Chapter 5 – Technology Exploitation

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Technology Exploitation

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Technology Exploitation

- The process of generating profit or achieving other benefits from technology.
- The utilization of new technology or scientific developments to improve the performance of products, services or manufacturing processes.
- Time-lag exists between invention and innovation: non-existent complementary technologies, existence of low-cost alternatives, standards and government regulations

Technology Exploitation Routes

1. **In-house development:** ***the production and distribution of technology are carried out within the company.***

2. **Joint commercialization:** ***production and distribution are carried out in collaboration with other organizations through joint ventures or other forms of alliance.***

3. **Selling technology:** ***can take place at any stage of technology development, including idea, prototype, patent and license sales.***

Technology Exploitation Sub-processes

- **Commercialization/marketing :** ***earning revenue from sales, derived from a set of processes, particularly marketing, since successfully introducing a new product or service into the market requires advertising, distribution and selling of a product or service.***
- **Technology transfer :** ***transferring technologies internally from an R&D unit to a manufacturing department, from an external company/partner to the internal manufacturing department or from an internal R&D unit to a partner company's manufacturing department***
- **Technology utilization:** ***put new technologies into use (integrating/adjusting/customizing/improving)***

Technology Exploitation Sub-processes

Two major factors of marketing

1. recruitment of new customers
2. retention and expansion of relationships with existing customers.

1. **Marketing plan is the mix of the four Ps: product, price, promotion and place. It should reflect the wants and desires of consumers in the target market**
2. **Market research supply information to what, where, when, how and why questions about a company's business.**

Marketing Processes

- **Market preparation.** *Preparing the market refers to readying customers and other companies for the change by educating the market on a product or service.*
- **Targeting.** *Finding the right customers and learning their characteristics in order to decide on the marketing features to direct to the varying customer segments, for which it is important to understand adopter types.*
- **Positioning.** *Technology marketing builds its positioning according to the adopter type. It requires a clear-cut positioning strategy based on developing a completely working product/application rather than diversification.*
- **Execution.** *one or two specific niche markets where it can dominate rapidly and force out competitors. Customer trust and company image reduce the risk of adoption, but technology firms need to do more than that.*

Technology Transfer

- Technology transfer is the process by which the technology, knowledge and information developed by a creator is applied and utilized by an applier.
  - Creators might be an individual, an R&D department within a company, another commercial developer company, a partner company doing collaborative R&D, a non-profit organization or a government agency.
  - The applier might be a manufacturing department of the company where technology is developed internally or cooperatively, it might be a commercial company, a competitor or the government.
- If either the creator or applier is from a different country, technology transfer takes place at the international level.

Factors Affect the Success of Technology Transfer

- High level of technical understanding where transfer is done.
- Feasibility findings of the technology are high.
- Advanced development activities overlap with the new technology.
- Growth potential of the application is high.
- The existence of an advocate of the transferred technology.
- The existence of advanced technology activities in a development laboratory to complement the transferred technology.
- External pressures from competitors and markets enforcing quick adoption.
- Joint programmes between technology developer and technology buyer.

Technology Transfer Processes

- Determining the transfer method, actors and timing.
- Pre-transfer activities.
- Transfer activities.
- Evaluations and improvements.

Determining the Transfer Method, Actors and Timing

- Informal processes include technical information exchange through published material, in the form of printed or electronic information exchange through published material, in the form of printed or electronic media, meetings, symposia, individual exchanges or reverse engineering.
- Formal technology transfer approaches are based on legal arrangements between the participants in the transfer process. The major methods of external technology transfer are:
  - OEMs.
  - Turnkey plants.
  - Licensing (in and out).
  - Acquisition.
  - Collaborative R&D.

Technology Transfer Method

- **Over-the-wall mode:** ***Receivers have no close contact with developers. Examples arc licensing and turnkey plants.***
- **Receivers-as-consultants mode:** ***Developers have the main responsibility but they consult frequently with receivers. Some licensing and collaborative R&D might be performed in this mode.***
- **Team mode:** ***Receivers and developers work together to develop and transfer technology, for example through collaborative R&D.***
- **Apprenticeship mode:** ***Receivers become developers under the direction of the main technology or knowledge owner, for example OEM.***

Pre-transfer Activities

- Formal technology transfer relies on legal documentation, a contract including binding conditions on what will be transferred, between whom, when, how and for what price.
- After the contract is prepared either by the developer or the receiver, it is jointly negotiated and a final form is reached.
- Before the technology transfer starts, there might be a number of adjustments to physical facilities and workforce depending on the location, infrastructure, expertises.

Transfer Activities

- Physical installations and adjustments take place mainly before the transfer process starts, although further changes may be needed after technology is transferred in-house, depending on whether problems arise and to accommodate unforeseen application needs.
- careful planning will be required to shift from the old phase to the new phase keeping in view:
  - physical utilities
  - employee training
  - new process measurement systems
  - the processing of the data from those systems.

Secure learning and Efficient Communication.

- Transfer includes tangible as well as intangible knowledge. It is not only the capturing and learning of knowledge, but also its diffusion across the company that makes it valuable.
- Culture-building activities involving manufacturing, marketing and R&D people should aim to establish a common language.
- Communication must be formal and informal & should deal with :
  - Introducing new products from the development lab to the production floor.
  - Providing the optimum level of documentation on existing products.
  - Becoming multilingual, fluent in the language of customers, marketers, engineers and designers.
  - Facilitating orderly and cost-effective changes to products now in production.

Evaluations and Improvements

- There are difficulties in measuring the success of technology transfer. The degree of technological innovation, the level of application and the purpose of transferring the technology play a role in determining the effectiveness of technology transfer.
- The evaluation might be carried out in any combination of the following effectiveness dimensions: benefits, system, availability, capacity and supply.

Evaluations and Improvements

Williams and Gibson (1990) parameters:

- licences,
- requests for help,
- competitive advantage gains,
- cost savings,
- site visits,
- technology briefs,
- jobs created,
- market share gains,
- technical presentations,
- new businesses started,
- new products,
- time spent,
- transfer budgets,
- new customers,
- new sales,
- transfer expenditures,
- productivity gains,
- royalties,
- return on investment (ROI),
- success stories,
- technical problems solved and
- user satisfaction.

Technology Utilization

Utilization processes consist of three major steps:

1. **Measure technology utilization/performance.**
2. **Identify priorities and develop a business case to improve utilization.**
3. **Implement changes.**

Measure Technology Utilization/Performance

- **Technology evaluation raises the following questions for technology managers:**
  - **What is to be evaluated?**
  - **Who is to be involved in evaluation?**
  - **What roles do they play?**
  - **What criteria arc to be used in the evaluation?**
  - **How they are weighted?**
  - **How arc the criteria to be measured?**
- **Factors of Judging Criteria :** ***strategic importance to firm, actionability, validity, appropriateness, clarity, performance, and cost-effectiveness.***

Measure Technology Utilization/Performance (Cont.)

- In the input-process-output model:
  - Input measures are the time and resources required, such as people or information technology.
  - Process measures are the indicators of efficiency of the innovation process within an organization, such as the time required to bring an innovation to market.
  - Output measures are directly related to the commercial impact of innovations, such as revenues generated by a new service or product.
- Benchmarking models are used to determine how well a business unit, division, organization or corporation is performing compared with other similar organizations

Identify Priorities And Develop A Business Case To Improve Utilization

- Performance evaluations can give conflicting results and prioritizing the improvements might be difficult, so criteria should be established for determining which measures are most appropriate and helpful.
  - understand the role of the external environment in utilizing the technology
  - diversify the product/market range based on the core capabilities developed
  - adjustments to match internal strengths, to eliminate weaknesses and to improve competitiveness in global markets.
  - reliability, maintainability and availability
  - Technology integration and synergy
  - Misfit between technological innovation and organizational structure
  - underutilization

Reverse Innovation

- Reverse innovation attempts to understand the customer problem and come up with a solution that will take into consideration a variety of factors: availability of electricity, portability, durability and price.
- The goal is to fill five gaps in a developing country that lead to reverse innovation:
  - the performance gap,
  - the infrastructure gap,
  - the sustainability gap.
  - the regulatory gap.