INTELLECTUAL PROPERTY MANAGEMENT, MONETIZATION

&

TECHNOLOGY TRANSFER

STRATEGIES IN CSIR-NIIST

Business Development Division

CSIR - National Institute for Interdisciplinary Science and Technology
(NIIST), Industrial Estate P.O.,
Thiruvananthapuram, Kerala 695019, India

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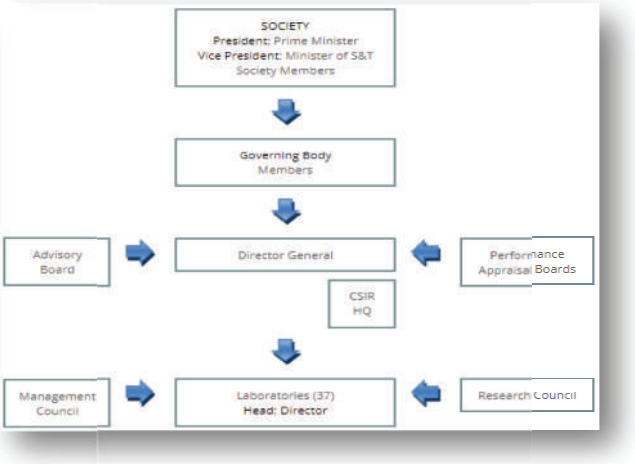
1. COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)

The Council of Scientific and Industrial Research (CSIR) is a premier autonomous research and development organization in India. Constituted in 1942 as a society under the Societies Registration Act, 1860, CSIR has been instrumental in pioneering scientific and industrial research in India. It operates under the Department of Scientific and Industrial Research (DSIR) and is known for its extensive network of laboratories and research institutes spread across the country.There are 37 constituent laboratories under CSIR.



CSIR Society

The CSIR Society is the apex body of CSIR, responsible for setting the broad policy framework for its activities. It provides overall guidance and direction to the organization, ensuring alignment with national priorities.

- President

  The Prime Minister of India serves as the President of the CSIR Society. The President oversees the society's functioning and ensures that its activities contribute to the nation's scientific and technological advancement.

- Vice-President

  The Union Minister of Science and Technology is the Vice-President of the CSIR Society. The Vice-President assists the President in overseeing the society's operations and ensures effective implementation of its policies.

- Members of the Society

  The members include ministers and secretaries of various departments, all members of Governing body including DG CSIR, scientists and industrialists.

Governing Body

The Governing Body of CSIR is responsible for the general superintendence, direction, and control of the affairs of the society. It makes decisions on administrative and financial matters, ensuring the smooth functioning of the organization.

Composition

- Chairman of Governing Body: Director General (DG), CSIR
- Members of the Governing Body: Includes Principal Scientific Advisor, NITI Aayog Member, eminent scientists, industrialists, and senior government officials such as secretaries of various departments.

Director General

The Director General is the chief executive of CSIR and is responsible for the overall management of its laboratories and research activities. The Director General also serves as the Secretary of DSIR and provides leadership and strategic direction to the organization.

CSIR Laboratories

CSIR laboratories specialize in different areas of scientific research and industrial development. These laboratories are spread across India and are equipped with state-of-the-art facilities. Each laboratory is headed by a Director.

Management Council and Research Council

Each CSIR laboratory has a Management Council and a Research Council to ensure effective governance and strategic planning.

Management Council

The Management Council is responsible for the administrative and operational management of the laboratory. It oversees the implementation of policies and ensures efficient utilization of resources.It is chaired by the director of the laboratory. The Director of a sister laboratory is included as an outside member.

Research Council:

The Research Council is responsible for guiding the laboratory's research agenda. It comprises eminent scientists and experts who provide strategic direction and evaluate the research projects undertaken by the laboratory.

The Research Council within each CSIR laboratory sets research priorities based on national and global trends, monitors project progress to align with strategic goals, and optimizes resource allocation for maximum efficiency and impact. This ensures focused and impactful scientific advancements across CSIR's diverse research areas.

2. NATIONAL INSTITUTE FOR INTERDISCIPLINARY SCIENCE AND TECHNOLOGY

The National Institute for Interdisciplinary Science and Technology (NIIST), one of the constituent research laboratories of the Council of Scientific and Industrial Research (CSIR), is situated at Industrial Estate, Pappanamcode, Thiruvananthapuram, Kerala. CSIR-NIIST conducts basic and applied research and development in several areas that are vital to the nation.

With six major divisions—Agro-processing and Technology, Microbial Processes and Technology, Chemical Sciences and Technology, Materials Science and Technology, Environmental Technology, and the Centre for Sustainable Energy Technologies, NIIST- AIML fosters innovation across multiple sectors. The institute collaborates with industry partners, undertaking testing, analysis, contract projects, and consultancy services while maintaining strong connections with national and international research networks.

NIIST's impactful research has led to groundbreaking publications, potential patents, and noteworthy technology transfers. The institute excels in food processing, post-harvest technologies, fortified foods, functional materials, and environmental research, alongside major contributions to

chemical sciences, drug delivery and theranostics, smart molecular materials, pharmaceutical formulations, industrial enzymes, 2G ethanol, microbial processes, and metal casting. Its ability to translate knowledge into commercially viable prototypes and products underscores its commitment to applied research.

A frontrunner in emerging technologies, CSIR-NIIST is shaping the future of hydrogen energy, advancing regional industries in coir and rubber, and unlocking the potential of rare earth metals for functional applications. Recognized for its research output, the institute consistently ranks among the top-performing scientific establishments in India.

Beyond research, NIIST plays a pivotal role in human resource development, producing PhD graduates, training postgraduate students, and conducting skill development programs. The institute holds a unique distinction as Kerala's sole NABET-accredited laboratory for environmental impact assessment studies in mining, ports, and harbors. Additionally, it boasts NABL certifications for dioxin and PCB analysis, as well as water and wastewater analysis, reflecting its unwavering commitment to precision and quality. With a vision to expand its scope, NIIST is advancing towards accreditations in the food and agricultural sectors, aspiring to become a premier hub for testing and analytical services. At the heart of NIIST's mission is a dedication to scientific excellence, innovation, and sustainable solutions, continually striving to address the evolving challenges of our time.

3. REVENUE SOURCES OF CSIR-NIIST

The CSIR-NIIST ensures its financial stability through a variety of revenue sources.These resources play a critical role in funding the institute's research and development activities, enabling it to maintain up-to-date facilities and contribute significantly to scientific and technological advancements. This section provides an overview of the primary revenue streams that sustain CSIR-NIIST.

3.1. Government Funding

Government funding forms the backbone of financial support, primarily sourced through CSIR/DSIR and other national funding agencies. The funds that come from CSIR are based on strategic priorities and

institutional needs. These funds support core research activities, infrastructure development, and operational expenses for the institute.

For the last couple of years, CSIR has substantially funded some flagship programs related to renewable energy, nanotechnology, and environmental sustainability. Therefore, funding would not only be linked to basic research but wouldalso lead to technology development and industry collaborations so as to enhance the role of the institute in fostering innovation and economic growth.

3.2. Industry Collaborations

Industry collaborations form some of the more important modes of revenue generation. The interactions involve cooperation in research projects, consultancy services, and joint ventures. Industry collaborations involve shared resources, expertise, and funding; hence, these enable NIIST to take up complex scientific challenges and accelerate the development of technologies that are ready to go to market. Such partnerships also generate revenues through funding from projects, IP licensing, and access to industry-specific research facilities.

3.3. Consultancy Services

The consultancy services offered by NIIST are specialized for industries, government agencies, and other organizations looking for technical solutions. This spans from chemical analysis to environmental monitoring, materials characterization, and process optimization. The clients are able to benefit from the facilities available, human resource potential, and customer-tailored solutions.

Consultancy services bring in income for the institute. Some of the solutions address real-world problems, the reputation of the institute as a trusted partner in scientific consultancy, thereby improving industrial competitiveness toward sustainable development.

3.4. Intellectual Property (IP) Licensing and Selling

The IP generated through research efforts has immense potential for earning revenue through licensing and commercialization. NIIST actively files its inventions and innovations in the field of biomedical devices, sustainable materials, environmental technologies, etc. Such patents help in negotiating licensing agreements with industry partners intending to commercialize research outcomes.

The IP licensing agreements bring in royalties, upfront payments, and milestone-based revenues to the NIIST. The NIIST IP portfolio exemplifies the commitment towards societal innovation and research excellence.

In addition to licensing, CSIR-NIIST may sell IP rights outright. This involves transferring full ownership of patents and/or technologies to another entity, typically in exchange for a lump sum payment. This sale provides immediate financial returns, which can be reinvested into further research or other activities. The sale of IP rights often requires detailed negotiations to ensure that the technology's value is fully compensated.

3.5. Training Programs

NIIST conducts a series of training programs, skill-development workshops, and courses for professional upgradation and knowledge update in emerging areas of science. These programs are targeted at researchers, industrial professionals, students, and government officials who want to update their knowledge on current developments in the respective areas. Courses range from advanced materials science and environmental sustainability to some of the innumerable applications of biotechnology.

The programmes generate revenue through training programmes by way of registration fees, sponsorship, and collaborations with educational institutions and industrial partners. Apart from raising extra money, these programmes are very important in knowledge dissemination, capacity building, and talent development, enhancing their role in the matters of scientific education and innovation.

3.6. Analytical Services and Incubation Facilities

This institute has advanced facilities and equipment for research in almost all branches and makes them available to outside users, industrial collaborators, and partners. This includes specialized laboratories, cleanrooms,and advanced analytical instruments. In this regard, NIIST provides access on a fee-for-service basis to external users to avail of facilities and expertise to pursue their R&D needs.

The revenue accruable from the infrastructure services goes toward the maintenance of facilities, equipment upgrades, and ensuring operational sustainability. In addition to such services, NIIST also provides incubation support in its Innovation Centre. Incubates can avail of the facilities and expertise in the laboratory by paying a fixed amount every month. Aspiring

incubatees can either come up with an idea or take license of NIIST technology and get incubated. NIIST Innovation Centre would also help them in obtaining patents and registering their companies.

3.7. Spin-Offs and SPVs

Spin-offs are companies formed by CSIR-NIIST to commercialize technologies developed by the Institute. Spin-offs often enter into licensing agreements with CSIR-NIIST for the use of its technologies. This generates additional revenue through licensing fees and royalties, providing a continuous income stream as the spin-offs develop and commercialize the technologies. These new entities focus on bringing specific innovations to market. The institute may take equity stakes in these spin-offs in lieu of a license fee, allowing it to benefit from the companies' growth and success through dividends or capital gains. This financial stake aligns the interests of the spin-offs with those of CSIR-NIIST, fostering a mutually beneficial relationship. CSIR-NIIST also supports the formation of Special Purpose Vehicle (SPVs) companies for the commercialization of Intellectual Property, either alone or through joint ventures.

3.8. Commercialization of Technologies

The commercialization of technologies involves bringing new innovations developed at CSIR-NIIST to market. This process includes strategies such as direct sales, partnerships, and joint ventures. The institute may enter into agreements with external companies for outright sale or licensing of its technologies, generating revenue from these transactions.

Joint ventures or partnerships with industry players can also facilitate the joint development and future commercialization of technologies. These agreements involve shared investment, risk, and rewards, with revenue generated from commercialization activities shared between the partners. Service contracts, where CSIR-NIIST provides specialized technological solutions or support to industry clients, further contribute to revenue. By successfully commercializing its innovations, the institute creates additional revenue and ensures its technologies have a significant market impact.

4. PROJECT MANAGEMENT AND IP DEVELOPMENT

CSIR-NIIST focuses on multidisciplinary research to develop innovative technologies and solutions. Effective project management at CSIR-NIIST is crucial for ensuring the successful execution and delivery of research projects. This section provides a comprehensive overview of the project management practices at CSIR-NIIST, detailing the key steps from project initiation to closure, and highlighting the roles of the Business Development Division (BDD) and Project Monitoring and Evaluation Division (PMED). The various projects undertaken by the institution are-

Collaborative Projects at the institute involve partnerships with other research institutions, universities, and industries. These projects aim to combine resources, expertise, and knowledge to achieve mutual research goals. By sharing resources and intellectual property rights, the institute and its partners can address complex scientific challenges more effectively. Collaborative projects often lead to long-term relationships and significant advancements in various fields.

Sponsored Projects are projects funded by externalagencies other than government bodies. These projects focus on specific research questions or technological challenges identified by the sponsor. The institute benefits from the financial support provided, which allows it to pursue targeted research with clear deliverables and timelines. The ownership of the results is typically negotiated between the institute and the sponsor, ensuring mutual benefits from the outcomes.

Consultancy Projects involve providing expert advice, analysis, or research services to external clients. The institute leverages its scientific expertise to solve specific problems for its clients. Operating on a fee-for-service model, consultancy projects are usually short-term engagements where the intellectual property generated typically remains with the institute. This model allows the institute to contribute to industry advancements while generating revenue.

Grant-in-Aid Projects are funded by grants from government departments, public sector companies, or international government bodies. These grants support research that aligns with the strategic priorities of the funding entities. Researchers at the institute apply for these competitive grants, which provide financial support for specific areas of research. The outcomes of grant-in-aid projects are often published and disseminated to

the broader scientific community, promoting transparency and knowledge sharing.

Corporate Social Responsibility (CSR) Projects involve collaboration between the institute and corporate partners as part of the companies' CSR initiatives. These projects focus on societal benefits, such as improving health, education, and environmental sustainability. Funded by corporate CSR budgets, these projects aim to create a positive impact on communities and society at large. The long-term sustainability and scalability of CSR projects ensure that they contribute meaningfully to societal well-being while enhancing the corporate partners' reputation.

4.1. PMED and BDD

At first,the Planning Division at CSIR-NIIST was responsible for overseeing all project management activities. Over time, the need for specialized management practices led to the division of this unit into two distinct entities: the Business Development Division (BDD) and the Project Monitoring and Evaluation Division (PMED). This restructuring was done to streamline operations and enhance the efficiency of project management processes.

The BDD was established to focus on bridging the gap between scientific research and its commercialization. Its primary objectives include technology transfer, industry collaboration, intellectual property management, market research, and securing external funding and grants. On the other hand, the PMED was created to handle the monitoring and evaluation of projects, ensuring that they meet their goals and adhere to timelines and budgets.

Grand-in-Aid projects and CSIR projects are managed by PMED while sponsored, consultancy, collaborative and CSR projects are managed by BDD.

4.2. Steps Involved in Project Management Activity

CSIR-NIIST's project management practices are comprehensive and well-structured, ensuring the efficient and effective execution of research projects. The combined efforts of the Business Development Division (BDD) and the Project Monitoring and Evaluation Division (PMED) facilitate the successful initiation, planning, execution, and closure of projects. By adhering to these practices, CSIR-NIIST continues to advance scientific

knowledge and develop innovative solutions to address various industry-specific and societal challenges.

4.2.1. Project Initiation

The initiation phase at CSIR-NIIST begins with the formulation of a project proposal by a Project Investigator (PI), supported by Co-PIs. For Grant-in-Aid Projects (GAP), which are externally funded by government bodies like the Department of Science and Technology (DST) or the Department of Biotechnology (DBT), the proposal is first submitted to these funding agencies. Once the proposal is approved, a sanction order is issued, and funds are allocated to the project.

Internally funded CSIR projects follow a slightly different initiation process. These projects are grouped under various schemes and submitted to the CSIR headquarters for approval. Upon sanction, these projects are assigned specific project numbers, and funds are allocated accordingly. The initiation phase ensures that all projects, whether externally or internally funded, are well-defined and have the necessary financial backing.In the case of sponsored projects, CSR and consultancy projects, the project will be formulated after successful negotiation with the clients and subsequent fund transfer to CSIR-NIIST.

4.2.2. Project Planning

The planning phase is critical for the successful execution of projects at CSIR-NIIST. This phase involves several key activities:

Agreements

For sponsored, consultancy, collaborative,and CSR projects managed by the BD Division, agreements are always executed with the clients to formalize the terms, deliverables, and financial aspects, ensuring clarity and legal compliance. In contrast, for GAP projects managed by PME, agreements are not mandatory and are only executed if the funding agency specifically requires it.

Securing Approvals and Compliance

For GAP projects, planning also includes securing the necessary approvals from the funding agencies and ensuring compliance with their guidelines. This involves submitting detailed project plans, budgets, and timelines for approval and adhering to any specific requirements set by the funding

agencies. Ensuring compliance with these guidelines is crucial for maintaining funding and support for the project.

Budgeting and Resource Allocation

Budgeting and resource allocation are fundamental components of project planning at CSIR-NIIST. Detailed budgets are prepared for each project, outlining the estimated costs for personnel, equipment, materials, and other essential resources. Accurate budgeting according to CSIR Guidelines ensures that the project has sufficient financial support to achieve its objectives.

Resource allocation involves assigning the necessary personnel, equipment, and materials to the project. This step ensures that all required resources are available when needed, thereby preventing delays and ensuring smooth project execution.

Scheduling

A comprehensive project timeline is developed during the planning phase, detailing the sequence of activities and key milestones. This timeline serves as a roadmap for the project, helping to track progress and ensure that the project stays on schedule. Gantt charts, critical path analyses, and other scheduling tools are used to visualize the project timeline and identify any potential bottlenecks or delays.

Risk Management

Risk management is a proactive approach to identifying and mitigating potential risks that could impact the project's success. During the planning phase, potential risks are identified, and mitigation strategies are developed. This involves assessing the likelihood and impact of each risk and creating contingency plans to address them. Effective risk management helps in minimizing disruptions and ensures that the project can adapt to unforeseen challenges.

4.2.3. Project Execution and Control

The execution phase involves implementing the project plan and achieving the set objectives. Continuous monitoring and evaluation are essential to ensure that the project remains on track.

Key aspects of this phase include:

Regular Reviews

PMED holds periodic review meetings to assess the progress of both GAP and CSIR projects. The primary goal is to ensure that research outputs contribute to knowledge creation or public welfare, with an emphasis on innovation and scientific impact. Regular review meetings help in identifying and addressing problems early, ensuring that the project stays on track.

The review for sponsored, consultancy, and CSR projects is more commercially oriented and is performed by BDD. The goal is to ensure the successful execution of projects with external sponsors, companies, or CSR bodies, focusing on deliverables, timelines, and client satisfaction. The performance is assessed based on the predefined objectives agreed upon with the sponsor or client.

Resource Management

Effective management of resources is crucial during the execution phase. This involves ensuring that personnel, equipment, and materials are used efficiently and effectively. Any adjustments needed are made promptly to avoid delays. Resource management also includes addressing any issues related to resource availability, such as equipment breakdowns or personnel shortages, to ensure that the project continues smoothly.

Quality Assurance

Ensuring that project deliverables meet the required standards is a key focus during the execution phase. Quality control measures are implemented throughout the execution phase to maintain high standards. This includes conducting regular inspections, tests, and reviews to ensure that the project's outputs meet the specified quality criteria. Any deviations from the quality standards are addressed promptly to prevent any impact on the project's success.

Industry Collaboration and Technology Transfer

The BDD facilitates industry collaboration and technology transfer during the execution phase. This involves identifying potential industrial applications for the research outcomes, negotiating agreements with industry partners, and ensuring the smooth transfer of technology. Industry

collaboration helps in aligning research activities with market needs and industry demands, increasing the impact and relevance of the research projects.

Market Research and Analysis

Market research and analysis are conducted to identify trends and opportunities for the commercialization of technologies developed during the project. This helps in aligning the research activities with market needs and industry demands. Understanding market trends and demands allows the researchers to tailor their projects to meet real-world challenges and opportunities, increasing the chances of successful commercialization.

4.2.4. Project Closure

The project closure phase ensures that all project activities are completed and the project is formally concluded. This phase includes:

Completion of Deliverables

All project deliverables are finalized and handed over to the relevant stakeholders. For GAP projects, final reports are submitted to the respective funding agencies, such as DBT and DST. This step ensures that all project outputs are documented and delivered as per the project plan.

Financial Reconciliation

All financial transactions are reviewed, and accounts are closed. This includes ensuring that all funds have been used appropriately and documented accurately. Financial reconciliation helps in providing a clear financial picture of the project, ensuring transparency and accountability.

Writing Off

In cases where the agreed funds to the project have not been received from the clients, a formal process of writing off these unspent amounts is conducted. This involves documenting the reasons for the short receipt of funds and obtaining necessary approvals for the write-off. Writing off ensures that the project's financial records are accurate and it is complete to the extent the project goals have been achieved.

Issue of Office Memorandums

BDD, as well as PME,ensures that all necessary memorandums of understanding (MoUs) and office memorandums are issued in time. This includes the signing of the closing office memorandum, which marks the official end of the project. Signing these memorandums formalizes the project closure and ensures that all contractual and legal obligations are met.

The BDD ensures that all intellectual property-related activities, such as patent filings and licensing agreements, are completed.

4.2.5. IP Ownership

Scientists and researchers carry out experiments, generate data, and analyze results according to the plan of the project. At different stages of research work, any new process, product, or technology that is developed is recognized as potential IP.

In respect of the projects funded by government departments and agencies, the IP and/or knowledgebase rights shall be subject to the standard terms and conditions of the grantor. In the event the grantor does not have standard conditions, or in the case of non-government agencies, the ownership rights shall vest with CSIR.

Sponsored projects are externally funded, often by private agencies or industries, focused on solving certain problems or developing new technologies, and, therefore, have huge potential for IP development. Such sponsored projects will normally result in patents that can be commercialized in the future. The ownership of the Intellectual Property shall ordinarily rest with CSIR-NIIST.Nevertheless, IP ownership may be conferred fully or partly to the funding agency after ensuring higher compensation for giving away the institute's share of the Intellectual Property.

The ownership of the IP will be defined in the agreement, and their respective responsibilities to obtain and maintain IP rights will be detailed therein. If the intellectual property is jointly owned, decisions on securing IP rights and sharing of patenting expenses will be shared equally by CSIR and the sponsoring organization.

In Collaborative projects involving technical contributions from collaborators, the IP developed shall be jointly owned. The acquisition and maintenance of such IP shall be mainly the responsibility of CSIR; however, the expenses shall be shared equally by CSIR and the collaborators. Decisions on securing IP rights shall be jointly made by CSIR-NIIST and the collaborators.

Consultancy projects are expert advice or service extended to an external client, generally in industries or governmental bodies. Projects are more service-oriented, not aimed at generating newer innovations or technologies. Hence, in most of the consultancy projects, major IP rarely evolves. However, any minor IP generated during consultancy work is documented and protected according to the institute's policies.

Laboratory records are to be maintained by the researchers working at CSIR-NIIST throughout the project cycle. All these records will be very useful in supporting IP claims and will periodically be reviewed by the project leaders. The institute has a team that files the necessary applications with the relevant IP authorities and takes care of maintenance of IP rights by means of the payment of renewal fees.

5. IP PROTECTION STRATEGIES AND IP VALUATION

5.1. IP Management at CSIR-NIIST

Intellectual Property (IP) Management is essential for protecting and commercializing innovations generated within the institute. The process begins with researchers disclosing new inventions, which are evaluated by an IP management team for novelty and patentability. IP coordinator in NIIST oversees the patent lifecycle, including filing and maintenance. The Business Development Division then focuses on commercializing the secured IP through licensing agreements. Additionally, the IP strategy aligns with research priorities and market trends, ensuring compliance with national and international laws while maintaining ethical standards. This comprehensive approach safeguards the institute’s innovations, promotes their dissemination, and contributes to institutional growth.

Intellectual property management is the duty of the IP coordinator and the Patent Committee. All the Heads of Divisions are members of this patent committee in addition to its Chairman and convenor (IP coordinator).

The IP management process at CSIR-NIIST involves the following steps:

i. The inventor discusses their invention with the IP coordinator and submits an Invention Disclosure Form (IDF) if the IP coordinator deems the invention patentable.

ii. The IP coordinator forwards the IDF to CSIR-URDIP for a Patentability Report, which is prepared based on an extensive patent search using advanced patent databases.

iii. If the Patentability Report confirms the invention's novelty and inventive step, the inventor is asked to proceed with a three-tier process.

iv. In the first tier, the inventor presents the invention to the scientists and the Head of Department of their division, submitting the meeting minutes and recommendations to the IP coordinator, requesting the convenor to convenethe Patent Committee, which forms the second tier.

v. The IP coordinator issues a 15-day notice to invite any objections regarding inventorship or the invention's title/summary before convening the Patent Committee.

vi. The Patent Committee thoroughly reviews the invention and, after deliberation, sends the file to the IP coordinator along with the meeting minutes and recommendations for finalizing the complete specification and drafting the claims in Form 2.

vii. The IP coordinator reviews and approves Form 1 (which includes the invention's title, applicant, and inventors) and Form 2.

viii. The inventor submits the documents for the Director's approval through the IP coordinator, Business Development Division Head, and the Patent Committee chairman for authorization to file the patent application.

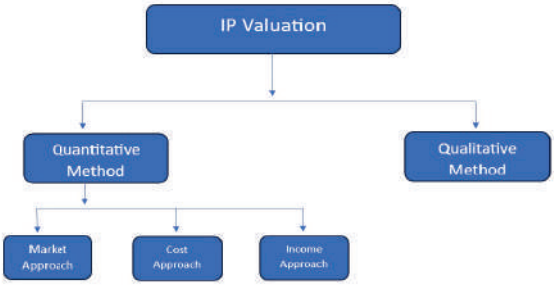
ix. If filing in foreign countries is proposed, the inventor must obtain a Techno-Commercial Feasibility (TCF) report from URDIP through the IP coordinator and secure the Director's approval for filing abroad.

x. The patent application and related documents are forwarded to the CSIR Innovation Protection Unit, CSIR Headquarters, for filing both in India and abroad.

xi. The IP coordinator and Patent Committee annually review the patent portfolio to decide which patents should be maintained and which should be allowed to lapse.

5.2. IP Valuation

IP valuation is a very complex process involving a number of methods to determine the value of an intangible asset. The following quantitative methods give out a structured path to find out monetary value for the IPs through various approaches - Comparative or Market Approach, relying on market comparisons; Cost Approach, focusing on the cost to reproduce or replace an IP; and Income Approach, which deals with the future potential earning capacity for the IP. It is complemented by qualitative methods that provide insight into strategic and qualitative aspects of IP.



Quantitative methods deal with finding a monetary value for the IP. The three main approaches within this category include: Comparable or Market Approach, Cost Approach, and the Income Approach. The comparable or market approach mirrors the value of the IP against similar assets that have sold in the market. It is a value estimate based on multiples or prices obtained from similar IP transactions. It uses market comparisons to derive value

The Cost Approach values the IPs based on the cost of reproducing or replacing an asset. In this method, one looks at the cost to be incurred for the IP recreation and not at the current market value for the same. Value estimation would be derived from the reproduction or the replacement costing less depreciation and obsolescence. It calculates the expense involved in creating a similar product or service from scratch.

The Income Approach values IP based on its present value of future earnings attributed to the IP. It considers the revenue that, in the future, shall be generated by the IP. Value estimation includes the immediate calculation of the present value of future earnings directly related to IP or the costs saved by owning IP. The approach uses the techniques of discounted cash flow in estimating these values.

Valuation of IP- Direct Method

The following factors are critical in determining the overall cost of IP at the laboratory level:

a) Cost of development (direct investment for creating IP)
b) Cost of securing IPR
c) Cost of maintaining the IP
d) Laboratory overhead (Notional amortization on staff, equipment and facilities deployed development IP)
e) Opportunity cost based on potential profit opportunity to the client.

Firstly, the cost of development forms the foundation of IP pricing. This includes several key elements:

a. S&T Manpower: The cost related to science and technology manpower deployed on the project, according to prescribed rates, is worked out. This will ensure coverage of financial investment with regard to expertise and time applied towards IP development.
b. Raw Materials and Consumables: The price of the raw materials and consumables used in making the product development is taken with an inclusion of 25% overhead over them. This overhead will compensate the incidental expenditure incurred towards procuring, handling, and management of such materials.
c. Physical Inputs: This accounts for other physical inputs such as utilities and facility usage, with 25% overhead as in the cost of raw materials, it represents a broader view of the resources used to develop an IP.
d. Use of Equipment: All the costs associated with the use of equipment utilized for the project are considered here.
e. Outside Vendor Costs: Any external payments that are made in the course of a project, such as consultant fees or any other outsourced services, are added to the cost, plus an additional 25% overhead, to account for all to cover associated administrative expenses.

Secondly, the cost of securing the IP must be taken into account. This includes legal fees, filing costs, and other expenses incurred in the process of patenting or otherwise protecting the intellectual property. Notably, there is a minimum floor price of Rs. 5 lakh per IP that should be levied for securing rights, ensuring that the laboratory recovers at least a baseline of investment in legal protections.

Additionally, the cost of maintaining the IP is crucial, as it represents the ongoing expenses associated with keeping the intellectual property rights active over their full term. This may include renewal fees, legal compliance costs, and other related expenditures.

The indirect costs associated with IP development also play a significant role in pricing. This includes a notional amortization of investments made in staff, equipment, and facilities utilized for the project, as well as intellectual inputs. The percentage allocated for these indirect costs typically ranges from 20 to 40%, reflecting the long-term nature of investments in research and development.

Lastly, the application of Goods and Services Tax (GST) at a rate of 18% is essential for compliance with tax regulations, and it is added to the total cost of the IP.

By carefully considering these factors, the laboratory can arrive at a comprehensive and fair pricing structure for its intellectual property, ensuring that all associated costs are adequately covered while fostering innovation and collaboration.

6. IP MONETIZATION AND TECHNOLOGY TRANSFER

IP monetization is a critical aspect of transforming innovative research and developments into economic assets. The IP monetization plays a pivotal role in bridging the gap between scientific innovations and their practical applications in the industry. By strategically leveraging its extensive portfolio of patents, trademarks, copyrights, and trade secrets, CSIR-NIIST ensures that its intellectual assets are not only protected but also effectively commercialized to generate economic value and societal benefits. The institute employs a comprehensive approach to IP monetization, which includes licensing agreements, joint ventures, technology transfer initiatives, and support for spin-offs, start-ups and

SPVs. Each of these strategies is particularly designed to ensure that CSIR-NIIST's intellectual properties are not only safeguarded but also utilized to their fullest potential. By doing so, the institute fosters an ecosystem of innovation and entrepreneurship, driving economic growth and contributing to societal advancement.

IP monetization at CSIR-NIIST involves several strategic approaches aimed at leveraging its IP assets to generate revenue and foster innovation. One significant method is ***selling IP outright***, where CSIR-NIIST transfers ownership of patents or proprietary technologies to interested parties. This involves a one-time payment and allows the buyer to fully appropriate the IP, providing immediate funds for further research and development.

Another major route through which CSIR-NIIST generates revenue is licensing. Different companies and organizations are licensing patented technologies from CSIR-NIIST. With this license, either exclusively or non-exclusively, it is issued for manufacturing products. Exclusive licenses are issued to one licensee alone so that no other organization or party can use that particular technology. This is preferred only in the case of high-value, breakthrough technologies where exclusivity is essential to the gain market advantage. Non-exclusive licensing concept will facilitate granting of licenses to as many clients for use of the technology; this happens in the cases of technologies whose application domain is very wide, across different sectors.

Using IP as collateral to secure funding is a less common but strategic approach. Financial institutions assess the potential market value of the IP and provide loans based on this evaluation. This method allows the licensees of CSIR-NIIST to obtain immediate capital for research and development while leveraging the inherent value of its IP assets.

CSIR-NIIST also promotes the creation of start-ups and spin-offs to commercialize its research outputs. This entrepreneurial ecosystem ensures that scientific discoveries are transformed into marketable products, boosting economic growth and innovation. Start-ups benefit from access to IP, technical support, and incubation facilities.

The institute transfers its technologies to industrial partners through formal agreements. These agreements outline the terms and conditions under which the technologies are transferred, including financial terms such as upfront payments, royalties, or milestone payments. Technology transfer ensures that CSIR-NIIST benefits financially from its innovations while

enabling industrial partners to enhance their product offerings and competitive position.

Technology transfer is the process of systematically transferring scientific findings, innovations, and technologies from the institute to external organizations like industries, government bodies, and other stakeholders. The primary aim is to attain value addition, simplification, diversification, and increased productivity of process or product. This process typically includes the following stages:

- **Search stage**
- **Adaptation stage**
- **Implementation stage**
- **Maintenance stage**

In the search stage, the institute identifies the needs and capabilities that potential recipients would want. This consists of understanding the recipient's specific requirements with respect to technology and self-evaluation of the institute's own capabilities in order to identify suitable innovations. What becomes very important at this stage is relative compatibility assessment between both parties with respect to their policies, priorities, and strategic goals so as to have mutually beneficial collaboration. The importance of good working relationships and clear communication channels that would be established between the recipient organization and CSIR-NIIST cannot be underestimated in such collaboration.

The social and economic desirability of the technology is assessed at the stage of adaptation by means of market analysis and stakeholder interaction. It carries out marketing studies to evaluate possible demand for the technology and what impact it may have on society and economy. This kind of interaction, which involves government, industry experts, and prospective end-users identified as relevant stakeholders, brings in their feedback and supports the development of technology for the needs of society. A feasibility study will be conducted for testing the technical feasibility of the technology in a practical setting and its economic viability in regards to cost-effectiveness and return on investment, and financial sustainability.

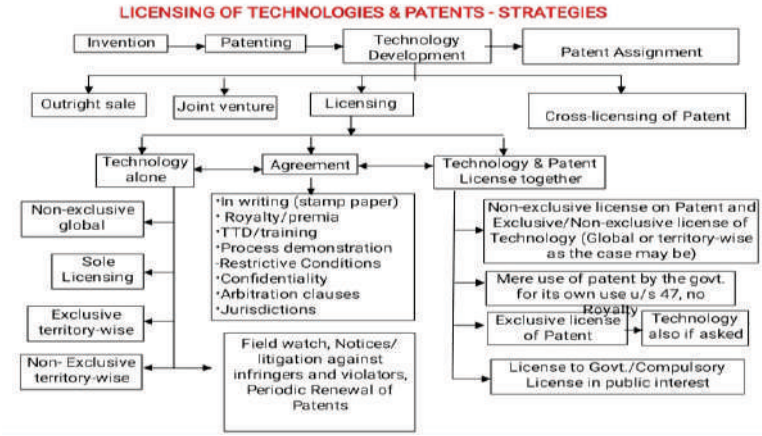
The implementation stage involves arranging the necessary resources for the development and commercialization of the technology. Securing funds and investments is very important to sustain the process in the form of grants, industry partnership etc. for financing. A team of skilled

professionals, including scientists, engineers, and business experts, helps manage the technology transfer process effectively. During this process, prototype developments are followed by pilot projects and field trials to fine-tune the technology and collect adequate data for further improvements.

At the maintenance stage, the technology is deployed full-scale in view of the setting up of all infrastructural facilities and resources by the recipient organization. The CSIR-NIIST will continue operational support and training to the recipient's staff for the successful operation and maintenance of the technology. Continuous monitoring and evaluation of the performance of the technology with feedback will help in adapting improvements. Necessary up-gradation and enhancements will be made based on feedback and changing market needs.

6.1. Methods of Technology Transfer

Technology transfer can occur through various methods, depending on the nature of the invention and the strategic goals of the organization. These methods include outright sales, joint ventures, and licensing agreements, where the technology or patent can be licensed exclusively or non-exclusively, either globally or on a territory-specific basis. Licensing agreements typically address royalties, training, process demonstrations, confidentiality, and legal clauses like arbitration and jurisdiction. Other strategies include patent assignments, cross-licensing etc. Regular monitoring and enforcement actions help protect the technology, ensuring compliance and preventing infringement.



6.1.1. Licensing

Licensing is one of the primary methods of technology transfer. In a licensing agreement, the receiver purchases the right to utilize the technology. This transaction can take the form of an outright purchase or involve payment of an initial lump-sum amount followed by royalties on sales. There are several types of licenses available to cater to different needs and circumstances:

i. Exclusive License: This type of license allows only one licensee, meaning the licensor has no rights to exploit the technology or product themselves.

ii. Sole License: This is similar to an exclusive license, but the licensor retains the rights to exploit the technology or product as well.

iii. Non-exclusive License: In this arrangement, there is no limit to the number of potential licensees, allowing multiple entities to use the technology.

iv. Irrevocable/Revocable for Cause: These licenses can either be permanent or can be revoked under certain conditions.

v. Territory: Licenses can be granted on a global scale or limited to specific geographic regions.

vi. Field of Use: Licenses can be specific to particular markets or applications.

vii. Royalty-bearing/Royalty-free: Some licenses require the licensee to pay royalties, while others do not.

viii. Sub-License: The licensee can grant sub-licenses to other parties.

ix. Cross-license: Two parties license their respective technologies to each other, often to avoid litigation and encourage collaboration.

6.1.2. Joint Ventures

Another significant method of technology transfer is through joint ventures. In a joint venture, two or more entities combine their interests to share knowledge and resources to develop technology, produce products, or complement each other's capabilities. The rewards of the venture are shared by the entities involved, making this an attractive option for acquiring technology and for sources to gain markets. This collaborative approach not only accelerates technological development but also spreads the risks and costs among the partners involved.

6.1.3. Equity in Licensing

CSIR-NIIST takes an equity stake in lieu of lump-sum payments or royalties. For non-exclusive licenses, a minimum of 3% equity is required, while for exclusive licenses, the requirement is a minimum of 6% equity, according to CSIR Guidelines. This approach is particularly utilized in spin-

offs and start-ups, ensuring that CSIR-NIIST benefits from the growth and success of the enterprises that leverage its technologies. By taking an equity stake, CSIR-NIIST aligns its interests with those of the licensee, fostering a long-term partnership that can yield significant mutual benefits.

6.2. Technology Pricing

Technology pricing involves setting a price for the transfer or licensing of technology, a process distinct from intellectual property rights (IPR) valuation. Unlike IPR valuation, which focuses on determining the overall value of a particular IP, technology pricing is specific to the agreement between the licensor and the licensee. Various factors influence this pricing include:

Nature of License

- Exclusive Licenses:An exclusive license grants the licensee the sole rights to use, develop, and commercialize the technology within a specified scope. This means no other entity, including the licensor, can exploit the technology within the agreed parameters. Since the licensee has the unique opportunity to capitalize on the technology without competition from others, the exclusivity often commands a higher price.If Exclusive, it depends on period of exclusivity, application exclusivity, minimum royalty clause, minimum royalty clause.

- Non-exclusive Licenses: Non-exclusive licenses are typically less expensive since multiple parties can license the same technology. However, the overall revenue generated from non-exclusive licenses can sometimes surpass that of an exclusive license due to the higher volume of licensees.

Status of the Licensee Company

The size and status of the licensee company play a significant role in technology pricing. Smaller companies, such as Small Scale Industries (SSI), may have limited budgets, so the pricing might be adjusted accordingly to make the technology accessible. Medium and large-scale industries might be willing to pay more due to their greater resources and potential for higher returns on investment. Large multinational corporations may be charged a premium due to their extensive market reach and financial capabilities.

6.3. Evaluation of Technology for Transfer

Evaluation involves assessing technical, business, and social attributes to ensure technology readiness for commercialization.

Technical Attributes:

- Novelty of the technology, IP Landscape in the domain to
- know FTO
- Technical feasibility
- Technical compatibility (new systems/modifications/small
- modifications/no modification)
- Complexity
- Process advantage/Efficacy of the product
- Developmental maturity (theoretical/lab scale/bench scale/pilot scale/full scale)
- Technology benefits (to end user)/Benchmarking
- Future scope for improvement / next level
- Technical expertise availability
- Technology Readiness Level

Business Attributes:

- Market demand
- Business opportunity/marketing strategy
- Revenue potential
- Time to commercialization (Negative scoring attribute)
- Competitive advantage over other technologies/products in market
- Market entry barriers
- Cost Advantage
- Geographical market reach
- Regulatory Acceptability/Compliance
- Public Perception

Social Attributes

- Benefit to end user (directly/indirectly)
- Creating job opportunities
- Societal Impact
- Health benefits if any
- Social recognition
-

6.4. Technology Transfer Bottlenecks

Despite the structured approach, technology transfer at CSIR-NIIST faces several bottlenecks that can hinder the effective commercialization and adoption of technologies.

Low Technology Readiness Levels (TRLs)

Technologies at low TRLs are not yet ready for commercial use. Overcoming this bottleneck requires additional research and development to advance the technology to higher TRLs.

Lack of Funding for Scale-up and Pilot Plant Studies

Insufficient funding for scaling and pilot testing limits the ability to refine and validate technologies. Addressing this bottleneck requires securing funding through grants, partnerships, and investments.

Limited Commercial Prototypes for Market Validation/Field Testing

The absence of commercial prototypes hampers market validation and field testing. Developing prototypes and conducting pilot studies are essential for gathering data and refining technologies.

Lack of Market Research Studies

Insufficient market research limits the understanding of market needs and opportunities. Conducting detailed market studies helps in identifying demand, trends, and competitive landscape.

Lack of Techno-Economic Feasibility Reports (TEFRs)

The absence of TEFRs limits the assessment of economic viability and market potential. Developing TEFRs provides a comprehensive evaluation of the technology's economic prospects.

Limited Access to Risk Capital

Restricted access to risk capital limits funding opportunities for innovative projects. Addressing this bottleneck requires exploring alternative funding sources and fostering investor interest.