Council of Scientific and Industrial Research

Legacy and the Path Forward

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CSIR was founded on 26 September 1942. The agency was to play a role in catalysing technology-led industrial progress and contribute to the socio-economic development of India. Autonomy was considered necessary even at the stages of establishment by the forefathers of the organisation. From a group of five laboratories conceived in 1945, CSIR has grown into a network of 37 laboratories. This has been feasible on account of support of strong political will, committed actions and record of performance by the agency.

Here's a broad look at the evolution and growth of CSIR as an organisation.

***Early Period (1942-56)*:** At its early stages, CSIR was needed to mobilise resources and support from both Government and private sectors. Donations from private players were solicited and obtained in the form of cash, land and physical infrastructure from state Governments and philanthropists. During the first 15 years, the number of CSIR laboratories grew to 17. CSIR, then, was the only major Research and Development agency of India. It participated in the development of R&D manpower through Extra Mural Research support as well as in addressing national problems through tools of science as an intramural research body.

Period of Growth (1957-71): Further expansion of the network of CSIR laboratories continued during the next 15 years. Dual roles of Extra- and Intra-Mural Research Function as National

laboratories network continued and prospered. Those were times when India had to gain food security. CSIR played a strong support function in India's food security drive. Swaraj tractor and several other agricultural implements to suit India's culture-based agricultural systems and technologies for agrochemicals were delivered through coordinated intra-mural research programmes. Technology for Amul powder from buffalo milk is a case in point of CSIR's effort in providing technology solutions to national problems. CSIR's role in nation-building was evident.

Period of Consolidation (1972-86): With the formation of the Ministry of Science and Technology, promotion of research through Extra Mural Research support became feasible. CSIR could focus on intra-mural industrial research and development and in establishing linkages with the industrial sector. Technological self-reliance had become the national priority. Reverse engineering in critical areas became a CSIR action.

Research in the development of drugs through process innovations for rendering the Indian health care system affordable became a priority. R&D work of CSIR had led to a share of as many as 12 of the 16 drugs introduced in the Indian market during that time. Direct relationships between the R&D priorities of CSIR laboratories in commodity oriented sectors like food, ceramics and leather could be traced and expanded.

Yet, concerns were expressed on financial self-sustainability of CSIR. The Abid Hussain Committee ("Towards a New Perspective", Report of the CSIR Review Committee, Abid Hussain *et al.,* 1986) made some recommendations with game-changing potential. Forward engineering thrust was emphasised. Capitalisation of intellectual outputs was accorded high priority.

Period of Reinvention (1987-2001): Concept of External Cash Flow (ECF) was introduced. During 1987-95, there were steady increases in ECF. Change of leadership at CSIR brought a new found dynamism within the system. CSIR 2001 was revealed in 1995. New paths were paved. With economic globalisation and liberalisation of economy at the National level, agencies like CSIR reinvented themselves for entering into the dynamic market competition in non-strategic technology space.

The Kelkar Committee ("Reinventing the CSIR", Report of CSIR Review Committee, Vijay Kelkar *et al.,* 2004) reviewed CSIR and yardsticks for R&D performance measurements in terms of public-, private-, strategic- and social- goods were drawn up. Efficiency and performance indicators became an internal norm. CSIR implemented a Technology Mission on leather sector successfully and catalysedthe technology-led development of the Indian leather industry. The motto of "CSIR would like to matter to India more" became the doctrine internally.

> **It is desired that CSIR chooses a sustainable path for delivering values for an aspiring Nation in technology-enabled creation of jobs and increasing her share in Global High Technology Trade. Mindset change from project implementation to nation building is a way forward for the New CSIR of new India.**

Period of paving a way for new CSIR (2002-16): Corporate culture in ways of working was emphasised. Physical and R&D infrastructure of all CSIR laboratories were updated and modernised. CSIR academy was established through an Act of Parliament. CSIR focused on emerging as a major global leader in innovation space. CSIR was poised for second-stage reinvention and renaissance. Changes in the external environment forced the concept of New CSIR. Tools of the past could hardly help CSIR in paving paths of the future. Paving the way for New CSIR became the priority.

***Period of transition (2016-2030) towards New CSIR for New India*:** The world view on industrial research in public-funded systems is undergoing seismic changes. In-house research and development which affords first-mover advantages in the marketplace for the inventor and the investor in a competitive market environment is the global norm. World view of industrial research is tilted in favour of R&D for private and strategic good in the current IPR regime. Sustainability of public funded and open ended industrial research is challenged globally. CSIR as one of the largest Public funded agencies engaged in industrial research and development needs to innovate for sustainability in the new millennium. Sustainability is the new mantra.

Uniqueness of CSIR

With a few exceptions, CSIR-India is a unique intramural research agency on a global platform with widely differing sectoral interests. CSIR remains the intellectual leader in creating Intellectual Properties with potential commercial interests. Industrial research leads to national outcomes only when connected seamlessly to wealth or value creation. Generation of intellectual properties from industrial research without market connectivity is inadequate.

Conversion of intellectual properties into wealth and/or value needs interface with other players in the mind-to-market chain. CSIR could well lead the formation of a vibrant industrial research ecosystem by engaging in gainful partnerships. Capitalisation of the IPRs and other industrial research outputs in the form of sustained revenue flow from business processes is a priority.

New paths forward

India is undergoing major internal transitions. The Government of India has launched some important national flagships for the creation of demand pull for products of industrial research and development. Technology-based innovations are in demand. Make in India, Invest in India, Digital India, etc. are all indicators of the transition happening in India.

SWOT Analysis of Current CSIR

Strength	Weakness	Opportunity	Threat
Build-up of physical assets	Ageing of physical assets created	Emerging National priority and flagships	Outdated intellectual infrastructure
Expertise-base in diverse R&D areas of industrial interest and brand image	Critical gaps inconverting knowledge Into wealth/value creation	To emerge as reliable source of game-changing technologies and lead Atmanirbhar Bharat	Competition from R&D systems of MNCs in India for R&D for India
Strong IPR base and patenting work culture	Inadequate capitalisation of IPR assets for royalty flow	Leveraging first mover advantages in IPR world	Flight of talent base of CSIR in favour of other S&T systems
Proven record of past performance in technology delivery in planned economy	Weak record of performance in areas where technology assets are mobile	Scope for entering into dynamic global competition in global technology market	Competition shake out in globalised knowledge economy in select R&D areas
Linkage capital with some core industrial sectors and academy	Excessive reliance on transaction model & poor cash inflow outside R&D services	Scope for building relationship model with some select industrial sectors with IPR sharing provisions	Horizontal transfer of technologies into manufacturing base and import of high technology products
Corporate work approach for non-strategic research and development with networking capacity	Excessive dependence on public funds with low revenues from IPR and royalty accrual	To gain leadership in catalysis of technology and innovation-led manufacturing in non-strategic sector	Changing world view of industrial research in favour of outsourcing to small companies and non-corporate systems
Ability to create technology-leads in time scales aligned to industrial partners	Low share of sustained incomes from private sector	Leveraging intellectual assets for moving towards financial self-sustainability	Internal complacencies and imbalances in open to targeted R&D priorities

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Quantum increases in technology-led employment in the manufacturing sector are desired by the Government of India. Unprecedented opportunities of indigenous industrial research and development are being opened up. Atmanirbhar provides a base of capitalisation of intellectual assetsof CSIR. At these times, return from past investments into CSIR and to the Nation in the form of deliverables in the near future is expected.

New positions and paths for emerging as a leader: Industrial research does not permit open-ended research models. Time-bound and value appraised strategies are critical. Portfolio management of research priorities for each industrial sector of importance might differ. It might be necessary to identify and select industrial sectors of importance based on analysis of gaps in technology pipeline and positioning of CSIR as a dependable partner for the chosen sector. An organisational strategy to invest intellectual and financial resources judiciously on time-bound and focused industrial and translational research could be a priority.

New models for connecting knowledge to value creation: CSIR has relied on supply side and technology push and transfer model for long. Success of CSIR laboratories has been higher in commercialisation of technologies when CSIR adopted technology pull and relationship models. Relationship models call for approaches for joint identification of R&D goals, co-investment and co-generation along with industrial partners. Long term partnerships among CSIR and industrial stakeholders are crucial.

Definition of roles and sharp focusing of goals: Public funded models for industrial research have not succeeded globally. Industrial research demands high levels of contextualisation and demand-driven approaches complete with sensitivity analysis of technological gaps and unmet needs. Direct coupling between development and deployment of technologies with commercialisation links are necessary. Evidence-based decision-making for partnering industrial sector is a good starting-point. Sector-specific business models with shared objectives based on co-investments and generation of values for both CSIR and stakeholders may seem a need.

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New models for partnerships and alliances: New models for Public Private Partnerships for R&D are called for. CSIR may like to seek a New CSIR Act of Parliament with enabling provisions of rules and regulations for moving towards financial self-reliance. Many small economies of the world which are innovation leaders in high technology arena, are suffering negative balance of trade. Innovation ranking of a country and her performance in global trade do not seem strongly coupled. CSIR could forge alliances with innovation leaders from small economies and leverage its capacity to drive the costs of manufacture down through R&D innovations and enter global market for technology supply.This would call for innovations in designer partnerships and strategic alliances for mutual benefits.

New governance models for changing growth trajectories in times of transition: Current governance model suits public funded research for only social and public good with high reliance on budgetary grants from the Government. New CSIR needs to embrace R&D for private good for mobilisation of at least 50% of its annual financial needs through revenue-generating mechanisms. Currently, a large share of revenue flow into CSIR is from technical and R&D services. CSIR might review its own governance model for moving towards financial self-sustenance within the next five years. New business models without diluting core objectives are essential.

Right Positioning of CSIR in the Mind-to-Market Chain

Social capital in the form of trust between the industrial sectors of choice and the CSIR laboratories isnecessary. Right positioning of CSIR in the mind-to-market chain, building social capital and financing R&D through a mix of hard and soft money are crucial.

Several historic contributions of CSIR are recalled. Shaping the future of CSIR in the current world view of industrial research demands innovative measures. It is desired that CSIR chooses a sustainable path for delivering values for an aspiring Nation in technology-enabled creation of jobs and increasing her share in Global High Technology Trade. Mindset change from project implementation to nation building is a way forward for the New CSIR of new India.