

***Visvesvaraya  
as Engineer-Sociologist  
and the Evolution of his  
Techno-Economic Vision***

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**NIAS LECTURE L1 – 2001**



**NATIONAL INSTITUTE OF ADVANCED STUDIES**  
Indian Institute of Science Campus  
Bangalore 560 012 India

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2001

**Published by**  
National Institute of Advanced Studies  
Indian Institute of Science Campus  
Bangalore 560 012

Price : Rs. 80/-

**Copies of this lecture can be ordered from:**

The Controller  
National Institute of Advanced Studies  
Indian Institute of Science Campus  
Bangalore 560 012  
Phone : 080-3344351  
Email : [mgp@hansadvani.serc.iisc.emet.in](mailto:mgp@hansadvani.serc.iisc.emet.in)

ISBN 81-87663-18-9

**Typeset & Printed by**

Verba Network Services  
139, Cozy Apts., 8th Main, 12th Cross  
Malleswaram, Bangalore 560 003  
Tel. : 334 6692



In recent years, sociological approaches to the history of technology have interposed new aspects that have brought the history of technology to the notice of policy research and policymakers. In particular, this renewal is encountered in studies on the sociology of techno-scientific innovation, and is reflected in publications appearing in journals such as *Social Studies of Science*, *Technology in Society*, *Technovation*, *Technology and Innovation*, and even *Technology and Management*. Traditionally, the history of technology was designed to address different audiences and serve different functions. In the first instance, the history of technology chronicled the

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□ Some of the material presented here is obtained from the Visvesvaraya papers at the Nehru Memorial Museum and Library. The research on which this lecture is based has been sponsored by the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore.

□ Lecture presented on 7<sup>th</sup> January, 1999 at the XIII Course for Senior Executives on "Leadership and Society: An Integrated Approach to Knowledge and Information", National Institute for Advanced Studies, Indian Institute of Science Campus, Bangalore.

progress of technological development. In this capacity it addressed both science and technical education, providing a frame and a repository of relevant technological objects for practising engineers and technologists. However, during the nineteenth century a particular genre of history emerged: the genre of heroic biography emphasizing the persona and contributions of several 'technological heroes'. For example, the contributions of James Watt, Stephenson, Edison, Marconi and innumerable others. This genre persisted into the twentieth century, playing a significant cultural role in positioning technology at the centre of contemporary culture. While the primary problems addressed by the history of technology related to the genesis of invention, the process of innovation, the transmission of innovation, and finally the impact of technological innovation on society, the new sociology of technology, on the contrary, established that the process of technological invention and innovation is much more complex than hitherto discussed in the history of technology. Furthermore, innovation is a social process, involving a multitude of actors, resources and circumstances rather than the result of the effort of a uniquely endowed individual. In other words, serendipity and genius have been underplayed by a more carefully elaborated contextualism. Thus, in short, the focus of this history of technology includes communities, workers, women, unsung laboratory assistants, and engineers, and in the process has questioned fundamental assumptions underlying the earlier history of technology,

such as technological and social progress. But, more significantly, it has rejected the Eureka approach to the history of technology and instead focussed upon understanding the complex interactions taking place between the science and technology system and society.

A few weeks ago, I received a wonderful book for review: *Edison: A Life of Invention* by Paul Israel. Initially, I assumed that this was another paean to a technological hero of the modern era, but half way through the first chapter I realized, to my relief, that this book was an exceedingly careful detailing and analysis of Edison's life of invention, this time told not as the history of a mythologized Edison (though the shadow of that iconic presence remained in the background) but rather as a figure shaped by and shaping the competitive American environment of technological invention. This led me to rethink through an extended piece of research I have been involved with, namely an intellectual biography of the Indian engineer Mokshagundam Visvesvaraya. Visvesvaraya was not strictly an inventor in the sense of Edison, but he certainly was a very remarkable innovator. The primary difficulty which confronted me in this project was to identify those elements within his socio-cultural environment which provided a medium for the realization of a vision that he was instrumental in giving form to, but which could not in any sense be localized or restricted only to his persona. But even if such a piece of

research was realisable – given the absence of a detailed archive that Israel had access to in the case of Edison – it is still possible to indicate that writing an intellectual biography of Visvesvaraya is indeed difficult, since he survived in a culture that was not in any sense enabled by the market or driven by the state.

In the talk that follows, I shall attempt to identify the factors that were instrumental in enabling the realisation of Visvesvaraya's project: I say project since what we do have today are concretely inscribed (in more ways than one) monuments and institutions as evidence of his project in the erstwhile Princely state of Mysore and in Karnataka more generally. On the other hand, while he had an important role to play in the All India Manufacturer's Association and the Bombay Plan; I would like to see these as ventures towards the realisation of a vision that may have given rise to various other projects.

### **1. Internal autonomy and indirect rule:**

#### **The opportunity for alternate development under a colonial regime**

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Colonial India was divided into directly administered British India that included the Presidencies of Bombay, Madras and Calcutta, the Provinces; and the native states or the Princely India of the Nawabs and Maharajas that were under indirect

rule. There were a number of disparities marking the latter, hence even these cannot be seen together. By the end of the nineteenth century, and the early decades of the twentieth century, four of these princely states had managed to acquire the status of 'model states' within the British Imperial dispensation. This was further reflected in a certain degree of internal autonomy accorded to them in matters of internal administration and decision making. The four states were Mysore, Travancore, Cochin and Baroda. Their subsequent social development record has given economists cause to wonder whether it was the degree of freedom available to these states which was responsible for realigning their trajectory towards modernisation in a less convulsive manner than what happened in other parts of India. The thesis is rich in possibilities and needs further exploration. Moreover, it would be interesting to situate the success of Visvesvaraya's vision against the backdrop of such an evolutionary framework.

However, studies of British imperial policy have not carefully examined developments in Princely India that in extent occupied a third of the British Indian Empire. Although by the end of British rule many of these states were degenerate versions of 18<sup>th</sup> and 19<sup>th</sup> century kingdoms, nevertheless, other states had made considerable progress towards attaining self-sustaining administrative and political growth, emerging as viable and cohesive monarchies under the leadership of

prime ministers or dewans, who were the product of a combination of Eastern and Western traditions. Thus the introduction of modern technology, education and administration in these regions was accomplished without disturbing the fabric of their socio-cultural life drastically.

A study undertaken by the economist John Hurd – concerning the evolution of population, economic and social conditions in 31 British Indian districts and 28 indirectly ruled neighbouring states – reported that 2/3rds of the latter were less developed. However, more recent statistical studies have suggested that most states registered a general though not striking improvement. The central provinces however proved to be an intractable exception. Some of these states developed faster than the British-Indian provinces; possibly due to greater availability of capital and less stringent regulation regarding income-tax and labour. However, for the period 1925–1937, Hurd's theory of the backward states does not apply to Mysore, Baroda, and Hyderabad which showed better growth rates than Bombay, Bengal and Madras.

Mysore was a native state under indirect British rule, and under the stewardship of Visvesvaraya, as Dewan of Mysore (1912–18), struggled for more autonomy. Furthermore, it was during Visvesvaraya's tenure that the Instrument of Transfer of 1881 was replaced by the Treaty of Mysore. The attempt to achieve this autonomy in internal administration

was pursued by the two most influential dewans of Mysore: Visvesvaraya and Mirza Ismail. This minimum autonomy ensured that interference from the Centre was restricted, and that it became possible to develop a cultural unity consistent with the local conditions and traditions. By 1927, Mirza Ismail had taken a small step towards reducing the annual subsidy to Rs.2.55 million. Although the demand for autonomy had first surfaced in 1881, the attempts of Visvesvaraya and Mirza Ismail succeeded because they were able to enlist the support of their respective maharajas in negotiating autonomy with the British.

The year 1910 was one of economic and political crises in the state of Mysore. The Mysore administration was perceived by the populace as alien, consisting largely of Tamil Brahmins who, having trained under the British-administered Madras Presidency, landed plush jobs in the Mysore administration. The Swadeshi movement that had begun to sweep Bengal after 1905 echoed very weakly in Mysore, in part due to the absence of a commercial class to respond to the Swadeshi movement<sup>1</sup>. The influx of foreign goods precipitated the marginalisation of local manufacturers and artisans; consequently, there was little or no expansion in the domains

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<sup>1</sup>It is important to note that the citizenry of the Princely states did not join the freedom struggle till quite late. While the rulers of the states may not have sabotaged the participation of the citizenry in the struggle, they did little to encourage the cause either.

of metallurgy, pottery, carpentry and textiles, and at the same time the state did little to support commerce and agriculture either. Thus, although the socio-political situation of the times may have demanded a policy similar to that proposed by Visvesvaraya at the time, yet Visvesvaraya realized that the opening up of Mysore could create opportunities for economic development. The engineer-sociologist, a term I shall define later, possibly recognized that promotion of technological systems could have the power to penetrate and shape wider cultural expressions by drawing these values into alignment with a technologically inspired social trajectory. On the other hand, Visvesvaraya's view of development was nominalist. According to this view, underdevelopment was evident in the visible gap between the industrialised West and the backward colonies. Furthermore, that development necessitated that India follow in the footsteps of the Western industrialised nations. This analysis of his, based on a comparison between dynamic Western society and India, eventually shaped the emergence of the inevitable state-capitalist model of development to be adopted in a primarily agricultural economy in order to restructure the economy on the lines of the then existing industrial capitalist nations, although his exemplar was Japan after the Meiji revolution of 1868.

In 1919, after a trip to Japan, he published his *Reconstructing India*, wherein he argued for the 'wise assimilation' of modern

methods of production, marketing and distribution. In this scheme, social reform amounted to building the nation from the village level through primary and technical education. The economic restructuring of the villages was necessary to economic progress. A common feature of this book and his later *Planned Economy for India*, was that Japan, the United States and Sweden appear as the developmental exemplars for India. However, for very different reasons, Japan turned out to be a model worthy of emulation for many an Asian nation, largely due to the manner in which it had leap-frogged into the modern industrial era. According to him, both Sweden and the United States had vast resources as India did. The former had learnt to harness them appropriately and efficiently. In addition, the governments of these nations had intervened during the initial years to develop capitalist industry and, by the end of the century, had caught up with the developed nations of Europe.

Economists have argued that Visvesvaraya was a 'developmentalist', who recognized that the realization of his vision necessitated more autonomy for the state. The Treaty of Mysore resulted in reasonable independence in internal affairs and conferred a higher status on the State. He could thus initiate such projects as the building of the Krishna Raja Sagar dam, the Bhadravathi Iron and Steel Works, and the railway line established between Mysore and Arasikere. The years 1910-1918 were fascinating in the

economic history of Mysore on two counts. First, the state witnessed the initiation of far-reaching industrialisation, which in turn was accompanied by strident efforts to achieve economic self-reliance. During Visvesvaraya's stewardship as Dewan, Mysore witnessed the rise of economic nationalism in Mysore. However, the local administration sought to reverse the gains of economic independence so acquired. Despite these countervailing tendencies, the foundations of a modern industrial state had been laid the first steps to which were taken in the last decades of the nineteenth century.

## **2. The apprenticeship of an innovative civil engineer**

Before he donned the mantle of the engineer-sociologist in Mysore State, Visvesvaraya worked as an engineer in Bombay Presidency. Little attention has been paid to the importance of these years in shaping his views and his vision. My own feeling is that his exposure to the industrializing and technical culture prevalent in Bombay Presidency and his travels abroad, in particular to Japan, during these years were of prime significance in the development of his vision which he gave concrete form to in Mysore. Pune was home for him: he obtained his training in engineering here, and subsequently it became his headquarters for 15 years; it was also the seat of the Government of Bombay. I shall briefly inventory his technical and social exposure during these years.

He was responsible for the design and installation of automatic sluice gates, which he patented at Khadakvasala, that enabled the control of flood waters on the Mootha canal. This technological accomplishment put him amongst the experts on flood control in India. *The Madras Mail*, of May 8<sup>th</sup> 1903, speaks of his invention of automatic shuttlers, study of which was the hobby of numerous irrigation engineers. Despite which, the shuttlers installed on the dam near Bhabghar were an ingenious modification. More than anything else, he earned a footnote for himself in the subsequent history of irrigation technology.

His introduction of novel irrigation schemes in the drought-prone regions of Bombay Presidency were a success. The success was in part ascribable to the inclusion of farmers in the implementation of these schemes and a policy of open dealing and transparency. He was already converted to two ideas that characterised his persona – the idea of *public transparency* and the image of the *faceless bureaucrat*. The scheme for drought irrigation has been seen as a modern revision of the traditional 'thal system' prevalent in Nasik and Khandesh, wherein the establishment of irrigation systems had been hindered by the topography of the country, since it involved exorbitant rock cuttings and construction of canals of immense lengths. This was compounded by the undulating character of the country that required special levelling and preparation of fields for irrigation. Historians

of technology have still to study how Visvesvaraya creatively adapted a traditional system within a modern technical practice.

It was during these years that he was called upon to design the barrage at Sukkur, now in Pakistan, on the Indus. He then went on to design the drainage system for Aden, and gradually came to be recognized as an advisor on drinking water and drainage schemes for urban conglomerates. Gradually he earned a reputation outside India as well. As a technologist and technocrat, his vision had acquired substance; by the time he quit his position in Bombay Presidency, moved to Hyderabad, where he initiated legendary flood-control schemes that saved the city of Hyderabad from annual floods. The forty-six-year old technocrat had a well-painted picture in mind when he entered the services of the Mysore Maharaja as Chief Engineer. In addition, while at Pune and Bombay he socialised with leading industrialists from Bombay, particularly Thackersey who was his good friend. Visvesvaraya's ideas of the nation, public and citizenship developed amidst his camaraderie with Ranade, Gokhale and Tilak.

### **3. The birth of the engineer-sociologist**

One course a sociologist treads towards understanding the changing profile of contemporary society is by following the

path of innovators in their investigations and projects. The procedure developed by Michel Callon, who has made ample contributions to the literature of technoscientific innovation, has proved to be successful in the study of radical innovations and engineers who are forced to develop explicit sociological theories. He has coined the notion of the 'engineer sociologist', which serves as a model to which the sociologist turns for inspiration. Along with Bruno Latour he has developed the theory of the actor-network, that is central inasmuch as it recognizes the sociological style of the 'engineer-sociologist'.

It is my firm conviction that this notion, and its concomitant theory, would prove fruitful in trailing the unfurling vision of Visvesvaraya. That the idea is not too far-fetched in discussing Visvesvaraya is reflected in his biographies written in the 1960s and 1970s long before the sociology of technology acquired a certain acceptability. Sitaramaiah thus speaks of the Visvesvaraya project as that seeking to 'engineer the economic welfare of the whole of India'. We may well propose a sort of periodisation to the creation of this persona. The period from 1890 to 1907 was that of the professional engineer. The engineer-sociologist comes out in the open well after 1912 when he takes over as the Dewan of Mysore. In any case it would be interesting to briefly recapitulate the influences that shaped the emergence of this role, by identifying the various dimensions ascribable to his project.

### *3.1 The persona of the administrator in the realization of the vision*

It may reasonably be suggested that as administrator he introduced the Weberian style of bureaucracy to the culture of Mysore. His personal code of conduct, and his relations with his colleagues, was meant to be an exemplar of this sort of institution. Narendra Pani in his introduction to the diary of a bureaucrat, K.R.S. Iyengar, of Princely Mysore and a contemporary of Visvesvaraya, points out that the source of conflict between the two appears to have arisen from two distinct views of the bureaucracy. The Western ideal of bureaucracy was premised on the differentiation between the personal and the official. In the Weberian notion of bureaucracy, the bureaucrat was personally free and subject to authority only with respect to their impersonal official obligations. Prior to Visvesvaraya's appointment as Dewan, personal relationships were reflected further in the complete acceptance of nepotism in the bureaucracy which extended to the personalized reactions to corruption as well. The functional deviation from the Western ideal were complemented by structural differences: the powers of the Deputy Commissioner in the State covered both the executive and magisterial functions. The monarch rarely vetoed the decision of his Dewan<sup>2</sup>, and finally the State lacked financial

<sup>2</sup> Narendra Pani in his introduction to the diary he has edited writes with reason that the bureaucrats (in Mysore) in 1881 were among the most powerful individuals in the state, exercising administrative control and having a say in the decision making with the Dewan who too was a bureaucrat.



resources to ensure that the Deputy Commissioner could exercise the powers invested in him. Visvesvaraya, as Dewan, pressed for the institution of a Westernised bureaucracy that clearly distinguished between the personal and the official, while K.R.S. Iyengar, his colleague was opposed to Visvesvaraya's development schemes. The role of the bureaucrat according to Iyengar was that of an administrator and not of one proposing innovative and creative development schemes.

The fact that Visvesvaraya developed in the mode of the modern bureaucrat was further reflected in the two central events of his life. He resigned from his post in Bombay Presidency when he was superseded by a British official to the post of Chief Engineer that he felt he had right to on the merits of the case<sup>3</sup>. A year later he was invited to take over as Chief Engineer in Mysore by the then Dewan, T. Ananda Rao. Visvesvaraya initially expressed some reservation of working with a monarch and his array of courtiers. Ananda Rao had to convince him that the Maharaja's vision coincided with Visvesvaraya's vision of developing vast irrigation works and of encouraging the development of industries and of technical education. A year later he took over as Dewan of

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<sup>3</sup> As Dewan, it was often pointed out that his conception of bureaucracy was founded on the ideal of merit, and that if an official was efficient then all other considerations, including personal ones, had to be ignored, and even seniority mattered little.

Mysore and proposed large-scale government investment in Mysore to build a base for industrialization along the following lines:

- the construction of a reservoir to generate hydroelectric power and irrigate 100, 000 acres of land;
- the establishment of an iron and steel factory in Bhadravathi, and the commencement of a soap factory using locally available sandalwood; and
- a scheme for industrialization based on the spread of higher education, thereby founding Mysore University, the first in Princely India.

This programmatic transformation could only be affected through a more efficient bureaucracy in tune with Western ideals. Hence the conscious projection of an apolitical image facilitated his implementation of various schemes and projects, even though he was often the victim of his political views – for one, he was never associated with the Congress or the politics of the freedom struggle, though implicitly he was quite in tune with the scientific and technological agenda of the nationalist scientists. A qualification is nevertheless in order. During the emotional upsurge following the partition of Bengal, he never followed the theosophists in the glorification of India's past. At an address at an engineering college he spoke of India's grievously low per capita income and the need for an economic plan to eradicate poverty, with the Government playing an important role in its

enforcement. Bjorn Hettne calls Visvesvaraya the most brilliant Dewan in the history of Mysore, even though he was far too Westernised for his times. One of the factors that influenced his choice as Dewan because was his distance from the power struggles at the central and local levels.

### 3.2 The triptych painted by Visvesvaraya

Visvesvaraya's technological vision may be schematised as a triptych. This inveterate innovator felt that the vision could never achieve realization if he pursued the implementation of each panel of his triptych sequentially. The developmental process could only be bootstrapped if steps were taken towards implementing components of programmes from each of the panels simultaneously. The fascinating feature of the triptych is Visvesvaraya's integrated perspective which recognized that all three programmes should be commissioned simultaneously. The relationship between these programmes was therefore symbiotic; the installation of one component in the panel would catalyse the initiation of programmes in another panel. Thus, in order to initiate so many programmes in parallel, the state exchequer would certainly have been strained, which explains why in his own times he was criticised severely for extravagance and wastefulness by the traditional bureaucracy. But he managed to carry the monarch along with him, and one might say that his public image stood him in good stead. By the 1920s, long before the benefits accruing from his schemes began to trickle down to

the populace, his figure began donning the walls of common households in urban and even rural Mysore.

**Table 1. Visvesvaraya's triptych for development**

Strategy	Realizations
<b>Technical and technological education</b>	
University of Mysore <sup>4</sup> (1916)	Augment administrative autonomy in the State
Bangalore College of Engineering (1917) Jayachamrajendra Polytechnic (1942)	Promote indigenous industrialization Development of indigenous technical skills
<b>Rural Industrialisation</b>	
Irrigation Works	Increased acreage for agriculture
New Crops	Introduction of sugarcane and mulberry
Rural Industry	Development of industries for sandalwood oil, silk weaving and distilleries
<b>Industrialisation</b>	
Hydroelectric works	Increased power for expanding industrial base
Ehadravathi Iron and Steel Works	Development of railways in the State, and later an automobile and subsequently aircraft industry
Banking institutions and professional societies	Mysore Bank, professional bodies with linkages with the All India Manufacturers Association <sup>5</sup>

Through his books, programmes and pamphlets, it becomes evident that there were three core components of this vision of transformation: the domains of education; industrialisation

<sup>4</sup>In addition to developing agriculture, he proposed the founding of agricultural schools in the State, and the school in Hebbal with a large farm was opened in 1913. Similarly, training institutions in mechanical engineering were founded in district headquarters.

<sup>5</sup>He was president of the AIMA for several years and co-director of the Tata Iron and Steel Co. Ltd.

and, rural modernization. As pointed out earlier, India's backwardness was ascribed to illiteracy and the consequent lack of skill and working capacity. Industrialization became an instrument of change reflected in his slogan: 'Industrialise or perish'.

This vision of development of the State, very clearly articulated in his writings, was deeply interconnected with cross-linkages between the three panels, and with developments in one closely stimulating developments in the other. Thus education was essential to produce a cadre of trained professionals to administer the State, a cadre of engineers who ensured the industrialisation of the State at a number of levels. The significant feature of the university was that it was designed to be a teaching university and not merely an examining body with post-graduate classes. Mysore thus became the arts centre of the State, and the Central College, Bangalore, the science centre, drawing upon the expertise resident at the Indian Institute of Science. And much later, he conceived of a polytechnic that would turn out trained technicians. This panel thus provided the human resources inputs to sustain the programmes to be undertaken in the other two panels. The hydro-electric scheme was also visualised in such an integrated manner. While approval for the project was obtained on the pretext of supplying reliable power to the Kolar Gold fields, the Maharaja was convinced that the real benefit lay in the

increased acreage of land to be brought under agricultural cultivation.

However, true to the economic thinking of the time, an industrializing economy had to reduce its dependence on agriculture. Visvesvaraya's conundrum was to accomplish this without neglecting the agricultural economy. Hence his scheme for rural industrialization. The emergence of the silk industry in Mysore and the sugarcane-related industries were seeded programmatically. Technical personnel were sent to Japan for training in modern methods of sericulture. Looked at another way, this component of rural industrialization was a sort of intermediate stage in industrialization, wherein small industries would develop around rural villages and absorb unemployed rural workers in medium-sized workshops. This was to be accomplished through local initiative and government assistance. Finally, his most problematic project concerning the Bhadravathi Iron and Steel Works, was conceived as a first step in the larger-scale industrialization of the state. The project itself did not prove to be economically viable till the mid 1930s for a number of reasons that were addressed by Visvesvaraya himself long after he had retired. One of the primary reasons was that during the post First World War years there was a disastrous fall of prices of iron and steel which jeopardised the iron and steel industry. However, despite this setback, the subsequent stage in the industrialization of Mysore, as visualised by Visvesvaraya,

was to establish a car factory. On a trip to the United States with other members of the All India Manufacturers Organisation, he negotiated a deal with Chrysler<sup>6</sup>. The project fell through primarily because the British administration torpedoed the proposal. But destiny had other things in store. During the Second World War, the allied forces needed a unit for servicing their aircraft in the Eastern sector. And Visvesvaraya played an instrumental role in negotiating a deal with the industrialist group Lalchand-Hirachand and the government in setting up Hindustan Aeronautics, which initially was to be a car factory, at Bangalore.

Furthermore, the Bhadravathi unit was located very carefully. It was close to Kemmanagundi from where the iron ore would be shipped; the plant was on the Bhadra River that would provide the water source; and the wood for the furnaces would come from the surrounding forests. The railways provided the connection between the Presidency towns. The Mysore-Arsikere line was laid down during his time, reducing the distance between Mysore and Harihar, the latter thereby provided the rail connection with Bombay Presidency. The Bangalore-Kolar line linked the interior of the State with Bangalore.

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<sup>6</sup> In any case, much else came out of that trip. The delegation visited the Ford factory in Degenham, and subsequently founded Hindustan Motors in Calcutta and Premier Automobiles in Bombay.

Looked at differently, as an *administrator*, Visvesvaraya believed that a bureaucracy in the Western mode, stimulated by the work ethic of capitalism, would not go berserk. This is not to say that he was not aware of the possibility that capitalism possessed the potential to run amuck. Which is why he was to write: "The unfettered spirit of industrialism will result in anarchy and violence unless the employing class meets the problem of peaceful methods of negotiation and conciliation". Secondly, as has been indicated repeatedly, his vision of the *technology society* relationship was an engineer's vision: technological determinist, i.e. the advance of technology brought in its wake social development. He thus attempted to socially engineer change through technology. His *economic programme* has been categorised as state-capitalist – inspired by Japan and the United States – the State invests in education and in industry till private companies no longer need the support of the State. Finally, his central ideological orientation, if there was one, was to decrease the State's dependence on agriculture.

The clarity of his vision has often rendered him vulnerable to the criticism that it had the precision of an engineer – a rather euphemistic way of saying that his ideas about society were often simple and naïve at times. Captive to the idea of technological efficiency he was quite naïve about the complexities underlying social causes and concerns. An apocryphal story is told by the leading journalist from Mysore,

Gundappa, when he was deciding a name for his newspaper. He chose: The Citizen, The People, The Karnataka. Visvesvaraya quizzed him about why he did not decide upon: Progress, Forward, Advance. Gundappa writes the first list suggested political democracy and historical tradition, the second the gospel of material regeneration, and the urge for modernism. The paper in its day attacked the deliberations of Visvesvaraya's Mysore Economic Conference for its 'amateurish planning of the Conference and its promises to extract moonbeams from cucumbers'. Through the Economic Conference, Visvesvaraya stressed the need for the organization of statistical abstracts, that were meant to help the planning of agriculture, and other economic activities.

### *3.3 Building KRS: the engineer-sociologist at work*

The genesis of the Krishnarajasagar (KRS) Dam is very interesting because it marks a milestone in the unfurling of Visvesvaraya's vision. If the founding of the Mysore Economic Conference of June 1911 and the passing of the resolution of June 1912 for establishing the State Bank of Mysore marked one stage in the elaboration of Visvesvaraya's economic agenda, the proposal for the KRS Dam that was much criticized in its time for being too extravagant financially marks another one. However, history and economics have since vindicated his plan, but the more important aspect is how despite opposition from within the Mysore administration and the British resident he was able to effectively translate his vision

into a realizable project. The sociology of technology has thrown interesting light on the manner in which technologists focus their inventive or innovative effort to overcome reverse salients. Much like generals channel their forces, the engineer defines the salient as a set of critical problems that when solved will correct the situation. Prior to 1912, there existed the pressing need to modernize the Sivasamudram power station that fed the Kolar Gold Fields – this modernization plan was tied up with the modernization of the mines themselves. Visvesvaraya recognized that this was an opportunity to push for his scheme that was much larger than that of the immediate requirements of the British and would simultaneously persuade the Maharaja who was more interested in the development of the State. The justification for the KRS Dam simultaneously intersected with three programmes. In the first instance it would provide the reliable power needed for a modernised KGF, and would in the process neutralise any opposition from the British. Secondly, Visvesvaraya effectively translated his proposal into a scheme for extending irrigation in the region in and around Mysore thereby expanding the domain of agriculture. This would have appealed to the Maharaja who had in any case empowered Visvesvaraya with the task of initiating development projects in the State. Thus the idea of a reservoir at KRS was a master move that would have appealed to the Maharaja's agricultural constituency as well. And finally, the surplus power generated from KRS would enable the industrialization of the region –

this was, in a manner of speaking, a central element in his vision of the technological development of the State. Many years after the construction of the KRS, issues relating to its technical or financial feasibility continued to be debated and were the source of much criticism, but the agricultural and industrial transformation of the Mysorean landscape over the subsequent decades stand out as proud testimony to the wisdom underlying that vision.

#### **4. Visvesvaraya as the inaugurator of planning in India**

Any discussion of Visvesvaraya and planning must take cognisance of the fact that before the achievement of independence, planning was not anathema to the Indian industrialist class, and that it was Visvesvaraya who gave the notion a great deal of deliberation and concrete form in his book of 1936 and through his association with the Bombay Plan. However, his approach to planning must be distinguished from Mahalanobis' Soviet-influenced approach: in that it stressed a more capitalistic planning effort<sup>7</sup>. However, what is most germane is that an important strand

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<sup>7</sup> In the *Planned Economy for India* Visvesvaraya wrote: "... a planned economy is required to ensure the rapid advance of industry, agriculture, commerce, finance, and particularly for increasing production, and earning power, reducing unemployment, and encouraging self-sufficient and closer interdependence between various parts of India. It should provide for the material resources and manpower of the country and the application of the latest inventions and discoveries of economic interest to the fullest extent".

of the Nerhuvian legacy was inherited from the work of Mokshagundam Visvesvaraya. His *Planned Economy for India* that appeared in 1934 bears evidence of two important insights. (1) The recognition on his part of the importance of estimating national income. (2) His appreciation of the decline in the population dependent on agriculture with the introduction of structural changes in an industrial economy. While his vision recognized the potential for the agricultural growth of the economy, he felt that the primary increase in productivity and output would result from industrial development. Industrialization would in turn accomplish three things: augment production; provide employment; and make available more goods at cheaper rates.

Education was a means to achieving this end. As far as planning was concerned, it was essential to acculturate the population to the new industrial culture such that it could contribute to a developing industrial society. Planning necessitated the collection of data at the district level, and these efforts could be complemented by departments such as the Department of Industries which were indeed established after his tenure as Dewan came to an end. While economists have long debated his contributions as an economist, they do not deny that the recommendations he submitted to the Congress Committee on Planning in 1936 provided for Nehru's contributions in the post-independence era. It would be interesting to briefly contrast the role of

planning as conceived by Visvesvaraya and Nehru respectively (see table 2).

This vision was not technological but was a frame for social engineering – of embedding a new technological culture in order to achieve social transformation. And it is here that Visvesvaraya appeared as a visionary, whether it was his emphasis on planning for the nation, or on district level planning, or the Bombay plan, or his guidance of the All India Manufacturers Association etc.

### 5. Some questions from our own vantage point

With the benefit of hindsight, we may well ask whether he placed excessive emphasis on industrialization, or did he conceive of a balanced relationship between the development of agriculture, industry and education? It appears from the foregoing discussion that while he was a proponent of large-scale industrialization, he was not oblivious to the needs of agriculture. It must not be forgotten that he started his career as an irrigation engineer and that he recognized full well the strengths and weaknesses of the agricultural economy. He identified six bottle necks in the advance of Indian agriculture: (i) the high population pressure on the land; (ii) the repeated fragmentation of land holdings; (iii) the primitive methods of cultivation; (iv) the wasteful use of farm manure; (v) the poor utilisation of women in the

**Table 2. Two visions of technology and planning**

Visvesvaraya (first half of 20 <sup>th</sup> century) <sup>8</sup>	Nehru (second half of 20 <sup>th</sup> century)
Canvas: Mysore Vision: national. Functioned in Mysore when the State had a certain degree of autonomy quite uncommon under colonial rule	Canvas: the nation Vision: international, non-aligned. Headed Independent India
A technocrat, imitating Western ways, in a society where he assumed that groups functioned in harmony	Conscious of class differences and conflicts. His socialism resulted in a mixed economy
To break monopoly of upper castes in skilled jobs he set up a revolving fund to award scholarships to students from the non-Brahmin castes	Nehru advocated a reservation policy wherein a percentage of jobs for the oppressed castes were enshrined constitutionally
Reasonably successful in fostering cooperative linkages between research <sup>9</sup> , industrial and financial institutions. Instituted the Mysore Chamber of Commerce to ensure coordination between industry and government policy	Linkages didn't quite work as Nehru desired – the IIT graduates ended up going abroad, no satisfactory linkages forged with research institutions
Mysore Economic Conference performed functions similar to Planning Commission	Nehru's Planning Commission performed functions recommended in the 1934 Plan
Underlined importance of education and commerce	Expanded educational system, linking it with planned development
Admired the first Soviet Plan, but was certain that this was not what India needed	Emotionally attached to the socialist model of planning, but achieved State-led capitalism
Rural industrialisation could solve rural unemployment	Sought to operationalise community development
State theory of economic development, and his plans were directed at leapfrogging.	Nehru's vision of development was based on a historical and international perspective

<sup>8</sup>This table has been extracted from the paper by Vinod Vyasulu on the Nehru legacy.

<sup>9</sup>He was President of the Indian Institute of Science for five years, and suggested the need to establish an All India Organisation for Scientific and Industrial Research with national laboratories attached to it: "Science is a rising force, it is creating a new world about us that needs to be watched and pressed into service, and in any case it would be courting disaster to ignore it ... the intelligence of the people, natural resources and available capital should act and react on each other so that with its cumulative effect, the country can make permanent progress".

work force; and (vi) the rural indebtedness of the farmer. This appreciation of the agricultural economy shaped his prescriptions for the agricultural economy which maybe summed up in two propositions.

- An agricultural economy that sells merely grains and raw materials remains poor.
- The degree of development of an economy is inversely proportional to its dependence on agriculture.

Between the years 1900 and 1930, the percentage of the Mysore population involved in agriculture increased, possibly for two reasons. More areas came under agriculture, and sections of rural industry were marginalized.

However, did the inability of Bhadravati to reach viability vindicate Chatterton's appropriate technology thesis? Alfred Chatterton was brought to Mysore from Madras Presidency, but after a short period the two fell out. But more than personal idiosyncrasies, they were separated by distinct visions of industrialization. As is evident, Visvesvaraya was totally committed to modernization and the introduction of large-scale industry as encountered in the developed nations. Chatterton was of a different persuasion and felt that modern technology could be re-crafted to work at different scales where they would prove viable, once cognisance had been taken of the cultural embodiment of technology. In other words, he may have been an early proponent of appropriate

technology, although this clearly was not in the 1970s variant of it. But this gives us cause to re-think the original thesis, namely that the indirectly ruled states did embark on a trajectory of modernization and industrialization that was different from that of British India only in its impact. As far as the Bhadravathi Iron and Steel Mills was concerned, the demand for steel fell after the War, accompanied by a drop in the price of steel, that sent the company into loss. Moreover, there was still no ample demand for steel in the country at the time. Chatterton's remark to the Royal Society in London in 1925: "unfortunate enterprise, the Bhadravathi Iron Works will have to be shut down", was premature. For within a decade the fortunes of the Iron Works turned for the better. Did Visvesvaraya's experiment in Mysore have any impact on post-independence India?

Technocrats from Mysore – in fields such as irrigation, sugar, paper, fertiliser and steel, worked in industries at the all India level and contributed substantially to the development of these fields. Visvesvaraya emphasised the development of indigenous talent, while at the time Tata depended on foreign expertise. In fact, those who built the Iron and Steel Works were the very ones who built the Tata Iron Works. Visvesvaraya's contributions need to be appreciated at a number of levels and along different dimensions. Two important levels are those of the State of Mysore and that of India. At the level of the Princely State of Mysore under



indirect British rule, his contributions must be measured along side that of Nehru against the backdrop of the nation fifty years later.

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ISBN 81-87663-18-9

ISBN 81-87663-18-9