Tata Power, Tata Steel, Tata Airlines (now Air India), Indian Hotels, Telco (now Tata Motors), Lakmé, Tata Tea, Tata Consultancy Services, and many more. It had to face tremendous challenges in establishing these companies in terms of raising the capital, getting regulatory approvals, and finding and retaining talent. A few examples of such pioneering activities with examples of innovations are given below.

Empress Mills: Cotton mill on a roll (1874)

In 1874, Jamsetji established a cotton mill named Empress Mills at Nagpur. Though it was not India's first cotton mill, multiple innovations were carried out under his leadership that kept the mill profitable for several years. Ring spindles were not successful in the USA, where they were invented. The trials Jamsetji conducted on ring spindles led to his team to perfect the use of 'traveller', the tiny bit of steel that takes the yarn around the ring. These innovations doubled the output of the Empress Mills and were later adopted by the cotton textile industry in India.

Finding skilled workforce was a big problem in those days. Attrition was as high as 70 per cent mainly due to the casual nature of workmen who would leave for their native places, taking long breaks for marriage or death in their families or to ride out fatigue. To make the working conditions better, Empress Mills was the first in India to have ventilators, sprinklers, and humidifiers. Sprinklers helped in settling the floating cotton and humidifiers helped in safety as they prevented fires. To promote loyalty, Jamsetji organized several award ceremonies to give prizes to employees for attendance, output and conduct. For the first time in India, he started a provident fund and a gratuity scheme. He also started the concept of apprenticeship and provided students with residences close to the factory. By 1922, Empress Mills had a crèche for the babies of working women, maternity benefits, factory schools (promoting adult literacy and skill development) for older boys, night schools to teach music and dance, and gymnasiums. Each school had weekly entertainment, holding concerts, magic-lantern shows, recitations and wrestling events.

The outcome of these innovations was noteworthy. In 32 years, the stock price of Empress Mills rose from Rs 500 to Rs 5,718, and, during the same period, it also paid a dividend of Rs 5,488 per share.

Steadfast visionary: Filling the education gap

In 1889, Governor Lord Reay, chancellor of Bombay University, in his speech spoke about the Indian educational system and its deficiencies. Jamsetji was so influenced by the chancellor's speech, that he created two institutions:

i. The J.N. Tata Endowment Fund (1892): In 1892, Jamsetji decided to send

a few chosen students to England every year. The same year, long before the Rockefeller and Carnegie Foundations were established, Jamsetji Tata established the J.N. Tata Endowment Fund to provide higher education to deserving Indians. Since then, 3,500 Tata scholarships have been awarded, including those given to luminaries such as K.R. Narayanan, ex-president of India, Dr Raja Ramanna, renowned physicist, and Dr R.A. Mashelkar, former director general of the Council of Scientific and Industrial Research (CSIR).

By 1924, a fifth of Indians in the Indian Civil Service (ICS) were scholars who had been supported by the J.N. Tata Endowment Fund. Tata Institute of Social Sciences (TISS), India's first institute for social sciences; Tata Memorial Cancer Research Hospital, India's first cancer hospital; and Tata Institute of Fundamental Research (TIFR), India's first institute for research in mathematics and physics that became the cradle of India's atomic energy research, all came into existence through this fund.

ii. Indian Institute of Science (1898): Jamsetji once said, 'Freedom without the strength to support it and, if need be, defend it, would be a cruel delusion. And the strength to defend freedom can itself come only from widespread industrialization and the infusion of modern science and technology into the country's economic life.'

By 1898, Jamsetji had made up his mind to act on his conviction that India's progress would depend on the establishment of an academic institution which focused on science. He realized that countries such as the United States of America, Germany, and Japan had made rapid progress because of advancement in science. In 1899, he announced that he would spend £200,000 to build the Indian Institute of Science. While several people lauded him, a few Parsees struck a discordant note. They felt that a great fortune was being diverted from their community.

Jamsetji's belief on the need to sharpen the minds of Indians was so deep that he told an interviewer, 'There is one kind of charity, common enough among us, and which is certainly a good thing, though I don't think it is the best thing we can have. It is that patchwork philanthropy which clothes the

ragged, feeds the poor, and heals the sick and halt. I am far from decrying the noble spirit which seeks to help a poor or suffering fellow being, but charities of the hospital and the poor asylum are comparatively more common and fashionable among the Parsees. What advances a nation or a community is not so much to prop up its weakest and most helpless members, as to lift up the best and most gifted to make them of the greatest service to the country. I prefer this constructive philanthropy which seeks to educate and develop the faculties of the best of our young men. And if this is to be done, what I ask my fellow Parsees is: "What difference is it to them whether it is exclusively for their benefit or for all?"'

The institute was delayed due to lack of approval from the Government of India, which was under the British rule.

During a visit to an industrial exhibition in Dusseldorf in 1902, Jamsetji saw the rapid progress that Germany had made in electricity and steel. He wrote to his son, 'We are all surprised at the superiority of all German machines and articles.' The application of science for innovation was very evident to him. The foundation stone for the Indian Institute of Science (IISc) was finally laid in 1911 after Jamsetji had passed away in 1904. Today, this is one of the leading institutes in Asia. As of 2016, it had a total of 717 patents with more than 60 per cent of them active.

Tenacious as steel – Tata Steel (1907)

Table 1.1: Tata group chairpersons

1. Jamsetji Tata (1868–1904)
2. Sir Dorabji Tata (1904–1932)
3. Sir Nowroji Saklatvala (1932–1938)
4. J.R.D. Tata (1938–1991)
5. Ratan N. Tata (1991–2012)
6. Cyrus P. Mistry (2012–2016)
7. N. Chandrasekaran (2017–Present)

In 1882, Jamsetji started the work of setting up an iron and steel plant in India. It took him around twenty years to scout for iron ore and coal mines.

He understood the importance of the combined role of experimentation, tenacity and patience to execute a plan. In 1901, he wrote an application to obtain licences for exploring, trial mining and smelting iron ore in Lohara (in present-day Maharashtra), for a period of four years. The government in those days allowed a licence for a maximum of two years. He wrote in his application, 'I require to be perfectly assured that I shall be allowed to try my experiments for at least four years, as for such a large and difficult undertaking, this time is absolutely necessary.'

Finally, in 1906, when the details of the steel plant were finalized, his son, Sir Dorabji Tata, set out to London to raise the capital for it. The reports were very positive about the quality and availability of iron ore, and the low cost at which the ore could be converted into pig iron. However, they failed in raising the finance from London because there were differences in opinion regarding the degree of control sought by the representatives of English investors. In 1907, riding the Swadeshi wave, Dorabji decided to take the bold step of appealing to Indians for the capital. The decision was risky and many predicted failure. The prospectus was issued in 1907. The public came forward to help in large numbers and at the end of three weeks all the capital of £1.6 million required for construction was secured almost entirely from 8,000 native Indians. Maharaja Madho Rao Scindia of Gwalior subscribed for the entire issue of debentures that were raised to provide for the working capital of £400,000. This was a financial innovation of a rare kind.

Power generation: First father, then son – Tata Power (1910)

In 1875, Jamsetji attempted to set up a hydroelectric power plant near Jabalpur on the waterfall on the River Narmada. He negotiated for the land but the deal fell through. Later, in 1897, the idea was reignited when David Gostling, who had set up a hydel plant in Darjeeling, identified the Western Ghats as an excellent catchment area for the heavy monsoon rains. However, before the project could be launched, Jamsetji passed away. Dorabji, who took over as chairman, took the project forward. As the project took shape, it turned out that it was not only new to India but was also the first of its kind in the world. Three catchment areas Shirawta, Walwhan and Lonavla, all three separated by a few miles, were identified. Shirawta was spread over 5

square miles and held 7,200 million cubic feet of water. Walwhan, 65 feet deep, could hold 2,600 million cubic feet of water. The plan was to store water in these catchment areas and let it pass through masonry canals to the reservoir at Lonavala, and then through pipes to the powerhouse at Khopoli. A five-mile-long river bed of solid masonry was built to create an artificial river that travelled under a roadway and the railway until it reached the pipes, which discharged water equal to the flow of the River Thames in London.

During the opening ceremony of the hydroelectric plant, Dorabji said, 'The Western Ghats is among the regions that receive the heaviest annual rainfall in the country. However, since the precipitation occurs over a period of only 90 days in a year, the storage of water is required for generating electricity all the year round. The challenge lay in building a large storage capacity needed to meet the annual requirements. The great dam at Shirawta is larger than the Assouan barrage (Aswan Dam), which, on its completion, was hailed as one of the engineering wonders of the world, and the Walwhan dam is a little inferior in size to Sir William Willcock's great work on the Nile. For no other hydraulic scheme has storage on such a gigantic scale been attempted.'

Experimenting with an equation – Tata Chemicals (1940)

In 1957, Tata Chemicals wanted to increase the production of soda ash at their Mithapur plant by about two-and-a-half times. A 31-year-old engineer, Darbari Seth (who later became the chairman and managing director of Tata Chemicals) was asked to visit the German company that would take up the job of designing the plant to increase the production capacity. Upon his return, Seth dissuaded the management board from employing the German consultant and presented his own proposal for increasing the production by five times at a much lower cost.

Out of the sixteen members of the board, only one supported him – J.R.D. Tata, the then chairman of Tata Sons. The average age of the team led by Seth was just twenty-nine years. The team designed, erected, and commissioned the plant that increased the production six times over.

Social Innovations

When Jamsetji introduced programmes such as accident compensation for textile workers – unheard of in the late nineteenth century – it raised many eyebrows. During his address at the opening of a new extension to the Empress Mills on 5 April 1895, he said, 'We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.' Today we would give it a fancier name – HR Innovation – and its antecedents can be found in Jamsetji's recipe for business prosperity.

Innovations during the early and mid-twentieth century addressed the needs of an underdeveloped country. Empress Mills introduced pension in 1886 and provident fund in 1901 (it became a law in India in 1952). It started free medical aid in 1913, schooling facilities for the employees' children in 1916, sickness and maternity benefits in 1921. The eight-hour working rule was started in 1912 in Tata Steel, long before it was generally accepted in Europe and the USA. Leave with pay was introduced in 1920 in Tata Steel, at a time when it was unknown in either England or America. It was established as a law only in 1936 in France and in 1945 in India. Profit-sharing bonuses began in 1934 in Tata Steel (the earliest mention of a similar programme could be traced to Scanlon Plan in the 1930s in the USA) and retirement gratuity in 1937 (the Indian Parliament passed the bill in 1972).

Ratanji Dadabhoy Tata, first cousin of Jamsetji Tata, had played a key role in setting up the Tata Steel plant. Addressing Tata Steel shareholders on 25 October 1923 during a period of shortage of funds in Tata Steel, he said, 'We are constantly accused by people of wasting money on the town at Jamshedpur. We are asked why it should be necessary to spend so much on housing, on sanitation and waterworks, on roads, on hospitals, and on welfare. People who ask these questions are sadly lacking in imagination. We are not putting up a row of workmen's huts at Jamshedpur – we are building a city.'

As the Tata group made a mark for itself on India's industrial map, India made a mark on the world's map as a free country on 15 August 1947.

The spirit of innovation was innate in the founder and his generation. They were unconsciously pioneering and innovating, which was the need of the hour in the country at that time and could have continued perhaps forever if the sudden change after Independence had not killed this spirit.

INNOVATIONS AND ENTREPRENEURSHIP AFTER INDEPENDENCE

Post-Independence, in 1956, the Indian Parliament adopted the socialistic pattern of development. As a result, the government started taking control of major industries such as steel, power, telecommunications, etc. Private businesses found it very difficult to conduct and expand their business because of tough regulations which necessitated companies to obtain a licence for every business decision. This period, known as Licence–Permit Raj, was the most constraining period during which the country grew at a meagre rate of less than 4 per cent.

Between 1960 and 1989, Tata companies made 119 proposals to expand old plants or to start new ones. Almost all of them were rejected. In 1969, J.R.D. Tata said, 'I cannot decide how much to borrow; what shares to issue, at what price; what wages or bonuses to pay; and what dividends to give. I even need the government's permission for the salary I pay to a senior executive.' Imports were expensive and difficult, leading to limited choice for the customers. The quality of products sold by companies was far below global standards. While the cost plus fixed profit norm was a paradise for existing manufacturers and whatever they produced got sold, they were also shackled as any expansion needed licences and the government blocked any attempt to create large companies.

Several Tata companies were founded in the twentieth century. Many of them had the Tata name, though, before 1991, Tata Sons held only minority stakes in these companies. The threat of nationalization influenced Tata Sons decision to have only minority stakes.

The Turning Point and Beyond

Liberalization – The New Dawn

Post-Independence, the Indian economy was dependent on the USSR to a large extent. After the economic crisis in the USSR in 1982, Indian exports

started to dwindle. By 1990, the oil prices had doubled due to the developments in Persian Gulf which eventually led to the Gulf War of 1991. In 1991, India's foreign exchange reserves had fallen to just about Rs 2,500 crore, just sufficient to buy essential commodities for three weeks. India pledged 67 tonnes of gold to get a loan from the International Monetary Fund (IMF). This is when the Indian government started the economic reforms and the doors were opened for privatization and Foreign Direct Investments (FDI). The necessity for obtaining licences was gradually removed, eventually resulting in the markets becoming competitive. Domestic companies, including those of Tata, felt threatened by multinationals that were likely to enter the Indian market. We can now say that this threat was real because the FDI increased from US$ 132 million in 1992 to US$ 3 billion in 1998 and US$ 41 billion in 2009. The only way Indian companies would have survived was to improve and improve fast.

India went through a very exciting phase after 1991 – people who had been deprived of global products were able to possess them. The middle class was growing rapidly and the country had the youngest population in the world. The perception that Indian consumers were more inclined to run-of-the-mill, middling products gradually started to change. Even everyday commodities such as atta (flour) were differentiated by companies, and customers were ready to pay a premium.

Period of Consciously Improving: Excelling to Fight Competition

In 1991, the Tata group's revenue was US$ 4.4 billion and it had 120,000 employees. To face the likely onslaught of competition from multinational companies, it adopted a clear policy: Drive improvements and reduce cost.

The Tata Business Excellence Model (TBEM), a take-off from the Malcolm Baldrige National Quality Award in the US, was adopted in 1994 to drive improvements and align organizational processes. The TBEM process required an annual assessment of Tata companies by a team of trained Tata assessors. The outcomes of such assessments were used to recognize and award companies that exhibited higher levels of improvements. The assessment also put pressure on companies to learn from one another and improve their processes. There was enough to learn as the gap between Tata

companies and world-class companies was huge. Failure was generally not acceptable as there was absolutely no need for people to experiment with something new when there was so much to catch up with by learning from others.

The key trait that was imbibed during this process over the next decade and a half under the leadership of Ratan Tata was *humility to learn fast*.

There was no single, uniform Tata logo and every company was using its own individual logo as its identity. There was no unified brand promise from the house of Tata. In 1998, Tata Sons initiated another programme named Brand Equity and Business Promotion (BE–BP), to lay guidelines for a common Tata brand that stood for a certain level of trust amongst all the stakeholders. BE–BP ensured that every Tata company would follow the guidelines on ethics and would achieve a minimum level of performance excellence as measured through TBEM assessment. At the same time, to prevent hostile takeovers, Tata Sons invested in securing the status of being the single largest shareholder in every Tata company.

The TBEM programme, supported by BE–BP, worked extremely well as it awarded well-performing companies and built the pressure on the companies to maintain the trajectory of continuous improvement. By 2004, the revenue of Tata companies had increased to US$ 22 billion. Eighty per cent of the revenue came from companies that had cut costs, improved their processes, and had set new benchmarks for efficiency in the Indian industry.

This improved level of performance made the leadership team confident enough to begin globalization. Between 2000 and 2008, more than thirteen companies were acquired by various Tata companies with an investment of over US$ 17 billion.

The key innovations of the Tata group from the founding years until 2006 have been summarized in Table 1.2.

Table 1.2: Pioneering and Social Innovations

	Pioneering Entity	**Social Innovations**
Pre-1947	• Taj Mahal Hotel • Tata Power • Tata Steel	• Pension and gratuity fund • Provident fund • Eight-hour workday

	• Tata Chemicals • Tata Airlines (now nationalized) • Tata Motors • Indian Institute of Science • Tata Oil Mills (sold to HLL) • Lakmé (sold to HLL)	• Free medical aid • Schooling facilities for children • Leave with pay • Accident compensation • Profit-sharing bonus • Gratuity upon retirement • Maternity benefits
1948–91	• Tata Consultancy Services • Tata Tea • Voltas • Titan	• National Centre for Performing Arts
1991–2006	• Tata AIG • Tata Sky • CROMA • Electoral Trust, the first independent trust in India	• Forty-hour, computer-based adult literacy programme

The intense focus for driving improvements and catching up is also evident from relatively fewer examples of innovation that happened in the first 10–15 years after liberalization.

- The Second Career Internship Programme (SCIP) started in 2008 to give an opportunity to those women who discontinued their employment after maternity and were looking to restart their careers after a break of two to five years.
- Nowhere in the world had any company set up an electoral trust to donate funds to political parties, but after Tata group created one in 1996, quite a few other corporate houses have done the same.
- Tata Indica, India's first indigenously developed passenger car, was launched by Tata Motors in 1998. This was a bold experiment by the then Chairman, Ratan Tata.

Improving Unconsciously

With increased rigour for continuous improvement for more than a decade, employees started to unconsciously improve. They instinctively began looking for best practices from around the world and adopted them. They sought the support of consultants to bring tried and tested practices into companies and improved their results. Almost everywhere, Tata companies and managers used to say, 'We want to improve, tell us what we can adopt. Show us someone who is doing it and we will do it too.'

While the unconscious improvement orientation did produce good results, it also became a problem when viewed through the lens of innovation which required people to venture into untried areas and territories – a proposition that was considered risky in a milieu that had become averse to failure. It was very clear that managers were adopting well-established practices from around the world and had become reluctant to break the mould and do something for the first time. The need was to blend 'Drive for Improvement' with 'Willingness to try something new'.

Clarion Call to Managers

One of the first persons to sense the shift that took place from unconscious innovation to unconscious improvement was the then chairman, Ratan Tata. In one of the annual events in 2005, attended by the CEOs, he spoke about the need for innovation. He said, 'To be leaders, we need to innovate. We need to bring out the creative strengths of our people and create an environment where we do things differently and do things others have not done.'

His concern was that in their endeavour to improve – that too unconsciously – Tata managers had become comfortable in being followers. While he did recognize that these managers benchmarked themselves against the best and tried to emulate them, sometimes even surpass them, that was not sufficient to meet the business challenges of the coming decades.

Citing leading Japanese, Korean, and Chinese companies that grew by innovating, not by copying, Ratan Tata impressed upon the CEOs that, 'If we

want to be up there, we have to give some attention to being innovative in terms of what we do. I am just trying to say that we should create a space where we can lead, do things differently and do things that others have not done. We will not, in the long-term global environment, ever be leaders unless we are also innovative.'

With Ratan Tata suggesting innovation-driven leadership, the two main challenges that emerged were:

a. How do companies change themselves to allow their people to express creative ideas that would be given serious consideration by the management?
b. How do companies inculcate innovation without losing the trait of continuous improvement?

Ratan Tata was personally involved in two major products of Tata Motors. The first was Tata Indica – the indigenously designed car that was launched in 1998 – and the second was Tata Nano, a compact city car that was priced at Rs 1 lakh and was unveiled in 2008. In 2005, while the work on Tata Nano had just begun, Tata Motors had launched Tata Ace – a light commercial vehicle, which created an altogether new product segment. All these were bold projects and drove home the point of leaders taking bold risks, a necessary attribute for the innovation culture. Ratan Tata, whose resolve towards innovation had increased as a result of these projects from a company with which he was passionately associated, said during a conference in December 2005, 'I would only say that as we go forward, let us be bold, let us think big and let us not be risk-averse in terms of what we do and let us not be afraid to be leaders. We should not be followers.'

The Beginning of an Innovation Focal Point

In 2004, I was leading the Knowledge Management (KM) programme for Tata Steel which had received global recognition. It had won the Most Admired Knowledge Enterprise (MAKE), Asia award in 2004. In the same year it was selected as the best-practice partner by the American Productivity and Quality Council (APQC). I was asked to facilitate the implementation of Knowledge Management in all other companies.

By the end of 2005, after hearing Ratan Tata urging everyone to focus on innovation, I mooted the idea of organizing a competition on innovation inviting employees from Tata companies to participate. The pilot of innovation awards was done in 2006 and was branded as Tata Innovation Day. The programme was run quietly, without any fanfare, as innovation was not a mandate for us. A total of 101 teams participated from thirty-five Tata companies in this inaugural programme.

This Way to Conscious Innovation

A few months after the first Tata Innovation Day, a group of senior Tata leaders spent more than a week in the US, visiting companies well-known for their innovativeness: 3M, Intel, Microsoft, HP, Raytheon, and the Harvard Business School. While there was a lot to learn, there was one core lesson – these companies took a lot of care to recognize their innovators. 3M presented inspirational stories about their innovations and the people behind those innovations. We realized that none of the Tata companies had a process to identify and recognize innovators. Tata Innovation Day was considered a step in the right direction.

Ratan Tata, in his address at a leadership conference in December 2006, said, 'In the past, I have talked about innovation and I am delighted to see the action that has been taken by the team that went to view the innovation processes and the environments in some of the world's most innovative companies. I am delighted that this has taken place and very, very excited that we have made this first move. But it is only a first move. We have an immense task ahead of us now.'

He further said, 'In our quest for innovation, we should have the humility to recognize and draw on good ideas and creative thoughts, irrespective of where they come from, whether they come from academia, whether they come from a workman, or whether they come from a young manager, and we should be able to assess such ideas and have the vision to be able to see how far it can go. The challenge, therefore, for all of us in managerial positions is, in fact, to create that environment of encouragement and motivation.'

The message was clear – we needed to drive a change in the mindset of

Tata employees to Consciously Innovate. We had come almost a full circle. The Tata group was unconsciously innovative in the pre-Independence period. Now we were working towards being consciously innovative. (Figure 1.1).

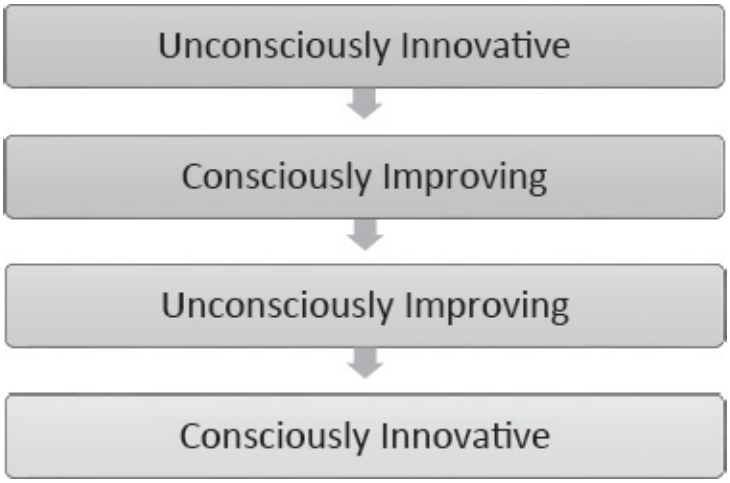


Figure 1.1: The transformation

A Right Home for Innovation

Influenced by the way dedicated teams were successfully set up in the past in Tata Sons to facilitate the subjects of ethics, HR, brand, TBEM and knowledge management, the executive committee of the Tata Quality Management Services (TQMS) (a division of Tata Sons) decided to create a focus group to support Tata companies as a knowledge partner in building the environment and a culture of innovation.

One school of thought proposed the TBEM team to also focus on innovation. The concern expressed by another school of thought was that business excellence and innovation had opposing philosophies. Sunil Sinha, the then CEO of TQMS, that owned TBEM said, 'It took more than twelve months to decide the most appropriate home for the innovation programme – on one side we had Corporate HR which had carried out desk research on innovation, and on the other hand TQMS, which was known for its deep connect with companies, and was driving the subject of Knowledge Management. Innovation was viewed as the natural extension of KM.'

Finally, a small team within the larger TBEM team was created to focus on

innovation. The innovation team was not permitted to engage in any activities related to business excellence. There was a virtual wall between the employees who worked on business excellence and innovation.

R. Gopalakrishnan (Gopal), the then executive director of Tata Sons was asked to lead the innovation programme in 2007. He formed an independent governing council, named it Tata Group Innovation Forum (TGIF) and co-opted members who were either senior leaders (CxO) or innovation heads in companies. I assumed charge as the convener of TGIF and the head of the innovation team responsible for the charter of TGIF which focused on encouraging companies to create an environment for innovation.

A Tool for Self-reflection Provided a Good Start

A workshop with Prof. Julian Birkinshaw, professor of strategy and entrepreneurship at the London Business School and an expert on innovation, resulted in the development of the InnoMeter tool. It was used to assess the strengths and weaknesses of companies on their innovativeness using three dimensions: Culture, Processes and Strategy.

Several companies undertook the InnoMeter exercise to measure how well they were oiling the innovation engine. Invariably in every company, the InnoMeter outcomes created anxiety (we called it *creative tension*) as the scores were far below the expectations of management. Many companies that were doing very well on TBEM suffered low scores on the InnoMeter. This clearly indicated that making improvements in all areas as defined in TBEM was inadequate to show good results on the metric specific to innovativeness. Not having a clear definition for innovation, not providing a simple and fair method for employees to give ideas and finally complete absence of rewards and recognition for innovation were a few common messages found in almost all the InnoMeter studies.

These learnings, particularly extracted from the InnoMeter studies contributed to the refining of Tata Innovation Day, the pivot around which the innovation programme was being inculcated.

Low Self-awareness Led to Low Self-confidence

In 2008, a survey-based research was carried out with 1,800 employees from thirteen large Tata companies located in India. Out of several questions in the survey, the two that provided several insights were:

a. How innovative is your company on a scale of 1 to 5?
b. How innovative is the Tata group on a scale of 1 to 5?

Employees from twelve out of the thirteen companies stated that the Tata group was more innovative than their own company. The question we asked ourselves was: What is Tata group? The thirteen companies that we surveyed together contributed to more than 80 per cent of the revenues of all Tata companies.

In 2010, a similar survey was conducted with 435 employees of five companies located in the UK and Europe. Our hypothesis was that the results would be different as the employees in that geography would be aware and confident about their innovations. The results, however, were similar to the results of the 2008 servey. Not only did the participants perceive their companies to be less innovative as compared to other companies in that geography, they felt the same when compared with the Tata group.

None of our companies, unlike 3M and a few others globally, had a mechanism to identify, share and celebrate their best innovations amongst its employees. This lack of information about the innovations from their own company, along with the fact that the employees were reading about innovations happening within and outside the Tata group, led them to feel that their own company was less innovative than others. This feeling manifested as a low score given by them to their innovativeness, indicating lack of self-confidence.

Another simple exercise during the roadshows of Tata Innovation Day corroborated this further. The audience was asked to write down top five innovations that their organization had done in the last one year. The responses revealed a disconcerting fact – there was very little convergence, which meant there was lack of information about their own innovations. This established the first insight: The lack of knowledge about oneself and the perception that others are better could be one of the reasons why employees

lacked self-confidence and doubted their innovativeness.

The second insight was that almost all companies lacked a formal and well-defined recognition programme for innovation. We dug deeper and found that some companies had annual awards but only a few recognized teams for innovations. However, further analysis revealed that those who recognized teams for innovation neither defined a yardstick to assess innovations nor highlighted the innovativeness of the project in the citations that were given to the winners.

The third insight was that the middle managers exhibited the least confidence about the innovativeness of their companies. The senior leadership of companies had started asking their employees to take bold innovation projects and assured their support to them. The young employees, as always, were full of energy and ideas and wanted to work on exciting innovation projects and were confident about their capabilities. The middle managers, however, believed that continuing with improvements would help them achieve their quarterly and annual performance targets and would lead them to the path of personal growth.

The fourth insight revealed the widespread confusion between the two words – improvement and innovation. We created our own simple explanations to help employees differentiate between the two, but the larger message delivered to them was that both improvements and innovation are equally important. One should always strive to be part of at least a few projects that would qualify as innovations. Chapter 3 explains the method we use to differentiate between innovations and improvements.

In 2007, Gopal, in one of his interviews said, 'The Tata group has a long history of innovation. However, many are unaware of the extent and significance of the innovations undertaken and their impact on the entire group and nation.' This was reaffirmed when he once asked a group of about a hundred managers in Kolkata to raise their hands if they thought the Tata group was innovative. Only a few hands went up. For the next hour, he went on to share the stories of the Tata group's innovations through the decades. Towards the end, he asked the same question again and this time most of the people raised their hands. Telling stories to people about their own innovations is the best way to disseminate information to make employees

aware about their potential and infuse self-confidence in them. It is a case of we-have-done-it-in- the-past and we-can-do-it-again.

The verdict based on these insights and findings was clear: Tata Innovation Day had to be scaled up. It was expected that the programme would capture inspirational stories of employees and sharing them with Tata employees would help in building self-confidence – the beginning of a virtuous circle.

The March Ahead

From here on, the Tata group's innovation journey focused on awakening the innovative DNA that was latent in the Tata group, right from its inception.

The InnoMeter and Tata Innovation Day (later branded as Tata InnoVista) together became the springboards for a few more practices that enabled innovations in companies. Most Tata companies are largely left-brain organizations, full of engineers, MBAs, and accountants who are used to a structured approach to work. Considering the profile of these employees, we created simple and logical programmes on innovation.

The task was massive, considering that we had to make a large cultural shift in companies that had been in existence for several decades. This transformation was complex since there were several fledgling companies and quite a few acquired companies. We continued to consistently invest in building knowledge on innovation and experimented fearlessly. Some experiments failed and many others succeeded.

♦ 2 ♦

NOT ALL EXPERIMENTS ARE SUCCESSFUL

'We should bear in mind that not all innovative ideas are successful and we should not jump to the conclusion that a failure means that this is not the way to go.'

Ratan N. Tata
Chairman, Tata Sons, 2006

INNOVATION IS ALL ABOUT EXPLORING NEW KNOWLEDGE

'Freedom to fail' was a new award added in 2007 in Tata InnoVista. The story behind this inclusion gives a peek into how the experience of Knowledge Management contributed to the innovation programme.

When I was leading the Knowledge Management programme of Tata Steel (till 2004), it was initially focused on capturing, disseminating, and reusing extant knowledge of the employees. At a later stage, a system called Knowledge Communities (aka Communities of Practice) was added to create and explore new knowledge. One of the deliverables for these Knowledge Communities was to conduct new experiments in their respective fields. To encourage them to undertake newer experiments that would help create new knowledge, we had not only built an incentive system, but also instituted an award called Freedom to Fail. This award was given to those who carried out an experiment which had failed, but if successful, it had the potential to find a new way of doing things (new process) or create a new thing altogether (new product).

I was very keen to add this award in Tata InnoVista but was not getting explicit internal support. By December 2006, though the TGIF had not been

formed yet, straws in the wind suggested that a body would be constituted which most likely would be led by Gopal.

Dared to Try

During one of the gala dinners at the leadership conference in 2006, I grabbed the opportunity and asked Gopal about his views of adding the Freedom to Fail award. His response was, 'It is a good idea, but do you think people will come forward to participate?' I responded, 'I would like to give it a shot. I would like to run it for two years. In the second year, if we do not get traction, I will call it a failed experiment, but only after applying for this award and perhaps winning it!'

This is how Freedom to Fail became the second award in the InnoVista programme. The success of 2006 had resulted in the enthusiasm of 2007 but was tempered with some trepidation because the new award expected teams to share their failures instead of success in front of a large audience.

My worries started in the first quarter of 2007, when I saw enthusiastic participation in the successful innovations award but not in the newly introduced Freedom to Fail award. Gopal's words were haunting me. Before the closing date of the entries, I met a few CEOs and senior managers with whom I had an excellent relationship and explained this award to them. We discussed about various projects and initiatives that their companies had tried but were unsuccessful and picked one project that wasn't embarrassing to share in front of the audience. Absence of contenders for this award greatly helped in getting companies to agree for participation. We got six nominations!

Very soon, this award created excitement not only within, but also in the external world. In 2008, this award was renamed as 'Dare to Try' and received more than 100 nominations in 2009.

Antecedents in Similar Ideology

We researched relevant literature and looked for similar awards or concepts which may have preceded our own. We discovered the following:

a. In the same year when we introduced the award, Dombrowski et al. (2007) wrote about the high risks involved in innovation and the need for

leaders to support innovators. The article states: 'The point we want to drive in is that behind each successful innovation story that we hear, there are people who champion the idea, rally for support at each stage of the innovation process, and make it their mission to make innovations successful. These intrepid people who put their careers at stake and take enormous risk on behalf of their organizations in making innovations successful are capable of doing so because of the support they receive from their leaders.'

b. Senior management should explicitly manifest their willingness to accept failures, since managers, by default, prefer to conform than take risks. Schoemaker and Gunther (2006) write: 'Although organizations need to make mistakes to improve, they go to great lengths to avoid anything resembling an error. That's because most companies are designed for optimum performance rather than learning, and mistakes are seen as defects that need to be minimized. Executives, moreover, perceive that flawless execution is what makes them valuable to the organization. In business (except for venture capital firms and entrepreneurial startups), an executive's reputation and rewards are typically based on the height of his or her successes, not on the depth of learning from failures.'
c. Kriegesmann et al. (2005) introduce the concept of Creative Failures. This type of failure occurs when managers depart from familiar routines in a bold attempt to carry out experiments, undertaking manageable and prudent risks. People who commit creative errors should not be mocked or derided, but rather encouraged to undertake further sensible risks in a spirit of optimism. The authors also defined errors such as sabotage and concealment of failure which should not be tolerated. In a similar manner, Edmundson (2011) defines various types of failures and creates 'a spectrum of reasons for failure'. At one end of this spectrum are *blameworthy* failures, examples of which could be deliberate deviance, inattention or lack of ability. Leadership reaction to such failures need to be of zero tolerance and strong disapproval. At the other extreme are intelligent or *praiseworthy* failures which happen despite thoughtful experimentation and generate valuable information and insights. According to Edmundson, organizations commit less than 10 per cent

blameworthy failures, but unfortunately, more than 70 per cent are treated as blameworthy.

d. Indian Space Research Organization (ISRO) launched the first SLV-3 in August 1979. After a dream take-off, unfortunately, the satellite tumbled back into the Bay of Bengal. The chairman of ISRO, Prof. Satish Dhawan, told his tired and dejected team members to stay away from the press conference, which he then addressed in person to explain what went wrong. In July 1980, the second SLV-3 mission took place and, this time, it took off like a dream and stayed the course as expected. Prof. Dhawan requested the team leader Dr A.P.J. Abdul Kalam (who later became the president of India) and his colleagues to address the press conference. (The importance of this kind of support from leadership, specifically from the immediate boss, for innovation has been examined in Chapter 6.)

e. In the early 1990s, Gerhard Bihl was the human resources director of the Regensburg factory of BMW. His challenge was to 'convert the ideas from paper into practice'. He began an activity which he called Flop of the Month or, later more elegantly, Creative Error of the Month. In contrast to the conventional employee-of-the-month scheme, which eulogizes the error-free, highly efficient, and ideal employee, this activity focused on the 'tragic hero' of everyday business, whose experiences harboured unexpected learning potential. Bihl recalled that while one of the written behavioural maxims of the organization was to allow every employee to take calculated risks, in reality, if anything went wrong, the person would usually get a rap on his knuckles. To correct this behaviour of managers and make people follow the written norm, Bihl himself gave awards and took on the responsibility for failures. In three years, he gave only a dozen awards indicating that it was not easy to make creative errors. Once Bihl left the company, the concept lost the momentum, and finally died down.

f. Tanner (1997) reports that a company president created the Golden Egg Award to emphasize the importance of learning rather than blaming. He wrote: 'The sharing of mistakes and other misadventures was a favourite part of monthly meetings of a group of presidents of Ann Arbor businesses.' The Golden Egg Award was given for the best 'mistake' of the month. The winning president was expected to take the trophy back to his

office and leave it on his desk for the entire month. The presence of the Golden Egg raised questions from visitors and led to telling the questioner how he got the award. It also gave the president the chance to be a model for treating mistakes as opportunities to learn how to do it better rather than as a situation requiring blame. It legitimized the importance of learning from failures and successes.

The above examples show that encouraging creative errors or praiseworthy failures was considered important for the innovation culture though remaining a corporate challenge.

Operationalizing the Award

Dare to Try award is meant for people who attempted a bold innovation but were unsuccessful in their attempt. One might ask, 'What is the definition of being unsuccessful? If Edison was working for a company in which a similar award existed, would he have applied as many times as his filament for the electric bulb failed?' Apocryphal claims of his failures vary between 3,000 and 10,000 times.

Participation of teams for this award is a public acknowledgement of their judgement to call it a day or draw a line. It indicates that the path selected by the team to achieve an end goal or an end state has been travelled on long enough, and it is now certain that the chosen path will not lead to the desired results with the current knowledge or resources. We strongly believe that, to get to the innovation, the person or the team will have to conduct several experiments and many of them may fail. Only after all the experiments in the chosen path have failed and the innovator decides either to change the path completely or shelve the project altogether, should he or she participate in this award. Thus, in the case of Edison, he wouldn't have applied for this award at all because before reaching the end of the path (failing to find the right element for the bulb), he got the electric bulb that could be commercially used.

A climate of trust needs to be generated among the employees to make them believe that acknowledgement of their creative failures would be appreciated. A public award like Dare to Try was the best way to build this

trust amongst employees. The decision to include this award as part of annual innovation awards helped in institutionalizing it and not making it dependent on a bunch of passionate managers. This award catches the attention of all the jurors, who unanimously feel that this award would have been the toughest one to create and equally difficult for teams to participate in.

Behaviours Nurtured

The award encourages three distinct behaviours that are necessary for an innovation attempt to qualify as a creative error and for organization to build a culture that encourages bold innovations:

a. Exemplary Intent
b. Exemplary Effort
c. Exemplary Withdrawal and Exemplary Reactions ex post facto

Exemplary Intent

The attempt made by the team should be audacious enough to create something very unique which would have generated a large impact for the company and the customers. Chapter 3 explains 'Uniqueness' and 'Impact' in great details. The amount of risk in the project is another key indicator that defines the strength of the intent.

Exemplary Effort

It is equally important for the teams to put in the best possible effort to mitigate the risks to achieve their audacious goal before quitting the path or their journey of exploration. For such projects, it is necessary for the teams to have an unambiguous backing of the management to garner resources. The teams need to have a high level of perseverance (but we do not want them to become obstinate and resist killing a project that has no hope) in their attempt to overcome the challenges before quitting the chosen path.

This behaviour is critical in order to avoid any dysfunctional behaviour amongst employees who may not put in their best possible effort to

overcome the roadblocks. To ensure that the teams make wholehearted attempts before declaring the end of the chosen path, the efforts are assessed not only in terms of magnitude but also in terms of quality. The teams need to use best possible methods and tools to mitigate the risk.

Such projects deserve to be appreciated for their bold attempt, very similar to the children who get appreciated from their parents for their first attempts to walk or write and players get from their coaches for new ways to score.

Exemplary Withdrawal and Exemplary Reactions

The team which puts exemplary effort behind their exemplary intent should not feel dejected after they decide not to pursue the chosen path. To achieve this desired state, it is imperative for the teams to establish that they gave up only because they were left behind with no options and have reached the end of the path. Once the exemplary effort is established, it is the responsibility of the management to exhibit that their trust on the team's capability is not dented. To assess the behaviour of management and teams, equal importance is given to the three types of reactions:

a. *Reaction of management*: Failures are emotionally charged; getting an organization to accept and consider creative errors differently takes a strong leadership. Even in case of a praiseworthy failure, most management teams usually penalize their people. Some are indifferent, some are investigative, a few blame the team, and only a handful of them appreciate the team for their bold attempt, perseverance and resourcefulness. Answers to the following questions indicate the outlook of the management. Did the management continue to pursue the project; if yes, did they do this with the same team or a different team? Were the team members given an opportunity to work on another challenging project or were they shunned or dumped?
b. *Current state of the team:* The teams are on the receiving end in such cases and hence it is important for them to know how the failure got communicated internally and externally. The role assigned to the team after the project is shelved conveys a lot about the organizational culture.
c. *Organizational learning:* As per Edmundson (2011), examining our failures

in depth is emotionally unpleasant and can chip away our self-esteem. Most employees and managers speed through or avoid failure analysis altogether because analysing failures requires inquiry with openness, patience and tolerance – which creates difficult situations. Motivating people to go beyond first-order reasons to understanding the second- and third-order reasons for the failure is a major challenge. The process of de-layering is important to find the root cause and obtain new learning, but it is unpleasant for all.

Projects are assessed to check if they provided fresh directions to management and people down the line. It is equally important to know how well, in what tone or manner, and with whom were the learnings shared.

The boldness of intent and intensity of effort are the two necessary inputs that decide if the innovation attempt was a creative error. The third behaviour of exemplary reaction is necessary to build the organizational culture that encourages employees to share their exemplary intents and volunteer themselves to work on them – some of which may turn out to be exemplary innovations.

Talking about the Dare to Try award, K. Ananth Krishnan, executive vice-president and chief technology officer, TCS, said, 'It is an amazing award, focusing on an aspect of innovation that is much talked about but rarely rewarded: making room for failure. While all pundits say that the ability to take risks and fail are a part of innovating, it is rare for the innovator to admit he has failed; and rarer for anyone to award him for it. When I speak to my customer CxOs about an award appreciating a failure, they can't believe their ears! The award name puts such a positive spin on the failed attempt that innovators are open to sharing their experience, rather than be ashamed of it.'

Examples of Exemplary Attempts

Let us discuss a few examples that exhibit these exemplary behaviours.

Speaking Walls

‘Speaking Walls’ was an idea which took birth in 2007 when two managers of Tata Steel Europe visited the BAU exhibition in Munich, searching for new ideas. They found a company called Puren GmbH that sold soundboards which, when incorporated into ceilings or walls of the building, caused the entire wall to emit sound. This improved the acoustics and eliminated the need for box speakers and wires. It was an ideal product for sterile rooms and announcement systems in acoustically challenging metal buildings. Puren soundboards were generally installed by creating an opening in a wall, and after installation of the soundboard, the opening was plastered around the soundboard units.

This triggered an idea to manufacture steel walls that worked as audio speakers. The team found that this would be the first pre-installed sound system in walls and it would dramatically reduce time and cost of on-site installation. The team created a production process to sandwich the audio speaker system between two steel sheets. A speaker system was placed between two steel sheets on a continuous production line in a steel plant. This was complex because the speaker system had to be installed on the steel sheet on which a uniform layer of liquid polyurethane was applied. After the polyurethane became foam, a second steel sheet was put on the top and everything together went into the oven for curing. The team, for the first time in the world, successfully sandwiched a speaker system (magnet and coil) in a moving, continuous production line.

The electrical equipment needed to survive the production process, which involved contact with reactive liquid foam chemicals and withstanding a hot curing oven. After eighteen months, the product was technically successful, delivered a magnificent experience, but was not commercially successful because the customer was hesitant to accept this big change. While the project failed to deliver commercial success, it was able to contribute to the brand strength by giving a clear message internally and externally that the company invested in path-breaking ideas and had cutting-edge capabilities to produce new products, some of which may not be successful.

Coral reef

Consumer products like Tata salt and industrial products like soda ash are

manufactured in the Tata Chemicals' factory in Mithapur, on the coast of Gujarat. Coral reef ecosystems are known to have great economic, social and cultural importance. These unique ecosystems in Mithapur were under great pressure that had aggravated due to rising sea water temperature, a phenomenon called coral bleaching. Globally, half of the coral reefs were surviving in less than 0.2 per cent of the world's oceans.

The need for conservation of the remaining reef area was growing day by day to sustain ecological equilibrium, particularly in small island nations. Coral reef areas of Gujarat felt similar pressure after the tsunami in 2006 and were in need of conservation. A team from Tata Chemicals conducted an initial survey to assess and understand the extent of degradation and damage to the reefs. Field observation along the Gulf of Kutch and Mithapur coast established that coral reefs were distressed beyond their regenerating ability.

To start the conservation, in 2012, the Mithapur reef, located outside of the Gulf of Kutch and extending over an area of 10 sq.km, was selected to carry out the reef recovery work. An extensive study suggested that only twenty-seven varieties of reef-building coral species had survived. Typical shapes for coral species are wrinkled brains, cabbages, table tops, antlers, wire strands and pillars. Mithapur's coral species were mostly table tops and cabbages – plate- or boulder-shaped. Usually the antlers, wire strands, and pillar types attract more fauna, but this variety was less than 10 per cent of the Mithapur reef.

The team decided that the best method for reef recovery was restoring coral through transplantation (asexual method) and artificial reef building (sexual method). Acropora coral fragments were collected from the Agatti Island in Lakshadweep and were first transplanted at a nearby nursery site for more than two months to reduce the transportation stress. On an experimentation basis, twenty-two coral fragments were transported by ship, train and car to Gujarat which took around four days. No one in India had tried such a long-distance transportation (1200 km) and transplantation of corals.

Eighty per cent of live corals survived the transportation, which were acclimatized with Gujarat waters for over two days at Mithapur. After six days, ten coral fragments were transplanted at Mithapur reef and eight coral

fragments were transplanted at Laku, which was inside the Gulf of Kutch. These transplanted coral fragments survived for only six months at Mithapur reef and four months at the Gulf of Kutch. The El Niño effect of rising sea water temperature above 30.5 degrees Celsius, heavy wave action, and high turbidity of water had increased the stress load on these delicate corals. After two years of work, the team learnt the science behind coral reef conservation.

Use of bacteria for rust prevention

Corrosion of steel is a perennial issue faced by the steel industry. Steel is made largely in two forms: sheets and bars. Steel companies apply a coating on all types of steel to avoid corrosion. When the sheets are cut after the coating, the freshly cut edges, devoid of the coating, get exposed and become susceptible to corrosion. To control cut-edge corrosion, paint systems loaded with inhibitors are used. One of the main corrosion inhibitors is hexavalent chromium, which is to be banned soon by most countries because it is carcinogenic. For the last several years, many research groups had tried to find an alternative inhibitor. The innovation team of Tata Steel Europe used a completely different approach in 2013. Hydrophobic chaplins (proteins extracted from bacteria) had shown water-limiting behaviour and by applying it as a coating to the cut edges, the team believed it was possible to prevent corrosion.

The team worked on this project for four years, of which more than a year was spent in finding a novel method to extract and purify chaplins. For the purpose of coating large surface area of sheets, chaplins had to be produced in large volumes, which was achieved with the support of Swansea University in the UK. The team designed a bio-reactor that would continuously produce the chaplins. The process for producing the chaplins used extremely harsh chemicals initially, but the team designed a more environmentally acceptable method.

The team found that the coating was hydrophobic (repels water) on one side and hydrophilic (attracts water) on the other. The idea was to ensure that the hydrophilic side attached to the steel and the hydrophobic part remained on the outside, thereby repelling water and stopping corrosion. The team created the most effective mix from five chaplins to make the coating

material.

Finally, the coating was tested for its ability to withstand a wide range of temperatures. The samples were then assessed for the durability and corrosion performance tests. The team found that the smallest imperfection in the coating due to either surface roughness of steel or surface damage due to scratches led to the tearing and peeling of the coating. This peel exposed the underlying steel surface, undermining the corrosion protection. However, more importantly, the peeled-back coating exposed the hydrophilic part of the underside of the coating which attracted more water. This led to excessive corrosion – exactly the opposite of what was being attempted. After four years of work, the team stopped use of chaplins for coatings.

Dual-core novel engine

The automotive industry has been on a major drive to reduce vehicular weight. In 2010, a team from Jaguar Land Rover looked at reducing the weight of the power train (engine and transmission system) while enhancing the performance and NVH (noise, vibration and harshness) attributes of the car.

The team decided to make the diesel engine in two pieces – a core component and separate outer casing. The team also planned to have two cores – one for gasoline (cast in aluminium) and the other for diesel (cast in iron), made of a high-grade material which could withstand the high structural forces. The outer case was supposed to be made of a low-cost material using pressure die-casting process. The aim was to achieve reduction of weight, cost and carbon dioxide without sacrificing any structural attributes.

The team developed the prototype model and established the manufacturing and service implications. It achieved a significant weight reduction by 10 kg. All structural targets were met except for a compromise on NVH in a particular frequency range. The project was shelved after one year as it had residual risks. When the team was asked about the benefits from this project, they quipped, ‘It raises an individual’s ambition and courage to try and do something different, without fear of criticism of failure. Individuals are now more prepared to offer ideas on novel ways to approach

solutions as opposed to playing safe.'

The clever jelly

The global trend towards weight management products indicated that consumers wanted to snack and feel full but they did not want to consume unhealthy junk food. The team decided that products such as vitamins and green tea, with additional health benefits, would be more attractive to customers and also support in strengthening their brand promise of 'Good for you'. The product would have doubled the revenue per serving, one of the strategic objectives.

The team from Tata Global Beverages, traditionally a tea and coffee company, came up with an innovative product called The Clever Jelly with a sub-brand of Sukk. The product was a jelly drink sold in a 180-gm pouch and contained 6 gm of fibre to provide satiety. It also contained green tea, vitamins and minerals, and had only 83 calories. It was sold in shelf-ready trays and was targeted at younger people who snacked on the go. The product had over thirty times the revenue per serving as compared to a traditional tea bag.

Jelly drinks did not exist in majority of global markets. This launch created a whole new category in the highly competitive multi-billion-dollar soft drinks market. The product faced a different challenge. The traditional business used multiple retailers to sell tea, a stable, ambient product with an eighteen-month shelf life. To launch a jelly drink such as Sukk through the convenience store channel required not only the product but a whole new supply chain including refrigerated distribution. Moreover, the business had to build capability in marketing, sales and supply chain and secure enough quality outlets to make the product available to customers. This project was called off as it couldn't meet these challenges.

Lightweight and Sound

After three years of research starting 2012, a team of innovators at Jaguar Land Rover developed interior and exterior sound-deadening automotive components out of multiple sustainable materials. These included plastic

residues from end-of-life vehicles, calcium carbonate (a waste product from sugar-refining industry), and polypropylene (PP) and polyethylene terephthalate (PET) from the carpet industry. The attempt was to reuse waste products that were otherwise sent into landfill or low-value applications. The team developed several blends using these wastes, and the initial test results were promising. The heavy-layered material showed a weight reduction in the component and delivered better results on critical performance parameters. The team successfully made front and rear wheel arch liners, load space sides, and load floor. They achieved a significant reduction of 33.7 kg CO_2e (carbon dioxide equivalent) or 15.6 per cent per vehicle with the new LANDS (Lightweight and Sound) materials. Despite these positive results, the project couldn't be deployed because of the lack of a mature supply chain of raw material and resultant higher cost.

High strength steel for electrical components

Copper and copper alloys, though expensive, have been the long-standing and accepted materials for electrical components. A team from Tata Steel Europe attempted to replace the copper alloy material with steel that was priced much lower than copper. The inherent properties of copper are significantly different from those of steel, making copper much more acceptable for electrical purposes. The team produced steel that met several critical performance factors: high strength; good spring characteristics; good electromagnetic shielding; low contact resistance; sufficient bulk electrical conductivity; good solderability; good corrosion resistance; and long service life.

The surface of this high-strength steel was protected with a layer of nickel-plating. The steel components were successfully produced and qualified in the customer's laboratory tests. The customer was also ecstatic about the significant cost-saving opportunity. However, a sudden decision by the customer to move their manufacturing site from the United States to China created a problem. The movement to China restarted the process of testing the product with much more severe corrosion tests owing to the unpredictability of component storage in high-humidity conditions in China.

The corrosion tests revealed small areas of rusting along the edges of the

electrical component, which interfered with subsequent soldering. To address the problem, the team tried heavier electroplating and alternative coatings such as NiZn (nickel–zinc). Unfortunately, none of these worked.

The Hesitation was Short-lived

The participation grew fifty-five times in the first eight years of introducing this award. Employees, managers and leaders gradually understood the value of this award in building the culture of innovation. Gopal, in one of the interviews said, 'Celebrating failure is our way of telling people that we want them to try new things, and if they make good, honest efforts and fail, that's okay.'

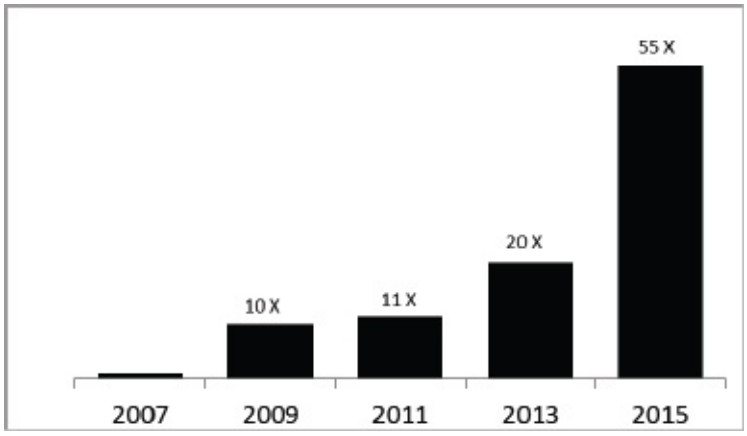


Figure 2.1: Growth in participation in Dare to Try award with 2007 as the base year

Companies had been finding value in this award as was evident from the statement of T.V. Narendran, managing director, Tata Steel: 'The award in a way echoes with Tata ethos, where we provide an individual enough avenues and freedom to experiment different ideas without any fear of failure. An individual perhaps needs more motivation when he or she fails in an endeavour than when he or she tastes success.'

Narendran made a very interesting observation. For every individual, memories associated with failure are critical, long-lasting and may have a bearing on the self-confidence and professional career. These memories related to failures could be full of reprimands and losses or could be soothing – like a mother affectionately applying balm on her child who has been hurt. Employees' outlook to bold innovation projects depend largely on how the

organization responds to people when they fail.

The Award: Good or Bad?

One must be cautious about the negative aspect of this award. If the child starts to infer that the easier way to get her mother's attention and affection is to get hurt, and starts doing so, it is not a good sign for either.

In 2009, a media company covered the story of the Dare to Try award. That was the time when the Tata Nano car was also in the news. The agency used a picture of Nano car alongside the article to visually associate the article with Tata. Upon inquiring from the editorial team of the media company about the reason for using the picture for the article, we were told that the phrase Dare to Try conveyed a bold endeavour and since Nano car was a very bold product, they used it.

While the team at Nano was very busy trying to make the car successful, it triggered an important question in our mind – will Dare to Try award be considered an easier award to win and hence will it encourage people to take bold projects and make half-hearted attempts? In the absence of a definitive answer, we started to promote this award rather conservatively and cautiously. We started to emphasize a lot on the 'exemplary effort' dimension of the award.

We had positioned this award in a similar manner to the base camp for a mountain-climbing expedition, indicating that the recipient of the award is expected to climb a difficult peak successfully in the future and ideally win an award for a successful innovation.

Definition and Criteria Make the Award 'Good'

In 2012, CEB, a leading member-based advisory company that provides insights, tools and actionable solutions, studied the Dare to Try award in detail. CEB combines advanced research and analytics with best practices gathered from companies. In one of their reports, they stated that the maximum value from an unsuccessful attempt to innovate lay in the lessons that the team learnt, which companies in the past had tried to glean but achieved limited success because the process of extracting learning discomfited the people involved. The risk a manager ran of getting

stigmatized by a failed attempt to innovate emerged as the major deterrent to innovation. CEB identified three types of risks to the stakeholders from failures:

a. Reputation risk: The risk to innovators of being called incompetent.
b. Risk of perverse incentives discouraging risk taking: If the owners/management resort to penalizing people, it discouraged them from taking risks in future.
c. Risk of repeating the same mistakes: If people are not penalized and learning from failures are not shared, the organization may keep making similar mistakes in the future.

CEB further reported that the definition and criteria of Dare to Try addressed these risks effectively.

a. The high visibility of the award addressed the reputation risk by strengthening the leaders' desire to champion the innovations. Since participation happened across companies and business units, it comforted the participants as they saw themselves one amongst several others.
b. The criteria made the team accountable for mitigating the associated risks. The anchored scale used for evaluation made the participation non-opportunistic by discouraging people to fail by taking on too big an innovation without trying hard enough.
c. Participation necessitated teams to capture all the learnings. The criteria expected that these were shared appropriately within and across the companies through various forums and channels.

The above analysis carried out voluntarily by a reputed organization reassured us that the questions we asked the team and the criteria we applied for the award were together helping us achieve our objective of encouraging teams to take riskier innovation projects, backed by wholehearted effort.

Armed with the above research, in 2015, we set out to find the answer to our next question for which we sought help from the academic institutes. By this time, we had enough data on participation to carry out meaningful analysis. The question we asked the researchers was: 'Tell us if Dare to Try

award is encouraging failures in any manner? In other words, are we applying the balm too much (or too quickly)?' Based on seven years of data, Prof. Phanish Puranam of INSEAD and Associate Prof. Reddi Kotha of SMU addressed this question using a multi-pronged research design.

First, the professors developed a computational model to determine the conditions under which rewarding failure may be harmful or beneficial for the innovative output of the organization.

Second, they analysed the historical data to check if the pattern of entry and re-entry by innovators in the failure and successful innovation awards were consistent with the insights from the model. During the period 2008–14, there were 7,642 projects that were successfully completed and 801 projects in Dare to Try. This provided a unique longitudinal data of seven consecutive years to observe the effect of an employee's participation in the Dare to Try and the subsequent activity of the employee.

The analysis was performed by comparing two sets of similar employees, being different only inasmuch as one of the two had participated in the Dare to Try for the first time in the focal year. The performance of both these sets was tracked to extract
key insights.

The reward for failure indeed appeared to act as a painkiller, reducing the cost of failure, but not making failure more attractive than success. The reward stimulated employees towards succeeding in the future by trying again. The research indicated that participation in Dare to Try not only increased the chances of an employee's participation in the successfully completed innovations by 36 per cent, it also increased their chances of delivering high-impact innovations by 21 per cent. This established that participating in the Dare to Try category served as an anodyne.

In one of the other surveys of 333 CxOs (including those reporting to them) in early 2017, 50 per cent of them confirmed that the risk involved in the projects that belonged to Dare to Try was more or much more than the risk involved in projects that were successfully completed.

Lastly, in mid-2017, we analysed the past winners and found that there was not a single company that won only the Dare to Try award and didn't win the successfully completed innovation award. Seven companies between

themselves had won all the nine Dare to Try awards during 2011–16. The same seven companies took home 70 per cent of awards meant for successfully completed innovations.

The above research and analysis led us to the conclusion that celebrating and learning from innovation failures engenders a culture of innovation.

A FAILED EXPERIMENT: THE LEADING EDGE

In 2007, a new award called The Leading Edge was also added to invite innovative business ideas from employees. The intent was to include the front end of innovation also in the annual innovation awards. As one would imagine, the award evoked strong interest and the popularity grew rapidly as employees, perhaps for the first time, could share their innovative business ideas systematically. They fancied the jury as venture capitalists (VC) who would hear their ideas and invest in a few. India's venture capital ecosystem was in a nascent state at that time, and employees were excited to get a chance to present their ideas with a hope of converting their ideas into new businesses.

Many ideas were related to the existing business of companies which created confusion amongst stakeholders of the concerned entity. The stakeholders protested, 'Why are others getting ideas for me to implement? I already know about all these ideas!' Ideators felt anxious and distressed, 'We don't see a process to fund our ideas. Will someone take our ideas forward?'

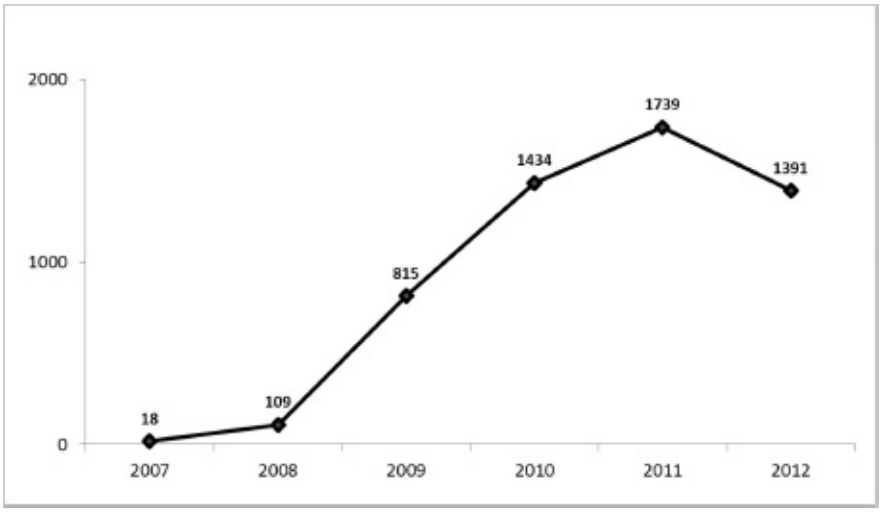


Figure 2.2: Growth in number of new business ideas

Since the award was created under the family of innovation awards, the criteria to select the winners was heavily biased towards the yardsticks used for judging innovations: Novelty and Potential Impact (explained in Chapter 3). Factors such as market readiness, difficulty in execution, investment needed, alignment with strategy, and return on investment (ROI) were not considered during evaluation. Being an award process, a few ideators were awarded every year, regardless of their projects' potential to get incubated.

It was evident that, while we were running this as an award programme to engage employees and encourage creative thinking, it was arousing hopes amongst employees. This created disharmony because ideators saw the programme as an expression of commitment to fund the ideas.

Learning from the above, at the end of 2012, we created another programme called Challenges Worth Solving (CWS). We threw a few real-life problems and challenges, faced by the companies, at the employees and asked them to give ideas and solutions within five days. The challenges belonged to several functions: marketing, operations, administration, retail, etc. Ideation, collaboration amongst employees of different companies, gaming to spot good ideas, and social networking. All of these were achieved through a crowd-sourcing platform that also used prediction markets for spotting good ideas. This programme generated a lot of interest.

Under this programme, ownership of the ideas rested with the company from where the challenge originated. Ideas that had promise were formally acknowledged but no awards were given to ideators at this stage. Formal rewards were given by the beneficiary company only after the idea was implemented. This programme helped us promote the front end of innovation by spurring creativity, enhancing employee engagement, enabling inter-company exchange of ideas, and striking up collaboration.

Finally, in 2013, The Leading Edge award was dropped. However, it had given birth to the stronger CWS programme.

This chapter highlighted the role of the Dare to Try award in promoting risk taking at middle and senior levels, and the need to continuously validate and refine the award to steer the right behaviour. The chapter also shared lessons derived from The Leading Edge award that failed to meet the objective of spurring creativity. There is another subtle lesson in this chapter

– employees always look for a nod from the leader (sponsor) to move ahead with their idea. In this case, on both the occasions Gopal gave permission (along with a warning in the first case) to carry out the experiment. Innovative ideas are riskier and hence most innovations suffer because employees look for explicit permission and many managers and leaders hesitate to give a clear 'go ahead' to riskier ideas.

Sunil Sinha, the then CEO of TQMS, shared a very interesting and insightful observation in the context of leadership's role in driving innovation: 'Ratan Tata was the chief inspiration officer for the innovation programme in the Tata group. Having said that, Ratan Tata was initially not in full agreement with all the innovation programmes especially that brought focus on the "process" part of innovation. The greatness of Ratan Tata is that he never stopped the programme and allowed it to continue and experiment.'

The innovation programme progressed with continuous experiments and refinement but this is not a book on the biography of the innovation programme. Chapter 3 explains a few key words that form the core of the innovation vocabulary and are used across all the innovation awards, and Chapter 4 explains the architecture of the InnoVista programme in detail.

♦ 3 ♦

A LIVING LEXICON ELEVATES SELF-CONFIDENCE

'Gandhiji's Dandi March from Ahmedabad to coastal Dandi (390 km) became a fulcrum of the Indian independence movement. The procession began with seventy-eight followers from Ahmedabad on 12 March 1930. It ended at Dandi on 6 April 1930 with hundreds and thousands joining the march en route and at the end. Movements are not processions of people, they are constituted by the pulsating heartbeats of committed human beings.'

R. Gopalakrishnan
Chairman, Tata Group Innovation Forum
at Tata InnoVista awards programme
25 April 2012

What are the best innovations ever? Typical ones that would make the list are smartphones, aeroplanes, electric bulb, cars, electricity and electronic gadgets including computers. Products that we use, feel, touch or consume get perceived as innovations.

Why are some products considered to be more innovative than others? The answer is hardly consistent. It could range from the sheer quantum of sales or the valuation of the company that makes the product or it could be the popularity of the product itself. iPhone, according to some, is a great innovation as it changed the way people use phones and it surprised customers. No one else was able to think about it until Apple did.

We asked a different question to our employees, 'How is innovation defined in your organization?' The responses were far from consistent. Try this out with a bunch of people in your company. Due to inconsistency in definition, the filters that people apply in their minds to identify examples of

innovation are also inconsistent.

When we started our innovation programme, we invited teams to come forward with all their innovations delivered during the recent years. People in different companies, and, in fact, even within the same company, used their own judgement or yardstick to decide the projects that were fit for this purpose.

Many people were tentative and hesitant to participate as they grappled with several unanswered questions and lack of confidence. Over the years, after speaking to thousands of people, and conducting several surveys, we have found the following questions that create anxiety in the minds of people, denting their confidence, and stopping them from participating in innovation awards. When enjoined by the leaders to pursue innovation projects, the same questions confuse employees and discourage them from identifying projects that would qualify as innovations.

1. Is my work truly innovative or is it just an improvement?
2. Innovations are delivered by R&D guys. I am not in R&D award, so?
3. I am not involved in designing any new products, so how can I innovate?
4. I don't have a patent. Is my innovation of any worth?
5. I cannot assign a monetary value to quantify the impact or benefit of my innovation. Would it still count as an innovation?
6. My project benefitted us only once and is no more in use. Innovations are known to have a future value and so will my project still be considered as an innovation?
7. We belong to a small company. Our innovations will never be able to compete with innovations of larger companies in the marketplace and also for awards.
8. Last year, my project was better than my colleague's, but his project won the limelight. Is there an objective way of judging innovations?

As in many organizations, none of our companies had a definition of innovation. A definition gives an unambiguous starting point to shape a subject. It works as a pivot around which the structure of the subject could be built. It gives an opportunity to build a vocabulary to propagate the subject, and for people to debate and improve.

The subject of innovation is actually very rich in its vocabulary because of thousands of research papers and books that have been written by academicians. Unfortunately, this vocabulary is not well known among the working professionals and has remained confined to academicians and consultants. A few words and phrases that employees mostly use during a discussion on innovation are: Ideas, Invention, Creativity and Patents.

The vocabulary gets built and used rapidly if the subject gains popularity. Let's take a few examples from cricket. Powerplay (fielding restrictions in limited-overs cricket) was added to the dictionary of cricket once the shorter form of one-day cricket matches started and evolved. Once T20 (the shortest form of a cricket match today at international level) gained popularity, we got newer words such as the slower ball, knuckle ball and free hit. The two shorter forms of cricket became more popular than the traditional, longer-duration matches and helped in producing many more skilled cricketers in India. Now look at baseball. How many Indians even possess the basic vocabulary of this sport? The situation would be similar amongst Americans and Europeans when it comes to the vocabulary of cricket.

We wanted to make the innovation sport as popular as cricket (in India), played by almost every Indian and in all forms – from gully cricket to the international level. Tournaments such as the Indian Premier League (IPL) has provided more opportunities to players and has raised the aspirations of people. We used Tata InnoVista, our innovation tournament, to inspire employees to actively play this sport and make innovation a popular sport. If more people play a sport, then, by virtue of their interactions, they get to know more about the finer details, which in turn helps them play better. We knew that our innovation tournament, if supported by the leadership, could take the form of a movement, and would give us opportunities to gradually add new terms and words to the active vocabulary of our people.

For innovation to become a movement, we wanted all types of innovations to be taken up and presented by employees from all age groups, functions and corners of the organization. To address the eight concerns listed above and to make the innovation sport- inclusive and equally attractive for people working in all parts of the organization and in diverse industries, we worked on two broad aspects (Figure 3.1).

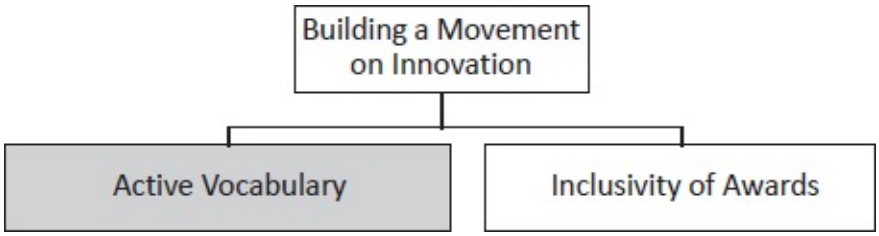


Figure 3.1: Two brand aspects of a movement on innovation

This chapter explains the key vocabulary and the role it is playing in building the innovation movement. 'Inclusivity of Awards' is explained in Chapter 4.

ACTIVE VOCABULARY

Defining new words to enrich the vocabulary is a simple academic exercise but making people understand, use and spread those words actively is always a challenge. To disseminate the vocabulary, we use all the three touchpoints provided to employees to participate, prepare and pitch to win the innovation awards:

a. The *road shows* (similar to exhibition matches or friendly matches that the world cricket body organizes to promote cricket in new countries): In 2009 the focus was on encouraging people to participate without thinking about the quality of innovation. As a result, the participation grew by eight times. By 2017, the focus had shifted to spreading the advance vocabulary amongst employees encouraging them to strive for high impact innovations.
b. The *submission/entry form* is used by employees to nominate their project. Basic questions such as 'How do you avoid or delay your innovation getting copied by the competition?' made employees ponder for a while. Advance questions such as, 'What could be the limitations in the current business model that would constrain the outcomes of this innovation?' or 'How are customers solving their problem today or what solution is your best competition offering for the same problem?' encouraged them to discuss the same with their managers and business unit heads.
c. The *evaluation criteria* are used by the judges to ask questions, evaluate projects and decide the winners. The criteria have improved every year

and has been instrumental in building and spreading the vocabulary. Employees also use the criteria to prepare themselves. Two key dimensions of the criteria that are common for all awards are: a) Uniqueness of the innovation and b) Impact of the innovation.

These two dimensions of the criteria form the bedrock of our vocabulary. Hence let me explain these in detail:

Dimension #1: Extent of Uniqueness

Uniqueness is the source of differentiation that innovation creates in the mind of the customer, be it in the product, service or process. This dimension of uniqueness helps in distinguishing incremental improvements and innovations. The extent of uniqueness could be used as one of the inputs to assess the level of success an innovation might get in the marketplace.

The extent of uniqueness is not always easy to measure or assess. While the teams and management may use this uniqueness to decide Go or No-go for a project, ultimately it is the customer or the beneficiary who decides if there is sufficient uniqueness. The customer also evaluates if uniqueness in the innovation is commensurate with the price at which he would be willing to make a switch from the existing product/services/processes. While too little of uniqueness gives a tag of 'me too', a very high degree of uniqueness may fail to get adopted by the customer and may come to be known as 'much ahead of time' or 'overpriced'.

Two lenses are used to assess uniqueness of innovations:

i. *Lens No. 1 – Newness*: In simple terms, it tells us how early or late the team was in thinking and delivering a unique or new element in its products or processes as compared to others. An innovation could be 'new to the world' on the one hand or, on the other hand, it could just be 'new to their existing customers'. In between these two extremes, there would be other intermittent pointers like 'new to all the customers in the industry' or 'new to everyone in the country' or 'new to the target market' or 'new for the team.' This wide range of newness accepts all types of work that an employee has done for the first time.

We encourage employees to participate in Tata InnoVista with all their

projects that have made them feel proud. By participating and comparing their projects with others, they get to know the level at which they are playing – gully cricket or international level. The chances of fuelling their desire and improving their capability to pursue higher-order (more unique) innovations are likely to increase if they participate in the tournament more often. Almost 50 per cent of the InnoVista participants in 2017 were returnees which indicates popularity of the awards and the value people derive from their participation.

Newness is evaluated from two perspectives: (1) How new it was for the creators or producers of innovation, and (2) How new it is for the consumers.

For most innovations, the extent of newness could be assessed using the published literature. Newness of technology-dominated innovations is determined by trawling through patents, journals and other documents to get the required information and data.

There are many situations in which it is difficult to assess newness due to lack of comprehensive data or authenticated information. In such cases, and also to validate the newness obtained through the above process, we use the second lens.

ii. *Lens No. 2 – Obviousness*: This lens is useful for non-patentable product/service innovations and unpatented process innovations that happen inside a factory or operations. For non-patentable innovations, the competitive information is difficult to find. Process innovations are usually not protected legally but are kept as trade secrets and know-how. In the absence of reference data about what others have done, the first lens of newness cannot be used to determine uniqueness. In such cases, this lens of obviousness is applied twice: first on the problem that the innovation has solved and then on the solution contained in the innovation.

Obviousness of the Problem

At the fundamental level, all the problems that customers face in accomplishing their jobs by using products, services and processes are potential opportunities for innovation. Clayton Christensen of Harvard

Business School has said that innovations (products and services) are hired by people to accomplish a job better. So, if a job can be executed better (solves a problem) by hiring a new product, customers would do so. It is, therefore, not surprising that a high level of emphasis is given by companies to listen to and observe customers to spot newer problems and define the problem accurately. We ask teams questions such as, 'Which problem of the customer has this innovation solved?', 'Is the problem new or old?', 'How were the customers dealing with this problem earlier?', 'How are the competitors solving the same problem?', 'If your innovation is the best at solving the problem, what is the next best solution available to solve the same problem?'

People usually don't like to answer such uncomfortable questions. These questions, over a period, nudge employees to uncover higher-order (unstated) problems of customers and define them sharply, thereby improving the capability of innovators, their managers and mentors. This aspect is highlighted in the case study of Jaguar Land Rover in Chapter 7.

When the lens of obviousness is applied to the problem or need of the customer, it shows how new or unknown the problem would be to the people who could have attempted to solve it. On the one hand, the problem could be obvious and long-standing (for example, frequent charging of phone or use of cables to charge the phone), but extremely difficult to solve. People in various parts of the world would have made several attempts to solve such problems. On the other hand, the problem could be unknown or newly uncovered (for example, the first iPod which uncovered the latent frustration of customers in managing and listening to music of their choice) or the problem is actually new (problems related to autonomous cars).

Solving well-known and obvious problems that have existed for several years with an out-of-the-box and non-obvious solution is likely to contain lot more uniqueness as compared to solving the latent or newly identified problem. Once a new problem is unearthed, several solutions (innovations) get surfaced, until only a few survive. Following are the five examples of problems that had existed for several years and were well known to people who knew the respective industries. It was very likely that if someone had solved these problems, it would have certainly resulted in an innovation with

a high level of uniqueness.

While the problems are given below in brief, the actual solutions have been detailed partly in this chapter and partly in the following chapters.

Problem #1: All over the world, synthetic soda ash manufacturing industry used the 150-year-old Solvay technology. Part of the solid wastes generated in this process were either discharged into the nearby waterbody (river and/or sea) or were stored in heaps. Tata Chemicals' plant at Mithapur stored all its solid waste at a place called Malara. Over the years, the area around the solid waste site got populated. Constant flying of the dust due to high wind conditions became a sore point for them. For many years, the dust was suppressed by constantly spraying sea water, which worsened the situation because it increased the salinity in the surrounding area.

Problem #2: When Tata Power Delhi Distribution Limited (TPDDL), a joint venture (JV) between Tata Power and the Government of Delhi, was formed in 2002, transmission losses were rampant in India. The company distributed power to seven million people living in 512 square kilometres of north and north-west Delhi. More than half of the electricity distributed was lost (in reality, stolen) in transmission; service and reliability were also very poor. Everyone in India knew that this problem was not unique to Delhi; it was prevalent in other Indian states as well.

Problem #3: Another case of a perennial nature was from Tata Global Beverages that owned the Tata Tea brand. Accessing and acquiring new consumers in the rural markets was an old problem in India because many parts of rural India were in the media shadow. Tapping such markets for B2C products relied heavily on TV and radio, but with little impact.

Problem #4: The World Health Organization (WHO) recommends 80 gm protein per day for an adult; an average Indian adult manages to consume only 30 gm per day. Pulses were a major source of protein in India. Farmers were moving away from growing pulses because of lack of good-quality seeds and know-how, and difficulties in selling their produce at a viable price. Lower production resulted in higher price, making pulses less affordable for

poor. Imports of pulses had increased from 0.35 million tonnes in 1998–99 to 3.5 million tonnes in 2009–10.

Problem #5: For their IT needs in 2008, small and medium businesses (SMBs) were served by 7–12 small service providers. Around thirty-five million or 95 per cent Indian companies were SMBs that lacked the resources to either hire and retain talent for their IT needs or invest in constantly changing technology. Serving SMBs in a profitable manner was the challenge that all IT companies were grappling with.

Obviousness and Elegance of the Idea Behind Innovation

For all the problems or needs that are either old or new or newly unearthed, the obviousness of the solution serves as a second input to decide the uniqueness of the innovation. While applying this test of obviousness to an idea or solution, the innovation is also evaluated for its ability to solve the problem using attributes such as efficacy of the solution, convenience, cost, ease of use and willingness to use.

Figure 3.2 below summarizes the methods used to assess the level of uniqueness for the innovation projects. The first lens is of newness. If this is difficult to apply, the next lens of obviousness is used. It is first applied to the problem which triggered the innovation and then to the solution that solved the problem. Innovations that solve well-known (obvious) problems are likely to be more difficult and unique than those that solve less obvious problems.

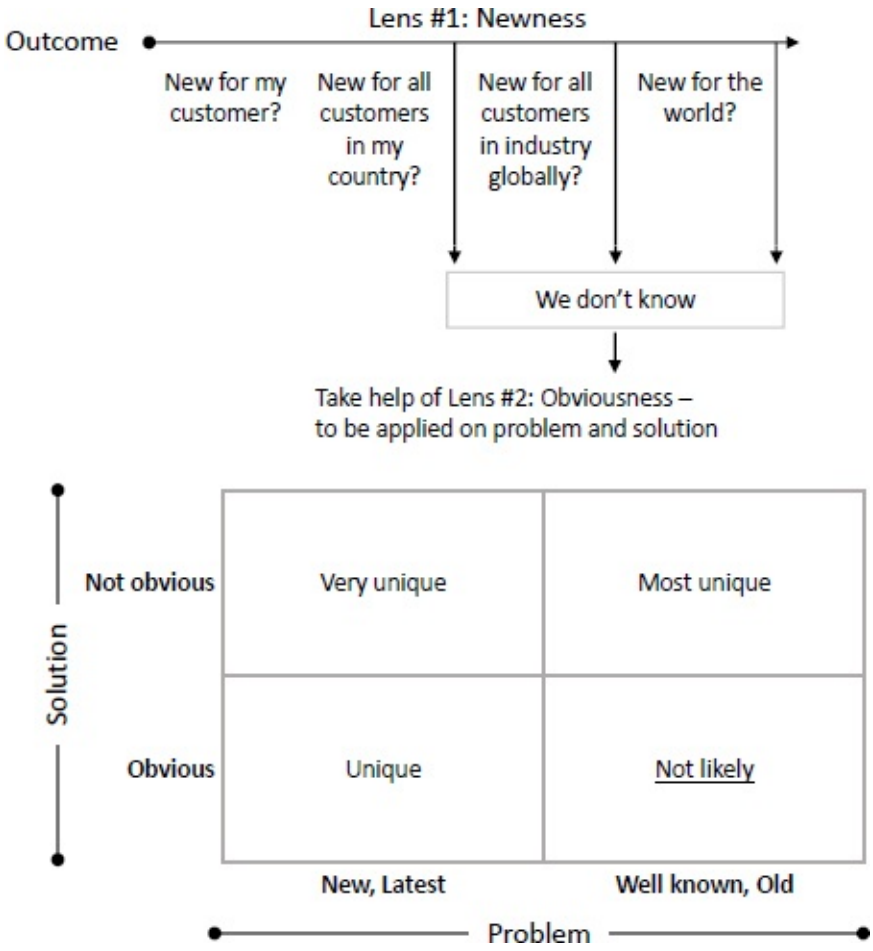


Figure 3.2: The two lenses to assess uniqueness

Plausible questions from the readers at this stage would be: 'With so much of objectivity in assessing innovations, will people, after applying the above yardsticks and assessing their innovations, participate for innovation awards?' The answer is 'Yes' because of two reasons:

- Tata InnoVista is a multi-tier recognition programme spread across multiple awards. In the last few years, additional tiers have been added after the companies created its replica for themselves. It has become similar to the game of cricket where one graduates from gully level to school level, to college level, to city level, to district level, to state level, and then eventually to the national team. Employees understand that all their attempts will not be moonshots and fetch them awards but every attempt would give them an opportunity to calibrate and prepare better for the future. For innovators, the programme has become very similar to what

local cultural events are for budding artistes who gather confidence and fame by performing in front of an audience. Data shows that in 2009, three years after Tata InnoVista started, members of winning teams amongst themselves had participated in only three innovation projects prior to winning the award. This number grew to sixty-seven projects in 2012 and 136 projects in 2017 pointing to the increasing number of attempts made by employees before they could win the award.

- The awards are decided based on relative performance and not an absolute number. Teams have no idea about the innovations of other companies. In fact, in a large company, people do not know the innovations of teams from other business units, functions and geographies. This lack of information keeps everyone hopeful.

Dimension #2: Impact or Benefit of the Innovation

If we ask any innovator about the benefits that their innovations have delivered, the answer is likely to contain either the benefits to internal customers (for process innovations) or benefits to external customer (for product and service innovations). It is seldom that the innovators would provide accurate details about the benefits that would accrue to their *own company* from their innovations. Here are some reasons:

a. Process innovations mostly benefit only the internal customer. The benefits from such innovations are usually difficult to measure in monetary terms (e.g., a reduction in the manufacturing time enabling more production but unless there is sufficient demand in the market, the benefits won't accrue). The benefit is difficult to quantify for the innovation that reduces cost, especially beyond the year in which the innovation was done. This is because there is no accounting system that captures the amount of cost reduced.
b. Innovations are expected to deliver differentiated experience to the customer and in exchange for this experience, the innovating company gets differentiated (higher) revenue or value. Issues related to cannibalization of existing products and services due to new product and

services make it difficult for employees to quantify the benefits to their own company.

c. Consider a situation in which a service delivered at a fixed price by a company to its client plays a crucial role in producing an innovation that belongs to the client and there is no differentiated benefit (premium or surcharge) to the company which delivered the service.
d. Companies that are in the B2B product space sometimes struggle to give an estimate of the time when the benefits from their new product would start accruing. This problem gets aggravated if the new product is a part of the larger product or service or a solution that the customer delivers further to its own customers. An example would be of a company that attempts to sell a new steel to manufactures of inner parts of a car. Since the next customer (automotive company) would have standardized its processes and machinery to process the parts made from the old steel, there is a resistance to change unless the parts made from the new steel assure quick breakthrough results. Benefits from such innovations are realized slowly as the product or service gets accepted gradually by the last customer in the value chain. Here is an example that shows how long it took for a B2B innovation to deliver benefits to the company:

   A major component of the passenger car tyre is rubber. Rubber doesn't have much intrinsic mechanical properties but has the desired viscoelastic properties. It is soft and sticky in summer but brittle and hard in winter. For the last 150 years, carbon black is being mixed with rubber to reinforce the tyre and provide the necessary mechanical properties. Carbon black is generated from petroleum, which is not environment-friendly. Moreover, the demand for high-performance tyres had been on the rise, as increasing number of high-performance cars are being produced.

   About 20–25 per cent of the fuel consumption in a car is because of the friction (rolling resistance or rolling drag) of the tyre on the road. Attempts have been made to reduce the rolling resistance of tyres to improve fuel efficiency of automotive vehicles. Besides the rolling resistance, two other critical factors that are important for a tyre are: lower abrasion to get higher tyre life, and higher wet grip for safe driving in wet and snowy conditions.

Tyre manufacturers have been trying to part-replace carbon black with silica. Unfortunately, silica doesn't disperse or distribute well in a rubber matrix due to compatibility issues. A few companies have developed dispersible silica that disperses well within the rubber matrix used by the tyre industry. Tata Chemicals' Innovation Centre innovated a highly dispersible nano-sized functionalized silica which dispersed even better in rubber and enhanced the tyre property and reduced tyre rolling resistance. Silica is hydrophilic and since it dispersed well, it gripped the wet surface of the road and didn't sacrifice wet grip. In the tyres made using nano-silica, rolling resistance was found to be reduced by 8 per cent and wet grip increased by 15 per cent. Tyre life increased by 10 per cent since nano-silica is harder than carbon black. Tyre testing is a long and expensive process. Tata Chemicals, along with tyre manufacturers, have completed the testing which took four years from the time nano-silica was first produced by the Innovation Centre.

e. The investment in converting ideas to innovation is dominantly in the form of people cost. These investments are not usually accounted for by innovators who consider these as fixed costs and the organizations too do not have a supporting process to capture these costs. Absence of this data makes it impossible for teams to report ROI from their innovations.

Report Benefits to All Stakeholders

Innovators need to think beyond the exciting phase of creating something new and develop a pragmatic understanding about the value delivered by their innovations. They should be asked to report the benefits of their innovations to each of the following stakeholders (Figure 3.3) separately over a defined period of time.

i. Internal customer
ii. External customer
iii. Customer's customer
iv. Own company

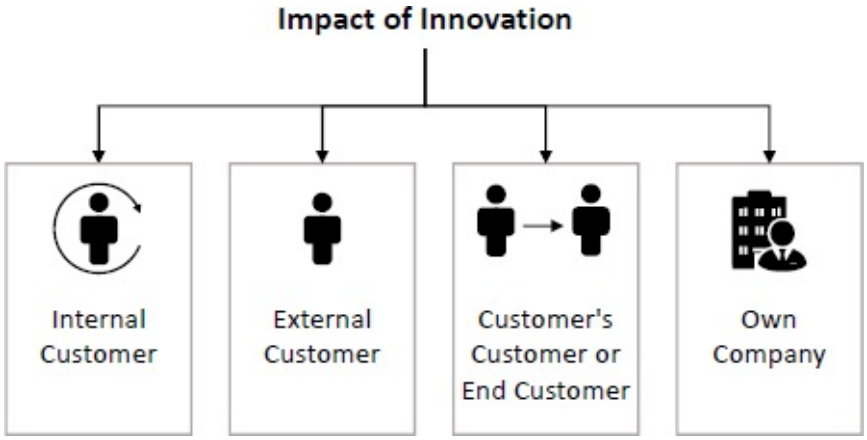


Figure 3.3: Beneficiaries of innovation

By asking questions about the quantum and speed of benefits that their innovation has brought and would bring to their own company, to the customers, and further to the customer's customers and so on (forward supply chain), it helps innovators think like start-up founders who are answerable to the investors for cash flows.

Four Lenses to Measure Impact

Business innovations are mostly judged by their economic return. It is rare to come across an instance when the business innovation award was given to an innovation for its outstanding impact on social or environmental factors. There are, of course, separate awards such as Social Innovation awards or Environmental Innovation awards.

In Tata InnoVista, innovations that create only social or environmental impact compete with innovations that have quantifiable economic impact. All these different types of impact get equal importance. To measure the impact of an innovation, we not only use all the three lenses of triple bottom line but also use a fourth lens of 'Change in KPI', the abbreviation standing for Key Performance Indicator. Innovations that improve the customer satisfaction score or employee engagement index cannot report the benefits in financial numbers. Some companies use or create complex models using statistical correlations to translate such intangible benefits into an economic value which is always contentious. We, instead, ask for the closest direct KPI that has improved because of the innovation. The percentage change in the KPI is

given equal importance to measure the impact. This fourth lens has made such innovations comparable with others that deliver economic or social or environmental benefits. The four lenses used by us to assess the impact of innovations are:

a. Financial or economic
b. Social
c. Environmental
d. Change in KPI

Examples of innovations that had delivered pure social impact, environmental impact and pure KPI impact are given below:

Innovation with social impact

Sugamya Pustakalaya is India's first and largest collection of accessible books – books that are accessible to the blind, people with low vision, or to persons with any other print disability. Globally, in 2016, only 5 per cent of all content was available in accessible formats for the print-disabled. In India, this proportion was barely 1 per cent. A key reason for this was that the commercial objectives of content publishers were not aligned to the information needs of the print-disabled.

Globally, publishers of content were not conversant with technologies for developing accessible content, nor did they fully understand associated copyright laws. Access Infinity is a technology platform of TCS that powered the Sugamya Pustakalaya, a pan-India ecosystem for real-time publishing of accessible media. The platform provides real-time availability of accessible content in all languages, meeting all the regulatory compliance (e.g., watermarking). The platform helps in creating an entire ecosystem for the country involving multiple libraries, thus creating a national catalogue. Users could access a collection of over 300,000 books, maintain their individual reading shelves online, and download books in chosen formats.

Books and publications could also be requested in accessible formats in offline mode, to be delivered via the local library. The platform has enabled publishers to generate accessible content in real time with minimal

overheads and aligned the disparate interests of stakeholders with the information needs of the print-disabled. India is the first country to institutionalize such a comprehensive platform. This innovation competed with other innovations that had higher economic value and ended up winning the award in 2017.

Innovation with environmental impact

The leather manufacturing plant of Tata International in Dewas, Madhya Pradesh, generates a large amount of solid and liquid wastes. They are leather shavings, trimmings (containing chromium compounds) and the end-of-process water which contains dyes, chromium salts, sulphate salts and several unreacted chemicals. To make 1 kg of finished leather, an equal amount of waste is generated. This waste has led the leather industry to be classified as a highly polluting industry. Tata International had been utilizing this waste for generating biogas, bio-fertilizers and poultry feed.

Leather usually has surface defects and voids which need to be filled before making a product. Companies use chemical fillers to hide and fill these defects and to impart body to the leather for end use. These fillers are neutral with low reactivity and as a result they are partly absorbed by the leather, making them less effective. Since a large amount of these fillers were not absorbed, this increased the effluents of the plant.

In 2014, Tata International started using solid waste from leather industry to develop reactive fillers. The team created a chromium-free protein hydrolysate to make the reactive filler. Binding of reactive filler with the base leather was much better because it was developed from leather waste containing the same collagen and amino acids which are available in the base leather. This filler, along with other chemicals, not only filled the defects on the leather but also improved other characteristics of the leather. The financial impact of this innovation was not very high, as the cost of buying the chemical fillers was less when compared with the scale of operations. However, the environmental impact it created made a significant difference. Moreover, the company decided not to protect the technology and shared it with the industry for others to use.

Innovations that changed a KPI

Tata Motor Finance (TMF) provides loan for buying commercial vehicles (such as trucks) produced by Tata Motors. Most of their customers were first-time buyers who bought the vehicle to earn their livelihood. There were quite a few customers who were not able to use the access mechanisms of Internet and telephone to make loan-related requests, ask queries, and raise a complaint with the company. A TMF team received an idea on their crowd-sourcing platform and created a WhatsApp channel through which the customers could reach out to the company.

The penetration of WhatsApp had become very high and the company found that those who did not prefer the usual channels (emails, call centre) were active users of WhatsApp. This new channel, popularly known as WhatsApp CRM, received around a hundred queries every day. As a result, the customer satisfaction on Top Box (the best rating given by respondents in a survey) improved from 44 per cent to 66 per cent. The Top Box score for convenience in using the WhatsApp channel was at 79 per cent, as compared to 30 per cent for customer service centre and 49 per cent for emails. The company was the first amongst banks and non-banking financial companies (NBFCs) to use WhatsApp for customer connect. This project was a contender in the finals in 2016.

Choose the Right Metric

To assess the impact of innovations using any of the four lenses explained above, we don't use only the absolute numbers. The impact created by innovation is first normalized by comparing with the size of operations that produced the innovation (ability to provide input/resources) and with the size of market served by the company (scale of opportunity available to create impact). This exercise removes disparity by not allowing undue advantage to innovations of large companies. For instance, the impact of an innovation of a smaller business unit of a large company is compared with the size of the business unit and not with the company.

It is equally important to use the relevant metric to judge the impact created by the innovation. For a product that targets the mass market,

revenue numbers alone may not be the right measure in the beginning; penetration or market share might be a better metric. The opposite is also true; for a small company or a product line targeting premium customers, absolute financial numbers could be more relevant as compared to market share (unless there is a way to find the market size of premium products).

The best metric that one can use in all situations is change in KPI. While this is ideal, it poses another challenge: 'Which KPI should be used to measure the impact?' KPIs follow a tree structure in all organizations. A large change in a KPI of a division could create a very minuscule change in the KPI that is tracked at the organization level. To make it comparable across innovations, we use only those KPIs that are tracked at the CxO level.

When Can We Say that Innovation is Successful?

The next question one could ask is: 'The benefits from an innovation are usually realized slowly as the acceptance of innovation increases amongst customers. Hence at what stage shall we declare an innovation successful and reward it?'

An award for innovation should ideally be given at a time when there are no doubts about its success. It is also desirable that the announcement of award should evoke interest and surprise audience and readers. Therefore, there is always a dilemma about the timing of the award. If the award is given much after the innovation is successful in the marketplace and people know about it, there is not much excitement – neither for the recipient nor for the audience. On the other hand, giving an award to an innovation at a very early stage would be very exciting for the recipient and the audience, who may be unaware about the innovation. The downside of doing this early is the risk of innovations not meeting the expectations of the company and the customer after winning the award, which may raise questions on the effectiveness of the award process.

To balance the above contrasting needs of the audience, the recipient and the sponsors of award, the impact of innovation is considered in two parts: Past and Future.

Past/Current Impact

Innovations deliver returns during a wide range of time period. Some take a longer period (for example, product innovations in the B2B space, as explained earlier with the example of tyre), some others give returns rather quickly (service innovations and marketing or sales innovations). There could even be those innovations that have just a one-time impact of saving costs: Reducing the time to restart the factory after a major overhaul, reducing the cost of a large capital investment, etc.

In our programme, innovations need to show a minimum of six months of data to prove their impact using any of the four lenses. However, if the innovation has delivered a one-time benefit it doesn't have to wait at all. There are some more exceptions to this period of six months – pure digital innovations just need three months of data.

Future Impact

To assess the full impact of an innovation, an equal emphasis is given to the future potential impact. Innovations that have delivered one-time benefit or have a very short shelf life are not assessed on the future potential impact. The same four lenses are used for the assessment of future impact. The future impact is estimated by innovators using a few assumptions. Evaluation of these estimates can be best done by challenging the basis for making these assumptions and the strength of enablers that would influence the achievement of predicted impact. A few such enablers are given below:

a. The appropriateness of the chosen target market, business model, and organization structure have the most influence on the future impact. For new product innovations, the responsibility of commercialization is mostly given to existing sales and marketing teams who prefer to use the prevailing target market and business model. Due to the structure and prevailing practices, the sales teams may lack the much-needed passion and perseverance to sell a new product that is meant to replace a fairly successful product of the competition. Similarly, the need of having an alternative business model and expanding the target market are not considered naturally by them. Innovators and managers often grapple with the existing business model to get the most from their innovation but

are helpless as they are not authorized to make any changes and those who can make changes are hesitant to attempt as there is a lot of internal resistance to any new change.

b. The extent of emotional connect the product or service is likely to establish with customers is another assumption and enabler that enhances the chances of B2C innovation achieving its projected impact.
c. Most innovators are happy after accomplishing their innovation and seeing the first customer, but innovation doesn't end with this. It is, in fact, the beginning of commercialization and a long battle that needs to be fought and won in the marketplace. The longevity (short-term, medium-term or long-term) of uniqueness also determines the quantum of future impact. This subject is discussed later in this chapter. The strength of protection (patents) and the strength of the pipeline of future innovations are two enablers to maintain the uniqueness. The teams need to keep their interests alive until the innovation is scaled up to a respectable level, has become irreversible, and is difficult to replicate.

The above questions related to the enablers of future impact of the innovation have contributed further to the vocabulary and have started influencing the innovators and their mentors to discuss these questions at the very beginning of their future innovation projects.

Let us look at an example. The Indian Railways primarily maintains three types of wagons for bulk material movement a) BOBSN (side discharge) b) BOBRN (bottom discharge) and c) NBOX (revolving type, turned upside down to discharge). These three wagons have had individual designs all these years. The loading and unloading stations for these three are quite different and hence they can't be used interchangeably. This necessitated having sufficient number of wagons of each type all the time.

Tata Steel, which contributed 4 per cent of the total freight of Indian Railways, owned two types of wagons: BOBSN and NBOX, under the Own Your Wagon Scheme (OYWS). Steel companies had to maintain enough inventory of different types of wagons for their internal raw material movement. In 2016, Tata Steel engineering team designed a Dual Discharge Wagon that could be used as BOBSN as well as NBOX. This was a

breakthrough as it reduced the capital cost and improved the availability of wagons (previously, wagons that were needed were not always available while wagons of other types remained idle at the same time). This project won the award as the team could share their vision of changing the target market from Tata Steel to all customers of Indian Railways.

Figure 3.4 summarizes the method used to assess the innovations for their impact. Past impact is assessed using the objective numbers accomplished by the innovators. Future impact is assessed using the projected numbers, the basis for making the assumptions and the strength of enablers.

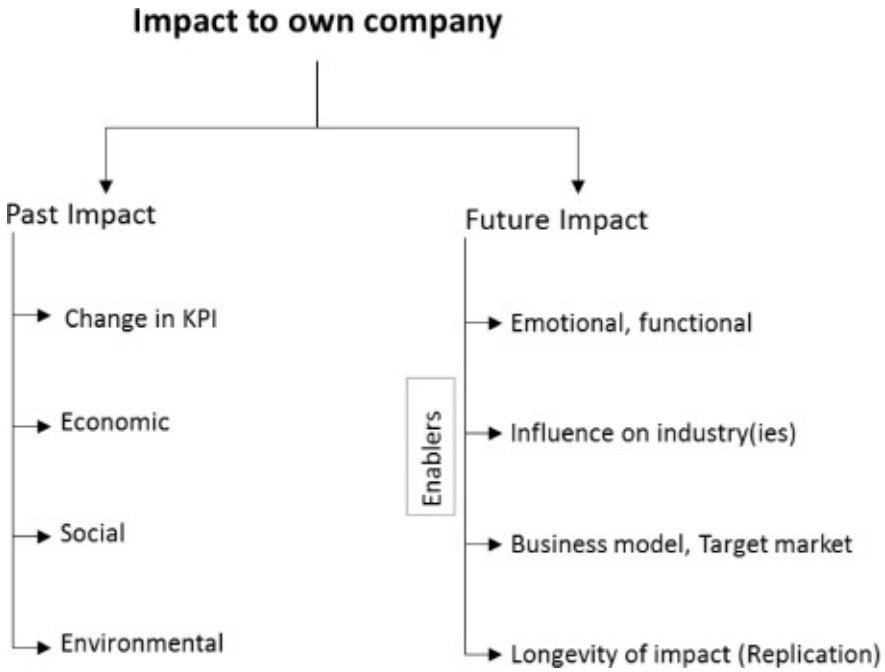


Figure 3.4: Assessment on the 'impact' dimension

Replication by Competitors

Let me narrate a story from the time of Jamsetji Tata. In 1884, Jamsetji's Express Mills was producing the best yarn in India. The mills had reached this high level of quality and productivity due to Jamsetji's prolific experimentations and improvements narrated in Chapter 1. He didn't believe in 'trade secrets' at all. He would share the improvements and the processes without any hesitation with others, including rivals. His principal aim was to raise the standard of the industry in the country. Once, an agent of a rival

company came to Jamsetji and sought advice about the machinery that they should purchase for the new mill they were planning to put up at Nagpur, where the Empress Mills also was located. The advice was so readily tendered that the agent was suspicious. Jamsetji told his friends, half in jest, that if the new mill failed, it would be better for him (as a potential acquirer) if it contained the proper machinery.

The situation had changed by the late twentieth century and the beginning of the twenty-first century as companies started protecting their innovations. For an innovation to deliver benefits for a longer time, it is generally considered important to ensure longevity of uniqueness by avoiding or delaying competitors from copying it. Innovations that are protected by patents find it easier to achieve this. We know that patents cannot be registered to protect innovations that are not based on technological breakthroughs. The thought of using patents alone to sustain the uniqueness of innovation and assure a better chance of achieving the projected future impact was limiting and created two problems:

a. The assessment of future impact became unfair to those innovations that were fantastic, but had no opportunity to register patents
b. It created dysfunctional behaviour amongst employees to file a patent even if it didn't make sense to invest in the patent-filing process. If there was no scope for a patent in an innovation, the team started to lose interest.

To address these problems and continue to encourage employees and managers to innovate and patent only relevant new technologies and discoveries, we made a few changes in the definition and criteria to reflect the following:

1. Having patents alone is not enough. Ideally the patent should be able to ring-fence all possible alternative paths that the competitors could use to achieve the same result. The strength of patent in preventing others from developing similar products and services is considered more important.
2. The terms patent and patent strength have been replaced with 'difficult to replicate'. Patents are nothing but a legal way to stop others from copying

so that the innovator could (protect and) enjoy the returns for a longer time. There could be many other ways of building entry barriers to achieve the same result of thwarting the competition. Trade secret, business models, extensive sales channel are some examples to achieve the same. Grabbing a sole licence of a new technology from a technology provider could be another way to avoid replication. One more way to make it difficult for others to copy an innovation that is difficult to protect is to plan a series of fast-paced innovations to keep it ahead on uniqueness.

It is essential to note that there are some innovations that the team and the company would like others to copy and adapt in the interests of the community, the industry or the nation. Such innovations are measured on exactly the opposite axis, i.e., ease of replication.

A Few Examples

Referring to the problem of farmers moving away from growing pulses because of lack of good-quality seeds and know-how, and difficulties in selling their produce at a desired price, the More Pulse (MoPu) programme of Rallis began as a pilot for black gram in a district of Tamil Nadu in 2011 to encourage farmers to produce more. The programme provided quality seeds to farmers, guided them through effective agronomy practices to improve productivity, and thereafter offered buyback of the produce at a fair market price. The produce was processed and packed in its unpolished, natural form and marketed by its parent company Tata Chemicals under the brand name of I-Shakti.

The state of Maharashtra partnered with Rallis to help farmers through MoPu. In a structured survey done by the government through the Federation of Indian Chambers of Commerce and Industry (FICCI), it was established that the MoPu programme, on an average, improved yields by 30 per cent while reducing cost of cultivation to farmers by a similar magnitude. The programme was so successful that more states invited Rallis to initiate MoPu. Till 2017, over 700,000 farmers had been covered. To enlarge the scope of this agro-product line, Tata Chemicals created the Tata Sampann brand and also added spices with the differentiation of authenticity. There

hasn't been any patent in the last few years of this agro-product's journey, but its quick introduction of new, authentic, and differentiated products at a national level has helped the company garner a respectable market share among the branded products. Other than the speed, its reach on both sides – farmers on one side due to its fertilizers and pesticides and consumers on the other side due to the trusted Tata Salt – is making it difficult for others to replicate.

The room air conditioner (AC) business of Voltas was in the red and was facing headwinds in 2006. It had slid to the fifth position in terms of market share, way behind Korean and Japanese companies who had deep pockets. The team found a gap in the products available in the market. The running cost of ACs was extremely important to the consumer. In 2007, Voltas launched thirty new products – all with 10–30 per cent lower energy consumption, indicated by 'star' ratings (three years later, the government mandated energy labelling of ACs). The sales increased by 40 per cent even though products were priced higher than the competition.

Two years later, a new business model was adopted by Voltas that replaced the old model of manufacturing and shipping themselves. It created a lean and flexible manufacturing plant in India for the outdoor units. The logistics was outsourced to a third party and the company developed new ways of reaching out to customers. The sales outlets were increased from 900 to 14,000 and franchisee model was introduced to expand the service network. The different-model-different-channel (DMDC) policy was adopted to avoid conflicts across various types of channels.

By 2013, this string of big and small innovations enabled Voltas to achieve maximum market share (it sold over one million ACs in 2017). Later, Voltas reduced its dependency on China for indoor units by investing in local original equipment manufactures (OEMs). A new communication campaign for all-weather AC reduced their peak season (summer) sale from 70 per cent to 50 per cent while increasing the overall sales. Voltas's advertisement campaigns won the prestigious Effie awards twice. It is the only company that publishes on their website the phone numbers of all the senior managers who are responsible for after-sales service. None of these innovations is protected by patents but copying all of them together is

considered to be next to impossible for the competitors.

Let us refer to the problem of 53 per cent electricity transmission and distribution losses in Delhi. By 2017, these losses had come down to less than 9 per cent. The TPDDL teams implemented several innovations, year after year, to accomplish this reduction. To name a few: development of a tamper-evident and faulty electricity meter; prudent management of underground assets (cables mapped through RFID markers) integrated with Geographic Information System (GIS); getting slum dwellers to install meters with the help of tailor-made Corporate Social Responsibility (CSR) projects; prediction of residual life of lightning arrestors; innovative cables for high voltage and low voltage; and real-time power manager.

Lastly, coming to the problem of soda ash manufacturing and the resultant pollution, Tata Chemicals made many attempts to reclaim the dump site by increasing tree plantation. However, all the attempts were unsuccessful as water was scarce in that largely arid region. A Tata Chemicals team worked on an innovative solution of using bio-fertilizers and bioremediation techniques to develop a green cover by using sea water instead of fresh water.

The team partnered with The Energy and Resources Institute (TERI), New Delhi, to collaborate with mycorrhizae experts to identify and isolate special micro-organisms. These compatible bacterial consortiums were used to inoculate the saplings' tender root systems, which turned out to be a successful endeavour in 2009. The micro-organisms helped the plants stay insulated from the salinity of seawater and to receive appropriate nutrients. The whole saline area was converted into a lush green belt, yielding vegetables in favourable seasons. No successful case studies had been published till then explaining how plants could grow on such a highly alkaline, dry and saline land. This innovation is not protected by Tata Chemicals.

IN CONCLUSION

This chapter explained the method of assessing the two most important attributes that define the value of innovations:

a. How unique is the innovation?
b. What is the impact of the innovation on various stakeholders?

We learnt that assessment of an innovation is contextual. It depends on the choices available at the time of assessment. A product could be very unique when compared with other products available to the target customer. The same product might be far less unique when compared with products available in other geographies. A product may be very unique when it was innovated but could gradually lose its uniqueness because of competing products.

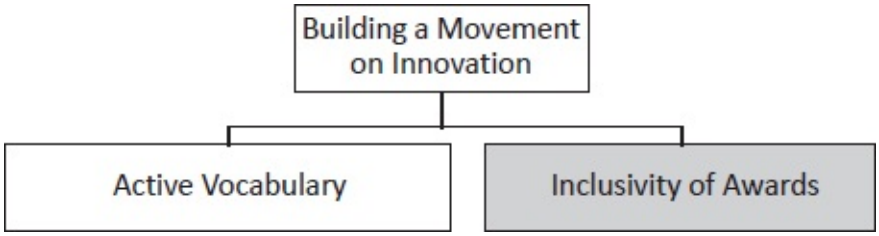
Impact generated by the innovation could be measured using several lenses – financial, market, environment, social or even an improvement in KPI. This inclusive definition of uniqueness and impact resulted in a lot of excitement and hope amongst employees who all felt '*We can do it*'. This prompted us to create equally inclusive awards, which would encourage participation and begin the virtuous circle of building self-confidence. The architecture of awards has been successful in enticing employees from all functions and geographies to participate, thereby making them learn the vocabulary and building this movement as explained in the next chapter.

♦ 4 ♦

A LEVEL PLAYING FIELD

'Innovation and Titan are inextricably linked. We are democratising innovation at Titan because when we democratize it in a company that has people with passion and courage, the entire level rises.'

Bhaskar Bhat
Managing Director, Titan
Titan Innovation Day
19 March 2018



During 2006–10, participation in our innovation awards had increased tenfold (Figure 4.1). We thought that most innovations would be either in New Products or New Services. In 2010, we analysed the nature of innovation projects that participated and won the awards in the previous two years. The findings given below, were insightful and prompted us to make several changes in the award architecture over the next few years.

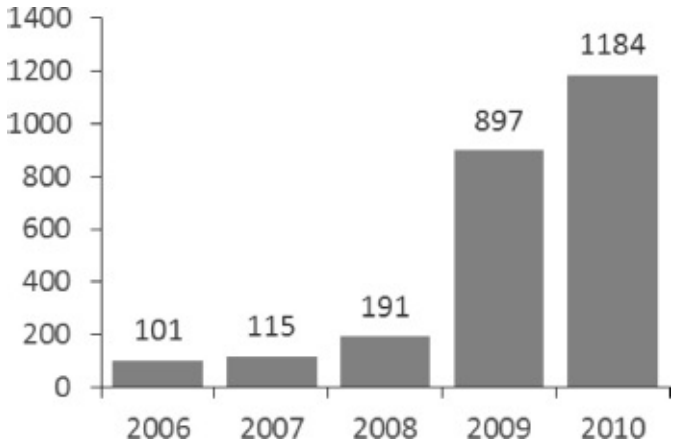


Figure 4.1: Growth in participation of teams

a. More than half the participants and winners were from manufacturing and their innovations were targeted at reducing costs and increasing throughput.
b. Product innovations were the second most popular amongst the teams and they won the remaining awards.
c. The teams from support functions such as marketing, sales, HR and logistics also participated but there wasn't a single winner.
d. Business model innovations had the least participation.

The share of awards won by process innovations in manufacturing was higher than one would have expected, because of the sheer economic impact that the manufacturing innovations achieved as compared to process innovations from functions such as marketing, sales, logistics, human resources, which struggled to make a mark with their impact numbers, and, in some cases, couldn't quantify the outcomes at all.

Let me give three examples of interesting innovations.

Example #1: Whale shark is the largest fish in the world – a harmless giant that comes to the shores of Gujarat to breed. Fishermen used to kill whale sharks to save their fishing nets. In a unique and innovative approach, Tata Chemicals brought about an emotional connect among the fishermen by creating associations between their cultural traditions and the fish. This linkage was established by communicating the notion that since the whale sharks entered Gujarat waters to give birth to little ones, they were like

daughters who came to their mother's house to give birth. Instead of providing nourishment to the daughters, the fishermen were killing them. This unique and powerful message was communicated with finesse through various mediums – street plays, spiritual leaders, schools, rallies and painting competitions. The behaviour reversed and the fishermen started to cut open their nets to release whale sharks whenever they got entangled. This project touched the jury and other participants emotionally but failed to win the award.

Example #2: The most critical area of a large business process outsourcing (BPO) company, apart from the backbone of its communication lines, is transportation of employees because a BPO, with its huge employee base, needs to cater seamlessly to myriad clients in multiple time zones across countries. Meeting client requirements is directly dependent on associates available as per plan. TCS used to pick up and drop its employees. The total commute time of employees was very long because they were picked up early to keep enough buffer for delays in the pickup process.

In 2009, the administration and HR teams implemented a new transport management system that integrated vehicle routing, employee roster schedules and vehicle tracking system to provide advance information to the managers about delays and absenteeism of their employees who were scheduled for pickup. The system had many firsts: It alerted employees in advance about the vehicle arrival time (as in car hailing services); had a panic button inside the vehicle; had built-in automatic safety alerts to the control room if there was a lone woman employee in the vehicle, etc. All these resulted in a 25 per cent increase in employee satisfaction and 25 per cent reduction in employee pickup costs but failed to win the award.

Example #3: The Jaago Re campaign was presented twice (once each in 2009 and 2010) by the Marketing and Sales team of Tata Global Beverages. The campaign was built to establish emotional connect with the customers of Tata Tea. Its objective was also to elevate the positioning of tea from a mere medium of physical or mental rejuvenation to a medium of awakening. Jaago Re One Billion (electoral) Votes Campaign was a unique programme to awaken the youth towards their electoral rights. The campaign received two

million visitors and the problem of non-receipt of voter IDs was solved for over 550,000 users. In 2010, Jaago Re was used to awaken the people of India against corruption. Both these were path-breaking innovations for a tea company and were done for the first time by a consumer product company. However, it too failed to win the award.

It was evident that innovations which were not from the core areas failed to make a mark when compared to those from manufacturing and core operations. There were two ways to address this problem – either through the evaluation criteria or by separating the non-core innovations. We did both. The previous chapter explained how the impact of innovation is measured and assessed using the four lenses, all of which have equal importance. A range of awards was introduced to provide a level playing field to people working in all parts of the organization. The architecture of all these awards has been depicted in Figure 4.2.

Let us start from the left of this figure and understand how these awards are mutually exclusive and collectively exhaustive in encouraging all employees to practise the innovation sport more often.

PILOTED TECHNOLOGIES: NEW TECHNOLOGIES DEVELOPED BY RESEARCHERS AND SCIENTISTS

This award captures and recognizes newly patented technologies that are at least 6–9 months away from reaching the customer and getting commercialized. It was created because of an insight gathered during an interaction with R&D professionals.

We know that the team constitution for innovation projects changes as things progress. For some innovation projects, the source of uniqueness lies in the technology developed by researchers and scientists. In the final stages of such projects, when they enter the commercialization stage and pitch for innovation awards, the teams seldom include the researchers or scientists who were instrumental in developing the technology. Doesn't this sound unfair? Why does this happen?

After a research team completes the technology development, it takes several months or may be years to successfully embed the technology into products and services. This period is much more if the new product needs

regulatory approval or thorough testing or requires a significant change in customer buying and consuming behaviour. The members in the team at this stage belong to operations, sales, marketing, product application, branding and supply chain. Together they work cohesively to successfully commercialize the innovation. During this time, the researchers would have moved to other projects and do not have an active role in this stage of commercialization and are forgotten (they too lose interest by then). This appeared to be logical and natural process, with no one at fault, but the researchers were losing out on the recognition due to them.

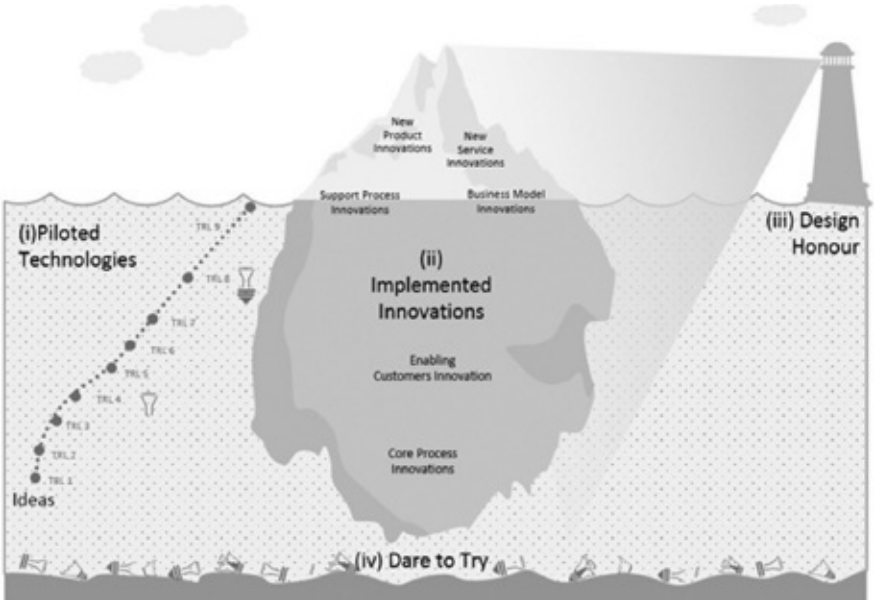


Figure 4.2: Architecture of awards

Some researchers expressed their unhappiness about not getting recognized for their work. We all know that awards are valued most if they are given immediately after the accomplishment. Considering this, we separated the two key milestones for a technology-driven innovation. First milestone is the time when the technology is successfully tested and a patent is registered. The second milestone is the time when the innovation reaches the intended customer. This award was created for the milestone, specifically for the R&D and technology teams. It encourages the researchers and technologists as they now stand a fair chance to get recognized immediately after the technology is developed.

These awards unearth interesting and relatively unknown research

outcomes which otherwise could have gone unnoticed in large organizations. The award also helps in bringing better alignment between the goals of R&D and rest of the organization. Making a new technology visible as soon as it is developed, puts pressure on the operations and marketing teams to commercialize it. This has led to the operations, marketing and product managers getting actively involved with the R&D team in deciding the future R&D projects. Finally, the award also brings newly developed technologies on the leadership radar.

K. Ananth Krishnan of TCS said, 'The Piloted Technologies award helps researchers look beyond the mere excitement over new technology. It sharpens their articulation around the novelty, impact, value proposition and differentiation that will be offered by the innovation.' He further said, 'On some occasions, our teams which received mentoring to prepare, benefited to such an extent that they began to reimagine their offering. We have had cases where the product road map changed completely, helping us get better traction with customers.'



Figure 4.3: TRL – Technology Readiness Levels

For the purpose of this award, technologies between TRL-and 4-8 are invited to participate (Figure 4.3 shows TRL levels defined for Tata InnoVista; these have been adapted from NASA) and the assessment is done using the following criteria:

a. *Uniqueness* (this has been explained in Chapter 3).
b. *Alignment with the organizational goals and confidence to overcome difficulties*: This element assesses the chances of getting funds for continuing the technology development in a sustained manner. It also assesses the extent of difficulty that the team is likely to face in the current and the next few TRL levels and the strength of their capability and preparation to overcome them.
c. *Potential impact* (this has also been explained in Chapter 3): This element is adopted for this award with a slight variation in replicability. Depending upon the final intent of the innovation, both extreme situations of replicability could be desirable. At one end, the research outcome may be well protected through patents, and on the other, the research outcome may not be protected at all as it would have been targeted to be offered as open source to either improve its chances of becoming an industry standard or to enable its free use for a larger social or environmental cause.



Figure 4.4: TRL – Technology Readiness Levels expanded

Analysis of projects indicated that TRL-8 and TRL-9 had a very long duration. Lack of (or very slow) progression to the next level for a long time in TRL-8 and TRL-9 created anxiety in the minds of management and researchers. It was also found that the activities in these two TRLs needed involvement of other functions along with R&D.

To make the progress visible without waiting for a long time in these two

levels, three sub-levels each were created in TRL-8 and TRL-9 (shown in Figure 4.4). Sub-levels were defined to convey the need of having technologists and business managers work closely to gradually transition the project from R&D to business.

IMPLEMENTED INNOVATIONS

These awards are meant for all successfully completed innovations and are assessed using only the two dimensions explained in Chapter 3 – Uniqueness and Impact. The opportunity available to employees to create impact through innovations is lopsided in most organizations – it favours product managers. To make this award inclusive, exciting, and to provide a level playing field to employees from all corners and functions of the organization, various types of innovations have been defined, depicted within the iceberg in Figure 4.2. Innovations above the water level are visible and available to the customer (new products and new services) for use. At the waterline are innovations achieved by marketing, sales, branding, HR and other support functions that are just about visible to the customers who are more aware and inquisitive than others. Just below the waterline are the cutting-edge knowledge services provided to customers that have significantly contributed in enabling the innovations of the customer. Innovations right at the bottom of the iceberg are carried out by the people in core operating processes of the company and are rarely visible to the customer. Let us have a close look at each of these:

New Product Innovations

There is no standard definition that distinguishes new products from existing products. A new product introduced by a company is not always seen as new by the customer. Take for example, a beverage company that launches a new beverage after undertaking significant consumer research and R&D expenditure but fails to impress the customer as they are unable to distinguish the new product from its previous version. Similarly, small changes in mobile phones do not always qualify as a new product in the minds of customers.

Similar challenge exists with the definition of products. Most customers

perceive products as something physical that can be owned and experienced by look, touch and feel. Service companies, especially the IT companies, use the term 'Product' for an IT application that is intangible and standard though customizable by customers similar to physical products.

An example of an intangible product was InstantApps that was launched by TCS in 2008. It was one of those early innovations in the industry that allowed multiple companies to share the common application instead of everyone running their own separate customized application. This product was targeted towards cost-sensitive small and medium enterprises (SME).

Bundling of a service to increase sales of a physical product also results in new product. In 2008–09, Tata Steel Europe had started supplying bespoke, cut-to-size steel plates to its customers within eight days from placement of the order. This was a path-breaking innovation as it was the first integrated steel company to offer such a service. The innovation provided customers better assurance of getting their steel on time that enabled them to place orders closer to the time of consumption. This is an example of a company adding a service component (cut-to-size) to the product, making it convenient and cheaper for the customer to consume. This innovation though didn't qualify as a 'new product innovation' in the eyes of customers.

With increasing influence of digital technologies in all walks of life, its use in differentiating physical products to make them easier, intuitive and enjoyable to buy, use and dispose of has increased. The case study of Jaguar Land Rover, later in this book, clearly shows how JLR has used digital technologies to further differentiate their products.

We have chosen not to define 'new products'. All product innovations need to necessarily undertake the test of 'Uniqueness' that was explained in Chapter 3. The definition of uniqueness covers a large spectrum, making the scope of new products very broad and inclusive.

New Service Innovations

These innovations could be delivered by both types of companies: (1) Companies that are in the business of providing services to their customers, e.g., software, hospitality, health care, airlines, etc., and (2) Product companies who wrap attractive and useful service features around their

products and are able to monetize and measure it.

Companies that produce and sell 'difficult to differentiate products' like steel (also known as commodities) have implemented interesting monetizable service innovations to migrate from selling products to selling solutions leading to overall increase in sales.

Tata Shaktee is Tata Steel's brand of corrugated steel roofing sheets. Consumers of this branded steel are primarily based in rural areas. Typically, a customer who wanted to build a roof for his house either approached a dealer directly to buy steel sheets or contacted a mason or fabricator who recommended him to a dealer. After purchasing sheets, the customer approached a local fabricator (mistry in Hindi) to make and install the roof. Customers were bothered by issues such as rusting, poor quality of accessories, poor aesthetics, and safety. In 2012, Tata Steel started roofing solutions as a new service for smaller customers who constituted more than 80 per cent of the total consumer base. The roofing solution known as Roof Junction, became a one-stop store to get optimally designed and manufactured roof including its installation at a reasonable cost. This greatly reduced the hassles of consumers who had to earlier go from shop to shop in search of good-quality accessories and trained fabricators.

Innovations in Core Process

A few examples of core processes are the credit approval process of a financial services company, the manufacturing process in a steel company, engine assembly in an automotive company, the housekeeping process of a hotel company, the testing and bug-fixing process in a software company, etc. The innovations in these processes dominantly result in reducing cost and improving efficiencies of the processes through shortening of cycle time – all leading to better profitability.

There are a few situations under which a core process innovation results in increasing the revenue. One classic example would be of an innovation that either reduces the cycle time of the production process or changes the raw-material mix to increase the throughput of the manufacturing process, thereby increasing the overall production. This may result in higher sales (assuming there is a demand).

Unfortunately, even though core process innovations result in reducing costs and improving profitability, they have limited visibility to the customers, market and other external stakeholders. This is a major reason why these innovations do not contribute towards enhancing the perception of a company about its innovation capability.

If we compare some of the most innovative companies globally with those who are most profitable (in absolute terms), we will get an interesting insight. Below is a list of top ten innovative companies published by three separate entities (Table 4.1). There are only a few (just three) companies that appear in more than one column. The lists are prevailed by hi-tech sector followed by pharma sector.

Table 4.1: List of ten most innovative companies

BCG (2017)	**Forbes (2017)**	**Fast Company (2018)**
Apple	Salesforce.com	Apple
Google	Tesla	Netflix
Microsoft	Amazon	Square
Amazon	Shanghai RAAS Blood Products	Tencent
Samsung	Netflix	Amazon
Tesla	Incyte	Patagonia
Facebook	Hindustan Unilever	CVS Health
IBM	Asian Paints	The Washington Post
Uber	Naver	Spotify
Alibaba	Regeneron Pharmaceuticals	NBA

Below (Table 4.2) is the list of most profitable companies taken from three separate sources:

Table 4.2: List of ten most profitable companies

Fortune (2017)	**China Daily (2017)**	**Insider Monkey (2017)**

Apple	Apple	Apple
Industrial and Commercial Bank of China	Industrial and Commercial Bank of China	Industrial and Commercial Bank of China
China Construction Bank	China Construction Bank	China Construction Bank
Agricultural Bank of China	Agricultural Bank of China	Agricultural Bank of China
Bank of China	Bank of China	JP Morgan Chase
JP Morgan Chase	JP Morgan Chase	Swiss National Bank
Berkshire Hathaway	Berkshire Hathaway	Berkshire Hathaway
Wells Fargo	Wells Fargo	Bank of China
Alphabet	Alphabet	Wells Fargo
Samsung Electronics	Samsung Electronics	Toyota Motor

There is a total of twenty-six companies in the three lists of innovative companies that indicates wide divergence in the method used by three agencies to prepare their lists. On the other hand, there are only twelve companies in the three lists of profitable companies, which indicates convergence in their method.

How many companies are there in both the lists of innovative companies and profitable companies? Only two, namely, Apple and Samsung.

In the list of innovative companies, some are recently founded. They are mostly from hi-tech sector and are far from achieving profits. Is the reverse true? Are the most profitable companies far from being innovative?

The list of most innovative companies is drawn using the *perception* of experts or shareholders (market cap), which is the reason for wide divergence in the list. The contribution of product and service innovations is the highest in building this perception. The list of most profitable companies is *objectively* drawn based on the profits reported in P&L statement of the companies resulting in convergence of the three lists. There is no doubt that

all these profitable companies would be using innovative ways and means to keep their costs lower and increase their profits. Many of these innovations would be in core processes, which unfortunately do not get reported in media and do not contribute in improving the perception of shareholders.

The role of core process innovations is critical for companies in countries like India that serve price-sensitive markets in the developing economies.

When it comes to examples of core process innovations, most of us would think of innovations that have reduced costs in a manufacturing set-up. Let me give two small examples from service companies – one resulted in reducing costs and the other increased revenues.

Example #1: e-Script is an example of a core process innovation in an IT company. In 2007, TCS implemented automation through software robots in the BPO industry. These robots carried out predefined tasks, earlier done by the associates. The innovation saved millions of dollars for TCS during those days. By 2015, this application was augmented by introducing a layer of artificial intelligence, machine learning and natural language processing. It won the innovation award in 2015.

Example #2: Process innovations of power utility companies such as Tata Power Delhi Distribution Limited generally reduce distribution losses which, in turn, increases the revenue. Use of tamper-proof electric meters, reduction in cable and transformer faults, reduction in billing errors, detecting unauthorized use of electricity are some of the examples that reduced the distribution loss and increased the revenue.

Innovation in Support Process

Consider support functions such as human resources, information technology, supply chain, marketing, sales, finance and accounts. Employees working in these support functions have a much lower opportunity to exhibit a high level of uniqueness and achieve an impact that is comparable to those who work in core process and new product development. Moreover, innovations in these areas are typically based on some simple and elegant ideas that are rarely backed by science and patents.

Given below are a few examples of innovations, which could contribute in

building the self-confidence of employees on their innovativeness but only after these are captured and recognized. Let me cite a few examples.

Example #1: MagiZinc® was a new type of patented steel coating developed by Tata Steel Europe. It not only offered better corrosion protection but also helped customers in easier processing of steel in their factory. The marketing team developed a Total Cost of Ownership scan (TCO scan) that quantified the exact increase in the customer's equipment uptime if they used this steel. This innovation enabled the customers to accurately calculate the economic value of switching from conventional steel to MagiZinc. It led to Tata Steel becoming the only steel supplier in the world to offer such an innovative service for its MagiZinc product. This innovation resulted in the first commercial orders much ahead of competition.

Example #2: TCS hires a large number (a few thousand) of fresh graduates from college campuses every year. A typical campus recruitment exercise at TCS involved visiting a set of identified institutes and conducting the selection process. The intensity of war for talent at Indian campuses had increased making it difficult to attract the top talent. TCS HR took the first big leap from the traditional modes of recruitment to creating an ecosystem of engagement throughout the life cycle of student and capturing their digital footprints. This enabled creation of leader boards to spot and map talent. Not only did HR programmes such as Campus Commune, Academic Interface, CodeVita, EngiNX and several others result in reducing the recruitment cost substantially, they also helped in spotting and attracting top talent. A complete case of HR Innovations in TCS is provided in Chapter 7.

Example #3: Silicomanganese (SiMn) is a critical ingredient in steel making and as with other raw materials, was being sold in bulk. Tata Steel too produced SiMn and decided to focus on the SME market in India. This market was plagued with quality, availability and service issues. The marketing team branded SiMn and sold it in small packages. Tata SILCOMAG was the world's first branded ferro-alloy introduced through an organized distribution system. This brought a paradigm shift. Pilfer- and tamper-proof branded bags with exact weight and product traceability were

unheard of for this type of a product.

Example #4: In 2009, the marketing and sales team of Tata Global Beverages implemented a rural marketing campaign using mobile phones in the rural areas of the state of Uttar Pradesh to deliver free entertainment. When any consumer called a specified number, they received a free call back that played Bollywood songs interspersed with brand messages about women's issues such as female feticide, black marketing, dowry, eve-teasing, etc. This resulted in a 10 per cent growth in tea sales in these markets.

Example #5: The marketing and sales team of Tata Motors started a rural marketing programme called Neev through which it created a network of trusted advisers called Tata Gram Mitra or TGM with people from government organizations and NGOs. TGM spread the message of using commercial vehicles as self-employment/livelihood enhancement options for rural youth. The programme partnered with Nehru Yuva Kendra Sangathan (NYKS), National Youth Corps (NYC), and the Indian Oil Corporation–owned Kisan Seva Kendra (KSK). The programme started in 2010 with pilots in seventeen districts and in five years it covered 60 per cent of the Indian market with more than 7,000 TGMs. In 2017, more than 7 per cent of the total sales of commercial vehicles were derived through Neev. The programme had no infrastructure cost for anyone and was supported by dealers who realized more profit through the sales achieved through Neev.

Business Model Innovations

New changes in target customers, revenue model, or cost model result in business model innovations. These are most difficult innovations to think, plan and execute as they face the most amount of internal resistance during implementation. In recent years, with increasing influence of digital and e-commerce, the number of business model innovations have increased. From teller counters to ATMs to advent of plastic cards and the recent proliferation of digital wallets are examples of new business models in financial transactions.

In 2005, mjunction, a joint venture (JV) between Tata Steel and SAIL, pioneered the e-auction of coal in India. This innovation transformed the

coal supply chain in India and made coal accessible to the smallest end-users and prevented cartelization. The coal e-marketplace resulted in market-driven price discovery, making it a win-win situation for both buyer and seller. It gave equal opportunity to all coal buyers to bid for coal in a completely secure online environment, ruling out chances of any manual intervention. Middlemen and black marketing were eliminated and consumers could buy coal directly in small lots – efficiently, conveniently and transparently.

In another innovation, mjunction transformed procurement process of tea for large tea packagers through online price discovery. The platform connected the buyer directly with suppliers. For many small and medium tea growers, it was an efficient and transparent way to access the buyer, making the process less cumbersome. Complete elimination of manual intervention made the process efficient, transparent and effective. The process reduced the buying-cycle time and gave buyers access to fresh tea, offered on the online platform within one day of production.

Enabling Innovations of the Customer

A variety of inputs are typically needed to conceptualize, execute and commercialize an innovation. One such input is 'knowledge' which could be in the form of an idea, concept, engineering, software, technology, etc. If a company sources such knowledge from external service providers to accomplish its innovation, how would you define the role of such service providers? Many B2B companies provide such knowledge services for a fixed, pre-negotiated fee. They wouldn't claim any ownership (and rightly so) on the outcome (innovation) and in several cases the service providers are not permitted to share the work with anyone.

The above is acceptable if the service provided is standard and undifferentiated – converting engineering drawings to detailed part-level engineering drawings or converting those drawings from one software to a different type of software or BPO services. All these have lower contribution in the outcome (innovation) and could be obtained from several service providers. The situation becomes complex if the knowledge service contributes substantially to the outcome and the service provider is selected for its capability to provide cutting-edge knowledge. Examples of such cases

are that of software services or design services or engineering design services. The question to ponder is: Aren't these service providers part of the innovation value chain? If yes, can we do something about it?

The extent of the role played by the service providers in enabling the innovations of their customers is an important factor to consider in such cases. The most desirable state for such service providers would be to become fully responsible for thinking, planning and executing innovations of their customers or in other words become an integral part of their innovation office. We recognize such efforts of our teams through this award, which encourages companies to further build their capability. These valuable, differentiated and customized services are likely to improve the customer's preference for the service provider in future contracts, resulting in a better share of wallet. Let's look at three examples:

Example #1: Tata Consulting Engineers Ltd (TCE) is an integrated design and engineering consulting company. It provides services in key sectors such as power, infrastructure, chemical, steel, metal, mining and urban transportation. As part of TCE's continuous endeavour to offer value-added services to customers, TCE always looks for opportunities to innovate. The innovation illustrated is an example of one such instance. TCE was engaged in providing consultancy services for a coal-fired thermal power plant. The major components of a thermal power plant were the (1) boilers that generate steam at high pressure and temperature and (2) turbine generators that convert thermal energy of steam to electrical energy.

The steam from the boiler is transported to the turbine through high-pressure pipes. Piping has always played a major role in thermal power plant and the most critical piping systems connect the boiler with the turbine. Due to high pressure and temperature conditions for which these systems are to be designed, seamless pipes of alloy steel materials were used. The piping system constituted approximately 3 per cent of the overall project cost. Conventionally, for large utility plants, two-lead piping was used to transport steam from boiler to turbine. TCE explored the possibility of using single lead instead of double for a 250 MW unit and convinced the boiler manufacture to accept those changes. This reduced substantial costs for the

power company. This single-lead design for 250 MW units later became industry standard in India. This change in design concept was considered to be a breakthrough innovation from TCE.

Example #2: In the digital microscopy domain, advancement of microscopy optics enabled a user to effectively view magnified samples. The level of clarity depended on the ability to handle complex microscopy components. A trained user was required to operate the system, analyse the outcomes and prepare the report. A German company wanted to make a digital microscope that could address the problems of complexity.

In a two-year project, TCS led the end-to-end product development, involving complete design and development, and engineering the module with algorithms and workflows. The new microscope automatically detected and corrected overexposure, underexposure, and low contrast regions in the 3D reconstruction. The product won the best innovation award for the Light and Life category in Germany.

Example #3: Intra Oral scanner was a small piece of equipment that allowed dentists to take digital impressions of the patient in a simple and intuitive manner. A company that manufactured this equipment was losing market share as there were problems in their equipment – too many lenses, high cost, outages, and poor ergonomics. One of the Tata companies was assigned the task to completely redesign the equipment. The new equipment had only 10 per cent of the previous equipment's lenses. It had self-alignment features, faster data transfer, and was free from all custom hardware. The scanner belonged to the client, was sold in the market without the name of Tata company. It was an intellectual contribution by the Tata team and their effort was recognized through the InnoVista award.

DESIGN HONOUR

Majority of the employees in Tata companies comprise engineers who are generally known to have analytical minds. There is a general perception that engineers can produce good functional products and services but are not equipped to make them intuitive and user-friendly. With the growing

influence of digital technologies, intuitive design has started gaining prominence in recent years. Not only products and services, even processes need design thinking to make them intuitive to follow and use.

Design thinking is a key enabler of innovation process due to its ability to:

a. Unravel new customer insights;
b. Use these insights to generate new ideas that enhance the functional performance of products and processes and meet the psychological and emotional needs of discerning customers.

The application of design thinking is likely to result in an elegant and intuitive product or process that is attractive, easy and convenient to use or consume.

Design Honour award provides impetus and democratizes the use of design thinking in companies. For the purpose of award and to create a clear distinction about the contribution of design thinking, equal importance is given to these design elements: graphics, textures, materials, contours, ambience, experience, functional performance, overall feel and customer experience.

Some examples of projects that have demonstrated these elements are:

- Packaging Design: The project introduced two different blends of tea in a single pack that could be mixed by the end- user as per their preference. It involved a patented technology to create a double-cap, multi-utility, single-sleeve jar as well as a double-chambered aluminium-foil stand-up pouch. Both packs were resealable by the customer to ensure freshness of each variant of tea.
- Digital Design: A customer engagement portal that enhanced the experience of customers in interaction, transaction and consumption of industrial data. The USP of this project was its unique user experience (UX) design for industrial assets and services.
- Space and Retail Design: Tanishq's Camac Street store in Kolkata incorporated the traditional Victorian architecture of Kolkata including large atrium, metal and marble staircase, lounge seating, and display pedestals. It was also embellished with terracotta and *kantha* work to

reflect local traditions and support local artisans.

Design Honour award is another step in making the innovation awards more inclusive with a level playing field for those who are not necessarily engineers. Who do you think would participate and flourish in these awards? The obvious answer would be the new product designers, corporate communication managers, IT managers, web designers and architects. Employees from these functions have presented exemplary projects but here are a few examples of unexpected projects that reinforced the value of having such an award that is open for all and not targeted to an exclusive bunch of employees. Let's look at three examples.

Example #1: Contactless Charity Tin, a project in which TCS partnered with a UK-based financial services client, caught the attention of everyone. It was a new product for the financial services company meant to arrest the declining charity as more and more people moved away from cash and did not have the change to drop in the donations box. It was a classical case study of using 'design thinking' approach to develop a solution for a customer. TCS collaborated with a top-ranked UK design school to help define the challenge and then identified approaches to solve this challenge. It went through a process of quick prototyping and field testing with potential users before arriving at the final solution. The team designed a contactless Charity Tin, enabling small donations with a single tap of contactless credit or debit cards or mobile wallets.

Example #2: Building Castles in the Air was a project of Tata Steel that constructed a scaffolding to repair a collapsed overhead roof at a height of 70 metres from the ground, without interrupting the production. While it was an example of a traditional engineering design, it differentiated itself with others because of the high customer involvement in developing and implementing the solution in a very hazardous environment.

Elements considered for evaluation of Design Honour

i. *Uniqueness or originality*

ii. *Functional value*
iii. *Emotional and Sensory appeal* (aesthetics)
iv. *Impact of Design:* Checks not only those beneficial to the company and customers but also for presence of any adverse impact of the design.

Example #3: In 2017, another project from Tata Steel that developed a railway wagon which replaced two types of wagons, resulting in savings of capital cost. The example was explained in Chapter 3.

DARE TO TRY

This award, depicted at the bottom of Figure 4.2, has already been explained in detail in Chapter 2.

SPECIAL AWARDS

All the awards discussed in this chapter are mutually exclusive and collectively exhaustive, considering all types of innovations that are possible in companies.

Special awards serve as a medium to encourage employees to experiment, learn and build new and emerging capabilities that are necessary to accelerate the pace and improve the quality of innovations.

There were three special awards in 2017 as discussed in the following paragraph.

Leveraging Open Innovation

The spirit of Open Innovation comes alive with the example of the founder, Jamsetji Tata, in 1899. This was the time when he was scouting for iron ore mines and coal mines to put up a factory for iron and steel. He was able to locate the iron ore mines in Lohara in the then Central Province of India. The coal that he found in the Warora mines was considered unfit for making iron. He took specimens of coal to England to validate if it could be used. The results were unsatisfactory but he did not give up. He advertised in various

technical journals offering a reward to anyone who could devise a method of smelting Lohara ore with Warora coal. Although a perfectly suitable method wasn't found, some of the answers contained suggestions which Jamsetji considered useful, and eventually decided that the reward should be shared among several people.

More than a century later, in 2008, Prof. Henry Chesbrough, Haas School of Business, University of California Berkeley and executive director, Centre for Open Innovation, Berkeley, conducted three workshops on Open Innovation for Tata employees. Despite the lessons learnt directly from him, it took us seven years to start practising Open Innovation using Tata InnoVerse. The programme has opened Tata companies to the external world for collaborative problem solving. The special award on Open Innovation attempts to accelerate the use of this concept for higher-order innovations and to de-bottleneck technology development process. The award assesses the role of external technology partner in developing or providing the technical solution that led to an innovation.

Tata Steel presented a project in 2017 which exhibited the power of Open Innovation. Rebars coated with a thick layer of zinc imparted good corrosion resistance but were costly. In 2007, Tata Steel employees mooted an idea of developing superior corrosion resistant rebars using Electrolytic Plasma Technology (EPT). Tata Steel partnered with CAP Technologies who had the patent for creating electro-plasma. After an eight-year-long effort, Tata Steel developed a unique manufacturing process for applying a very thin coating of only 8–10 microns on the rebars. The product fetched a premium of 25 per cent over conventional rebars.

Earlier in this chapter, under the heading 'Implemented Innovations', I had explained the family of awards called Enabling Customer's Innovation, which is a mirror image of this special award. The idea in both cases is to recognize the company that delivers the knowledge/technology which is necessary for the innovation.

Innovation at the Intersection

This award recognizes innovations that are at the intersection of material, computation and biology. Explaining the reason for initiating this award, Dr

Gopichand Katragadda , erstwhile Group CTO, Tata Sons, said, 'The future progress on innovation will happen at the intersection of technologies rather than at the core of any one technology. Given recent advances in our knowledge of biological systems and significant increase in computing power, I believe that the sweet spot is at the intersection of computing, biology and materials.' One recent example of the innovation at this intersection is given below.

Asymptomatic diseases, which show no apparent signs of a medical condition until it's too late, are silent killers. Millions of people worldwide are affected by these diseases. Discovering new ways for early diagnosis and treatment was the need of the hour. TCS developed a non-invasive micro-biome-based diagnostic solution for two asymptomatic clinical conditions, namely preterm birth (PTB) and colorectal cancer (CRC). The inventions, first of their kind, utilize variations in microbial communities residing inside our body as highly accurate diagnostic biomarkers.

Innovations by New Businesses

This award was created to encourage new independent businesses to focus on innovations right at the beginning of their formation and make it part of their DNA. The culture of investing resources in mid- to long-term riskier innovation projects fearlessly while focusing on annual targets gets best established during the fledgling stages of the business.

The Innovation Centre of Tata Chemicals Limited (TCL) was made an autonomous entity with a responsibility for creating new businesses. TCL planned to provide nourishing food in a palatable form to its customers through its brand Tata Sampann. Besan (ground split Bengal gram) was an important product sold by the Consumer Product Business of TCL. Besan had been traditionally used in deep-fried snacks, which had its associated health hazards. A deep understanding of besan's chemistry and water absorption properties (particle size) helped the business unit launch lower-oil-absorbing besan.

Neutrality of the type of impact and the exhaustive coverage of the award structure have encouraged more participation, for instance, by segregating the innovations of manufacturing from R&D department. Similarly, people

in support functions such as HR, sales and logistics did not have to battle against the manufacturing teams. Anyone who was proud of having done something 'new' fancied his or her chances at these coveted awards.

This inclusiveness of the award and exhaustiveness of its structure were designed to increase the competitive spirit and gradually improve the quantum and standard of innovations. How does one know if this is happening? What could be the indicators? The enormous amount of data and information generated in the process were used to analyse and identify levers to propel the standard of innovation projects being taken up by business units, functions and companies. This aspect would be covered in the next chapter.

♦ 5 ♦

THE STRATEGIC PERSPECTIVE

'Tata InnoVista has helped in raising the quality of innovation in TCS in two ways – by enabling a positive culture, and by establishing role models. The culture element is important at the scale and diversity of TCS – it allows our rich mix of technology, business, and entrepreneurship skills to come together and tackle ambitious challenges. The role models recognized by Tata InnoVista over the years have inspired our teams to try harder and go further on the journey of innovation.'

Rajesh Gopinathan
CEO & MD, TCS
6 July 2018

Tata InnoVista was started with the objective of capturing innovations and recognizing people to build self-confidence among employees. By 2011, the programme had taken deep roots and a large number of people were inspired to participate and felt proud to win. When the participation increased from hundreds to thousands and sustained for a few years, we shifted gears to make the programme more strategic and transformational. A high level of participation had generated rich data and information, which we started using to extract actionable insights for companies to improve their focus and drive. This chapter explains some of these insights, which may appear obvious to some readers.

INNOVATION QUOTIENT

How does one measure the innovation capability of an organization?

There are various methods that people have used in the past:

Market Cap

This method looks at the difference between the market cap and the book value of the stocks. The method assumes that the perception of the shareholders about the innovation capability of the company drives the price of the share and hence the market cap. While this is the generally accepted method (in absence of a better method), it favours B2C companies, especially the hi-tech companies in today's world. We had explained in Chapter 4 that this method doesn't often include B2B manufacturing companies that might be very innovative in their processes.

Percentage of Revenue from New Products

This method indicates the agility of companies in successfully introducing new products or services in the marketplace. Unfortunately, there is no standard definition for this measure and companies define it themselves as per their convenience and understanding. The reasons that make this metric non-comparable across companies within the industry and across industries are described below:

Definition of New Products

Some companies include incremental innovations in this measure and others do not. An example would be change in packaging of a consumer product. Will this qualify as a new product? Similarly, will a change in the screen size of a mobile phone qualify as a new product? Since this measure is defined by the company (producer) and not by using a standard definition or by considering the views and perception of consumers of innovation, there are large variations in what gets included and what does not – even within the same industry.

Time Period

Some companies measure the revenue from new products introduced in the previous three years, while others report this for the previous two years. This

variation amongst the companies in the same industry makes it difficult to compare them. The variation seems logical only if the nature of industry changes. For instance, this period for an automotive company could be higher as compared to a financial services company.

Cannibalisation

If the new product introduced by the company replaces an existing product or influences revenue from an existing product, the (negative) effect should ideally be considered when reporting this measure. Companies do not consider this negative impact which is not a true reflection of the innovation and hence not an ideal measure for comparison.

Other Limitations

There are some more limitations of using this measure as discussed below:

Process innovations

This measure of percentage revenue from new products doesn't consider process innovations which mostly result in cost reduction and hence improvement in profits. Even if one wishes to modify this measure to take into account reduction in cost, it is not possible to arrive at the annual number for cost reduction because these are not captured in any of the current accounting systems.

Profitability

The measure ignores profits (or losses) from new products. Many new products take time before they become profitable, which discourages companies to report 'Profitability or Profit from products introduced in the previous one, two, five or even more years'.

We have been able to devise a unique method to measure the innovation capability or Innovation Quotient. This method could be easily understood with the help of an example of a diamond merchant who buys rough diamonds and employs people to cut and polish them and finally sells them

at a premium.

Let us assume that every week this merchant assesses the value of diamonds processed by his people in that week. To assess the approximate value of every diamond, let's assume he uses two factors, namely size and finish (cut, colour, etc.).

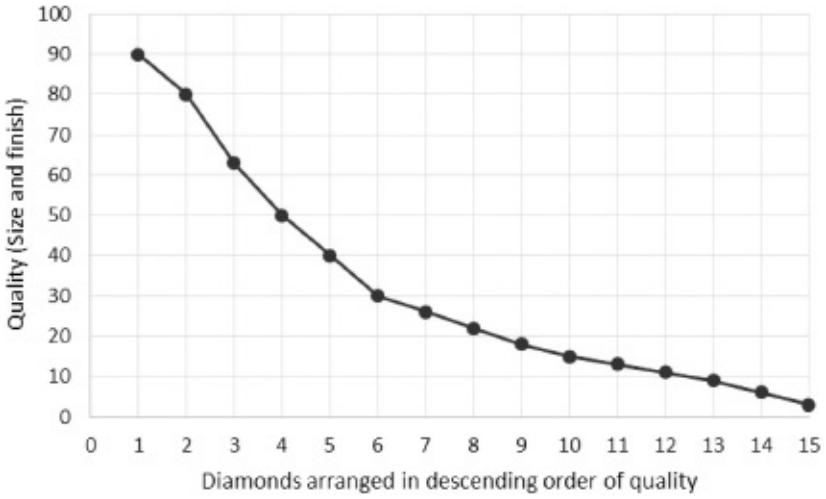


Figure 5.1: Assessment of lots of diamonds produced in a week

Let's also assume that using these two factors, he has found a way to assign a number in a range of 1–100 to every diamond. The number indicates the worth of a diamond – a higher number indicates a better price for the diamond in the market. The chart (Figure 5.1) shows the valuation of fifteen diamonds that were processed in a given week; it has been prepared by putting the diamonds in descending order of their expected value.

Next week he does the same assessment for the diamonds processed by his people. Data of Week #2 clearly shows that not only did his people produce two extra diamonds, but the overall quality also improved and hence this lot is likely to fetch better realization (Figure 5.2).

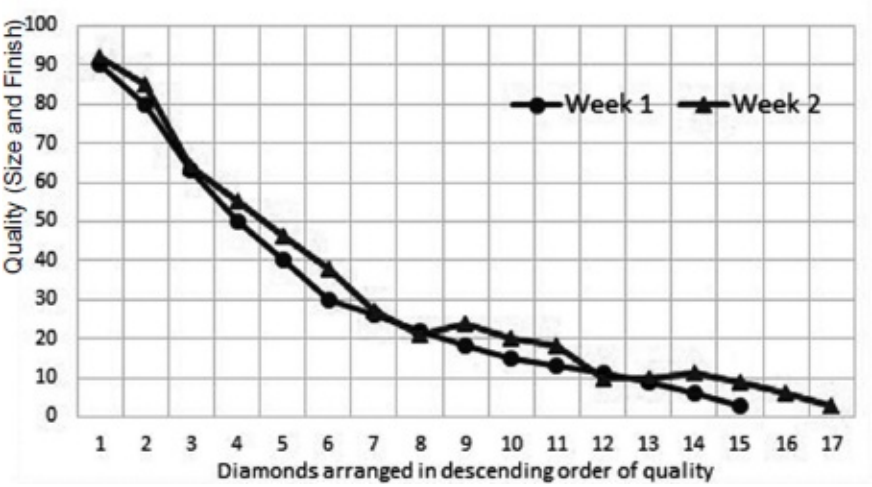


Figure 5.2: Comparison of two lots of diamonds across two weeks

A similar assessment could be done for the innovations completed by an organization or a business unit and the chart thus prepared is called Organizational Innovation Quotient (OIQ). This OIQ of a company could be compared across years, or it could be used to compare the performance of two business units of the same company in the same year. It could also be used to compare the Innovation Quotient of product lines or functions across the years. To get this OIQ chart, we need just two inputs: an inventory of all completed innovations in a year and the valuation (assessment) of each one of them. Tata InnoVista had enabled us to achieve both.

If a company systematically maintains a record of all the innovations done by all its competition (a good use of Competitive Intelligence process) and assesses them using the above method, they could find their Organizational Innovation Quotient in the industry. This assessment, if done year after year, could be a useful input to plan the investment that the company would like to make on innovations.

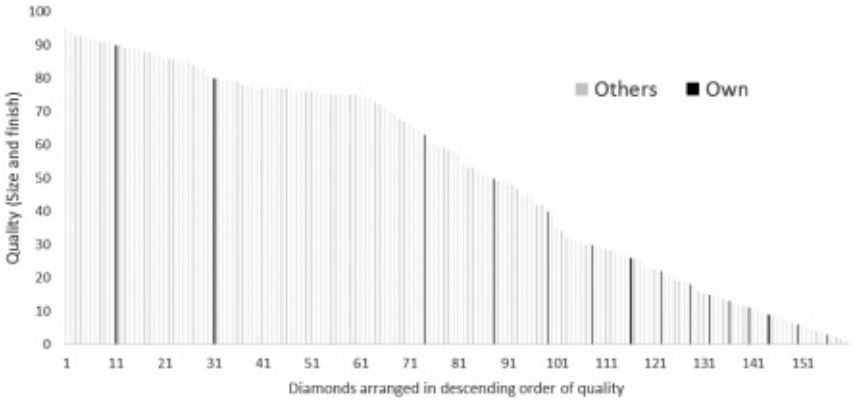


Figure 5.3: Comparison of diamonds produced in a week with others in the industry

For instance, let us assume that the diamonds produced by all other merchants were also assessed using the same method in week #1. The chart (Figure 5.3) shows the valuation of all the diamonds produced in week #1 by all merchants. Fifteen diamonds produced by our merchant are marked in dark black bars and those of everyone else are indicated in grey bars (this chart uses the same data as the previous two charts; the difference is only in the type of graph. It is a bar chart as compared to the earlier line chart). The chart clearly shows our merchant's market share in number of diamonds. It also shows that the quality of diamonds produced by our merchant is on the lower side. He has just three diamonds in the top two quartiles and twelve diamonds in the bottom two quartiles. This means that his revenue per diamond is likely to be less than average revenue of all the diamonds produced by all the merchants.

To assess the value of innovation projects we use two dimensions that were explained in Chapter 3 – Uniqueness and Impact. The assessment on these two dimensions gives a composite score that is used to plot the Y axis of OIQ.

ASSESSMENT OF INNOVATIONS

For Innovation Quotient to become a true reflection, most innovations should present themselves for assessment. All companies participate and take pride in showcasing their projects in Tata InnoVista. Our more recent communication to people is: 'Anything that makes you feel proud should

find its way into InnoVista.' Despite this, the question remains: 'Does Tata InnoVista capture all the innovations of the companies?'

The following two observations give us confidence that all the major innovations get into Tata InnoVista.

- The overall participation has increased fifty times in the last ten years. In these years, the number of awards has increased from three to fourteen. The value derived from this programme has prompted larger companies to start a similar programme internally for themselves. I have briefly explained this towards the end of this chapter.
- In the survey of 333 CxOs and others from fifty companies cited earlier, one of the questions that we asked them was, 'What percentage of your innovations get captured in Tata InnoVista?' The average response was 50 per cent. Companies that reported this number to be less than 50 per cent may not find OIQ to be a true reflection of their innovation capability.

How Accurate and Authentic Is the Assessment?

As explained earlier, the two dimensions used to build the OIQ chart are uniqueness and impact. Uniqueness, as explained in Chapter 3, is assessed using the information available in patents, research reports, consumer reports and the knowledge of experts, making it very objective.

The second dimension of impact is assessed based on the numbers stated by the team. To ensure the veracity of the projected impact, a senior business leader associated with every innovation validates the numbers reported by teams, thereby reducing the chances of any artificial inflation.

In 2014, the annual consolidated expected value of top thirty-eight innovation projects was US$ 1 billion. In 2015, the top eighty-six innovations were found to be worth US$ 1.3 billion. These numbers created excitement amongst the teams and Tata leaders. Some senior managers found these projected values of top innovations of 2014 and 2015 hard to believe.

In 2016, we undertook another exercise and approached the teams of 2014 and 2015 who together had claimed a return of US$ 2.3 billion. The exercise was carried out to verify whether the teams achieved their own projections,

and if they were found to be far from the actual results, what were the reasons and how could the situation be improved.

The result of this exercise was as follows:

a. Of the total 124 teams that were approached, twenty-nine teams of 2014 and fifty-six teams of 2015 responded (making it a total of eighty-five teams that responded). The expected value from their innovations, as reported by them in the respective years was US$ 1.7 billion.
b. The actual value achieved by these eighty-five teams was US$ 1.8 billion – very close to projections!

The above analysis indicated that the teams were making accurate projections and were putting their best effort in pursuing these projections. The above exercise validated our method (Figure 5.4) of assessing impact of the innovation projects to arrive at OIQ.

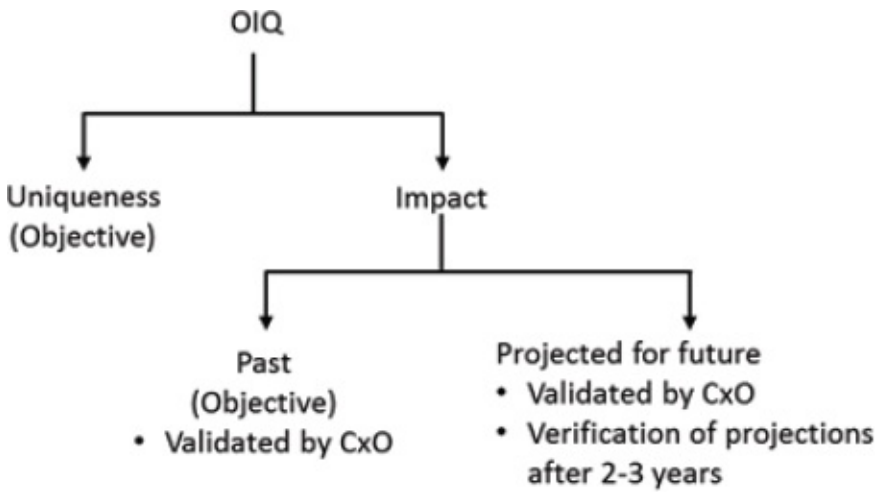


Figure 5.4: Objectivity of OIQ

INNOVATIONS SHOULD BE TREATED AS A PORTFOLIO OF INVESTMENT

Achievement of US$ 1.8 billion against the expected US$ 1.7 billion didn't mean that every team achieved about 5-6 per cent more than the expected value. Like any other investment portfolio that has uncertainty, these eighty-five innovations also represented a portfolio of recently completed

innovations fighting for success in their markets against the competition.

The analysis (Figure 5.5) shows that 44 per cent of the projects just achieved their expected outcomes, 36 per cent underachieved their projections and the shortfall from these were more than compensated by the remaining 20 per cent projects that overachieved their projections.

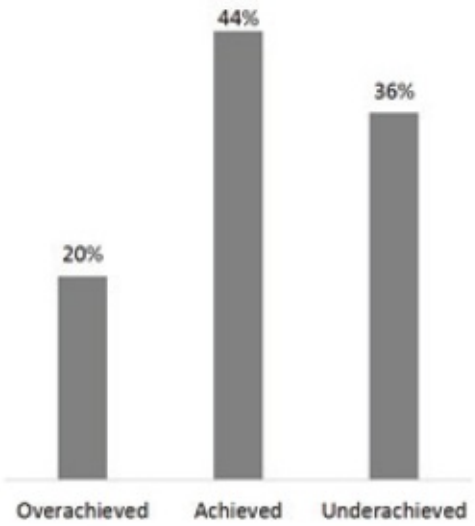


Figure 5.5: Performance of teams after 12–24 months

NOVELTY DEGRADATION AND IMPACT DEGRADATION

We were keen to know the reasons for the underachievement and overachievement of 36 per cent and 20 per cent projects, respectively, and if possible, use it to refine our innovation process. We asked each of the eighty-five teams about the current state of uniqueness of their projects as compared to the uniqueness that was reported when the innovations were assessed to create OIQ. We wanted to know if the uniqueness improved or maintained or degraded with time and also check if 'change in uniqueness' could be one of the factors that influenced the extent to which the returns from the innovation project were achieved. The results (Figure 5.6) were interesting:

a. Degradation in uniqueness of the innovation seemed to have influenced degradation of the impact. Degradation of impact means the team was unable to achieve the projected impact. There was a clear message:

Innovations that are not able to maintain uniqueness in the eyes of the customer are expected to fall short of achieving their projections.

b. *Maintaining uniqueness of the innovation is not sufficient to achieve projected outcomes.* We observed that more than half the projects that saw impact degradation had maintained their uniqueness. This meant that there are factors other than uniqueness which affect the returns from innovations.
c. *Improving the uniqueness of the innovation through either incremental or breakthrough innovations after it is commercialized, increases the chances of overachieving the projected performance.* Eighty per cent of the projects that overachieved their impact had improved their uniqueness also.

Uniqueness	Improved	14%	17%	16%
	Maintained	20%	27%	4%
	Dropped	2%	-	-
		Underachieved	Achieved	Overachieved
		Actual Impact		

Figure 5.6: Relationship between impact realization and change in uniqueness

Let's look at a few examples:

Example #1: Steeljunction, a retail store from Tata Steel, was conceptualized in early 2005. It won the InnoVista award in 2006. Steeljunction was born when focus on retail was very high and Tata Steel was already very successful in the retail sector for its steel rebar and steel sheets. The objective of starting the retail brand was to get Tata Steel into product business, especially those products that would consume its own steel. It was also an attempt to create opportunities to expose consumers to steel products and increase the overall steel consumption.

Steeljunction was the first foray of an integrated steel company into upmarket retail business. By 2006, Steeljunction succeeded in managing the front end – attracting customers, importing steel products from China, getting footfalls, and completing the first few pilots on modular kitchens. After 2006, the team had to innovate the back-end processes – increase the

range of products by getting into innovative steel products such as doors, steel gates, grills, modular kitchens, furniture such as cupboards and others. The management and team had to be patient in creating differentiated supply chain, after-sales service, and a cost model for consistent supply chain. There was a dilemma between 'achieving break-even' or 'achieving scale' with the limited investment that was approved for this venture. Finally, Steeljunction ended up keeping products of other companies and brands. It opened a few more stores but could not continue to retain or improve the uniqueness through continuous release of innovative processes, products and services.

Example #2: Dr Sumitesh Das, chief, Graphene Technologies in Tata Steel, has an interesting story to tell about the two projects that won the Tata InnoVista award in 2009 but couldn't meet the projections. They were awarded based on the promise they showed at the time of presentation. When we tested our hypothesis that degradation of uniqueness leads to degradation of impact he said, 'Degradation of uniqueness is not applicable to projects that have not been commercialized yet. Until and unless scale-up is accomplished within a fixed time, the difficulty to commercialize increases exponentially. As time passes, there is a degradation of perseverance and the killer instinct ebbs away.'

This is what mattered for the two projects that had completed only their technical journey and needed to complete the commercialization process. He was obviously referring to the Valley of Death in the innovation life cycle, which highlights the most difficult challenge of converting successful R&D outcomes into commercial use. The project of using nano materials in water to improve its heat extraction property needed the work to be done in two areas – manufacturing of nano material and systems engineering of the heat exchange system that used nano particles. The innovation was complex and needed dedicated team effort over a sustained period. Sumitesh told us, 'We were looking for internal sponsors who could help us put together a multi-disciplinary team drawn from Engineering, Projects, Procurement, Research and Technology. Putting such a team together becomes increasingly difficult, especially in cases where the distance between the core subject of project and

the core subject of the organization widens.'

Although the pilot project had shown big opportunities for saving energy and increasing throughput of the steel plant, it struggled on both the fronts – manufacturing nano-material and the engineering solution. Sumitesh further said, 'All innovations need at least one passionate person at the senior level. If the subject of innovation project is not the core aspect of the business, the chances of the project falling apart increases if there is no sponsor for seeing the team through tough times and helping in evolving different financing, administrative and collaboration options. It rarely happens that the team which did wonders at the lab stage is able to pull off a similar show when it comes to commercializing the innovation.'

This is what exactly happened in case of the other project of hydrogen harvesting, wherein the team tried to capture the hydrogen generated as a by-product when water was sprayed on the red-hot slag. The team achieved a purity of 84 per cent when it won the award and showed multimillion-dollar revenues from carbon credits. Unfortunately, as soon as the core members parted ways, the project stalled. The topic, once again, was far from the core and had no connection whatsoever with the steel-making business.

We probed Sumitesh further to find the reason for baton not getting handed over for non-core projects. He said, 'Such projects germinate and progress only due to the personal passion of a senior leader and not due to the strategic demands of the company. We have learnt this, and today we have a sponsor or a mentor who has been able to put together a multidisciplinary team. The sponsor is able to rope in different stakeholders, both financially and administratively, so that the time to commercialize is reduced. We still have a long way to go. Hopefully, with the Graphene business we will cross the bridge.'

Hence, instead of degradation of novelty, applicable to the performance of projects that have begun commercialization, it is the *degradation of perseverance* and killer instinct that matters for projects that need to jump the Valley of Death. Larger the distance between the subject of innovation and the core subject of the organization, higher are the chances of degradation in killer instinct and perseverance; and higher is the need for leadership involvement.

Example #3: After spending more than two years studying the small and medium businesses (SMBs), TCS launched the iON Platform in 2011, to enter the uncharted territory of SMBs. It was offered as an integrated IT-as-a-Service: Pay-per-use and Build-as-needed model to fit the technology requirements of SMBs in India. Over 200 SMBs and 100-plus educational institutes started using this in the very first year when it won the award. It started with around thirty-five solutions hosted on a single instance that reduced the cost to company (TCS) and offered better pricing to customers. It was the first integrated solution meant for SMBs and was available through the public cloud in multiple languages and multiple currencies. This was just the beginning for TCS iON.

While conducting various assessments of students, educational institutes and examination boards in India were facing several challenges such as paper leakages, logistics cost, and longer result-processing cycle time. The TCS iON team saw this as an opportunity and launched a cloud platform – TCS iON Digital Assessment to address these challenges. An award winner in 2013, the platform was a re-imagination of the assessment process by leveraging multiple technology innovations. In 2017, it had conducted over 80 per cent high-stake assessments in India. By 2017, more than a hundred million candidates had been assessed using this platform.

In 2015, with sixty billion paper-and-pencil assessments happening every year, iON offered digital evaluation for assessment of subjective answers. All stakeholders felt the pressure of exams – institutions worried about deadlines regarding results; students worried about possible loss of answer scripts; parents worried about fairness; administrators worried about secure movement and storage of answer scripts; teachers and evaluators worried about conduciveness of the evaluation atmosphere, etc. TCS iON created an application for the complete process covering application management, allocation of test centres, management of question paper, evaluation management, results management, and certification management. The platform could be scaled up to handle 600,000 candidate assessments across four shifts in a day. This innovation helped examination boards and universities save significant cost on logistics, fuel and manpower, and resulted in reduction of re-evaluation requests from 10 per cent to almost

zero per cent. It has also resulted in a fourfold reduction in processing time of exam results with 100 per cent error-free computation of marks.

Upon the arrival of Gen Y (born between 1980 to 1994) and Gen Z (born between 1995–2012) learners, came the flipped classrooms, outcome-led learning, analytics-assisted learning, adaptive assessments, open textbooks, and classrooms without boundary. To provide learners, publishers and trainers a marketplace to buy, sell and consume the learning material, TCS iON introduced yet another innovation, called TCS iON Digital Learning Hub, a content marketplace that brought publishers, distributors and learners together on a single platform. The platform offers courses, assessments, communities, events and other learning products in digital form. The iON Digital Learning Hub caters to learners across various segments right from kindergarten to 12th grade to working professionals. In 2017, the platform was shaped to maximize the corporate learning requirements. The innovation journey has not stopped here for TCS iON. Many new innovations are in the making including iON Digital Apps Hub, iON Digital Markers Hub, Secured and Customized device for assessments and marking.

Example #4: In 2008, Tata Steel Europe produced a metallic coating for steel strips called MagiZinc®. As compared to standard galvanization, this imparted greater corrosion protection to steel (four to six times more) at lower costs. Instead of traditional zinc coating, the new patented coating comprised magnesium, aluminium and zinc in a certain proportion. MagiZinc provided the best balance between adhesion quality, corrosion performance, forming, welding and cost. Commercialization of MagiZinc started with building-envelope market that demanded greater corrosion protection. It also accepted the substantial reduction in the thickness of the coating, resulting in lower cost when compared with standard galvanized steel.

The development and introduction of a new metallic coating for the automotive industry is a lengthy process. Material properties must meet the processing requirements and manufacturing constraints of the existing plants of automotive companies. Tata Steel Europe (TSE), in close

cooperation with the automotive industry, took five years of screening and testing to get the necessary approval.

Finally, in 2013, MagiZinc Auto was introduced, which offered the automotive industry many advantages over conventional zinc coatings. Outstanding resistance against corrosion and excellent stone-chipping performance allowed a reduction of coating thickness without loss of performance. Excellent press and assembly performance in the manufacturing plants of automotive companies ensured better production yields.

Selling MagiZinc was not easy as the customer machines were set to operate with zinc coated steel. In 2014, the marketing and sales team developed a Total Cost of Ownership scan (TCO scan) that quantified the reduction in tool wear-out in customer machines by using MagiZinc sheets and resulted in increased uptime of the machines. This enabled customers to accurately calculate the economic value of switching from conventional steel coatings to MagiZinc. In 2017 MagiZinc enjoyed 7.5 per cent of the market share.

In 2016, TSE was in advanced stages of developing MagiZinc Auto Full Finish steel for exterior parts (outer panels) of an automobile. This steel would allow automotive manufacturers to use thinner coatings and guarantee longer vehicle lifetime and reduce maintenance cost. Enhancing the surface quality for improving the paint appearance was the major challenge for developing such steel. The product was developed in close cooperation with early adopters like BMW and Volvo. In 2017, the company was in advanced stages of using MagiZinc for its tubes products also. All the above innovations had ensured that the manufacturing lines of MagiZinc operated at full capacity, giving significant cost advantage to Tata Steel Europe.

GESTATION PERIOD

Impactful innovations are well-planned bets of longer-term horizon and not an outcome of knee-jerk reaction.

Gestation period for an innovation is defined as the time it takes for an innovative idea to get converted into a useful innovation that starts giving

benefits to the intended customers. This period could be as short as a few weeks to as high as more than five years. The gestation period of an innovation depends upon several factors such as the industry, subject matter, type of technology and assets needed, market, target customers, cross-functionality, need for a change in internal behaviour, need for a change in buying or consuming behaviour and, finally, the sheer size or objective of the innovation. Within one company itself there could be innovation projects having a wide range of gestation period.

Citing an example of a variable that influences gestation period, Arup Basu, president, New Business and Innovation Centre at Tata Chemicals said, 'Typically, innovations that have an associated need to leverage fixed assets will require longer gestation periods compared to innovations where value is created purely by leveraging intangible and/or knowledge assets.'

Innovations that have a longer gestation period need perseverance of the team and the patience of management. While the former is one of the inherent qualities of innovators (explained in the next chapter), the latter is generally considered to be the bottleneck. We have heard expressions such as 'firefighting' and 'quarter to quarter pressure' which point to the fact that we are impatient for immediate results. Therefore, in a situation where management is typically interested in short-term results, why should projects that have a longer gestation periods be selected, and who should work on these projects? Perhaps, no one! That's why most managers increasingly focus on projects that have shorter gestation periods and are aligned to the imminent annual plan.

We carried out another small research and established a clear connection between the gestation period and the quality of innovation projects. For 2016–17, we analysed 857 innovation projects from more than fifty companies spread across industries. As expected, the gestation period of these projects varied substantially – 63 per cent of the projects had a gestation period of less than six months and only 2 per cent projects had a gestation period of more than two years. Table 5.1 gives the distribution of projects with increasing gestation period.

Table 5.1: Gestation period of 857 successfully completed innovations	

Gestation period	Proportion of projects
<6 months	63 per cent
7–12 months	21 per cent
1–2 years	13 per cent
> 2 years	2 per cent

Projects that were better than others on our assessment (uniqueness and impact), progressed through the award stages. Only thirty projects that passed the scrutiny of multiple jurors in multiple stages reached the finals (fourth stage). The distribution of these thirty projects, with increasing period of gestation, is given in Table 5.2:

Table 5.2: Gestation period of thirty finalists	
Gestation period	**Proportion of projects**
<6 months	10 per cent
7-12 months	33 per cent
1-2 years	37 per cent
>2 years	20 per cent

If we compare the two tables, we would observe that the share of projects with gestation period less than six months reduced from 63 per cent in the first stage to merely 10 per cent in the finals (three projects out of the thirty finalists). Two out of these three projects were digital in nature.

Nearly 55 per cent of the projects in the final stage that had a gestation period of more than a year were backed up by patents. A few had multiple patents too. The share of projects with higher gestation periods increased substantially and these had very little digital influence.

The above analysis didn't identify the factors that influence the gestation period. It indicated that the projects with higher gestation periods are likely to be more unique in the eyes of customers and expected to create more impact for the organization as compared to those that have lower gestation

periods (remember the two dimensions on which the projects are assessed). In terms of OIQ, such projects are likely to appear on the left side of the curve.

The estimated gestation period of ideas could, therefore, be a valuable information for senior management to consider while taking decision on finalizing the innovation portfolio for the next few years.

PROJECTS WITH HIGHER GESTATION PERIOD NEED SPONSORSHIP OF SENIOR LEADERS

Details of the mentor are also captured for every project in Tata InnoVista. Mentor is defined as the senior-most person in the organization who reviews the progress of the project on a regular basis during the gestation period and actively resolves roadblocks.

We know that innovation projects need active support of the leadership to overcome the internal and external resistance. This resistance is natural because innovations almost always end up making a current product or a process redundant. Garnering the required support and commitment of the leadership is an important role of the mentor. A small research conducted on the mentors of the top thirty finalists of 2017 gave us an interesting insight.

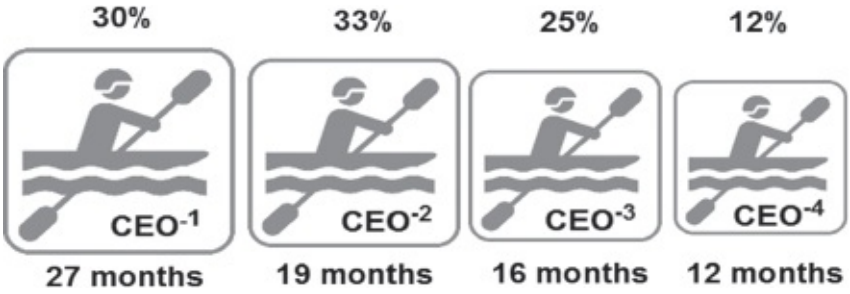


Figure 5.7: Distance between mentor and CEO vis-à-vis gestation period

For every project, we checked the distance between the mentor of the project and the CEO of the organization (difference in reporting levels). Figure 5.7 shows that the average gestation period of projects reduced as this distance of mentor increased. Gestation period was 27 months for projects that had mentors one level below the CEO and it was only 12 months for

projects which were mentored by people who were four levels away from the CEO. This data reinforced our belief that a project that needs resources for a longer period would need an active involvement of a senior leader as the mentor.

To get insights on the role of the mentor, we spoke to a few mentors: Dr Arup Basu, president, New Business and Innovation Centre at Tata Chemicals, Dr T. Venugopalan, CTO at Tata Steel, and Manish Singh, chief, Automation, at Tata Steel. Arup was the mentor of two projects that reached the final stage. One had a short gestation period of ten months (low-oil-absorbing besan), and the other that had a five-year gestation period (Quantum Dots of ZnO).

Venugopalan had mentored the electro-plasma-coated zinc rebars that took more than seven years to commercialize. Manish had mentored the winning project of automating the desulphurization mechanism of steel that had a gestation period of only one year. We took inputs from the winning teams also to get their views on the 'ideal' mentor. The reason for long gestation periods and the support needed by teams could be summarized under the following three heads:

Finding and Establishing the Customer Need

In case of electro-plasma project of Tata Steel, the technology was offered by a US company that had not used it for any product. Embedding a new technology into a product was a tall task. Moreover, the customers' need and their willingness to pay premium for a coated rebar wasn't established. Venugopalan said, 'If there was a ready customer for it, we could have done this project in 3–4 years instead of seven years.' Speaking about the besan project that had a short gestation period, Arup said, 'The customer need was very clear and obvious. The interdisciplinary team of scientists who were not coloured by any specific domain could convert a consumer need into a science problem to find a simple solution based on first principles of particle size.'

Getting Approvals for Funding at Various Stages of the Project

Another reason for the electro-plasma project of Tata Steel taking a longer

time was the use of a relatively new technology that was unproven. The technology was at TRL-4 level (as explained in Chapter 4) when the US company presented it. Venugopalan says, 'We took more than 3–4 years to approve the funding. People liked the technology and the idea but never approved until Ashish Anupam (chief, Marketing and Sales, at that time) pushed it, followed by the final big push from T.V. Narendran (vice-president, Tata Steel at that time) who gave the go-ahead.' The teams too felt that getting the resources and keeping the interests of senior leaders alive throughout the long gestation period is an important role of the mentor.

Carrying Out the Actual Work of Developing the Technology and Embedding It into a Commercial Product or a Process

The team including the mentor, needs to have a high level of perseverance to carry out experiments, conduct trial marketing, perfect the process and get the approval of customer and regulatory bodies. Arup said, 'Gestation period will typically be longer because of scale-up issues. We needed a manufacturing unit to be built either from scratch or repurposed.' Manish said, 'The mentor should have a high level of trust in the team and should continuously evaluate the project without allowing his team to dilute the project scope and lose sight of the end goal that was decided at the beginning of the project. He should find ways and means to maintain or improve the uniqueness of the project.' The teams felt that the role of the mentor is that of a trusted boss who would safeguard the team in case of failure. This point is further elaborated in Chapter 6.

Arup summarized the role of the mentor: 'Staying on course is the key challenge, especially since disruptions occur frequently impacting all the current assumptions.' He further added, 'The mentor needs to ensure that the quantum of benefits from the innovation project is explicitly built into the long-term financial projections of the company. This is the only indicator of the organizational commitment to such innovation projects.'

COMPANY-LEVEL AWARDS AND RECOGNITION

The success of Tata InnoVista in building capability and inspiring a large number of people in igniting them to join the movement prompted some

companies to initiate a similar process at their end, thereby penetrating deeper to increase the momentum of this transformation. Here are three examples:

Example #1: TCS had always participated in large numbers in Tata InnoVista but started winning awards only from the year 2013. Charudatta Jadhav, head, Accessibility CoE of Corporate Research and Innovation, led a team that won the award in 2016 and 2017. Charu, visually challenged, thinks that participating in Tata InnoVista is inspirational: 'My team has been to finals five times. The first three times we did not win. However, losing drove me to do even better the next time.'

Considering the size and spread of TCS, K. Ananth Krishnan felt that the company needed its own version of InnoVista to mine the best innovations in TCS, increase the engagement of employees on innovation, and create the same drive as Charu in several other TCS people. The process has been able to discover many new innovations that people did either unconsciously to delight their customers or those that others beside the team were unaware of.

TCS InnoVista is not only a contest but a platform to build the innovation capability across the organization. By taking it deep inside TCS, it is helping employees think through every innovation in terms of its business impact. For young innovators, the platform provides an opportunity to get quality time with seniors from outside their own teams, bringing a cross-disciplinary flavour to the interaction. In 2017, TCS received more than 2,000 projects from its employees located in forty-six countries.

Example #2: In the case of Tata Motors, setting the context of innovation, Girish Wagh, who led the development of Tata Ace and Tata Nano, said, 'Over the last twelve years, Tata InnoVista has acted as a catalyst for propelling innovation and has educated employees about the long journey one needs to undertake for being consistent on innovation. It has also prepared them to accept failures along the way.'

The emphasis of Tata Motors is largely on building the innovation culture by exciting and encouraging employees to participate, irrespective of the scale and size of their innovations.

Girish said, 'We have participants from departments as diverse as strategy,

manufacturing and horticulture, and management levels ranging from senior management to shop-floor employees. I myself have been on both sides of the programme, as a finalist team member and as a juror.'

Top 100 projects are mentored by senior managers including, in some cases, the Executive Committee members.

Tata Motors introduced a new category called Supplier's Innovation. It recognized those innovations of suppliers, which resulted in the innovations of Tata Motors. The learning from this experiment was used to introduce this award at the Tata InnoVista 2018.

Example #3: For Jaguar Land Rover, innovation and design are at their core for giving their customers a memorable experience. Tony Harper, director, Engineering Research, said, 'When ideas are translated into benefits for our customers, there is no greater, more sustainable source of competitive advantage.'

JLR expanded the scope of their long existing Henry Ford Technical Excellence awards. Dr Tayeb Zeguer, manager, Jaguar Land Rover said, 'For me it all started at Ford where wining the Henry Ford award was the biggest achievement for any engineer. The award recognized engineers who used their engineering skills to achieve product or process contributions. The work had to be significant in terms of technical effort. I had won two Henry Ford awards.'

Comparing Technical Excellence awards with JLR InnoVista, David Coleman, senior manager, Body, Computer-Aided Engineering (CAE) said, 'From the outset it was clear that InnoVista had much greater focus on business, environmental and community impact and this has sharpened my focus especially on the "being a good neighbour" aspect.'

The participation in awards is largely pull based and increasing number of participation from outside the technical areas and outside the UK signifies the popularity of this programme.

In the first five chapters, I explained the need for Tata InnoVista, detailed the design and architecture of this programme and explained the transformation it is creating in Tata companies. The stage is now set well to answer the question related to the main protagonists of this programme – the

innovators, who participate with great enthusiasm in this programme. What makes a person inherently innovative, who influences the innovator most, and what motivates the innovator and the companies to showcase their innovations in a programme as InnoVista? This is discussed in the next chapter.

♦ 6 ♦

THE INNOVATORS' ORCHESTRA

'Tata InnoVista creates a lot of buzz and enthusiasm as it gives an opportunity to individuals to separate the identity of their innovation from the organization and showcase it to a larger audience, including media. For some people, such an experience is a life-changing event, propelling them towards a perpetual innovation journey.'

Rajesh Gopinath

'Passion' is an essential ingredient for innovations to happen. The steady growth of projects in the programme was indicative of the growth in the number of people who were engaging passionately on innovations. An analysis of the people involved in these projects since 2008 is shown in Figure 6.1. The chart shows two types of participants – first-time participants and repeat participants. Either of the extremes for these two types of participants was not good for the programme – a higher percentage of first-time participants was indicative of a programme low in substance and unable to retain interest among the participants. Similarly, a very high percentage of repeat users would indicate that the programme was not able to meet its objective of creating a large movement by inspiring more people.

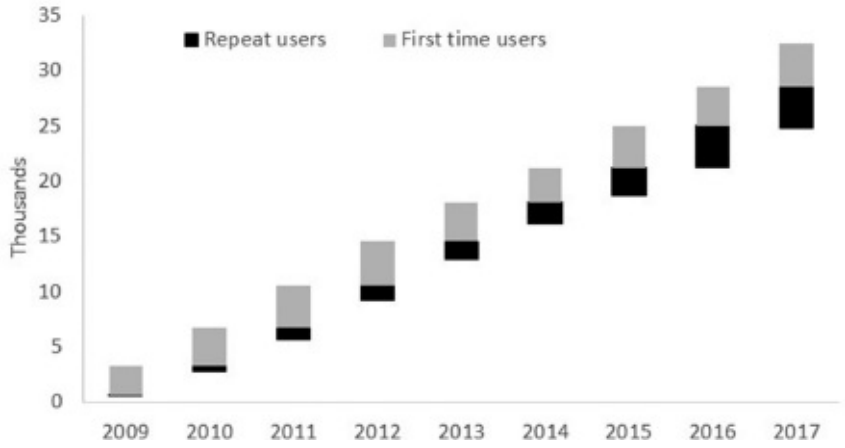


Figure 6.1: New and repeat participants of Tata InnoVista

A good mix of new and repeat users is the right way for this programme to grow. The next question we wanted to explore was: 'What makes people participate in innovation awards?' The answer had to be obtained in two parts. First, to participate in innovation awards one had to be an innovator. The answer to this question, 'Why do some people innovate?', would have given insights into the levers which could be used to further accelerate the innovation movement. Second, having completed an innovation, one should feel enough attraction for the awards that would drive the innovator to willingly put in the required efforts to participate.

WHY DO PEOPLE INNOVATE?

To find out why some people innovate while others don't, we identified serial innovators and conducted a survey, followed by a discussion of approximately an hour with some of them.

Our database had more than nine years of longitudinal data. From Figure 6.1, it is evident that there were around 30,000 unique innovators. The analysis below (Figure 6.2) presents the distribution of people in terms of the number of years they had participated.

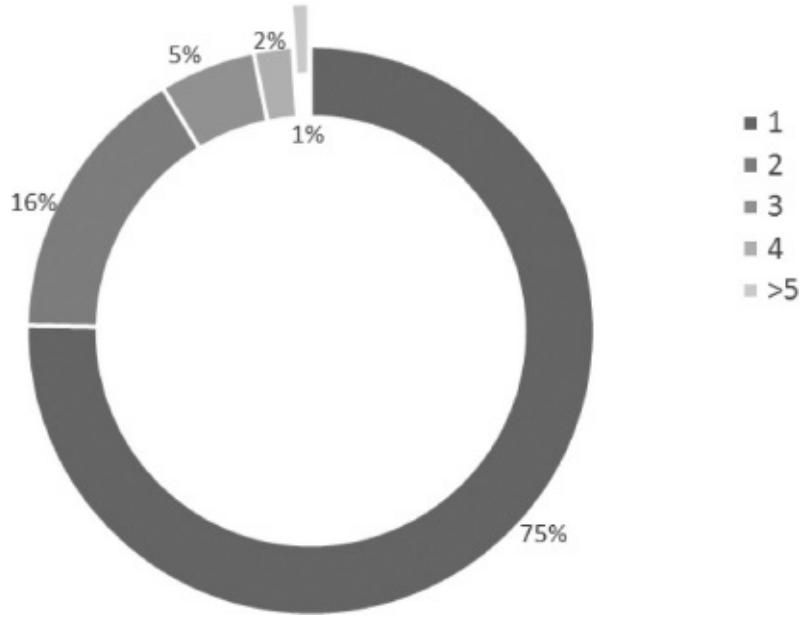


Figure 6.2: Frequency of participation of employees in Tata InnoVista

The figure shows that only 1 per cent people had participated for five or more years. The analysis also showed that only seventy-seven people had participated in seven or more years. We called these people as serial innovators. Fifteen more people, who had participated in five or six years but had won a disproportionately higher number of awards were also included in this list. We reached out to these ninety-two people to participate in the survey, out of which sixty-one responded. One-on-one discussions were held with twenty-three respondents to extract insights and stories to support the data.

These sixty-one serial innovators together had the experience of seeing through 1,229 innovation projects. While they represented only 0.2 per cent of the overall participants, they had a 4 per cent share of the finalists.

These innovators provided us insights on the commonalties amongst the serial and successful innovators. We also wanted to explore if any of these commonalities are distinct to serial innovators and hence we constructed a second set of people who had hardly participated in the innovation awards programme. This second set was comparable to the first set in terms of age, job profile and gender. We approached seventy-five such people to fill the same survey, out of which fifty-six people responded.

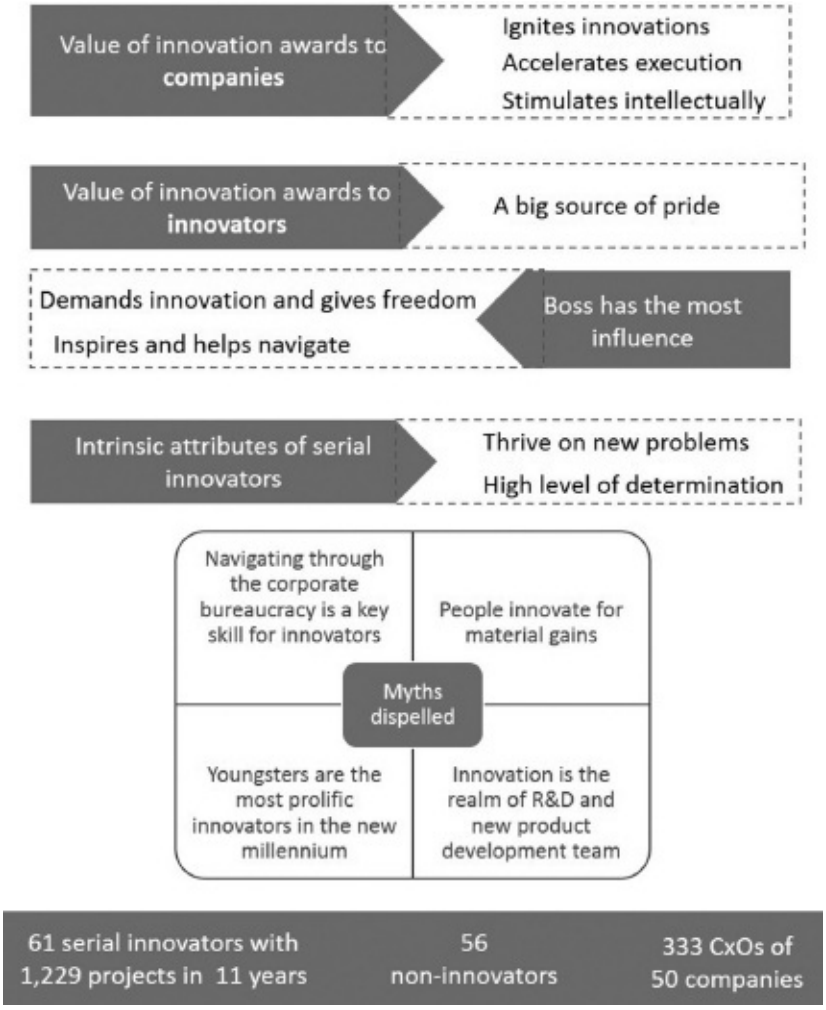


Figure 6.3: Summary of findings

The last set of people we studied to complete our research were CxOs (including those reporting to them), to whom we reached out, to understand their perceptions about the programme and their people who participated in Tata InnoVista. This was achieved through another survey in which 333 people participated.

THE FINDINGS

The insights derived from triangulation of data and information received from the above three sources, have been summarized in the following four sections (Figure 6.3):

1. Myths dispelled

2. Intrinsic attributes that make people serial innovators
3. External factors that make people serial innovators
4. Value of innovation awards – to innovators and their companies

Myths Dispelled

Youngsters are the Most Prolific Innovators in the New Millennium

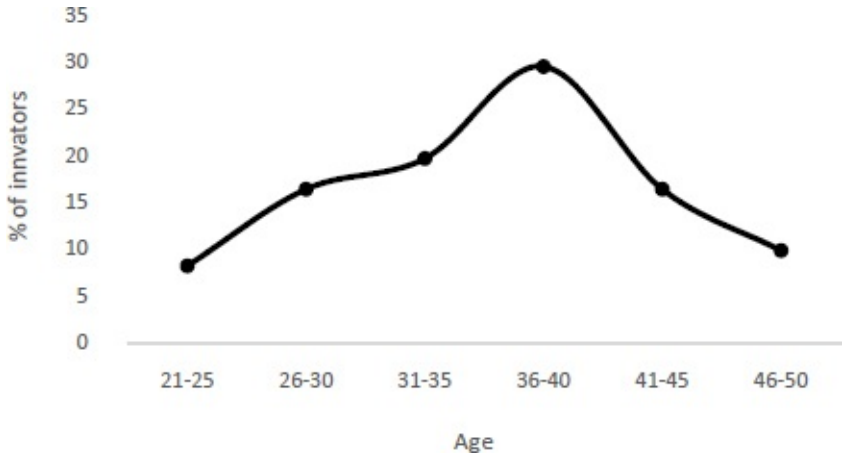


Figure 6.4: Age of serial innovators when they started

With start ups and their founders grabbing a large chunk of mindshare in the new millennium, there has been a growing view that youngsters have an edge when it comes to innovating. Figure 6.4 shows the distribution of serial innovators by their age. The age considered for this figure is the age at which the serial innovator recorded the first innovation. The observation period for this research started in 2008. People who were older than fifty-one years in 2008 would have retired when we began this research and hence they did not show up at all in this figure.

It is apparent from the figure that a fresh graduate with almost no experience at one end and a person with almost thirty years' experience at the other end started their journey as serial innovators. The figure also indicates that about half the serial innovators were in the range of 31–40 when they began their journey of becoming serial innovators. To sum up, the figure conveys that there is no right age for someone to begin the journey of a serial innovator, but the most favourable age appeared to be in between thirty-one and forty years. Don't miss it!

Ashutosh Kumar, head, Continuous Casting, LD#1, Tata Steel, was only

thirty-seven years old (in 2017) and had already won the award in 2013. When we asked the reason for him being a prolific innovator, he was modest enough to attribute it to his luck and the opportunities that came his way. This answer was very typical of young people like him who were known to be good team players and excellent implementers of innovation projects. His regular involvement with innovation projects increased his confidence and encouraged him to be more audacious and determined. In 2015, Ashutosh was a member of the team that missed the award for their innovation that reused the waste generated during the steel production. However, later when he became the head of another plant, he started to pursue the idea again.

Joe Amirtharaj, senior manager, Maintenance (Module and Assembly) in Titan (also thirty-seven-years-old in 2017), was an equally prolific innovator in the manufacturing environment of Titan. He too started as a team member in innovation projects and reached the final stages twice, in 2006 and 2017. His response was very simple, 'I give out-of-the-box ideas and, most importantly, I put my heart and soul into the project, which is critical for doing something that is off-track.'

Contrast this with V. Hariharan, assistant general manager, Material Engineering, ERC, Tata Motors, who would be above sixty years old by the time this book will be published. Hariharan felt that he was an expert in identifying opportunities and had a very high level of perseverance for pursuing the ideas. Even in today's digital age, he used to keep a pocket diary all the time and, on several occasions, had woken up in the night to write down ideas that occurred to him. He fondly remembered the work he and his team had done to improve the performance of exhaust systems of cars. Instead of coating nano-particles of platinum directly, the team deposited them on the top of nano-particles of another material. This resulted in improved performance of the exhaust system and saved substantial cost. When asked about his contribution, he said, 'My contribution was only in asking one question repeatedly, "How can the wetting angle be increased to avoid agglomeration of particles?" We went from one person to another, including engine experts from Tata Motors and experts on exhaust systems in the US.'

Gurmit Singh, chief, LD#1, Tata Steel, who would be fifty-nine years old in

2018, was very unlike Hariharan. He played an interesting role – similar to that of an angel investor while heading one of the divisions of Tata Steel. In the last nine years, he had been part of innovation teams on twenty-three occasions and had reached the finals of InnoVista five times. He believed that if people start criticizing an idea, it was likely that the idea and the associated opportunity was good.

This was an interesting view and we probed him for an example. He explained, 'Quick Start was such an idea and everyone said it was not possible and that the Sardar (the common parlance for a Sikh, which Gurmit is) has gone crazy! I pursued the idea and cajoled my team to try it out.' We spoke to a few of his subordinates and learnt that once he backed the idea, they did not have to worry about the failures, as long as he was informed of the experiments being conducted.

Like an angel investor, who is interested in the success of the venture, Gurmit too remained focused on success and encouraged a lot of collaboration with external teams. He felt the source of excitement at his age was only in discussing new ideas and backing them up. He coaxed his people to identify projects and then helped them remove the roadblocks and maintain the pressure to pursue the idea. On asking how formal the review process for the innovation projects was, he said, 'I know all the projects in my department but the review is informal. Formal reviews of innovation projects kill the creative elements of the project.'

Innovation is the Realm of R&D and New Product Development Team

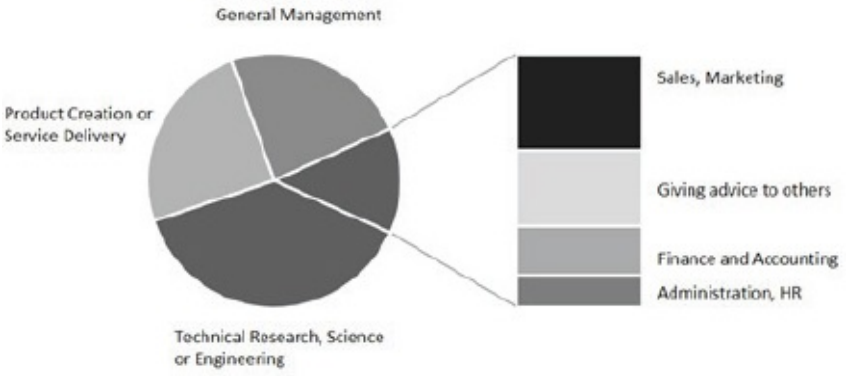


Figure 6.5: Distribution of serial innovators into their functions (job roles)

We were surprised to find serial innovators from functions that are not considered to get enough opportunities for innovation. Amol Khanapurkar, chief technology officer, HR, TCS, who was just thirty-nine years, felt that the innovations he did in making HR programmes intelligent at TCS earned him the role of CTO, HR. He proudly talked about CodeVita for which he was the chief architect. CodeVita is a unique platform that supported India in becoming a competent country in software programming. CodeVita entered the *Limca Book of Records* in 2015 as the largest team programming competition in India (it is explained in detail in the TCS case study in Chapter 7). Amol's determination to solve tough problems that people tossed at him came from his ability to get into the shoes of the customer to understand the problem and its repercussions.

He won the award once, but it was not for CodeVita. It was for automatic grading (evaluation and scoring) of the software programs submitted by fresh employees during their induction programme in TCS. The manual process that took a few days to grade and identify weak areas of every student could be completed in a few minutes because of this innovation, thereby shortening the waiting time for trainees and evaluation time for trainers.

Amol said, 'There was a lot of starting trouble because I went with a preconceived solution; but once the problem was debated and clarified, we solved it. Our solution resulted in a few million dollars' worth of savings every year.' Going down memory lane and explaining the genesis of the CodeVita project, he said, 'Sudeep (K. Sudeep, head, Talent Acquisition, India) told me that he wanted to increase the engagement with college students. To this problem, I responded that coding could be a good model to engage. Sudeep latched on to this idea and it gave birth to CodeVita.'

We asked him the reason Sudeep threw this challenge at him when there were thousands of others like him in TCS. Amol thought that Sudeep had been grappling with this challenge in those days and perhaps would have tossed the problem at several people. Since Amol had worked intensively in the project that identified the best coders amongst the TCS employees, he provided a direction to Sudeep. Insight: people should toss the problem at several people – related and unrelated to the problem.

S.D. Katariya, general manager, Capex Purchase, Tata Motors, had spent

more than thirty years in the purchasing function. The secret of his ability to innovate was the combination of his being an idea factory and his ability to assertively challenge others who may not necessarily be from his function. Explaining his pragmatic approach, he said, 'I give up on my ideas in 30 per cent of the cases as it enables me to win the argument in the remaining 70 per cent cases.'

N. Chandrasekaran, the erstwhile CEO of TCS, is a strong proponent of innovation and used InnoVista as a driver for spreading it outside the corporate R&D function, involving junior and senior associates. So focused was the push that within a short time it led to every business unit creating its own innovation offices (called Research and Innovation). Elaborating on this, K. Ananth Krishnan, executive vice-president and chief technical officer, TCS, said, 'Winners in the early years of InnoVista used to come exclusively from the Corporate R&D unit. In the last few years, we have taken the InnoVista rigour across the organization to the functional and business units. The participation has become more democratic and we see people in a wide variety of roles winning the award.'

People Innovate for Material Gains

None of the serial innovators we studied (except one who felt that innovation helped him in getting better performance appraisal score) identified material or financial gain as one of the drivers for them to innovate. Instead, they identified the following reasons that drove them to innovate.

i. Emotional satisfaction: Innovators used phrases such as 'Joy of creation', 'The lure of the possibility of success is highly addictive', 'The joy to see the returns/benefits', 'Joy of contributing to a social cause and making a difference in the world'.
ii. Intellectual satisfaction: 'The joy of exploring the frontier of new knowledge' and 'Joy of solving problems' were a few expressions used by our serial innovators.

Anindya Sarkar, principal technologist, Automation Division, Tata Steel, also a winner of InnoVista, loved to work on the front end of innovation –

idea to prototype – which was the source of his motivation. Have you heard of someone using sound to measure temperature although we all have learnt in school that the speed of sound changes with temperature? Or using techniques such as endoscopy to look through the Blast furnace that could have a temperature between 400 and 800 degrees Celsius? He felt most functions and organizational processes in a company are mechanical and predictable, which he found uninteresting – just the opposite of most managers who hate uncertainty. He said, 'People remember me if they are stuck and if I am able to solve the problem, it gives me immense joy.'

Sanjay Kimbahune, senior scientist, Embedded Systems and Robotics, Research and Innovation, TCS, said, 'I get a kick by solving social problems.' Explaining one such innovation that he mentored at the Digital Impact Square (DISQ) of TCS he said, 'While discussing with local administration and doctors, maternal mortality was identified as a big challenge. We picked the brains of a few gynaecologists on how they decide if the mother is at high risk.' A mobile application loaded with an algorithm was given to the auxiliary nurse midwives (ANMs), a village-level female health worker in India, who are the first contact persons between the community and the health services. They scanned more than 5,000 expectant mothers in Nashik district as a pilot project. High-risk women identified by the scan were referred to the doctor for prevention and care. During the nine-month period of trial in 2016, no maternal death was reported.

David Coleman, senior manager, Body, CAE, JLR, had a very inspiring story to tell us, 'Kevin Stride and I were only LL6 (first grade in management) in 1996 when we persuaded our company to try for an intelligent airbag system in the Jaguar XK car. Our company had been planning a more conservative facelift of the conventional airbag system, but the management accepted our challenge. I led this project from fundamental research with universities all the way to production of the car. It was right on the cutting edge and shocked the world beyond us that we did it. It led the way for us to deliver the world's first car to meet the new upgraded Motor Safety Standard ahead of Volvo, Mercedes and Toyota. Little old Jaguar beat them all because we dared to try – it remains my proudest moment.'

David was referring to the world's most advanced restraint system that

used the world's first occupant classification sensor (OCS) combined with an ultrasonic spatial array system, the output of which was analysed by the first-ever application of a neural network (machine-learning algorithms). This system differentiated between an empty seat, a child seat, a young child, and the position of an adult passenger to decide if it was appropriate or not to activate the passenger airbag.

Speaking about emotional satisfaction, Suman Biswas, chief, LP Planning, Tata Steel, said, 'If we can show that we can think different and others react to it by saying that it is a good idea but ... and after successful trials when the same people start gradually believing – this gives me joy.' Talking about his supply chain project that improved the availability of steel in various parts of the country, he said, 'Everyone felt that the cost will increase due to multiple handling of steel. We implemented the idea and within three months availability of stocks improved, resulting in better sales and higher premium for our products.'

Navigating Through the Corporate Bureaucracy Is a Key Skill for Innovators

It has been well researched that there are a variety of forces that work against the innovators. We, therefore, believe that the most important skill for a serial innovator is the ability to successfully navigate through the organizational bureaucracy. Surprisingly, only 3 per cent of the serial innovators felt that they had these skills.

The question then was: 'If serial innovators felt that they were not experts in navigating, who helped them with this challenge?' The study indicated that they looked up to their managers (boss) for this help. We will discuss this later in the chapter.

Intrinsic Attributes that Make People Serial Innovators

Our research uncovered a few distinct behavioural patterns, intrinsic to serial innovators. These are discussed below:

Innovators Thrive on New Problems – They Do Not Hesitate to Apply Creativity to Solve Them

All managers love problems but only those they have been trained to solve. New problems are unpopular amongst most managers because they do not like failures and prefer to be seen as a 'reliable manager'.

Dr Harrick Vin, then vice-president, TCS, learnt from Prof. Edsger Dijkstra, a Turing Award winner, the difference between a good and great scientist. He said, 'It is not in their abilities to solve a problem, but their abilities to select the problems to solve.'

Harrick believed that innovators should solve those problems that are likely to get aggravated over time. He learnt this from one of his innovations that enabled transfer of video files over low-bandwidth network. Over a period, the bandwidth became abundant, making his innovation redundant. He believed that in this digital world, innovators should solve the problem of harnessing abundance, not managing constraints.

Ability to observe people, spot the problem and visualize it was another strength of serial innovators. Sanjay told us, 'I find it easier to spot problems and give it a grand vision. My team helps me solve the problems, and in this process, we have filed forty patents out of which nine have been granted.' The project mKRISHI, in which he was a key member, had touched more than a million farmers by 2017. Talking about the project, he said, 'I built the platform ground up, deployed it in the field, and made sure that it touches the lives of farmers in positive ways. We got many awards but the most important reward was when one farmer called saying that it was his last call and he wanted to die. People on ground immediately connected with him, solved his issue, and saved his life.' Sanjay felt that most ideators or innovators were not able to give a grand vision to the challenge and this was an important aspect where senior leaders could provide support.

Successful innovators have a deep passion to *objectively extract the root cause before jumping to a solution*. Suman Biswas of Tata Steel knew that the problem of high cost of producing super-ductile steel was due to the expensive alloying materials used in manufacturing. Experts felt that the use of alloying elements was necessary to provide the required strength to steel. Suman and team analysed the problem in depth and believed that redesigning the process of making the final product (rebars) would give it the necessary strength even in the absence of expensive alloying elements. The

team did a quiet trial and produced super-ductile rebars but sold them as normal rebars to avoid the formal approval process. There was no loss to anyone from this experiment as the customer received better rebars at the cost of normal rebars. The team continued with the experiments for another month and established the consistency of the product. 'After a month,' said Suman, 'we presented it in the leadership meeting. Everyone immediately knew that this would save a few million dollars.'

Creativity was found to be a strength amongst the innovators. Forty per cent of the innovators felt that they were different from the others by virtue of their creativity. We further probed them on five types of creativity to identify the ones that were more useful in their role of being innovators:

- Scientific creativity (e.g., chemistry, life sciences, physics)
- Social creativity (e.g., solving personal problems, interacting with friends and family, managing people)
- Visual artistic creativity (e.g., crafts, interior design, fashion)
- Verbal artistic creativity (e.g., writing fiction, non-fiction, poetry)
- Sports creativity (e.g., sports performance, sports strategy)

The serial innovators felt that their scientific creativity was stronger than their creativity in verbal artistic and sports. On scientific creativity, serial innovators rated themselves twice as strong as compared to non-innovators.

One counter-intuitive finding from our research was the affinity of serial innovators for social creativity. Now that we know this, the reasoning is simple: Innovation projects need a high level of collaboration across the functions and with external entities. Ashutosh and Joe also emphasized about their strength of being excellent team players, which, in other words, suggests their strength in social creativity.

Innovators have High Levels of Obsession, Determination and Perseverance

In the previous chapter, we learnt that impactful innovative ideas have longer gestation periods. Such ideas are complex and require active involvement of multiple agencies over a longer period of time to successfully complete the implementation. A high level of determination is needed to execute an

outlandish idea. V. Hariharan of Tata Motors said, 'I have a mad obsession to take ahead the ideas, despite many roadblocks.' He felt that this obsession was necessary because for every supporter for an out-of-the-box idea there were ten adversaries.

After much persuasion, Hariharan was successful in convincing his colleagues to use an expensive grade of steel that saved processing time in the factory. He proudly said, 'Now this steel and method are being used in most light and medium commercial vehicles.' For an innovation that won him an award in 2009, the patent was granted only in 2017.

P.K. Pandey, head, Steel Making, LD#1, Tata Steel, shared an interesting story, 'In 2000, I was a foreman in one of the steel plants. In one of the night shifts, when I was responsible for the plant, I tried a very bold experiment of 'flying tundish' that could have substantially increased the productivity of the plant. This was never done in any steel plant that produces billets. The experiment failed.'

Cherishing his memory of 2010, he further said, 'Even after ten years, the failed experiment was bugging me. One day, in the evening when the plant was underperforming, I offered to make one more attempt to solve the same problem and increase productivity. An accidental meeting with my boss's boss on my way back home excited us so much that I carried out the experiment late evening on that day itself. It was successful and was done for the first time in the world. It took us to the InnoVista finals.'

V. Nellaiyappan, group manager, Titan, also had an interesting story on how 'passion to experiment' can help flourish innovation. Recalling a night shift in 1999, when he was solely responsible for the shift, he said, 'Suddenly an idea struck me to modify the design of the internal machinery of the wristwatch. I sat the whole night and designed it completely. My boss was not keen on this idea as he wanted me to focus on something else. I tried hard to get a prototype manufactured to convince my seniors. I showed the design to my colleagues, who all liked the idea. The news about my idea and my attempts to get a prototype spread for a month until one fine day, the head of manufacturing called me. He too liked the idea and within two days the prototype was made and shown to the managing director. The result was an innovation (calibre 5,000 hybrid movement) that has not only saved

several million dollars for Titan until now but also doubled the capacity of the plant.' He vividly remembers, 'The senior members of manufacturing with over thirty-five years of experience appreciated wholeheartedly with tears in their eyes.'

David Coleman of JLR, who led or mentored the teams from his department to reach the finals five times out of which they won twice, said, 'I never give up. I am still pushing for some innovations for over a decade.'

In their book, *Great by Choice*, Jim Collins and Morten T. Hansen found that 'Empirical Creativity' is one of the factors that make a company great. By empirical, the authors meant 'relying upon direct observations', by conducting practical experiments, and engaging directly with evidence rather than relying upon opinions, whims and conventional wisdom. David exhibited this trait when he added, 'My learning style is theoretical pragmatist. Theory always comes first and if it's theoretically possible, then no matter how challenging, it inspires me.' He believed that determination could be singled out as a key attribute because if one sees pioneers through the prism of history, they were almost never welcomed at the time when they were pioneering; they were usually feared, mocked or reviled and sadly that remains true even today.

External Factors that Make People Serial Innovators

We asked every serial innovator to imagine that they had been moved to another company with an expectation that they would continue to innovate. Most innovators were delighted to hear of such an opportunity as they believed that the new place would be easier to find unsolved problems. We also asked about the factors and conditions that would enable them to innovate in the new place. The response revealed that the role of people around the innovators at the workplace had the most influence. The influence of people during the upbringing of innovators from an early childhood to adulthood didn't come out as important. The role of school, friends, college and parents was also much lower on their being a serial innovator (Figure 6.6). Within the workplace, the influence of superiors was indicated as most significant by innovators, followed by that of subordinates.

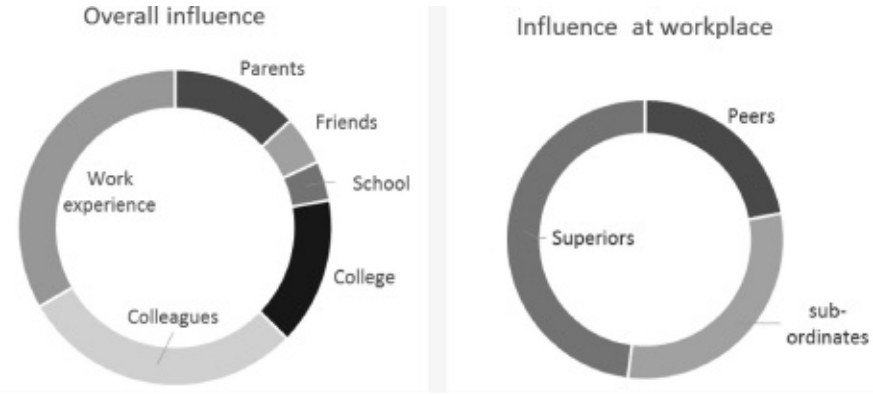


Figure 6.6: Factors that influence serial innovators

Innovators Prefer Managers (Bosses) Who Demand Innovation and Give Freedom to Experiment

Innovation needs people to experiment; many of these experiments fail. Innovators hate being shackled or prevented from doing experiments. They need confidence that they would not get penalized for failed experiments. Their managers give this assurance only if they believe and accept that they have problems and challenges which need to be solved and can be solved only if their people are ready to experiment.

Rajiv Kulkarni, head, Engineering, Tata Toyo Radiators, credited a lot of his success in innovation to Ravi Chidambar, the founding member and now the CEO of Tata Toyo Radiators. He said, 'Ravi influenced me the most and always drove me to do something new. He kept pushing the limits and never allowed me to be complacent by providing ready-made solutions available in the market. He also gives full freedom and budget to experiment.'

Rajiv narrated an interesting example, 'The deaerating tank that holds cooling fluid was made of metal and used to leak after a few years. Truck drivers, fleet owners and mechanics had learnt to live with the problem by welding the leaking tanks. We introduced a plastic tank that reduced the weight and became popular in the market. It worked well for several thousand kilometres, but then it too started leaking from the weld joint. Unlike metal tanks, plastic tanks couldn't be repaired. Ravi pushed us and asked us to make a plastic tank that did not have a welding joint! It was impossible to think at that time and no one took it seriously. He kept pushing and after a lot persuasion we carried out several experiments

involving new materials. Finally, we were able to make the first ever plastic tank for the cooling fluid with no joints. There have been zero failures in the last five years and we now sell it to several automotive companies.'

Subhashis Kundu Subhashis, head, Operations, H Blast Furnace, Tata Steel, spoke excitedly about his boss Uttam Singh. He said, 'We were operating our blast furnaces at a very high coke rate of more than 400 kg per tonne. With two years of experiments, we reduced the coke rate by more than 100 kg per tonne. This had a substantial impact on our bottom line. Uttam himself conducted two workshops to generate ideas and encouraged us to carry out experiments. He is not the one, like many others, who would ask the ideator to execute his idea. He will find the best person to execute good ideas.'

Conducting experiments in blast furnaces is considered extremely risky, so we asked Subhashis about it. He explained, 'If we fail, Uttam takes the full blame. There have been a few cases when he stood on the firing line for our failure.' Uttam included 'New Projects' in the Key Result Areas (KRAs) for all his people, for which individuals were supposed to take on projects and do new things round the year to achieve that goal. Subhashis clarified further, 'Every week in the Tuesday meeting, Uttam would encourage everyone to share the new things that were done in the previous week. Those who hadn't tried anything new for a few weeks were considered *not-so-good guys*!'

David fondly remembered his manager Rob Lloyd who later became the director of Body Engineering for JLR: 'I was a passionate innovator but he provided backup and support whenever I needed and was an effective influencer when it was required to gain support or resources. For example, I took on a challenge to deliver the world's first single motor Reach and Rake adjustable power steering column.' He further said, 'It was a radically different design but was one-third lighter, one-third stiffer and almost half the price of the then Ford-manufactured column. To do this, we had to "de-source" a Ford-made part. We had to justify that to Bob Widmer, Ford's executive director, and the powerful United Automobile Workers (the UAW). Rob backed me all the way. We delivered the column which featured a remote steering column lock. It was the world's first column lock to survive the insurance industry's two-minute attack test – most survive for about

twelve seconds – and it won the Global Ford CDQA (Customer Driven Quality Award). This column went on to be fitted on all our large cars and can still be found today in our F-Type.'

Monojit Dutta, chief researcher, Surface Engineering, Tata Steel, told us about a system that enabled them to innovate, 'All of us in R&D are allowed to spend 20 per cent of our time on any idea of our choice in any area related to the company. We have an innovation council that nurtures the idea in the first few months. If it meets the expectations and appears promising, it becomes a regular project.'

Another division of Tata Steel seemed to have emulated this in a slightly different manner. Anindya Sarkar of Tata Steel told us, 'We have Rs 50 lakh every year to explore new ideas. I have used this fund several times. I have not always been successful in my exploration, which is acceptable to my managers.'

A very interesting difference between serial innovators and non-innovators was the high inclination of serial innovators to rely on their boss as a source of support or inspiration.

An innovator prefers a boss who is an Inspiration, a Navigator and Adviser

Asim Mukherjee, head, Raw Material Research, Tata Steel, who as a team leader won the award in 2010 for the path-breaking innovation project on how to handle the iron ore slime in an environment-friendly and commercially better manner. He talked highly about M.C. Thomas, who was the head of iron ore mines when this project was undertaken. Asim said, 'Thomas evaluated all the solutions in great detail. He arranged discussions in relevant committees, which helped in selecting and prioritizing a diverse set of ideas. He then quickly created an engineering team and kept the momentum high.'

Chintamani Chitnis, head, Consumer Engineering and Network Planning, Tata Power, was very proud of his innovation of designing a compact substation which was the need of the hour in a city like Mumbai where real estate was always a constraint. Remembering R. Pillai, chief, Corporate Operations Management, Transmission and Distribution, he explained that unless the immediate boss was supportive, innovation could not thrive. We

asked, ‘Can the boss’s boss intervene?’ He responded, ‘Yes he can, provided he is engaged with the team very closely, which is very rare and not considered to be a good management style.’

V. Nellaiyappan of Titan had a story that went back to 1999, when he had completed a mere three years in Titan. He designed a world-time watch, which also resulted in the first patent for Titan. He showed the design to his boss J. Shivaswamy, who liked the design and immediately arranged a meeting with Xerxes Desai, then managing director of Titan, for the very next day and asked Nellaiyappan to go alone for the meeting. Desai heard him, looked at the design keenly and liked it very much. Eighteen years have passed and Nellaiyappan still gets emotional about the inspiration that Shivaswamy had provided.

T.V. Narendran, summarized this point, ‘There are individuals at Tata Steel who have presented their cases multiple times at Tata InnoVista and even won multiple awards. Typically, they are also high performers in the organization. The basic premise, however, remains that the departments they operate in provide them the opportunity and atmosphere to engage on such projects.’

When it comes to innovation, boss–subordinate hunt in pairs

The analysis of serial innovators showed that there were several boss–subordinate pairs who innovated regularly. There were a few serial innovators who had a common boss, who challenged them, gave freedom, and inspired them to innovate. In some cases, a *serial innovator was himself a boss who drove innovation with the support of his subordinates.*

T. Vijayakumar, group manager, Titan, who, after spending more than seventeen years with the watch division, was transferred to the jewellery division of Titan. He felt he got transformed completely in the new division only because of his boss, L.R. Natarajan (LRN). He said, ‘LRN always challenged the obvious. He used to give challenging jobs, which could not be carried out in normal ways but gave us the freedom to experiment without being prescriptive. He supported us by programmes such as Innovation School of Management, where we learnt new tools to identify challenges and generate ideas.’

Differentiating between bosses who seek innovation and bosses who drive improvement, Vijayakumar made a very insightful comment, 'Bosses who "encourage" their people get improvements but the bosses who "inspire and enable" their people get innovations.' Vijayakumar was very proud of the project that converted the standard handmade process of producing filigree items into a casting process that saved cost and improved productivity multiple times. Another serial innovator, M. Maarajan of Titan, described LRN as a person who 'drove innovation projects by encouraging the people to fail fast, learn fast, and succeed.'

One pair of boss–subordinate, where both appeared in our list of serial innovators, was P.K. Pandey and his boss, Gurmit Singh. Pandey told us, 'Gurmit is always willing to take risk and gives full freedom. In fact, if he gets to know that I have an idea, he will listen to it and if he is convinced that I can execute it, he would chase me to try it out quickly.' Gurmit was also the boss of Ashutosh Kumar, the young serial innovator we discussed earlier. Ashutosh felt that he had been lucky to have bosses who allowed him to experiment. He particularly singled out Gurmit Singh, about whom he said, 'He has been instrumental in promoting out-of-the-box thinking, always looking for unconventional solutions. He allows all types of experiments and doesn't spend time on discussing mistakes but invests time on finding out how to avoid such mistakes in future.'

Joe Amirtharaj of Titan won the Tata InnoVista finals in 2017 under the mentorship of his boss, K. Seenivasan (Seeni). Joe felt that Seeni's contribution was immense, 'Seeni always puts positive pressure and inspires one to work on challenging assignments. He plans newer things and keeps us on our toes.' We were intrigued by the *positive pressure* phrase he used. He elaborated, 'He puts pressure to do things that are aligned to the organizational needs and not for the sake of keeping people busy which many other bosses do.' Remembering the InnoVista finals of 2006 in which the team comprising Seeni, Joe and others presented the in-house-manufactured PLC (an electronic box that is used to control machines), Joe said, 'Seeni is a mechanical engineer, but he got the best out of us by giving us a free hand to try new ideas and clearly exhibiting tolerance for honest mistakes.'

Seeni had something special in him, said another serial innovator, Jayakumar Angappan, Senior Manager, Titan, who had participated in InnoVista for eight years. Jayakumar was proud of his innovation that trebled the productivity of machines, surprising even the Swiss manufacturers. He spoke about the major contribution of Seeni, 'He consistently gives well-thought-out stretch goals and challenges that emerge from his knowledge about the organization.' We threw a relatively difficult question at Jayakumar, 'If a new boss comes who doesn't throw challenges and doesn't support his people, will you feel suffocated and what would you do?' He had an interesting answer, 'With so many years, everyone in Titan now knows how to identify challenges and make progress. In such a situation, if the new boss doesn't change himself, it will be he who will feel suffocated!'

Another example of S.D. Katariya (from Tata Motors) clearly showed that he was a prolific innovator between the years 2009 and 2012, during which he accomplished more than 85 per cent of his innovations. Explaining the reason, he said, 'I had a like-minded person in my team in this period and we together used to challenge and fight for our ideas. That person left the company in 2013.' This example reinforced the importance of boss–subordinate pair in thinking, planning and implementing innovations.

We Know What Makes People Innovate, But Why Do They Participate in Innovation Awards?

The above discussions explained the intrinsic attributes and external circumstances that influence a person to emerge as a serial innovator. We were now left behind with the second part of the question that we had raised at the beginning of this chapter: 'Why do innovators participate in InnoVista?'

In our survey of CxOs and those who directly report to them, we asked them about the workplace performance of people who participated in Tata InnoVista. The analysis indicated that 87 per cent of the participants were high performers who had received a rating of above average or much above average in their performance appraisals. The CxOs felt that almost half the participants were in the rising phase of their career trajectory at the time of participation. This indicated the popularity or attractiveness of the programme in the minds of high-performing employees. This information

sharpened our research question, 'Why do innovators or high performing employees bother to participate in InnoVista?'

InnoVista is a Big Source of Pride

Sanjay Kimbahune of TCS told us, 'I was the winner in 2012 and received an award from Ratan Tata. The picture with him is a source of positivity and energy whenever I come across a difficult issue in my project.' P. K. Pandey, a two-time finalist in InnoVista, also shared a similar emotion, 'Employees work on the innovation projects as they aspire to get selected for the InnoVista finals. Winning the award is an experience that one never forgets. In fact, not only we, our bosses also take pride when they see their people in the finals.'

Sumeet Agrawal, project manager of the Access Infinity project that was one of the winners in 2017, said, 'Anyone who enters the global finals should think of himself/herself as a winner. Once we win, the kind of recognition we get within our company, amongst peers and on internal social network is so great that it gives a feeling of getting compensated far more than any financial reward.'

N. Chandrasekharan, the then CEO of TCS, was involved intensely with Tata InnoVista. Not only did he receive a briefing on the progress of his teams in InnoVista, he also used to personally interact with the finalists. Ananth, on behalf of TCS said, 'It [InnoVista] is a great platform to catalyse people for innovation. Reaching an InnoVista final, being in the Taj ballroom, presenting to the Tata leadership and being awarded by the chairman has all the glamour of making it to the Oscars.'

David of JLR said, 'In my role of leading the Body CAE team, InnoVista has played a key role in raising the profile of our group. Our team previously was perceived as a "back-office" team. As a consequence of reaching many InnoVista finals, Dr Speth (CEO) now knows me and the team I lead.'

While the above views are of the innovators, we also checked with CxOs the reasons for their people participating in Tata InnoVista. The top-ranked reason given by more than 300 CxOs (including those reporting to them) was: 'To get recognition at the company and Tata group level'. The lowest-ranked reason was, 'To improve their performance rating'. It was surprising

to note that making progress in the InnoVista did not guarantee people a better performance appraisal. Only 21 per cent of those surveyed felt that the performance rating of employees got positively influenced if the employee did well in Tata InnoVista. The survey also indicated that the winners of Tata InnoVista were not made celebrities but were looked up to by their peers and colleagues for advice as they served as mentors and coaches for other teams.

What do Companies Gain by a Programme Like Tata InnoVista?

While the motivation and inspiration provided by InnoVista to innovators was evident, we were equally keen to know the reasons for its attractiveness to senior leaders of companies, who approved the participation of their people in large numbers. The answers could be bunched under three heads.

InnoVista ignites more innovations: It drives people to find more problems and projects

Highlighting the role of InnoVista in igniting people, Pandey said, 'There isn't any equivalent of InnoVista in our company and hence we anxiously wait for it. It creates a very healthy competition to identify more problems, solving which could lead to innovations. Every year, beyond my stipulated task, I take personal target on a particular pain area and think of a solution which has never been tried. Even the new recruits in our plant look for guidance on selecting the problem to work that will be fit for InnoVista.'

Rajiv Kulkarni said, 'There are some people like me who naturally pursue new ideas, but InnoVista has ignited several other team members also to identify out-of-the-box ideas that could be useful to the company. In fact, people have now accepted this item to be one of the measures in the balanced scorecard!'

K. Ananth Krishnan had this to tell us, 'InnoVista wins are a part of the scorecard. Win or lose, our regional and global finalists always plan what they will field for InnoVista in the future!'

We gauged the perception of CxOs on the role InnoVista has played in influencing their people to actively pursue innovation projects – 60 per cent of the CxOs felt it did play that role.

InnoVista accelerates execution of innovation projects

To nominate their innovations for awards, innovators have to necessarily show the impact for at least six months. This is a minimum qualifying criterion and if a team missed it even by a few weeks or a month, it has to wait for another year to participate.

The pressure to implement innovation projects could be sensed from Pandey who told us, 'There is always a pressure to complete the innovation project quickly, so that we can participate in InnoVista. People in our department stay back for extra hours to implement their projects.'

InnoVista stimulates intellectually

Amol Khanapurkar, the architect of a few breakthrough innovations in HR processes at TCS, said, 'The focus on the end impact from the project has encouraged me to think ahead of starting a new project. This was not the case earlier.'

Ananth said, 'For the younger innovators, multiple rounds of mentorship by senior executives provide learning and visibility. There have been occasions where the product road map changed completely, helping us get better traction with customers.'

Narendran corroborated the intellectual value of InnoVista, 'The way the Tata InnoVista questionnaire is framed itself gives the participants a lot of ideas about what an innovative case should look like. In fact, the process of articulating the projects and answering the questions itself helps to build a thought process amongst the individuals as to how they can work differently on a problem and expand their horizon to give breakthrough solutions.'

♦ 7 ♦

CASE STUDIES

'As innovators we do not stop and give-up at hurdles. We overcome them and whenever we fall, we stand up again. I want you all to be the ambassadors for this mindset of seeding the innovation and going that extra step – not just talking about it but actually doing it.'

Dr Ralf Speth
CEO, Jaguar Land Rover
at JLR InnoVista
9 February 2018

In this chapter we have four cases that highlight various nuances of innovation and how the InnoVista programme deals with them. These behavioural aspects could be: Innovations need to be done in all areas of business (the Tata Steel case); innovation could contribute to a turnaround in the business (the Tanishq case); innovations should be measured using non-financial parameters too (the JLR case); multiple smaller innovations together could be disruptive and a source of competitive advantage (the TCS case). Each of these cases have been picked carefully to drive home the points that were discussed in earlier chapters.

The TISCON case of Tata Steel highlights the point that for a product to be successful, innovations need to be done in all areas, namely product, supply chain, customer service, sales, information technology and human resources. The innovations covered in this case exhibit the importance of using the iceberg chart (Figure 4.2) not only at an organizational level but also at a brand (TISCON) level.

The JLR case explains the use of digital technologies to deliver high-impact innovations, not only in products but also in the process of manufacturing

and selling cars. The case proves that economic returns should not be the only way to measure the outcomes of innovation. The case also highlights that as a company matures in its innovation journey, it gains confidence and starts solving well-known problems in new-found ways and also learns to unearth and solve latent problems of customers.

The jewellery business case of Titan (TANISHQ) gives a strong message that embracing innovation during tough times and driving it rigorously could be transformational. It also highlights the importance of process and the role of leadership in infusing self-confidence among people to take up riskier projects during difficult times.

The TCS case focuses on 'People' and proves that innovations in areas that are not considered amenable for innovation could be equally disruptive and a big source of differentiation. The innovative processes developed by TCS around people over the last several years serve as one of the strong sources of competitive advantage today.

WHAT MAKES TATA TISCON A PREMIUM PRODUCT?

'Conceptualizing something that has not been done and making it happen gives a great feeling!'

Suman Biswas
Chief, Long Products Planning, Tata Steel

Innovation is most apparent to us in products, especially consumer products that touch our daily lives. Of the several steel products from Tata Steel, one used in construction are rebars. Rebars have long been bought as a commodity due to its low affinity with the customer and also because it is difficult to differentiate. This product is visible to a few who belong to the construction industry. The product is consumed during construction within days or weeks and is never visible again to anyone.

Tata Steel realized that there were a few opportunities to differentiate these rebars which would break the shackles as a commodity and allow them to be sold at a premium. This shared vision encouraged its employees from various functions who were connected directly or indirectly with TISCON to

actively pursue innovations, some of which have been covered in this case. At an overall level, the case reinforces the following lessons:

a. The common belief that the product manager alone is responsible for driving innovations in product by adding features to make the product unique and differentiated is misplaced. The case highlights that for a successful product innovation, several or all parts of the organization, namely marketing, sales, process innovation, HR, R&D, technology, supply chain, operations, etc., need to support with innovations at their end.
b. Process innovations carried out by manufacturing, technology, supply chain, marketing and sales not only reduce costs but also increase revenue. This is counter-intuitive as we believe that most of the manufacturing and supply chain innovations would result in cost reduction. In case of TISCON, the increase in revenue happened when the process innovations increased the throughput of the factory or improved the product mix.
c. I have explained in Chapter 3 that uniqueness is a key factor that separates innovations from incremental improvements. This uniqueness in product must be first seen from the eyes of the customer, followed by the perspective of producer. For a 'global first' innovation to be successful, it should be relevant and amenable to the customer.
d. Many innovations explained in this case could be viewed as incremental by readers. However, for the customers of TISCON, these may be unique enough to make them buy happily, either because it would have been better in performance or it might be convenient to buy or consume. Some innovations may be viewed as incremental at the time when they happened but soon they became a springboard for several incremental or breakthrough innovations.
e. Creating a market for an innovation could take months or even years. The reason for this long time could be external factors, for example, customers not finding enough value (e.g., an expensive innovation that would reduce the cheaper labour). This could be addressed by continuously improving the uniqueness of the product or service or the combination of both (for

example, Superlinks, Readybuild explained later in this case).

FROM COMMODITY TO BRANDED PRODUCT

Rebars are steel rods with longitudinal and radial ribs to ensure better contact with cement and concrete. These are either sold in standard length of 12 metres or in coils which the end customer straightens and cuts at the construction site before use.

Rebars are manufactured in steel mills that are capital intensive. The input for these mills is a steel billet, a long rectangular piece of steel. Depending upon the customer requirement, the output, rebar, could have any diameter ranging from 6 mm to as high as 60 mm. The diameter of the rebars can be changed by using a different size of raw material and making adjustments in the mill. Rebars are differentiated by their ability to withstand earthquakes, corrosion resistance properties and reliability of supplies. The market price of these rebars ranges from Rs 30,000 to Rs 55,000 per tonne.

In 2000, a few years after the liberalization of the Indian economy, the TISCON brand was relaunched in the retail segment. By 2017, Tata TISCON had a market share of about 15 per cent and enjoyed a premium of about Rs 12,000 per tonne over the average selling price of rebars in the market. In 2017, 60 per cent of TISCON sales took place through its retail network.

Let us use the iceberg chart (refer to Figure 4.2, Architecture of awards) to discuss various innovations related to TISCON.

Dare to Try

These are valiant attempts to create breakthroughs and are depicted at the bottom in Figure 4.2.

Corrosion-resistant Rebars

Rusting of rebars had been accepted by the industry as inevitable. In 2010, a technology team discovered a method to coat rebars with a micron-thick polymer. This innovation started in a true garage style as the team conducted a few trials in a water tank in a garden and was able to convince the management for a pilot-scale plant. The project was later terminated as Tata

Steel found an alternative method of plasma coating that was more promising and finally became successful (discussed later in this case).

Joining of Rebars

Considering the length of trailers used for transportation, the standard length of rebars in India has been fixed at 12 metres. However, construction companies need rebars that are longer than 12 metres. These companies join rebars at the site either by welding or using wires (lapping). Welding is not desirable because it affects the steel properties adversely at the welded joints. Tying the two rebar ends manually with wires results in non-uniform joints and is considered a poor solution. In 2013, a team started conducting experiments to manufacture threaded rebars that could join the ends of two rebars.

The team attempted to make the ribs of the rebar work like threads. After several refinements, the team could manufacture a few tonnes of threaded rebars and offered it to marketing and sales to explore the potential. This project was later shelved as the market was not ready for this product at the proposed price.

In 2016, another team started a project on couplers that are used to join the rebars. The couplers available at that time in the market were made of a different grade of steel as compared to the steel used in rebars, which made the joint prone to corrosion. Moreover, the external surface of these couplers was smooth, which was not desirable in construction. The team used rebar's grade of steel to make couplers that were not plain externally. The project had to be shelved once again because of not meeting the target price.

A New Service to Design Houses for Customers

In 2011, the concept of design studio was introduced for individual house builders to help them prepare plans of their houses and provide structural design. It also provided them detailed list of material, which was essential to obtain a home loan. The experiment with the design studio started in the city of Dhanbad, which provided the customer with all the drawings, including those which specified the plumbing and electrical connections.

To keep the costs low, the design studio considered thirty-five standard-size plots of land with forty different designs of houses, each with some variants. This didn't work as the customers wanted a lot more customization in the design of their houses (e.g., location of the prayer room). Moreover, the software couldn't handle the varying by-laws of every city, defeating the purpose of creating value through scale.

Piloted Technologies

These projects exemplify the work done by the R&D teams that, in future, would result in product or process innovations. These projects are depicted on the left in Figure 4.2.

Corrosion Resistant Coating

In 2015, an team took on a project to coat rebars with a water-based Polysilane coating in a continuous line with air cooling. This made the rebars corrosion-resistant for four months until they got subsumed in the concrete. The team filed two patents, completed successful trials, and established commercial viability of the project.

Better Earthquake-resistant Rebars at Lower Cost

In 2014, an R&D team successfully created a better-quality earthquake-resistant steel by using micro-alloys and air-cooling the rebars instead of water-cooling during manufacturing. This team further innovated in 2016 along with the manufacturing team and created a new steel chemistry that didn't use expensive micro-alloys but used silicon and manganese that are less expensive.

Implemented Innovations

These innovations are depicted in the form of an iceberg in Figure 4.2. Let us start with the top of the iceberg – the product innovations.

Product Innovations

Innovations in TISCON have been dominantly around the functional

attributes, that provide long-term strength to buildings and bridges.

Corrosion resistant rebars: A global first

Rust on rebars starts forming within two weeks of manufacturing, which influences customers to buy freshly manufactured rebars. In coastal areas, corrosion happens faster due to penetration of salt and chemicals.

In 2007, a cross-functional team from marketing, sales, and technology pushed an idea of using plasma to provide a protective coating and make corrosion-resistant rebars. Unlike the hot dip method, wherein rebars are coated with a thick and non-uniform layer of zinc, the team opined use of plasma to coat a uniform, thin layer of zinc to give rebars a fresh look and position it as a premium product.

In 2009, the team conducted successful lab-scale trials and kept pursuing the idea for several years. In 2015, they successfully coated the rebars with a zinc layer using electro-plasma technology (EPT) at a pilot scale. This project was one of the early cases that used an external technology partner (Open Innovation).

Finally, in 2017, for the first time in the world, corrosion resistant zinc-coated rebars using EPT were commercialized. The 8–10 microns of uniform coating was achieved through a three-step process: plasma cleaning, electrolytic coating and, finally, passivation.

Earthquake-resistant rebars

Control of corrosion in rebars is usually achieved by applying external paints and coatings which do not last long. Making steel inherently resistant to corrosion has been attempted and refined globally for several years. Tata Steel too used to manufacture TISCON CRS which contained a high level of phosphorous to make it corrosion-resistant. Unfortunately, this was less ductile and not fit for earthquake prone areas. The manufacturing and technology team used copper instead, which formed a protective layer to resist corrosion. This new product had high ductility and superior corrosion resistance and was branded as Tata TISCON CRSD. Interestingly, contrary to commonly accepted knowledge, it did not cause any productivity loss;

instead, it provided more flexibility to the plant operations.

Joining of rebars

For a successful product like Tata TISCON, the next logical product extension was to sell couplers and pile cages (pre-constructed structure made of rebars) to make the construction activity efficient. Couplers help save on labour cost and space requirement at the site.

However, couplers were not available to smaller construction companies as they had to be ordered in bulk (a specific minimum quantity). Construction companies used to make these couplers themselves at the site by installing machinery which needed space in an already cramped construction site. Tata Steel started manufacturing couplers of various sizes for all its customers in their 'Readybuild' centres.

For the individual house builder, the steel purchase was typically spread over 10–15 months. The team sensed an opportunity to enrich the product basket for these customers and develop deeper relationship. This is how TISCON Superlinks (stirrups) and TISCON Footer (footing) were launched, which helped in bringing efficiencies and saving costs for the individual house builders.

Service Innovations

Service innovations around TISCON have resulted in creating a differentiation in the experience of buying and using TISCON. These too are depicted at the top of the iceberg (Figure 4.2).

Cut and bend service

Let us take a step back and understand how the rebars are consumed. At the construction site, every customer cuts and bends the rebars as per the building design. This cutting and bending was typically a manual, inefficient and labour-intensive process. As a result, construction projects had to grapple with problems such as high wastage and unavailability of skilled labour leading to inefficiencies. In 2008, Tata Steel became the first Indian company to open a Cut and Bend centre in Bengaluru and offer it as a

chargeable service to the customer.

Cut and Bend centres served almost every customer who needed rebars in various shapes and sizes. Better utilization of steel in these centres reduced the waste and the benefits were shared with the customers. This service made the construction more efficient (less requirement of space) and reliable (less labour problems) for the customer. However, a big change in the mindset was needed for the customers to use this as a paid service, which, like many innovations, was a slow process. The centres initially operated with 20 per cent utilization.

Despite this, Tata Steel continued with experiments at their Cut and Bend centre and their perseverance paid off in a few years. Tata Steel is now operating sixteen such centres under the brand Readybuild. It is the single largest brand in India that provides Cut and Bend services. More than 90 per cent of TISCON rebars that were sold in standard 12-metre length are processed in these centres.

For the first time in India, Readybuild centres operate as a one-stop shop for bar bending, cut to exact shape and size, provide identification tags and guide engineers at construction site to put the material to use. It was important for Tata Steel to have its distributors of TISCON move from just selling rebars to becoming providers of value-added services for institutional buyers. Readybuild centres was a perfect platform to make this shift – all the Readybuild centres are owned by distributors. The team worked on changing the mindset as there was resistance from the site contractors who were engaged in cutting and bending. To make this service reliable and accessible, a call centre was started to register and manage complaints.

Another team developed an in-house software called CuBe that optimized the cutting decisions, thereby reducing wastage from the previous 8–10 per cent to less than 4 per cent. The performance of this software was better than commercially available software at that time.

The bar-bending service in Readybuild centres relied on a non-standard process to prepare the bar-bending schedule. The distributors used local agencies who directly interacted with end customers to prepare the schedule. This created two problems: One, improper use of standard tools caused poor quality of output; and two, it resulted in a loss of opportunity for Tata Steel to

interact with their end customers.

A team came out with a unique idea of offering a centralized service through its associate company mjunction for preparing bar-bending schedule. It also included supporting services such as bar laying and bar mark drawings. This strengthened the positioning of Tata Steel as a complete solution provider for the construction industry and also for individual house builders.

Support Process Innovations

The innovations in support processes are not usually visible to external world and hence are shown just below the water level in the iceberg (Figure 4.3). In 2017, TISCON had built an all-India dealer network of 7,000-plus dealers for reaching out to over 500,000 consumers, who were increasing at a rate of 40,000 every month. Over 45 per cent of TISCON sales happened through exclusive TISCON dealers which was an achievement in a situation where there were more than 1,500 brands of rebars across India. A few innovations related to 'channel management' are still unique to Tata Steel and no other competitor has been able to replicate them.

Marketing and sales

Until 2006, rebars were sold by weight even to the retail customer, creating anxiety in the individual house builder's mind. Consumers were sometimes fobbed off by retailers who would either short-change the customer on weight or give a rebar of higher thickness. Once the consignment, typically weighing hundreds of kilograms, reached the construction site, there was no way for the consumer to check and verify its weight.

In 2006, Tata Steel introduced the system of selling TISCON rebars by numbers instead of by weight giving a big relief to customers. This change was introduced a couple of years after Tata Steel started publishing the rate chart of TISCON, a first in the industry. Until then, the retailers priced the rebars depending on the opportunity sensed by them. An innovative low-cost IT infrastructure, developed in-house by Tata Steel, provided homogeneity in customer experience across the TISCON retail counters. It enabled greater

transparency in pricing to more than two million house builders, thereby ending speculative pricing.

MITR (a vernacular word meaning 'friend'), a loyalty programme, was launched for masons who work at construction site. The programme offered masons long-term association with the brand, accident and life insurance, health check-up and skill development training. Gaining access to this 'limited membership' club had become aspirational amongst the mason community.

Human resources

TISLINK was a unique programme that supported TISCON dealers in their HR processes. Common HR policies for dealers were created by Tata Steel and training programmes were conducted to build capability on key skills needed amongst dealers' employees. Induction programmes to engage and excite the next generation distributors were also launched.

Supply chain and logistics

Distributors and dealers of Tata TISCON spread over 95 per cent districts of India resulted in a complex supply chain network. Average lead time to supply was more than thirty days, with large variations. Given this high and unreliable lead time, customer speculated and ordered very early or cancelled orders at the last minute. This either created starvation-led delays or resulted in excess build-up of inventory at the channel partner or construction site, thereby increasing working capital.

A complete supply chain system was innovatively redesigned by a Tata Steel team in partnership with in-house IT professionals. This reduced the lead time to 7–15 days, the average time required to transport the rebars from central warehouse to the construction site.

Core Process Innovations

These innovations are like backstage artists who are invisible to audience (customers) and therefore are depicted right at the bottom of the iceberg in Figure 4.2.

Avoiding counterfeits

In 2009, TISCON enjoyed a premium of about Rs 6,000 per tonne in the market. To get the same premium, the local steel manufacturers also sold their rebars as Tata TISCON. There was no reliable way for consumers to differentiate the real TISCON bars from others that were not. A Tata Steel team designed and built a machine that modified the manufacturing process to emboss the brand TISCON on the rebars, thus preventing counterfeits. Tata Steel sold these machines to their big competitors also for them to emboss their own brands on their steel and jointly fight against the fake products.

Increasing throughput with product consistency

By 2010, the demand for TISCON rebars had increased. Prompted by its inability to meet the market demand, a manufacturing team made major changes in a non-rebar plant to produce TISCON rebars. The team achieved it without any capital investment, considered to be a commendable feat, given that the capital cost of a new rebar manufacturing plant is very high.

By 2012, the demand for TISCON had increased further. Moreover, the shorter lead time promised to customers required the mill to be extremely flexible in producing various sizes (diameter) of rebars. The mill used to take several hours to change its output from one size to another. A team made several changes in the mill that reduced the changeover time to just about an hour.

To further increase the production, a team conducted several experiments to increase the speed of the mill to produce more rebars. The production process started at a temperature of around 1,000 degrees Celsius and the steel was cooled gradually to 600 degrees by spraying water at different stages of manufacturing to get the required properties of steel. At higher speed, there was not enough time for the steel to cool down, which is necessary for it to acquire the required strength. After conducting experiments in the running mill, the team could find a better combination of water nozzles to extract more heat from the steel and increase the speed of

the mill by 30 per cent.

By 2016, the demand for earthquake-resistant steel had also grown. Due to the constraints of capital expenses required to increase the capacity, Tata Steel produced this steel in the mills owned by their partners. A very counter-intuitive innovation, contrary to prevalent mill design and manufacturing practices, was implemented because of which five times more steel was produced in the mills owned by partners.

Expanding product basket without capital investment

By 2012, the demand for high-rise buildings had increased. These buildings needed rebars of bigger diameter (40 mm), which Tata Steel was unable to manufacture. As customers preferred a single supplier for all their steel requirements, it became imperative for Tata Steel to produce 40 mm rebars also. They had to be manufactured using billets of larger size, which the Tata steel mill was unable to handle. For the first time in the global steel industry, against the advice of several technical experts, engineers from Tata Steel persevered and were able to produce 40 mm rebars using the lower-size raw material.

No company in India used to manufacture the smallest rebars of 6 mm as they were most difficult to manufacture and resulted in poor yields. Tata Steel, in its subsidiary, The Indian Steel & Wire Products (ISWP) successfully started manufacturing 6 mm rebars in 2012 after a joint team made several innovative modifications in the existing mill.

Reducing cost

Earthquake-resistant rebars were manufactured by the industry using expensive raw material (billet) that contained chromium and manganese. The R&D and manufacturing teams of Tata Steel made two breakthrough innovations. One, they devised a new process of manufacturing such rebars without using expensive chromium and manganese. Two, they could manufacture these rebars in the mills owned by partners. This was particularly a unique challenge as most people felt that it would not be possible to produce this special-quality rebars in mills that were old and

lacking automation.

Future innovations in rebar and the rub-off on other products

In 2017, Tata Steel was piloting its GFX Superlinks, a graphene-coated superlinks that would increase its corrosion resistance multiple times. It was also piloting its e-selling marketplace (shop.tatatiscon.co.in) with geo-tagged dealers to generate excitement and engagement in a traditionally low-involvement product category.

The increasing focus on making the consumption of rebars more convenient and enjoyable for the individual house builders sparked a slightly unrelated innovation as detailed below.

Door of the house

Individual house builders give the highest importance to the door from the point of view of security and aesthetics. For many Indians, door is also a source of pride. Customers always had concerns about getting the right quality of wood at a fair price and being dependent on the carpenter. A steel door was considered to be devoid of aesthetics. In 2015, Tata Steel created a door called Pravesh (meaning entry) made of steel with wooden finish. Various options were made available to customers to choose from single or double leaf, type of lock, opening for light, fly screen, and dent and scratch resistance. There was an option to make the door more secure by embedding digital technologies. The concept was later expanded to windows also. Tata TISCON channel has been used to engage the customer early in this process of buying door.

If a similar iceberg chart (as in Figure 4.2) is prepared for future innovations along with the target year and expected impact, it could present an insightful picture of the innovations that are likely to happen. Other than the traditional method of 3 x 3 matrix, this iceberg chart is yet another way of looking at the portfolio of innovations that the company or business unit or a product line would like to invest in. Product managers and marketing heads should also try to predict the likely intensity of innovations in their industry or product line and superimpose their future iceberg (portfolio) chart on it to

determine the relative strength of their innovation portfolio. This exercise could lead to re-prioritizing the innovation projects or identifying new projects to strengthen the portfolio.

DIGITAL INNOVATIONS DELIVERED 'GREAT PRODUCTS FASTER'

> *'In my role of leading Body CAE team, InnoVista has played a key role in raising the profile of our group, which was previously perceived as a "back-office" team.'*
>
> David Coleman,
> Senior Manager Body CAE and Integration,
> Jaguar Land Rover

Patent-backed innovations fuelled by massive investments helped the automotive company, Jaguar Land Rover (JLR), achieve its goal of 'Great Products Faster'. This is the story of a company that had the lion's share in the innovation awards.

Within two years of becoming a part of the Tata group, (acquisition happened in 2008), JLR embarked on an aggressive plan to launch forty new products in five years. Considering a typical product development cycle time in the automotive industry to be seven years, the goal was very difficult.

By the end of 2016, JLR had met the target and grew its revenue from £5 billion in 2009 to £24 billion in 2017. What enabled JLR to meet its audacious goal? Unlike many other companies, JLR didn't stop at just identifying a target of forty new products. This target was used to identify innovation projects of all types, big and small, shorter and longer gestation. It pursued every project with relentless focus, evident from the conversion rate of its innovation projects, which was the highest in the Tata group.

JLR adopted a definition for innovation: 'A product, service or a process which:

a. Solves an external or internal customer problem or unarticulated need; and
b. Is unique or progressing towards uniqueness; and
c. Provides a premium return for the business.'

The number of patents that JLR filed in 2016 was thirty-three times of those filed in 2008. Interestingly, 33 per cent of the patent filings in 2016 was related to digital technologies. For the purpose of this case, we have evaluated only those innovations that had some digital influence.

JLR's digital journey began with the basics. The company invested in creating a world-class infrastructure for Computer-Aided Engineering (CAE) and High-Performance Computing (HPC). The plan was to enable virtual product development with extensive use of simulation and reduce the time to market, engineering costs, and environmental impact. At the same time, it also zeroed in on a bucket list of features of a great car which would be a pleasant surprise for the customers.

Great Cars are Intelligent and Connected

Customer wish #1: Car journeys should seamlessly integrate with my routine. It should provide productive and useful information safely while driving.

The Self-Learning Car of JLR comprises state-of-the-art software which identifies the driver and learns his or her preferences to offer a personalized driving experience: Driver's comfort (heated seats, heated steering wheel, cabin temperature settings, height of seat, steering and suspension) and convenience (media settings such as volume). It reminds about imminent actions (fuel refill based on upcoming journey, predictive navigation) and predicts the driver's preferences based on variables such as weather and schedule for the day.

Another innovation branded as InControl Remote allows the driver to interact with his vehicle using the smartphone. The customer can not only check on the status of the vehicle such as fuel level and locate the car in a parking lot, but also remotely activate features including vehicle preconditioning (heat or cool to optimum temperature), locking and unlocking of doors and windows, and setting and resetting the alarm. Once inside the car, it allows the navigation and infotainment to synchronize with the driver's smartphone, reads traffic speed limit and other signals, even informing colleagues about possible delays when heading for a meeting.

In addition to the above, it transmits relevant data from vehicle to vehicle,

warning others about hazards and obstacles over the horizon or around blind bends. If a vehicle has slowed or stopped, and poses a risk to other motorists, it would send a Hazard Ahead warning to nearby vehicles. This feature is also used by emergency vehicles such as ambulances, police cars, or fire engines to communicate with JLR vehicles for them to safely pull over and allow the emergency vehicle to pass.

The number of functions and features inside a vehicle is ever increasing. While this provides the user with more options and flexibility, it also adds to the number of buttons and menus that are to be handled by the driver, thereby making it complex to navigate whilst focusing on driving. Understanding that current customer preference favours smooth and minimalistic surfaces, JLR, with its innovation of gesture control, pioneered intuitive control of the roof blind. I am not getting into every feature that can be controlled using gestures in future JLR vehicles, but just imagine the far-reaching impact of this in the future.

Driver safety had been increased by reducing manual engagement with on-board infotainment and phone features. A driver-facing camera within the vehicle could use head position and gaze location of the driver and deliver features such as Auto-Start, Auto-Illumination, Customizable Short Cuts and Auto-adjust.

Driving off-road is a complex activity that places significant workload on the driver, involving tasks such as selecting gear, recognizing and avoiding obstacles, and planning the vehicle's path. Automatic Terrain Response in Land Rover uses sensor fusion and mathematical modelling techniques to determine the terrain type that the vehicle is driving over. Further, based on the identified terrain the system automatically optimizes the vehicle system settings for the terrain and alternatively advises the driver about the gear ratio and air suspension height that should be selected.

Wade Sensing feature provides information to drivers when travelling through fjords or when wading through water, particularly when visibility is poor. Graphical information is presented to the driver through the in-vehicle displays, indicating the depth of water that the vehicle is currently travelling through and the height of the vehicle relative to the water due to the gradient of the terrain being traversed. Additional information such as wading speed

relative to water level, specific water level warnings and ice-wade warning are also provided.

Automatic Terrain Progress control or, in simple words, Off-Road Cruise Control is a technology that allows the Land Rover driver to set a very low automatic control speed. The integrated control makes the vehicle progress automatically and confidently over difficult terrain without the driver applying the throttle or brake. The system automatically controls the vehicle's progress in adverse and off-road conditions such as ice and snow, wet grass, mud, sand, gravel, rugged surfaces, steep ascent/descent, rocks and boulders. This feature has been further improved as Terrain- Based Speed Adaptation, which uses cameras to sense uneven and undulating surfaces, flat roads, potholes and standing water. The information gathered is processed to predict the potential impact of these surfaces on the ride and automatically adjusts speed to keep passengers comfortable.

Great Cars are Safe for Drivers, Passengers, and Pedestrians

Customer wish #2: The car should be safe for me, my fellow passengers, and others on the road.

A patented seat belt design toolset, developed by JLR engineers, having two components – PRIMFit and SYSFit – gave JLR a competitive advantage in the development of seat belt systems optimized for comfort, performance and cost. The design improved the retention of child seats during collisions.

The United States New Car Assessment Programme (USNCAP) had introduced a new occupant injury measurement called Brain Rotational Injury Criterion (BrIC) that was caused when two cars collided corner to corner. During an oblique crash, the head in either driver's or passenger's seat could slip sideways off the frontal airbag or roll over the airbag surface causing BrIC. In such a situation the challenge was to retain the head on the airbag, minimize rotation, and meet all other injury criteria. With traditional frontal airbag systems, one had to add many extra restraint components to meet the BrIC requirement, which would have added cost and weight to the vehicle programmes. Instead, JLR's patented technology, consisting of one or two supplementary chambers added on to the traditional airbag surface, provided a better resistance to sideways and rolling motion of the head.

The Land Rover Discovery Sport pedestrian airbag system was completely new (first in segment) when it was introduced. This system enhanced the protection of pedestrian and vulnerable road users and resulted in a major contribution to EuroNCAP five-star rating for the vehicle. One of the major challenges in the innovation was to take care of the aesthetics on the external body as well as meet all functional targets including sufficient airbag volume. The airbag that is normally hidden behind a panel below the windshield deploys in sixty milliseconds once the sensor detects the impact with a pedestrian. The pedestrian airbag system was further enhanced by using Stereo Camera system. The state-of-the-art image-processing algorithm determines distance of the object with an accuracy of 99 per cent. The system analyses the images in real time and trains itself for different shapes: pedestrian, vehicles, lanes and traffic signs. It assigns a risk attribute to various types of detected objects.

Safe Pullaway is a JLR technology that used a stereo camera to monitor the area immediately in front of the vehicle. It helps to avoid low speed collisions with walls, garage doors or parked cars. The output of this stereo camera system also helps in giving warning for unintentional lane departures, traffic sign recognition (e.g., speed limit, no overtaking), and auto-transition from low to high beam depending on the traffic detected ahead.

Great Cars Give an Enjoyable Experience

Customer Wish #3: Anything that gives less than premium feeling undermines my experience and should be removed.

In the auto industry, defects that generate sound inside the vehicle are often difficult to diagnose and attempts to repair sometimes end up bringing forth more issues. Many different components in a car could cause squeak and rattle. Electric wires and pipes were not usually considered in the normal digital design process but a JLR team created a digital process to investigate and capture such issues at the design stage itself.

With the increase in vehicles with electric and hybrid power trains across the industry and use of more refined internal combustion engines that have low noise, wind noise has become more prominent. It increases levels of passenger discomfort and driver fatigue. Conventional method to test the

noise levels involves using a full-scale wind tunnel with the actual vehicle which is extremely expensive.

Moreover, physical testing using a prototype vehicle is not feasible because noise paths were unrealistic in prototype vehicles, compared to a production vehicle. Using the production vehicle for noise testing is too late in the product development to make any changes. A JLR team developed a series of virtual aeroacoustics methodologies, which could be conducted before the final design was frozen and the shape changes were still feasible.

JLR vehicles are sold in markets spanning the coldest and hottest climates. Customers expect fully automated climate control that quickly makes them comfortable. In 2013, a team used a mesh with around six million cells to precisely measure and predict the temperature and to improve the performance of air flow distribution.

Great Cars are Sustainable

JLR's need #1: The car and manufacturing process should be sustainable.

In 2013, JLR launched the new Range Rover and Range Rover Sport. It was the world's first full-size sports utility vehicle with all-aluminium body structure. The virtual development of this car happened in 2010 that resulted in a reduction of weight by 190 kg. The extensive virtual development of the car gave confidence to use several aluminium and magnesium castings and a new aluminium alloy material for the side panel. For 100,000 vehicles, this weight reduction translated to a saving of 298 million tonnes of CO_2. After achieving this successfully, JLR set a target of using 75 per cent of recycled aluminium in body structures.

Historically, off-road vehicles were built using ladder sub-frame construction that provided protection to vulnerable components of the vehicle such as the cooling pack. With SUVs being built on monocoque construction, testing physical prototypes for the vehicle's response in water and sand was not an efficient method. The digital solution used by the team for this purpose had enormous impact on the cost and performance of vehicle. For wading tests, the cost of design solution for under-trays and heat shields reduced by 70 per cent. For the design of bunny bar against sand dunes, a potential of 45 per cent reduction in weight was identified.

Another team at JLR challenged the prevailing practice of making plastic parts with constant thickness resulting in higher weight of the components. The team optimized shape and size of various plastic parts to achieve variable thickness. The pilots resulted in reduction of weight by 10–15 per cent.

Self-piercing rivets (SPRs) were used by JLR for joining aluminium body structures. Aluminium and SPR had been key enablers for JLR's lightweight vehicle strategy. In 2016, 60 per cent of JLR vehicles sold were made of aluminium body structures. The endeavour to further reduce the overall vehicle weight led to the optimization of the weight of more than 3,500 SPRs. The team implemented a new method to characterize the SPR joints in a variety of loading conditions. The project reduced the weight of SPR by more than 20 per cent.

JLR lightweight aluminium body structures were made from a mix of pressed sheet, casting, and extruded aluminium. There was no method to predict the durability of these aluminium bodies, leading to significantly over-engineered bodies. A large multi-partner collaborative project that included universities created a global first method to predict the durability of structural adhesive–bonded joints for SPR joint, bond joint, and the proposed ALRSW (Aluminium Resistance Spot Welds) joints.

Great Products Give a Great Buying Experience

JLR's need #2: Provide a unique buying experience to customers to build excitement around new products.

In August 2012, Jaguar introduced a new power train, tailor-made for the Chinese market. The need was to educate and excite the customer and create a youthful and trendy image. The team created a translucent life-size car on which 3D videos were projected to narrate various inspirational stories about the features of new car.

Later, the team in China developed an experiential test drive system called Never Stop Discovering (NSD). Through technology and immersive video, visitors felt as if they were behind the Land Rover wheel as they tried to conquer a variety of terrains and hazards. As in gaming experience, visitors were challenged to overcome each driving obstacle while maintaining the ideal speed and staying on track through accurate head movements and

keystrokes. Every driver was given a score, which he could post on the social networks and challenge his friends.

The very next year, when there was a need to bring the car to life in the showrooms before it physically arrived, the team created a to-scale digital version of the new Discovery Sport. JLR was the first company in the world to use 'immersive' augmented reality for sales experience.

Great Cars Must be Designed and Made Quickly

JLR's (and customers') need #3: Product design must be quick so that new cars can be launched sooner.

Thermoplastic welding is a well-known joining method that can join two plastic parts without any fasteners. When this method was used to make containers for automotive fluids such as hydraulic fluid, it was essential to create an enduring seal. A team developed a plastic welding test simulation, for the first time in the world, to avoid 'make and test' process of these containers and save development time.

Body in White (BIW) refers to the stage in automobile manufacturing when a car body's sheet metal components have been joined together. It is the stage before painting and before moving parts (doors, hoods and fenders), the engine, chassis sub-assemblies, and trim (glass, seats, upholstery, electronics) have been fitted. BIW joining in JLR happened through a combination of welds, rivets and adhesives. For a new vehicle, joining information came too late for engineers to do the virtual development of a BIW. For the first time in the industry, a JLR team developed a joining tool to automatically identify joint locations in a BIW structure at a very early stage of product development. The project shortened the time required to create the BIW model by 20 per cent.

A need was felt to detect failure events of curtain airbags early in the design stage so that issues could be handled swiftly and efficiently. For this, despite internal scepticism, a team developed a new method that did not rely on fully defined B-Surfaces (internal parts that cannot be touched and felt) but could use input from design sketches or simple A-Surfaces (visible exterior surfaces that can be touched and felt).

As mentioned earlier, SPRs are widely used by JLR. However, intensive

laboratory tests requiring longer engineering time and capital investment, had been the only way of confirming joint feasibility and performance of SPR. A team digitally predicted the feasibility of SPR and the joint performance and eliminated over 80 per cent of physical tests.

Road Load Data (RLD) is data and information about the real impact of road conditions on a real vehicle. To create a new car, one must know the effect of a real road load at the component level. To get this information, complex and reliable prototypes had to be built, which was time-consuming and expensive. Moreover, this was often achieved quite late in the design cycle, causing churn and deviations. Any change to the design parameters rendered the RLD data invalid, making it necessary to build new prototypes and redo the expensive data collection.

A team, as a first step, developed detailed data about road surfaces by using state-of-the-art laser scanners with very high resolution. As the second step, the team undertook a project to eliminate reliance on physical prototypes, still the most common method among competitors to get the design loads. The team integrated active systems into the simulation environment to achieve this.

The luxury interiors comprising internal components and fabric played a major role in creating a premium feel. The process used for performance assessments of internal components needed more than a hundred models to be run every time there was a change in design. A team developed a new process that reduced the overall time to analyse changes by 30 per cent.

We analysed all the fifty digitally influenced innovations referred to in this case on both the dimensions of evaluation criteria: (1) For 'uniqueness', we used the concept of Obviousness of Problem and Obviousness of Solution that was explained in Chapter 3 (Figure 3.2) (2) For 'impact', we checked the outcomes of these innovations in terms of revenue, cost, society, environment or KPI.

Figure 7.1 indicates two key information related to innovations: (i) The years in which the innovations were presented and
(ii) The performance of innovations in the awards programme. Awards were given based on the assessments carried out on all innovations in an objective manner as explained in Chapter 3. The figure illustrates how the quality of

innovations could be judged based on the obviousness of problem and the obviousness of solution. We learnt in Chapter 3 that finding a unique solution to a well-known or obvious problem is far more difficult and needs a long-term effort.

The figure also highlights that a company can deliver bigger innovations and achieve high impact if:

a. It can find new and elegant solutions to well-known problems. Automatic Terrain Identification and adaptive system is one such example.
b. It can find new problems that no one else has been able to observe, think of, or invest time in solving. Innovations related to the self-learning car and ability to control the car with vision and gestures are two examples from this case (please note that the problems or needs of customers, once discovered by a pioneer, seem to be obvious to others very soon). In such cases, even less elegant solutions could fetch excellent results and might work as a springboard for bigger innovations

Figure 7.1 also indicates that the ability of a company to identify 'not so obvious' problems improves over time. If the drive for innovation is maintained in the organization, this improvement is natural. Similarly, the ability to think and execute the not so obvious solutions also improves gradually as the confidence of employees increases by regularly playing the innovation sport.

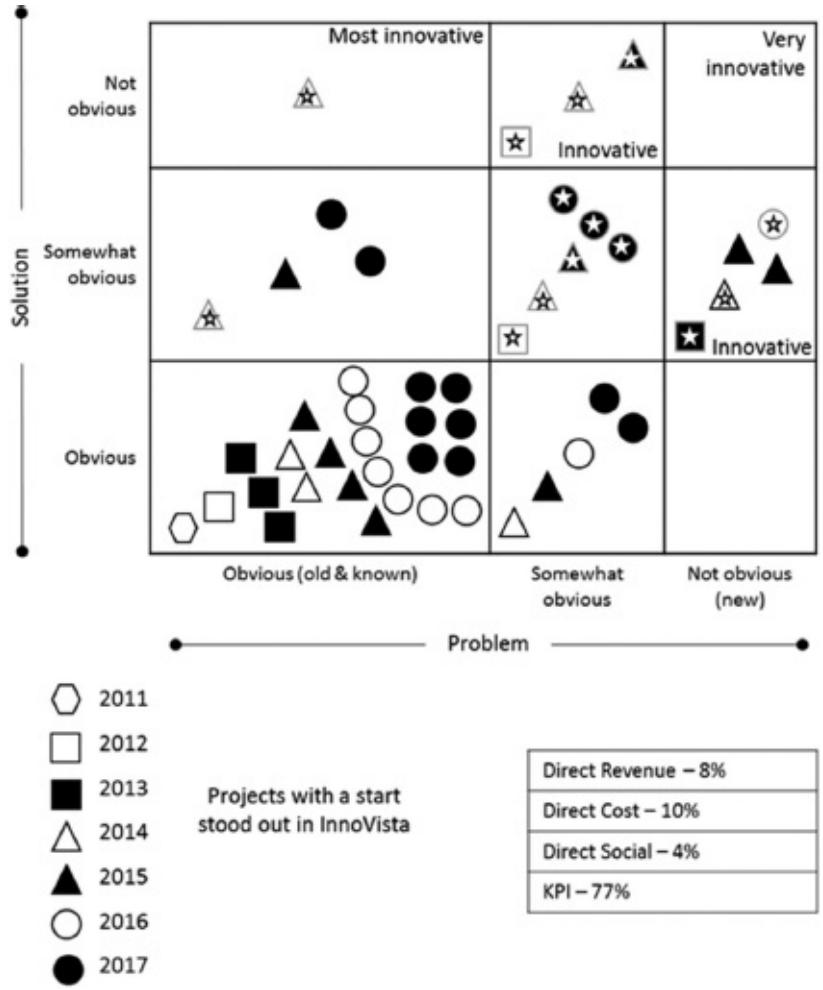


Figure 7.1: Defining uniqueness using the lens of obviousness and high contribution of KPI in impact measurement

TRANSFORMATION OF TANISHQ: AN INNOVATION FACTORY

'When I took up this project, everyone felt that it was impossible including my immediate boss.'

T. Vijayakumar
Group Manager, Titan

How does one make inroads into an unorganized sector in which customers have strong loyalty to local players? This is pretty much the quandary in which the Titan Company found itself when it launched its gold and diamond jewellery business, Tanishq, in 1995. One would imagine that jewellery business is all about new collections promoted by glamorous

Bollywood actresses. This was not true for Tanishq and hence we selected this case. This is a story of how a company decided to systematically drive innovations during the time of crisis and came out with unprecedented outcomes in their industry globally.

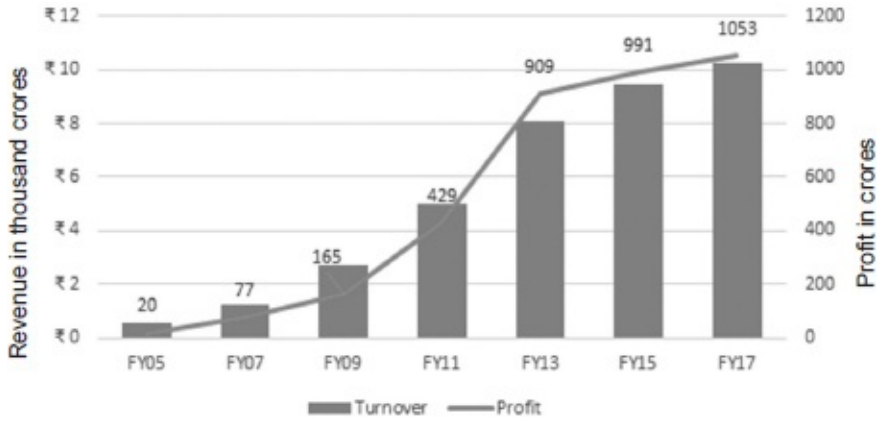


Figure 7.2: Revenue and profit growth of Tanishq

The jewellery division has had a noteworthy growth (Figure 7.2) in the last 10 years. In 2017, it contributed more than 80 per cent of Titan's revenue and profit. The key points that this case highlights are the following:

a. A passionate leader can use the vision or goal of the company or business unit to create a drive for innovation and make it contagious in the whole organization.
b. Most leaders believe that a crisis situation does not provide the right environment for innovation. Tanishq's innovation journey commenced during a crisis, after which it gained momentum.
c. It's common belief that innovation happens effortlessly if there is a culture of innovation. This statement induces these questions: Is culture alone sufficient for innovations to happen? How does one create such a culture? The case explains that processes also play a very important role for innovations to happen and contribute in creating the right culture, though gradually.
d. 'Global first' or very unique *process* innovations that could reduce a lot of cost also need a change in behaviour of employees to be successful, which needs perseverance.

The Titan Company

The Titan Company started as a watch-manufacturing company in 1984 as a joint venture between the Tata Sons and the Tamil Nadu Industrial Development Corporation. Subsequently, it started the jewellery business under the brand Tanishq and the prescription eyewear business under the brand Eye-plus. In addition to Tanishq, other brands in gold and diamond jewellery business are: GoldPlus, Mia and Zoya. Gold jewellery was, and continues to remain, dominantly an unorganized sector in India. For most Indian families there has always been a family jeweller from whom they purchase.

It was not easy for Titan to break these strong bonds with the family jeweller. On the one hand, it required innovations in building trust, branding, sales, marketing and new product development, and on the other, it required innovations in supply chain management and manufacturing to reduce costs.

Bhaskar Bhat, Titan's Managing Director, has personally defined innovation for Titan as, 'Novel or pioneering processes, products, or business models that deliver elevating experiences for the people we touch or create significant impact and value for Titan.' The innovations that enabled the jewellery division to achieve a very high level of performance not only within Titan but also in the jewellery industry could be grouped under three heads:

1. Lean and nimble manufacturing and supply chain
2. Trustworthy, aspirational and inclusive brand
3. Attractive and differentiated designs

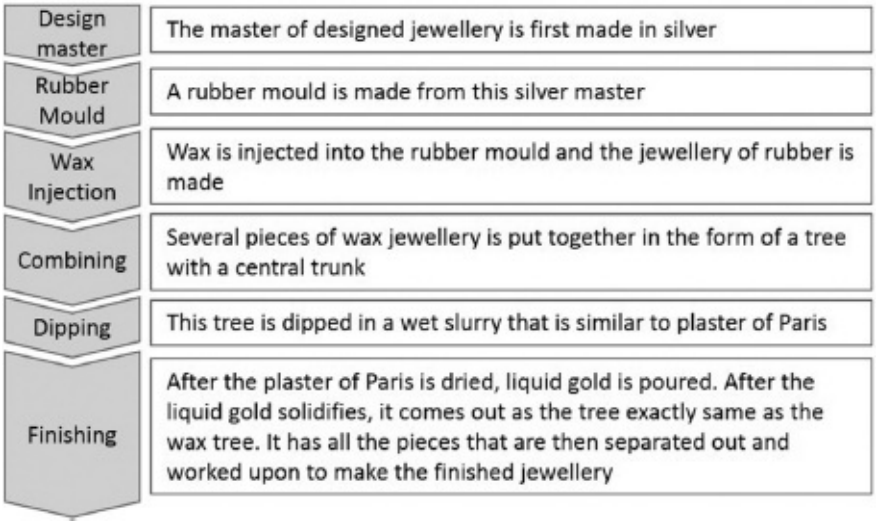


Figure 7.3: Process of making jewellery

Lean and Nimble Manufacturing and Supply Chain

Not long before, in 2001, one of the well-known management consultants had recommended Titan to close the jewellery division. The reason was low productivity, stormy labour relations, high inventory costs, and below par quality at their central manufacturing hub in Hosur, in north-western Tamil Nadu. The cost of making a product was 50 per cent higher than the local jeweller. The brand was new and the customer had to be acquired from the local family jeweller. This meant that Titan was not in a position to charge premium to recover the high cost of manufacturing.

As one last attempt to bail out, the jewellery division took a target of transforming the factory and make it the single largest source of competitive advantage in the industry. It all started with an unconventional decision of hiring a few engineers from automotive industry to achieve this goal.

The beginning: Making the bottleneck jump

Till 2005, the process of setting diamonds on jewellery was manual and also a bottleneck to improve productivity. Two shop-floor workers (Nanda Kumar and Jaya Madhu) gave the idea of pre-placing the diamonds in the mould before pouring the liquid gold. For the first time in the world had any jewellery maker deployed such a breakthrough innovation that did away with the manual process. After the liquid gold was poured, the diamond would

come out perfectly set on the solidified gold. This increased the productivity of diamond-setting process by a few times. For example, a necklace that used to take two days to set the diamonds could now be done in 15 minutes. However, the innovation team faced a lot of internal resistance as the jobs of diamond setters were at risk.

The above innovation shifted the bottleneck to the making of the silver master. The accuracy of the master decided the position of diamonds in the mould. In order to increase the variety and range of jewellery produced by the plant, the speed of manufacturing the master had to be increased. This is when the team, for the first time globally, started making rapid prototypes of the master using wax by virtually setting the stone. This prototype was used to make the silver master using the casting method. New designs that were introduced twice a year could now be introduced every month.

The above innovation led the Tanishq team to a new bottleneck of sorting and bagging the diamonds. Diamond bagging is a process of selecting all the diamonds required for a piece of jewellery and putting them together in a container and sending them onward for setting on the jewellery. If a necklace or a ring has twenty-five diamonds of different size and quality, a person will have to choose the right diamonds manually and put them together and send it for setting. For the first time in the world, a team built a fully automatic diamond bagging machine. This machine selected, sorted, weighed the diamonds, printed the tag, and transferred the information automatically to the SAP system.

The bottleneck now jumped to the diamond-buying process. The procurement and finance team innovated the process in a manner that the diamonds reached the factory the next day of raising the invoice, which used to take four days earlier.

A few years later, the process of converting a wax prototype to a silver master became a bottleneck. This is when rapid prototyping of the silver master itself began in Tanishq, thereby eliminating a few steps of creating a wax master and casting a silver master. For the first time in the world, the grooves and the claws (these are used to grip diamonds in the jewellery) were made in the master itself. This innovation increased the productivity of diamond setting by six times.

3-Day Miracle

Earlier in its journey, Titan had started outsourcing the manufacturing of jewellery to vendors called *karigars* (skilled artisans, in this case goldsmiths). The turnaround time from the karigars was 16–18 days, leading to high inventory cost. A team devised and undertook a project called 3-Day Miracle and reduced this turnaround time to three days by working on the mindset of the karigars and supporting them with simple processes.

Till 2014, 70 per cent of the jewellery was made manually by karigars whose knowledge and skills were not getting transferred to the next generation due to changing interests among the youth. This led to inconsistent quality leading to design mismatch, weight variation, and non-repeatability of the products. Titan created a one-year course called Jewellery and Precious Metal Worker (JPMW) in the local academic institute to ensure that the skills of jewellery making were not lost. The course was taught by Titan employees and the exams were held by the institute. A government certificate was also issued to successful participants.

Self-confidence breeds innovation: High-value studded jewellery

By 2010, the innovation movement had become contagious and employees were confident that they could break new grounds. High-value studded jewellery was still a completely manual process spread over fifty-six days. A team reduced the procurement time of coloured stones, from fifteen days to three days. For the first time in the Indian jewellery industry, a team mechanized the process that makes collets to hold the stones. As another first, frequently used elements were converted into masters and the casting method was used to manufacture such elements instead of making them manually. All this brought down the lead time from fifty-six to fifteen days.

L. R. Natarajan (fondly known as LRN) joined Titan in 2003 as the head of Tanishq factory. He is credited with the transformation of jewellery factory by focusing on innovation.

LRN knew that the shop-floor problems could be best solved by the

workmen themselves. He started the simple idea management system with a plan to personally drive the execution, which usually is the bottleneck process. For breakthrough ideas, employees were given 'Moment of Fame' awards and 'Hall of Fame' awards were given for successful execution of ideas.

To trigger creative thinking, LRN threw challenges at his people. He believed that an aspirational challenge would trigger innovations if supported by processes and systems. During his visit to the factory and in meetings, he always asked everyone about something that they had done new or wanted to do something new. His theme was: Simplify and Innovate.

He supported innovation projects by releasing key people from their day job to execute innovations. He even created discretionary funds at senior levels for experimenting and pushed people to make use of these funds.

In March 2008, the jewellery division celebrated Innovation Week. Various rewards and recognitions were given to employees.

Natarajan, B. Manimaran, R. Sharad, and K. Karthikeyan were the early innovators at Tanishq. This passion for innovation was quickly transmitted to T. Vijayakumar and Rajendran G. Out of the eighty projects that have been covered in this case, twenty-eight projects had at least one of these six innovators in the team. Interestingly, out of twenty-four awards that Tanishq has won in these years, there were ten projects that had at least one of these six innovators.

After automatically bagging the diamonds, the team set its eyes on bagging all the child pieces (smaller parts of gold that are attached to the main part of the jewellery) of a jewellery. All child items do not necessarily get cast (manufactured) together, hence there was a need to first sort them. The team had made some progress by using the digital image-processing method to automatically identify and sort the child items. The process of bagging cast items, rolled items, and stones was automated for the first time in the jewellery industry using a six-axis robot.

Filigree jewellery is very delicate and is handmade. It is made using very

thin wires that were hand-twisted. Every piece is different and it is almost impossible to make two identical pieces. The manual process made the jewellery very expensive. For the first time globally, Titan created these products using casting method, increasing the productivity by six times.

To make the Mia and Iva jewellery (these are the affordable brands) more affordable, Tanishq created first-of-its-kind fusion jewellery that had electroformed and diamond-studded hollow cast items. Manufacturing hollow gold items by casting method was a noteworthy innovation in the industry.

Capturing the invisible gold and reducing waste

Reducing wastage of gold during the manufacturing process was another opportunity for innovation and this directly impacted profitability. Several teams found new methods to recover gold from clothes, feet, shoes, paper, vinyl sheets, and mats that was otherwise being lost. One team started recovering gold from the papers that were used in the factory. Another team used a robot to blow out gold dust from air ducts and recover it.

The jewellery division started an Innovation School of Management in 2008 to involve more employees in innovation. The school had a principal and heads of departments. A customized six-month course on innovation was created and students were given challenges to work on. The course content had tools for the complete life cycle of innovation – from opportunity and problem identification to idea generation, selection and, finally, the execution of ideas. The focus was not only on the results but also on the process of thinking differently.

The school had five different modules focused on sharing concepts, tools and frameworks to generate ideas, determine methods to select ideas, and finally implement the selected ideas.

The students would work in teams of 5–6 members, out of which only one member had domain expertise. Every team was guided by a mentor chosen from the domain in which the problem existed. After three days of classroom training, four hours were set aside per week for the teams

to work on their projects and two hours per week were dedicated to sessions where field experts mentored them. At the end of the project, the students were awarded graduation in innovation.

To further improve the yield and reduce the gold loss, a team came out with a new method to cast the whole bangle instead of casting it in pieces and joining the pieces later.

Trustworthy, Aspirational and Inclusive Brand

To acquire customers from the family jewellers, Titan regularly innovated to make the brand inclusive, trustworthy and aspirational.

Trustworthy

In 1999 Titan had innovated the karat meter, a small instrument kept in retail shops that could measure the purity of gold in a particular piece of jewellery. This positioned Titan as one of the most trustworthy jewellers in India. In 2013, Titan created a mobile karat meter that could be carried to distant areas. This was made from a scrap analyser, ran on battery, and its weight was just 5 per cent of the earlier machine that was used in retail shop. Another global first!

In 2011, Tanishq gave the customer the option of directly speaking with the karigar to explain their specific requirement for the jewellery. Another industry first!

Aspirational

For the first time globally, Tanishq used technology to showcase a collection of more than 20,000 solitaire global diamonds online for customer to select and get the jewellery made in 7–10 days. The power of designing jewellery was passed into the hands of the consumer who herself chose the configuration of solitaire diamonds.

To increase the market share of wedding jewellery, which accounted for 40 per cent of the market size, Tanishq came out with a bold move of not

giving any discount on diamonds. Instead, they made it aspirational through their Queen of Diamond collection. This collection created a perception of Tanishq as a high-value diamond jewellery brand. It resulted in a 50 per cent increase in diamond sales.

Inclusive

In 2006, Titan created a new mass market brand called GoldPlus for rural and semi-urban India. The GoldPlus stores were opened in Tier B and C towns, where the focus was on providing plain jewellery at low cost without intricate or unique designs. Programmes were created to emotionally connect with autorickshaw drivers who were identified as the key influencers to get footfalls. GoldPlus created the world's largest gold bangle and displayed it at the stores, leading to increase in sales by 77 per cent and received a lot of unpaid print and TV media coverage.

For the customers of GoldPlus, diamonds were expensive and were considered inauspicious in many towns. American diamonds were cheap, but they had lost their glitter. Titan was the only jeweller that used the diamond-coated Swarovski (diamantine) crystals to offer a new range of jewellery. It obtained the sole right for the patented process of manufacturing diamantine.

In 2014, GoldPlus celebrated 5,000 years of India's jewellery tradition by bringing together all common and rare jewellery making techniques of India. This was done by creating GoldPlus Nano car, made of 80 kg gold and 12 kg silver, and used fourteen different techniques of jewellery making.

Mia brand was conceptualized based on the need for affordable, fine 'workwear' jewellery. It bridged the gap between very heavy traditional jewellery and casual costume jewellery, both being considered inappropriate for office wear. It was generally accepted that Indians wouldn't buy jewellery that was less than 22 karat. Many Jewellers would sell 18-karat gold as 22 karat. In 2012, for the first time in the Indian market, Tanishq made 18-karat jewellery, and sold it as 18 karat under the Mia brand, thus avoiding the cannibalization of its 22-karat jewellery. With the success of Mia, Titan made the Mia jewellery even more affordable by using 14-karat gold. In 2017, more than 80,000 pieces of Mia were sold and generated sales of more than Rs

100 crore. Mia has been very successful in meeting the aspirations of more than 100,000 people.

Attractive and Differentiated Designs

'Reflection' range of Mia brand used a few scientific principles to differentiate – yellow gold petals created a large reflection on the mirror-finish surface which appeared different from different angles.

Crowd-sourcing of designs in gold jewellery was unheard of because of the complex and involved manufacturing process. In 2013, the Mia brand invited its consumers to express their 'idea' of workwear jewellery in words, images or videos. Top 100 entries were put up for public voting followed by a round of telephonic interview with the panel of judges. Top ten winners of the contest were invited to Bengaluru for a three-day interaction with the Tanishq Design team to co-create their final designs.

Kundan jewellery (a traditional form of Indian gemstone jewellery involving a gem set with gold foil between the stones and its mount) for Zoya brand was designed in 3D forms, unlike the 2D forms that were available in the market.

The constant changes in the government regulations had significantly weakened the high-value jewellery category (jewellery worth above Rs 2 lakh). A team innovated on the cup (that holds the diamond) by giving it a mirror finish and an angle of inclination that made the diamond stand out more prominently. This design reversed the sales trend.

New and attractive designs have been one of the key drivers of jewellery-purchasing decisions. Tanishq has released new collections on a regular basis. The few that performed well in the Design Honour awards include the following:

Inara, a diamond-intensive bridal jewellery collection was inspired by the endless and formless cosmos, such as galaxies, orbits, planets, meteor showers, stars and the Big Bang. Iva was Titan's foray into the fine fashion jewellery space. The collection was centred on the use of coloured gemstones at a highly competitive price. Innovative cuts such as dandelion cut was used to create differentiation in the market. Concepts of modular jewellery were introduced that allowed addition of elements for day-wear, evening-wear, etc.

The fusion of 22-karat traditional gold techniques such as granulation and *veni* wire were used to create 18-karat diamond jewellery collection called Zyra.

The journey of innovation that started building its momentum in 2005 completely transformed the jewellery business in seven years. The quality of innovations improved year after year, reinforcing the point that innovation could be transformational if it takes the shape of a movement comprising people who use the right set of tools.

If we present all the innovations of this case (and a few others that happened during the same period) in a form of a tree with major innovations closer to the trunk of the tree or in chronological order just like a natural tree, it would look like Figure 7.4. This is yet another way to analyse past innovations, predict future innovations and create an innovation portfolio.

The rapid transformation of jewellery division could also be viewed quickly using the Innovation Quotient. Figure 7.5 shows the Innovation Quotient of the jewellery division for two years. In 2009, the innovation projects were scattered across the X-axis meaning that the quality of projects ranged from low to high. In 2011 the situation improved as evident from the figure with most of its projects appearing on the left end of the X-axis. Making this improvement in two years was a big achievement as it happened at a time when the total number of projects across the companies had increased (longer X-Axis).

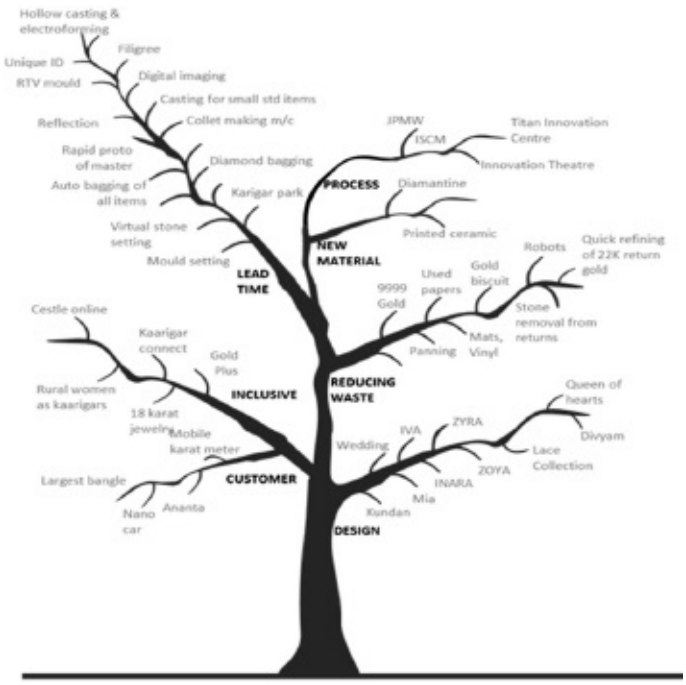


Figure 7.4: The Innovation Tree

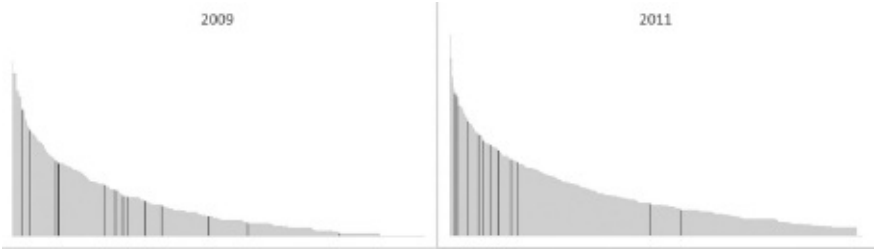


Figure 7.5: Organizational innovation quotient of Tanishq in 2009 and 2011

PEOPLE INNOVATIONS

'Attracting the best talent using technological innovations has been the game changer for TCS and a big personal achievement for me.'

Dilip Murugesan K.,
Senior Manager, HR, TCS

In every company, there are instances when seemingly very unique innovations fail to achieve noteworthy results. The case of Tata Steel had a few examples of this type. The reverse is also true. There are instances in which innovations that were considered incremental delivered breakthrough results over a period of time.

In 2017, TCS had around 400,000 employees, highest in a private company in India. By revenue, it is the largest IT services company in India and ninth in the world. Employees are right at the centre in the business model of TCS. Managing such a large number of people, most of whom are hired fresh from college, building capability, keeping them on the cutting edge of ever-evolving technologies and motivating them to be productive is a mammoth task.

Over and above this, it is quite a task to get employees to innovate in the B2B service industry in which companies usually help or enable their customers to innovate. The testimony of TCS doing this effectively is visible in how they have exhibited outstanding innovations in Tata InnoVista, winning 20 per cent of the overall awards that have been presented since 2006.

Human Resource Management is viewed as one of the most difficult areas to innovate. Not only are the new ideas difficult to generate and implement, the outcomes in the form of innovations are difficult to protect and prevent others from copying. This case study narrates TCS's HR innovations, most of which were industry firsts. A few qualified as global firsts.

This case reinforces the following points that have been discussed in the previous chapters:

a. HR innovations, as explained in Chapter 4, are support process innovations. As discussed in the same chapter, support process innovations could result in all types of impact (cost, revenue, social, KPI) on the company (Figure 7.6). Importance of these innovations cannot be undermined just because the outcomes were difficult to translate into economic measures.
b. Many HR innovations appear to be incremental that are not protected by patents. This makes them easy targets of replication by competition. Interestingly, the competitors are less motivated to copy as most of these innovations seem to be incremental in nature. Little do people realize that these incremental innovations could become the source of organizational culture and foundation on which differentiators get built in the future.
c. The innovations described in this case show that 'best in class' hiring and

induction process followed by a world class performance management system could be a key differentiator for companies that deliver knowledge services.

d. Most of these HR innovations were presented in Tata InnoVista after a separate award family of support process innovations was created. This illustrates the value of creating a level playing field for people in all functions to try new things and win innovation awards.

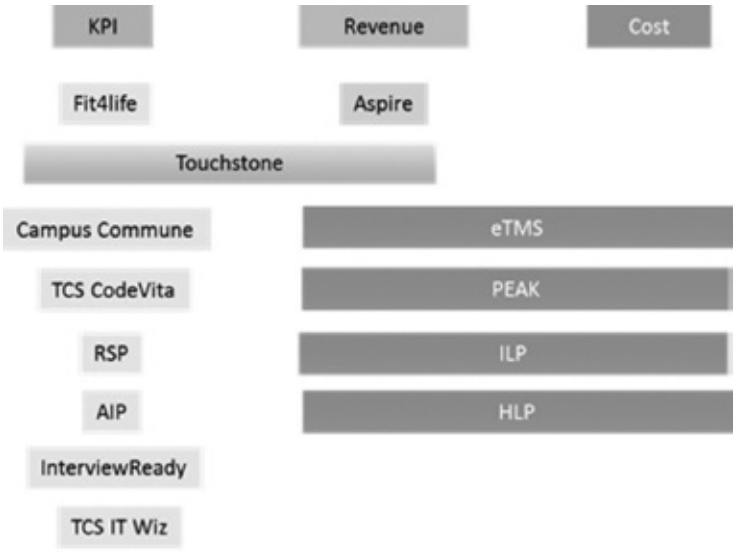


Figure 7.6: Impact of various HR innovations on KPI, revenue and cost

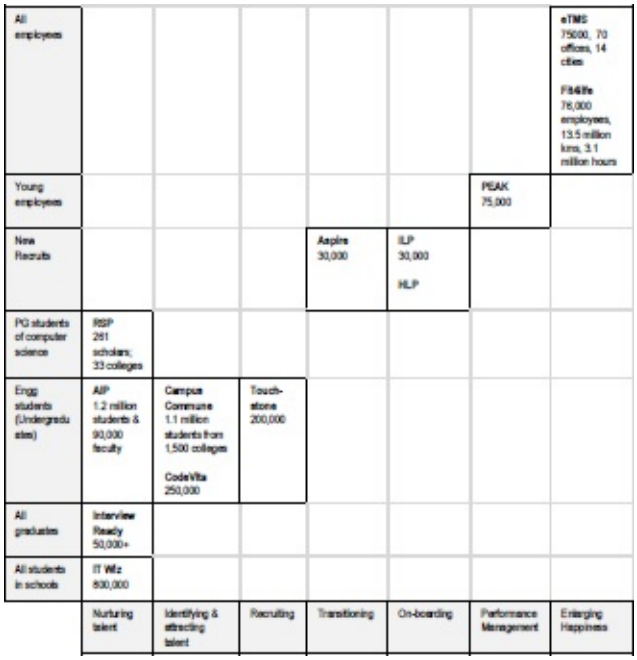


Figure 7.7: HR innovations mapped on value chain and target beneficiaries

TCS has innovated extensively and regularly in the complete HR value chain. Figure 7.7 depicts these using the life cycle of a person starting from school until the person joins TCS and starts contributing happily towards making TCS a world-class organization.

Nurturing Talent in the Country

TCS IT Wiz, a 'knowledge initiative' started in Bengaluru in 1999, is the biggest inter-school IT quiz in India for students of classes 8–12. The quiz aims at emphasizing the importance of IT skills that eventually increase the chances of making students more employable in the ever-growing technology fields. It nudges students to learn about newer technologies that are poised to have huge traction across the globe. TCS IT Wiz has earned an entry in the *Limca Book of Records* as the India's first IT quiz.

In 2016, it touched over 800,000 students from more than 4,000 schools including those that were located in Tier 2 and 3 cities. In 2017, due to rains, a few students could not travel by road from Siliguri to Kolkata to participate in the quiz. Their school, at its own expense, flew the students to Kolkata. One of their teams ended up reaching the finals. The popularity of the quiz is also evident from the fact that many schools coach their students for it as part of their annual academic calendar. A few years ago, a person compiled a book containing all the past questions of the quiz and sold it at Rs 150 each.

In the five months of 2017, the tweets on IT Wiz reached more than 2.5 million people.

In 2003, TCS launched the Academic Interface Programme (AIP) to help strengthen relations with the academic community and improve employability of students. More than 1.2 million students have attended AIP workshops. AIP has Faculty Development Programmes (FDP) also that has trained more than 90,000 faculty members on the latest technologies.

A significant supply of talent to the BPO industry comes from graduate colleges across India. While the supply of graduates was high in terms of numbers, their employability was low because the curriculum lagged behind the needs of industry. Through AIP, TCS worked with colleges and universities to make Business Process Services (BPS) a part of mainstream curriculum. As a result, for the first time in the world, a degree-level

specialization in BPS was launched. This three-year full-time BCom degree programme designed by TCS was offered in ten colleges in India. To keep abreast of the upcoming technology changes, a MSc/MTech-level course on Big Data Analytics was also launched in six colleges.

Analysis of hiring data revealed that graduates from Tier 2 towns of India and those who have studied in the vernacular have severe limitations in their English-language skills. In 2015, TCS BPS designed and launched the InterviewReady app in thirteen languages to help job aspirants increase their employability by learning business communication skills and etiquette, and help them prepare for interviews.

This initiative won the Brandon Hall (one of the most prestigious awards programme globally on Human Capital Management) award in 2015 and 2016 and the Stevie award in 2016 (they are premier business awards that recognize achievements and positive contributions of organizations and working professionals worldwide).

TCS Research Scholar Programme (RSP) started with a question that was asked internally in 2008: 'Why are we not able to attract PhDs?' To address this, RSP was rolled out in 2010 to improve research talent in India, specifically in computing sciences. The programme is funded by TCS Foundation and managed by the CTO's office, which provides mentoring to the selected scholars. Research problems are provided along with financial scholarship for five years. A grant is also given to scholars and their guides to attend national and international conferences. RSP supports forty PhD students every year from thirty-three institutes, accounting for 20 per cent of the students who pursue a PhD degree in computer science in India. There is no other company in India that has a programme of this scale. The knowledge exchange between PhD students and researchers from TCS is further achieved through TCS Research Café which also helps in creating a serious brand of 'TCS Research and Innovation'.

Identifying and Attracting Talent

Around 1.5 million engineers graduate every year in India; TCS recruits about 30,000 of them. The competition to get the best talent is intense. How does TCS win this war for talent?

Campus Commune is an interactive social networking application that enables learning by bringing students, academicians, alumni, and subject matter experts together on a single platform. It was launched in 2011 as an on-boarding connect with students but has now evolved into a full-fledged campus engagement ecosystem that enables 1.1 million students from more than 1,500 colleges to interact and collaborate with TCS.

It is the only platform that engages engineering students through multiple channels. These channels, owned by business units of TCS are themed on a branch of engineering or a subject or on general interests such as communication skills and hobbies. While the channels help students in honing their technical skills, they also help students get a fundamental overview about less glamorous subjects such as software testing.

Campus Commune serves as a medium to host multiple contests such as EngiNX, a team-based contest that requires students to construct a prototype on the given theme. TestiMONY is another contest that is themed on software testing.

All channels are built around game-based learning. The gaming and reputation system analyses and quantifies the qualitative aspect of students' participation and is used to spot talent attract talent, and enable hiring of the best students from campus. In 2017, thirty-plus high-quality pre-placement offers were made purely based on the students' qualitative engagement with Campus Commune.

TCS CodeVita was introduced in 2013 as an annual programming contest for all engineering students in India. The programme encouraged thousands of students to embrace computer programming even though they may not be studying computer science. The contest grew in stature and now gets participation from 18 countries including the UK, the US and many from Asia-Pacific (a team from Scotland won it in 2014).

It has become renowned among the student community for its challenging programming questions. We quizzed Samartha Agarwal, a CodeVita participant, about the preparations he made for CodeVita, 'We cannot google CodeVita questions as they are completely new every year and are very challenging.'

In 2016, 250,000 students participated in CodeVita. Not only was the

competition tough, but it also had a steep curve of selection. Only 5 per cent of the teams (a team has two members) qualified after the first round. After the second round, only fifteen teams from across the world reached the finals. Internships and opportunity for an employment in TCS were offered to the winners in addition to attractive cash prizes.

Samartha, who was one of the thirteen students who were offered an employment in TCS, said with a smile, 'I didn't have to give the online recruitment test of TCS because of my performance in CodeVita. Moreover, my interview for the job focused on CodeVita and I didn't have to go through Aspire.' (Aspire is a pre–Initial Learning Programme [ILP] process explained later in this case.)

CodeVita submissions are evaluated against model answers, which accurately profiles the skills of students. For those students who took employment with TCS after CodeVita, a strong positive correlation has been established between their performance in CodeVita, ILP, and subsequently in actual projects as measured through the appraisals.

To design new puzzles for CodeVita year after year, a crowd- sourcing platform called Philacodist was developed by TCS in 2016, open to all TCS associates to create programming puzzles. The platform was further innovated in 2017 with the introduction of automatic plagiarism checks. Over a period, the CodeVita platform has become capable of evaluating several IT skills, viz., database programming, system administration and even software testing.

During the launch, CodeVita used the Stable Marriage Problem (SMP) algorithm (an algorithm that finds the most suitable pairs amongst a bunch of males and females) to attract a high a number of participation. The situation had completely changed by 2017 – there was peer pressure amongst the students, colleges and even states of India to perform better in CodeVita.

Recruiting

When a company like TCS tested 200,000 students every year through IT systems to recruit 30,000 people, it faced several challenges: (a) Students shared the questions with others after the test that would reduce the discriminative power of test. The proliferation of social media amplified this

challenge further. (b) The emergence of coaching institutes that assured candidates of cracking written tests of major IT organizations instead of preparing them with software engineering skill. TCS's HR team saw these challenges as opportunities for innovation.

Shivaram Biju (joined TCS in 2017) said, 'The aptitude test is tougher than that of everyone else. To prepare for a job in software companies other than TCS, we are told to focus only on the preparation for TCS.' Shivaram added, 'I wouldn't be in TCS if they too recruited like other IT companies who test only computer science–related knowledge and skills.'

TCS designed an integrated system, Touchstone, to address the issues related to online test. Several IT applications in those days could place questions and their answers in random order. The algorithm of Touchstone threw different-looking questions as against the parameterized style where the answer remained the same and the student could answer by recalling the answer to that question.

Touchstone has algorithms for detecting exposure of questions in social media and appropriately recommends quarantining a question that has high exposure. Based on the answers given by students, the algorithm also validates the discriminative power of the question and ensures there is no deterioration due to exposure.

Communication skills are essential for IT professionals. TCS was a pioneer in conducting an online fifteen-minute written test (known as email writing test) to automatically assess written communication skills of students. In 2018, TCS introduced a programming test to assess the basic concepts of coding.

Conducting interviews for over 50,000 aspirants was another challenge. The logistics inconvenienced both the interviewers and candidates. An application was developed to schedule and conduct interviews using video and web-conferencing technologies. Offer letters were released on the same day of the interview for selected candidates.

Transitioning

On an average, 12–16 months of time is available with students to join TCS after they are selected. Aspire programme of TCS taps into this available time

to make students industry-ready. It achieves this by developing technical and communication skills using three modules:

1. A preparatory module on basic technology and communication skills.
2. Technology Lounge, available once the student successfully completes the preparatory module. This module focuses on the fundamentals of various technology streams that have high demand.
3. Language Lounge focuses in honing business communication skills.

The students consume the content in the form of videos and study materials. They have to take a quiz at the end of every module, which gives them certain 'Aspire Miles' and unlocks the next level of learning. Each course has a transparent leader board that allows students to benchmark with others in the course. A student who does not score well in the first attempt gets another opportunity to attempt the quiz but would not be able to score full Aspire miles.

Since these courses and quizzes are conducted online while the student is in college, we asked Samarth if friends as proxy could help crack the quizzes of Aspire. He was quick, 'The catch is that TCS conducts a welcome test – Initial Readiness Assessment (IRA) – when we report for joining. If the performance in IRA does not match with Aspire miles and Aspire quiz scores, TCS sends back the students, with advice to come back later.'

More than half the students selected by TCS were from streams other then computer science. 'For such students, Aspire is a great opportunity to learn the basics,' said Shivaram. An equivalent of Aspire from other IT companies has not yet been reported.

In addition to the online Aspire, in 2015, TCS tied up with select colleges and rolled out two new models for Aspire:

Assisted Model

The students recruited by TCS from these colleges were taught specially selected courses as part of their eighth-semester (the last session of college) electives. The students were coached and mentored by both TCS and their college faculty.

Faculty Development Programme (FDP) Model

TCS provided inputs on technology and business communication requirements to the faculty members of colleges, who in turn trained the students selected by TCS.

Shivaram, who was in the college that had tied up with TCS for the Assisted Model, corroborated the value of Aspire, 'I was an average performer in college but came to know about my programming skills once I joined TCS classes in the eighth semester. I am from a non-IT discipline but I can now program better than some of the computer science students and as a result have got a joining date ahead of some computer science students.'

On-boarding

TCS used the performance in Aspire to form batches in order to ensure that new recruits in a batch were at similar level of knowledge. Upon joining, the new hire underwent three months of technology training. According to the competency level of the batch, the mix of basic and advance courses varied (minimum 15 per cent to a maximum of 65 per cent advance-level content).

Errors committed by trainees in the programming language could be either due to carelessness or improper understanding and application of concepts. For the programming lessons taught to newly hired students, TCS used to conduct tests every Friday to evaluate the learning during the week. It was a Herculean task for the trainers to evaluate and assess the answer scripts in a manner that could indicate to them the precise learning gap of every trainee.

Amol Khanapurkar from the TCS Innovation Lab, who worked on this challenge, said, 'When the answer scripts were shared with students after four days on Tuesday, it was always a dilemma amongst the students to focus on the issues of previous week and fill the gaps or prepare for the upcoming test on Friday.' Amol wanted to apply the logic he used in CodeVita evaluation which checked the code submitted by students. Vishal, who was responsible for the on-boarding process explained that unlike CodeVita, the focus had to be not only on the results but more importantly on checking the

software engineering skills of students.

Amol and team created a breakthrough patented solution which enabled the assessment in just five minutes and highlighted precise mistakes of every student, allowing the faculty to provide laser-sharp reinforcement of lessons.

In 2009, TCS BPO unit had started a twenty-one-day instructor-led behavioural training for fresh recruits. The programme was flexible, without a fixed curriculum and flow, which led to high dependence on trainers for quality of delivery. The challenge was to scale up and make it attractive for Generation Y and Z.

TCS launched a first-of-its-kind Hybrid Learning Programme (HLP) of eleven days comprising instructor-led learning, experiential learning, and online learning in a game-based environment. It also had a predictive analytics engine that identified talent based on qualification, location and sentiments of learners. The analytics of learner and facilitator behaviour checked malpractices and predicted attrition. HLP not only resulted in savings worth a few million dollars but also improved the time it took for the trainee to get allocated (as compared to 45 per cent of people getting allocated in less than ninety days, now 77 per cent get allocated in the same time) to projects.

In January 2015, TCS set up an Innovation Lab for new recruits with the primary objective of persuading the young minds to explore technical innovation. The associates were allocated in the lab for a short duration of 3–4 months to carry out applied research. Until 2017, nine frugal and four sustainable innovation projects have been delivered by the students. The lab has filed thirty-five patents and published twenty-one papers.

Building capability amongst business analysts (BAs) had become a strategic need for TCS because of the transformation that focused on positioning TCS as a trusted adviser to its customers and take on bigger assignments. To train business analysts who were young managers, TCS chose the method of story-based learning and non-business gaming with relevant lessons. The training was certified by the International Institute of Business Analysis (IIBA). One of the TCS business units that used this programme had five industry-certified BAs before the programme and after seven months of starting this programme, the number grew to seventy.

Performance Management

A survey conducted in the TCS BPO organization indicated that 79 per cent individuals felt that their immediate supervisors gave feedback either to discuss errors or to revise the targets upward. Over 83 per cent individuals felt appraisal ratings and the final performance bands didn't reflect the individual's performance and were seldom objective. A new performance management system called Peak was developed to enable continuous dialoguing, learning, engagement and career progression of associates.

In simple words, associates could add their remarks at any point and any time during the year against their goal and the first-level supervisor had to respond. The thread of remarks worked as a basis for performance discussion. A chat-bot (a software application that chats with the user and makes the user feel as if a real person is chatting) engaged with the employees proactively and gave them feedback about their performance. Over the course of time, the system was able to decipher quality of conversations, build insights, and throw up performance highlights and dissonance, if any. This served as a useful input in deciding and delivering learning needs of associates, forming future project teams, and succession planning. The system provided insights of various types: correlation between actual performance and the quality of conversation between the employee and supervisor, correlation between performance and critical instances in the life of associates such as marriage and birth of a child, etc.

Peak was deployed even to unallocated associates, who were offered time-bound, role-wise goal sheets that comprised milestones towards organizational initiatives, training and certifications. Based on the achievement of these goals, Peak assessed the performance of unallocated associates, which resulted in reducing mean time between allocations (MTBA). More than 75,000 associates who were on Peak showed a 50 per cent reduction in performance-related grievances and 50 per cent improvement in one-on-one connect with supervisors.

Enhancing Happiness

Hiring best-in-class engineers, on-boarding and training them in the best possible manner was necessary but not sufficient to ensure high

performance from the associates. Offices of TCS were in large cities and getting people on time to office while keeping the commute time short was a big challenge. The challenge became bigger considering the 24/7 business operations with a large workforce and multiple offices across large cities.

There were multiple challenges: semi-organized or unorganized vendors, safety of associates especially during night shifts, meeting regulatory requirements for ladies in night shifts, multiple shift operations, and handling voluminous data and employee communication.

A comprehensive Transport Management System (TMS) was piloted in 2008 with 13,000 associates who operated from ten offices in a city. It had an online rostering module, a vehicle routing software, vehicle mapping and tracking management, geo-tagged pickup addresses of every employee integrated with GPRS (general packet radio service) network, and employee identification using proximity-based access cards. Employees who had to be picked up as per the roster were sent an SMS informing them about the cab and driver details.

The information was sent at various intervals indicating the approaching pickup vehicle (as in cab-hailing services of today). This removed anxiety in the minds of employees who had to be picked up as well as those in the vehicle waiting impatiently to reach their office. Auto-escalations were made to the relevant supervisors at various time intervals if the employee did not board the vehicle. It helped the supervisor and manager plan the work for the imminent shift proactively. When a lady employee travelled alone, the control room was notified differently (even if a security escort was available in the vehicle). Panic button inside the vehicle and overspeed alerts ensured the safety of employees.

The system was slowly ramped up and in 2017, Enterprise Transport Management System (eTMS) catered to the needs of around 75,000 associates commuting to seventy offices spread across fourteen major cities in India. The mentor of the project, Cmdr Dinesh Rai, proudly said, 'eTMS has reduced cycle time for vendor payments, reduced no-shows, and enhanced occupancy in vehicles (average vehicle occupancy has improved from about 2.26 in 2008 to 3.7 in 2017). It has also resulted in higher associate satisfaction of 73 per cent in 2017 from 42 per cent in 2008.'

TCS Fit4life programme was launched in April 2012 with three objectives: Promote employee well-being, build camaraderie amongst them, and make them feel proud of their achievement and efforts. This wellness programme encourages associates to form teams, take a target, and perform aerobic sports such as running, brisk walking, cycling and swimming to achieve those targets. The programme is completely voluntary in nature but to encourage the associates to participate, TCS contributes a certain amount to a few charities every year for every kilometre or hour recorded by the associates. Professional coaches and nutritionist in twelve cities are appointed to support associates and their spouses in running marathons.

Over a period, activities such as yoga, Zumba dance, and gymnasium have also been added. During FY17, over 76,000 associates participated in this programme and contributed 13.52 million kilometres and 3.1 million hours in different fitness activities. Top ten performers were sponsored for the New York marathon. Buoyed by the success of this programme, it was taken to college campuses in nine cities in which more than 20,000 students from 500 colleges participated in the very first year. The programme is now being taken to schools for a 1-mile run.

♦ CONCLUSION ♦

As I sit down to write the last few pages of the book, I realize that a lot more can be achieved with a programme like Tata InnoVista. Similar to a banyan tree, it can spread and cover a large landscape, depending upon the imagination and interest of the sponsors.

I believe that Tata InnoVista is well-poised to extend its reach beyond the boundaries of Tata companies. In 2017, we started the Most Innovative Supplier award. It was presented to the company that delivered substantial benefits to one of the Tata companies through its innovation. On the other side of the value chain are our outbound supply chain partners: dealers, retailers, franchisees, distributors and service centres who all have a significant role in delivering customer experience. Tata InnoVista could expand and include these channel partners also to inspire and recognize them for their innovations in attracting, engaging and building loyalty. We believe the awards would help in igniting innovations in our extended value chain.

Technology development has been democratized substantially in the last decade or more due to rapid increase in start-ups and research centres along with the fast-evolving changes in the way people prefer to work today (consultants and freelancers). It is very likely that the solution for many of our problems already exist in some corner of the world – maybe in different forms in unrelated industries. Our early success with the pilots on Tata InnoVerse makes us believe that a large percentage of innovations, especially from larger companies, would soon have some flavour of Open Innovation. I also believe that India would become a very fertile ground for practising Open Innovation because of its improving ecosystem of start-ups that are developing cutting-edge technologies and look at established companies to

demonstrate their solutions.

An institutionalized Open Innovation system of a large conglomerate or company could be extended to its customers, which would take the mutual relationship at a strategic level and also serve as a differentiator.

There has been a rapid growth in the social sector. Start-ups and social entrepreneurs, supported by various government schemes, are trying hard to make a genuine difference. The mandatory contribution of funds for CSR as per Indian law has alleviated the problem of scarcity of funds. Making effective use of this money to deliver high-impact programmes in the communities is the need of the hour. Impactful social innovations, similar to business innovations, have long gestation periods. Companies need to partly unlearn their proclivity of donating money to provide immediate and temporary relief. Many problems that the communities face are similar across the country. NGOs, start-ups, and CSR departments of corporates innovate their own solutions to tackle the problems locally. A programme like Tata InnoVista could increase the share of strategic innovations and also help spot the best solution for a given social problem in a particular situation. By using the basic knowledge-sharing platform, all new solutions could be deployed in all other relevant places and drive efficiency in capital allocation for social impact projects.

I have showed in Chapter 5 that the gestation period of innovation projects has a considerable influence on their overall quality in terms of impact. How do we encourage senior managers to have a good mix of innovation projects from the perspective of gestation period? How about creating awards based on gestation period? This means that innovation projects that have a gestation period of less than one year could compete together and those that have a gestation period of 1–3 years would be bunched together. Similarly, projects that have a longer gestation period of, say, more than five years, would vie for an award amongst themselves.

The subject of Knowledge Management couldn't take off after the initial excitement mainly because it failed at the very first step of capturing 'new knowledge' of people. There is less motivation for employees to share their new knowledge for a purpose that is not time-bound and whose outcome is largely intangible. Moreover, the definition of new knowledge is as nebulous

as new products (explained in Chapter 5). This programme has proved that a competition or tournament is an effective way to capture the newly generated knowledge in the form of innovation attempts. Once the innovations are captured, these could be horizontally deployed within and across the business units, functions, geographies and product families. Therefore, if a KM programme is built on the superstructure of a programme like InnoVista, the chances of its success are high.

Finally, I believe that the transformation would take the next big leap if CxOs identify and own a portfolio of innovation projects (ensuring a good mix of big and small, short- and long-term, incremental and disruptive), invest in them, track them, and hold themselves accountable for resourcing the projects appropriately and not starving them. I believe this would create the most desirable environment for disruptive innovations that typically exists in the start-ups and impart more certainty to the process of creating long-term value.

Such musings seem to be justified when I read the recent thoughts of Ratan Tata on innovation: 'There are many successful traditional companies which are known for their excellence in execution and are considered to be the gold standard in the sectors they operate. But there are also companies that are driven to make a difference by "questioning the unquestioned" and developing "out-of-the-box solutions", to meet market demands. It is these less traditional companies that excite the marketplace through their elegant solutions and technological leadership. These are the companies that create an environment of mental freedom to "dream" and to innovate. These are the companies that attract and retain employees who inspire each other to find better solutions to existing problems. These are the exciting companies of tomorrow, driven by a culture that encourages innovation, and rewards new concepts and solutions. These innovative companies are those who believe that "nothing is impossible".'

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Case Studies

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♦ About the Book ♦

A must read for all leaders and managers who are not sure about how and where to begin their innovation journey. It also challenges the conventional thought that innovation has to be necessarily driven all the time by the top.

VIJAY GOVINDARAJAN
COXE DISTINGUISHED PROFESSOR, TUCK SCHOOL OF BUSINESS, DARTMOUTH COLLEGE

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A fascinating account for all looking to understand more about innovations in large complex systems, an even more relevant read for those seeking some inspiration for themselves to lead innovation anywhere.

DR SANTRUPT B. MISRA
CHIEF EXECUTIVE OFFICER, BIRLA CARBON, AND DIRECTOR, GROUP HUMAN RESOURCES, ADITYA BIRLA GROUP

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An outstanding read for anyone who wants to unravel the abstruse balance of subjectivity and objectivity in making, managing and measuring innovations!

SANJIV MEHTA

CEO AND MANAGING DIRECTOR, HINDUSTAN UNILEVER LIMITED, AND EXECUTIVE VICE-PRESIDENT, UNILEVER SOUTH ASIA

The author's royalties from the sale of this book will be donated to Tata Medical Center, Kolkata

♦ About the Author ♦



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CEO and Managing Director, Hindustan Unilever Limited, and Executive Vice-President, Unilever South Asia

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Vijay Govindarajan
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'A fascinating account for all looking to understand more about innovations in large complex systems, an even more relevant read for those seeking some inspiration for themselves to lead innovation anywhere. Ravi Arora has well researched, documented and drawn lessons from the experiences of the Tata group in its lifetime of innovation leadership.'

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