Technology Management (Finals) - Jaish Khan

1. Basics of Technology Management

1.1. Technology

> The knowledge, methods, and processes used to transform resources, often described as applied intelligence or systematized practical knowledge. It encompasses equipment (*hardware*) but also the knowledge to use it (*software*), the understanding of its function (*brainware*), and the practical skills or experience (*know-how*).

1.1.1. Classification of Technology

- **New Technology** → Recently introduced, impacting products.
- **Emerging Technology** → Potential for future commercialization, high research investment.
- **Low Technology** → Widespread, uses lower-skilled labor, manual operations, low research, stable base, serves basic needs.
- **Medium Technology** → Falls between low and high technology.
- **Appropriate Technology** → Well-matched to available resources.
- **Tacit Technology** → Experience-based, unwritten knowledge held by developers.
- **Codified Technology** → Explains how technology works, but not necessarily why, potentially excluding the developers' underlying knowledge (brain ware).

1.1.2. Technological Change

> The fundamental process by which economies transform over time. This involves alterations in the products and services they create, as well as the methods used to produce them.

Measuring Technological Change involves looking at several indicators:

- *Economic Indices* → Technological change is measured as the weighted average of the change in factor prices, holding inputs constant.
- *Geometric Index* → Technological change is equal to the change in output not accounted for by the changes in labor and capital.
- *Patents* → The number of patents granted serves as an indicator of technological innovation. Patent data is also used to study how technology spreads across companies, industries, and countries, and to evaluate the output of research activities.

Beyond these indicators,

1. **Rate of Improvement** → Measured by tracking a key performance metric (e.g., speed for vehicles, efficiency for lighting).
2. **Rate of Substitution** → Looks at how quickly a new technology takes market share from older ones.
3. **Rate of Diffusion** → Tracks the adoption of new products or processes by users. Interestingly, the growth in improvement, substitution, and diffusion often follows an S-shaped curve, starting slowly, accelerating, and then leveling off.

Theories of Technological Change

- *Neo-Classical* → Technology improves output with the same inputs, like a better recipe. Simple, but misses big changes.
- *Marxist* → Society and history shape technology, mainly for profit or survival, often replacing workers.
- *Schumpeter's* → Innovation (new ideas) drives the economy by disrupting things. Hard to define innovators or prove how it works.
- *Evolutionary* → Technology changes like evolution: invention (mutation) then popular adoption (selection), leading to gradual improvements. Needs more proof.
- *Market-Pull* → What people want drives innovation. Demand signals what to invent. Hard to define demand and why some technologies win.
- *Technology-Push* → Science and research create new technology, which then finds or creates demand. Doesn't fully consider economic influence.

1.1.3. Technological Innovation

> The process of turning new ideas into practical tools, devices, or procedures that benefit society. While often thought of as simply creating new products, it also includes improving existing methods, using cheaper materials, or reorganizing processes for better efficiency or lower costs.

The process typically involves several stages: *Basic Research*, *Applied Research*, *Collaboration*, *Technology Development*, *Technology Implementation*, *Production*, *Commercialization*, *Proliferation*, *Technology Enhancement*.

> **Innovation Management** → Creating an environment where new ideas, processes, or products can flourish. Senior management support is crucial for successful innovation. Innovation can be driven by these approaches:
>
> - **Technology-push** → Finding uses for existing or new technology.
> - **Market-pull** → Identifying customer needs and developing technology to meet them.

1.2. Technology Management

> It is essentially about how organizations or even nations handle their technological resources and capabilities to gain an edge and achieve their goals. Think of it as bridging the gap between engineering, science, and business management.

TM Activities

- Setting technology policies
- Predicting and assessing future technologies
- Developing technology strategies
- Transferring technology
- Managing technology projects and R&D
- Managing the skilled people who work with technology
- Continuously improving products and processes through technology.

3 levels of TM tasks

1. **Normative Level** → Dealing with the fundamental, major decisions that define a company's culture and overall policy regarding technology. It's about the core values and long-term direction.
2. **Strategic Level** → A technology strategy is developed based on the normative guidelines. The focus here is on effectiveness – ensuring the right technologies are chosen and implemented to achieve the company's long-term goals and maintain a competitive edge.
3. **Operative Level** → The strategic plans are put into action over the short term. The primary principle here is efficiency – making sure the technological resources and processes are used as effectively as possible in daily operations.

2 scopes of TM

Both scopes aim to increase efficiency, and they need to be aligned for technology management to be truly effective.

- **Macro (National Level)** → Involves a country's planning for technological development, identifying key technology areas, deciding whether to develop technology domestically or acquire it from abroad, setting up institutions to guide technological growth, and designing policies to regulate it.
- **Micro (Firm/Project Level)** → How individual companies use technology strategically to compete, integrate technology into their overall business

plans, evaluate new technologies and innovations, manage their R&D efforts, and deal with technology becoming outdated.

1.2.1. TM Framework

5 Steps of Technology Management Framework

1. ***Technology Identification*** → Finding technologies crucial for the company's strategy through activities like scanning, forecasting, understanding customer needs, and benchmarking.
2. ***Technology Selection*** → Choosing the technologies to adopt based on analysis, expert opinions, decision criteria, and financial assessment. This requires considering both tangible and intangible factors for long-term investments.
3. ***Technology Acquisition*** → Obtaining the selected technologies through methods like internal R&D, joint ventures, licensing, mergers, or technology transfer.
4. ***Technology Exploitation*** → Utilizing the technologies to gain benefits, such as improving processes, licensing the technology to others, developing new products, or enhancing the supply chain.
5. ***Technology Protection*** → Safeguarding the company's technological knowledge through patents, contracts, security measures, and retaining skilled staff.

2. Technology Identification

> The process by which organizations pinpoint the right technologies to stay competitive, offer updated services, and produce high-quality goods efficiently. Choosing the appropriate technology is vital for achieving company goals and maintaining a competitive edge.

What should businesses do for effective TI?

- Actively seek out technology intelligence and market information relevant to their needs.
- Stay informed about technological advancements in their field.
- Develop internal capabilities for systematically identifying and assessing potential technologies.
- Consider external factors like customer needs, competitor activities, scientific advancements, and regulations.

2 Approaches to Technology Identification

1. **Problem-Driven** → Start with a problem that needs solving and then search for available technologies that can provide a solution. Various tools can help in evaluating and choosing among different technological options.
2. **Technology-Driven** → Discover an innovative technology in one sector and then explore potential applications for it in other areas, potentially creating new market opportunities. This often involves scanning literature and conference proceedings.

2 Perspectives of Technology Identification

1. **Business Side** → Focuses on finding new services and technologies in the market that can be adopted and offered to customers.
2. **Technical Side** → Responsible for finding the appropriate and up-to-date technology needed to operate the services identified by the business side.

2.1. Technical Identification Factors

Several factors influence the technical side of technology identification.

- **Technology Trends and Developments:** Keeping up with the latest technological changes by monitoring industry trends, vendor roadmaps, and the achievements

of other companies.

- **Business Requirements:** Ensuring the identified technology can support the features and functionalities outlined in the service descriptions and align with the service development strategy and customer needs.
- **Internal Technical Needs and Assessment:** Evaluating the organization's current technical capabilities, including the need for modern technology, suitable tools, efficient processes, and skilled personnel, to ensure they can operate and deliver new services effectively.
- **Existing Technology Assessment:** Analyzing the current infrastructure, performance, reliability, and security to determine if it can support new services or if upgrades or new technologies are required.

2.2. Technology Identification Process

The main identification process involves these steps:

> **Input** ⟶ Gathering external factors like technology trends, customer needs, market competition, and regulations.

Main Process

1. *Scanning & Monitoring* ⟶ Continuously watching for new developments in relevant areas.
2. *Technology Intelligence* ⟶ Capturing and distributing technological information to inform strategic decisions.
3. *Technology Road-mapping* ⟶ Planning the evolution of products or processes by linking business strategy to technology development.
4. *Identify Customer Needs and Requirements* ⟶ Understanding what customers want and expect through market research and direct interaction.
5. *Identify the Technology* ⟶ Finding the technologies that can deliver the desired services and features, often by engaging with vendors.
6. *Making Preliminary Studies* ⟶ Conducting market research and analysis to assess the feasibility and potential success of new services.
7. *Validation and Verification* ⟶ Confirming that the new services and technologies meet objectives and customer expectations through studies, analysis, and reporting.

> **Output** ⟶ The result of the identification process, typically a *Service Description Documentation (SDD)*. This document details the service, its features, target customers, development strategy, and technical, support, and billing requirements.

🔗 **Roles and Reccomendations**

Different departments play a role in this process. Strategic Planning & Development focuses on future technical plans and strategies, while the Technical Operation Department implements these plans. Technical planning teams assess the organization's readiness and determine the technical requirements for new services, evaluating whether existing technology is sufficient or if new technology is needed.

⚠ Vendors

They are also key players as they provide information on the latest technologies and their future roadmaps. Organizations evaluate vendors based on technical criteria, the quality and specifications of their offerings, and their ability to support future enhancements, in addition to operational and financial factors.

3. Technology Selection

> Involves the selection of those technologies that are chosen to help organizations to achieve their ultimate goals.

Processes of Technology Selection

1. *Scenario Analysis* → Estimating the potential value of a technology or a portfolio of technologies under specific hypothetical future conditions or events, including unfavorable ones (like a change in interest rates) to understand potential risks.
2. *Portfolio Analysis* → Analyze an organization's current products, services, or technologies based on measures like market growth rate and relative market share to inform decisions about which technologies to invest in or divest from.
3. *Expert Judgment* → Relying on the knowledge and experience of individuals with specialized expertise in relevant areas to evaluate technologies based on predefined criteria.
4. *Decision Criteria* → Establishing clear definitions of what factors are important and relevant when evaluating options and making a final technology selection.
5. *Financial Analysis* → Evaluating the potential profitability, performance, and overall suitability of technologies, projects, or budgets from a financial standpoint to determine if they are sound investments.

3.1. Basis of Technology Selection

Selecting the correct technologies is important, especially for long-term investments. This requires considering a mix of quantitative, qualitative, intangible, and tangible factors.

- **Tangible Factors:** These are easily measurable costs, such as initial investment, ongoing operating and maintenance costs, and the cost of network and support services.
- **Intangible Factors:** These are less easily quantifiable but equally important aspects:
  - *Technical & Operational Aspects:* Features, reliability, performance, capacity, how easy it is to upgrade hardware and software, redundancy (backup systems), security, ease of use, ability to diagnose faults, and potential for future development.
  - *Vendor & Support Factors:* The quality of monitoring and billing flexibility provided by the vendor, compliance with standards, the quality of support, the vendor's ability to solve problems, their expertise, delivery time, experience, and overall reputation.

3.2. Technology Selection Criteria

A structured approach is used to define the criteria for selecting technology:

1. **Set criteria:** Establish the specific points that will be used to differentiate between different vendors and technological solutions.
2. **Define project-specific requirements:** Clearly outline the needs specific to the project, including central requirements and IT needs.
3. **Shortlist vendors:** Identify a smaller group of vendors whose offerings appear to meet the high-level needs.
4. **Document requirements:** Create a clear and detailed written record of all requirements to ensure effective communication with vendors.
5. **Evaluate vendors:** Assess the shortlisted vendors systematically using the consistent and meaningful criteria established earlier.
6. **Reach consensus:** Ensure all relevant stakeholders agree on the best vendor and solution.

> Considerations when defining selection criteria include: Ease of use, Delivery and support capability, Platform infrastructure, Application integration, Implementation processes and required resources, Training and knowledge transfer, and After-sale support.

⚠ Gather Information and Compare Vendors

1. *Create a matrix* using the established evaluation criteria and requirements. Include columns to note pros, cons, outstanding issues, and questions for each vendor.
2. *Evaluate vendors* further by checking references and holding structured presentations where vendors can elaborate on their offerings based on a detailed agenda.
3. *Map pricing* back to specific components to ensure an accurate, "apples-to-apples" comparison of costs.
4. *Shortlist vendors*.

Making the Final Selection

1. Determine which vendor's offering most closely meets all the defined requirements.
2. Strictly follow the original selection criteria to guide the decision-making process consistently.
3. Build a scoring template or tool that allows each member of the evaluation team to numerically score vendors based on the key differentiators. This tool helps to minimize emotional bias in the decision.

4. Work towards achieving consensus among all stakeholders so that everyone supports and feels ownership of the final technology selection.

3.3. Requirements Document

> To gather targeted information and facilitate direct comparisons between vendor offerings, a structured Requirements Document, often in the form of a formal "Request for Proposal" (RFP), is used.

It must cover several key aspects:

1. **Functional Requirements** → A list of required functionalities, asking vendors to confirm their ability and note exceptions. Focus is on essential items and functionalities, including license types for testing and training, supervisor support, reporting, and inbound/outbound resources.
2. **Technical Requirements** → A clear definition of necessary technical specifications for platform, software, and hardware, highlighting reliability, resiliency, scalability, integration, and security. Inquiries include preferred platforms and potential hardware upgrades affecting costs.
3. **Implementation Approach** → Details on the vendor's proposed approach for discovery, project management, and collaboration, including timelines for major phases (design, development, testing, cutover), roles, responsibilities, and details on testing types, plans, tools, and resources. Information on training types (classroom, on-site, train-the-trainer, knowledge transfer) is also requested.
4. **Support** → Inquires beyond 24/7 support, including service level commitments, warranties, upgrade processes, and potential release history/roadmap.
5. **Vendor's Qualifications and Experience** → Requests for documents and information to assess financial stability, contractual terms, relevant experience, organizational fit, and client references.
6. **Pricing** → A standardized spreadsheet for cost comparison of hardware, software, implementation, and support, including base pricing and potential discounts to gauge vendor seriousness, separated by product categories and locations.

4. Technology Acquisition

> A technology transfer, with transaction costs associated with the various stages of the acquisition process.

Technology can acquired in a number of ways: Internal Research and Development (R&D), Join Ventures and R&D, Subcontracting, Alliances, Industry-University Collaboration, Organizational Change, Project Management, Licensing, Technology Transfer and Technology Insertion.

⑦ What does Technology Acquistion require?

1. Identification of attractive technologies/partners with capabilities.
2. Assessing and Selecting the most promising ones.
3. Consideration and Negotiation of the terms of acquisition.
4. Transfer technology to the acquirer.

4.1. Acquisition Context

A structured approach will help to reduce complexity of all the possible scenarios and ensure that those involved remain objective and focused on the most important 3 questions:

⑦ Q1: WHY do we want to acquire the technology?

Organization's motives for wanting to acquire a technology affects the kind of technology they are looking for. There are 4 types of motives(M):

1. **Motive 1**: *Develop Technological Capabilities* → Is it done to:
   - Fill gaps in a firm's own R&D base or capabilities?
   - Fill holes in an existing product line?
   - Create and establish a new product for the firm?
   - Overcome technology exhaustion?
2. **Motive 2**: *Increase Strategic Options* → Is it seen as:
   - Opportunity to increase capabilities in light of changes in the firm's environment?
   - Overcoming internal technological constraints in order to enhance strategic flexibility?
   - Means to access the best available technology in the future?
3. **Motive 3**: *Gain Efficiency Improvements* → Is it a means to:
   - Reduce development time or costs?

- Increase customer interest?

4. **Motive 4**: *Respond to the Competitive Environment* → Is it important for:
   - Technology markets are emerging?
   - Environments are more hostile?
   - Rapid technological change?
   - Fast moving competitors in market area?

Q2: WHO are we going to acquire the technology from?

Technology can be acquired from a number of different kinds of sources like private companies, universities and government agencies.

It is very important to understand the characteristics of your potential partner as these will determine their expectations and behavior during collaborations.

Q3: HOW mature is the technology and how might this affect our acquisition options?

The maturity level + the amount of work needed to bring it up to the level your firm requires are highly significant factors.

4.2. Acquisition Evaluation

Once technology is identified you need to thoroughly assess whether the proposed acquisition is likely to meet your needs. 3 main factors:

1. **Firm's Absorptive Capacity** → Its the technical knowledge and acquisition experience, combined with its IP stock and willingness to embrace external ideas (avoiding "not-invented-here"). It also involves the firm's flexibility in adopting new routines, internal support, ability to share knowledge externally, and its capacity to apply and exploit the acquired technology.
2. **Partner Compatibility** → Partner compatibility in alliances hinges on several factors. These include a shared strategic vision for the alliance's goals and alignment between the partners' overall and alliance-specific strategies. A shared understanding of the alliance's strategic importance and mutual dependence further strengthen compatibility. The alliance's potential to add value for clients and its anticipated market acceptance are also crucial. Finally, compatible technical capabilities between the partners are essential for effective collaboration and achieving alliance objectives.
3. **Technology Suitability** → Evaluating a technology's suitability involves assessing if its acquisition meets the set objectives and its potential commercial value, while

also considering uncertainties related to the transaction and intellectual property. This assessment includes evaluating the target's *know-how* (employee skills and their application), *know-what* (specific technical and market knowledge like details and procedures), and *know-who* (expert contacts and organizations crucial for the technology's operation along the supply chain).

4.3 Other Topics

STAM Model	Description
Science	Understanding scientific phenomena.
Science/Technology Transition	Showing scientific feasibility for a new market technology.
Technology	Improving market technology reliability and performance for market demonstration.
Technology/Application Transition	Demonstrating commercial potential through initial revenue.
Application	Enhancing application price/performance to show sustainable business potential.
Application/Market Transition	Scaling price/performance for mass market growth.
Market	Marketing, commercial, and business development for sustainable industrial growth.

IP Protection Clauses → Parties changing their minds, Knowledge leakage, Lack of good faith, Underperformance, Procrastination and delays in reaching agreements and Third Parties' rights.

Ownership of Intellectual Property

- *Individual Ownership* → IP can belong to only one party.
- *Joint Ownership* → IP can be shared between parties who collaborated to develop it.
- *Public Ownership* → IP can be owned by everyone and is donated to the public. In this case nobody has the legal right to exclude others from using the IP.

5. Technology Exploitation

> The process of generating profit or other benefits from technology. It involves using new technology or scientific developments to enhance products, services, or manufacturing processes.

Technology Exploitation Routes

The production and distribution of technology:

1. **In-house Development** → carried out within the company.
2. **Joint Commercialization** → carried out in collaboration with other organizations through joint ventures or other forms of alliance.
3. **Selling Technology** → can take place at any stage.

Subprocesses of Technology Exploitation → Marketing, Technology Transfer, Technology Utilization.

5.1. Commercialization (Marketing)

> This focuses on earning revenue from sales and involves successfully introducing a new product or service to the market through advertising, distribution, and selling.

- 2 Key Factors of Marketing → recruiting new customers and retaining and expanding relationships with existing ones.
- Marketing Plan → mix of the "four Ps": product, price, promotion, and place, and should reflect consumer desires in the target market.
- Market Research → understanding the "what, where, when, how, and why" questions related to a company's business.

Processes of Marketing:

1. *Market Preparation* → This involves educating customers and other companies about a new product or service to prepare them for the change.
2. *Targeting* → This step focuses on identifying the right customers and understanding their characteristics to tailor marketing efforts to different segments. Understanding adopter types is important here.
3. *Positioning* → Technology marketing builds its positioning based on the adopter type. It requires a clear strategy focused on a fully working product or application rather than diversification.
4. *Execution* → This involves focusing on one or two specific niche markets to dominate quickly and push out competitors. Building customer trust and a strong company image is important for reducing adoption risk.

5.2. Technology Transfer

> This is the process by which technology, knowledge, and information developed by a creator are applied and utilized by an applier.
>
> - Creators can be individuals and R&D departments or other companies, non-profits, or government agencies.
> - Appliers can be internal manufacturing departments, other commercial companies, competitors, or the government.

Processes of Technology Transfer:

1. *Determining the transfer method, actors, and timing*: Technology transfer methods can be informal (e.g., publications) or formal (legal agreements). Major external methods include OEMs, turnkey plants, licensing (in/out), acquisition, and collaborative R&D. These methods can be categorized by the level of interaction between developers and receivers:
   - Over-the-wall → Minimal contact (e.g., licensing, turnkey plants).
   - Receivers-as-consultants → Developers lead with receiver input (some licensing, collaborative R&D).
   - Team → Joint development and transfer (collaborative R&D).
   - Apprenticeship → Receiver learns under the owner's guidance (OEM).
2. *Pre-transfer Activities*: Formal technology transfer uses a legal contract detailing what, who, when, how, and the price. This contract is negotiated and finalized. Before transfer, facility and workforce adjustments may be needed based on location and expertise.
3. *Transfer Activities*: Physical setup and adjustments primarily occur before technology transfer. However, post-transfer modifications might be necessary to address issues or new application requirements. Careful planning is crucial for the transition, considering physical utilities, employee training, new process measurement systems, and data processing.
4. *Evaluations and Improvements*: The success of technology transfer is hard to measure. Factors like the degree of technological innovation, how it's applied, and the transfer's goal impact its effectiveness. Evaluation can assess benefits, system-wide effects, availability, capacity, and supply.

Factors affecting success of Technology Transfer

- A high level of technical understanding at the point of transfer.
- Strong feasibility findings for the technology.
- Overlap between advanced development activities and the new technology.
- High growth potential for the technology's application.
- The presence of an advocate for the transferred technology.

- Advanced technology activities in a development laboratory that complement the transferred technology.
- External pressures from competitors and markets that encourage quick adoption.
- Joint programs between the technology developer and the technology buyer.

5.3. Technology Utilization

> This involves putting new technologies into use, which can include integrating, adjusting, customizing, and improving them.

Processes of Technology Utilization:

1. *Measuring technology utilization (performance)*: Technology evaluation raises the following questions like What is to be evaluated? Who and what roles do they play? What criteria? etc. Main factors when judging are strategic importance to firm, actionability, validity, appropriateness, clarity, performance, and cost-effectiveness.
2. *Identifying priorities and developing 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.
3. *Implementing Changes*.

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.

Reverse Innovation

Attempts to understand the customer problem and come up with a solution that will take into consideration a variety of factors like availability, portability, durability and price. The goal is to fill these performance, infrastructure, sustainability and regulatory gaps.

6. Technology Protection

> Aims to prevent unauthorized access, use, copying, modification, or disclosure of technology. This is crucial because technology often represents a significant investment and a competitive advantage for individuals and organizations.

⚠ **Challenges of Technology Knowledge Transfer**

- **Irreversibility:** Once knowledge is transferred, it cannot be retrieved.
- **Difficulty in Verifying Misuse:** It's hard to prove when and how specific knowledge is being misused.
- **Ownership and Origin Ambiguity:** Determining the original owner or source of an idea can be very complex.
- **Varying Legal Protection:** Technology protection laws differ significantly between countries.
- **Difficulty in Assembling Knowledge for Future IP:** Compiling the necessary knowledge to develop new intellectual property is challenging.

6.1. Technology Protection Mechanisms

Intellectual Property Rights → *Patents* (Protect inventions and industrial processes), *Copyrights* (Protects original works of authorship), *Trademarks* (Protect words, phrases, symbols) and *Design Rights* (Protect the visual design).

Other Protection Mechanisms

- *Secrecy*: Keeping knowledge confidential.
- *Design Complexity*: Making technology difficult to copy.
- *Lead-Time Advantage*: Being the first to market with a technology.
- *Confidentiality Agreements*: Legal contracts and internal practices to protect information.

✓ **Preferred protection mechanisms for different types of knowledge**

1. Tangible/Codified → **Patents**, Copyrights, Trademarks, Confidentiality Agreements.
2. Intangible/Codified → **Copyrights**, Trademarks, Confidentiality Agreements.
3. Tangible/Tacit → Secrecy, Complexity of Design, Lead-Time Advantage.
4. Intangible/Tacit → Trademarks, Secrecy, Lead-Time Advantage

Technological Protection Measures

- **Access Control Technologies** → Measures used by copyright owners to control access to their content. Examples: Password control systems, payment systems, time access controls.
- **Copy Control Technologies** → Measures that prevent, inhibit, or restrict copyright acts on protected content. Examples: Software locks, encryption, technology that locks documents to prevent copying, technology that makes unauthorized film copies unwatchable.

Circumvention Devices and Services

Technologies or services used to remove, disable, or circumvent technological protection measures.

6.1.1. Trademark

> A word, phrase, symbol, or design that identifies and distinguishes the source of goods (or a service mark for services). Rights are based on "use" and do not expire after a set time.

Symbols

- TM (Trademark): Used for goods before registration.
- SM (Service Mark): Used for services before registration.
- ® (Registered): Used after official registration.

Registration → Registration in a country protects the mark only in that country.

- *Benefits of Registration*: Public notice of ownership, Legal presumption of ownership nationwide, Exclusive right to use the mark.

6.1.2. Patent

> Protects inventions and industrial processes from unauthorized implementation. Typically last 15 to 20 years, depending on the patent type. Protects things like Machines, manufactured articles, industrial processes, chemical compositions BUT can take 2-3 years to apply.

Patent Types

- Design Patents → Protect the ornamental design of an article of manufacture.
- Utility Patents → Protect new processes or machines.

- Plant Patents → Protect new varieties of plants.

Motives for Patenting

1. **Protection:** Patents offer legal protection against unauthorized use of an invention.
2. **Blockade:**
   - **Defensive:** Patents can prevent others from patenting similar inventions.
   - **Offensive:** Patents can be used to prevent competitors from entering a market.
3. **Reputation:** Patents can enhance a company's image as innovative.
4. **Exchange:** Patents can be licensed or sold for revenue.
5. **Incentives:** Patents encourage investment in research and development.

Weakness of Patents → Patent are difficult to draft and their applications can be complex and expensive to make.

- *Copyrights as weaker but immediate protection*: Copyrights offer immediate protection for creative works, although less comprehensive than patents.
- *Secrecy as an alternative*: Keeping an invention secret avoids the disclosure required for a patent.
- *Design complexity hindering reverse engineering*: Complex designs may be difficult to copy even without patent protection.

6.1.3. Copyright

> Protects original works of authorship. Gives authors specific rights, prohibits unauthorized actions, and allows legal action against infringement or plagiarism.

Lasts for 70 years after author's death (individual works) or 95 years from publication or 120 years from creation (whichever is shorter). It protects works like Literary, dramatic, musical, artistic works.

Protected/Proprietary Technology → Technology owned by a business or individual that provides a benefit or advantage. Things like Movies, games, software, CDs, digital music (often protected by copy protection technology).

Confidentiality Agreements

A major protection tool as the risk of knowledge leakage could be severe. The firm has different levels of security which impose restrictions on what can be exchanged even between parts of the same company.

7. TM Tools

7.1. S-Curves

> A visual tool in project management that plots cumulative quantities like costs or labor hours against time. Its characteristic S-shape reflects the typical project lifecycle: a slow initial phase, a period of rapid progress, and a gradual slowdown towards completion.

Key Components of S-Curves:

- *Quantities Measured*: S-Curves primarily track **Man Hours** and **Costs**, which can be represented as absolute values or percentages.
- *Underlying Schedules*:
  - **Baseline Schedule** → The initial project plan established before commencement, outlining planned resources, timelines, and budget.
  - **Production Schedule** → The dynamic schedule used to track actual progress and forecast completion.
  - **Cut-Off Date** → A specific point in time used to assess the percentage completion of tasks.
- *Types of S-Curves*:
  - **Baseline S-Curve** → Generated from the baseline schedule, representing the planned project trajectory.
  - **Target S-Curve** → Generated from the production schedule, assuming all tasks are completed as planned.
  - **Actual S-Curve** → Generated from the production schedule and the current percentage completion of tasks, showing the real project progress to date.

⑦ Why Use an S Curve?

S Curves help project managers to:

- Track Project Progress.
- Analyze Project Performance and Growth or Contraction.
- Determine Project Start and/or Finish Slippage
  - **Slippage** → The delay of tasks compared to the original baseline schedule. This is calculated by comparing scheduled and baseline start/finish dates or actual and baseline durations.

7.2. Patent Analysis

> A management tool used for the strategic management of a firm's technology and product or service development. It enables businesses to assess their current technical competitiveness, forecast technological trends, and anticipate potential competition based on emerging technologies.

Advantages of Patent Analysis	Disadvantages of Patent Analysis
Broad Use: Supports IP/R&D management, strategy, etc.	Data Overload: Patent searches yield huge amounts of data.
Adaptable: Analysis can be tailored to specific needs.	Complex Review: Patents are often minor innovations, requiring expert review.
Reduces Risk: Helps identify new tech and reduces surprises.	Data Issues: Errors and inconsistencies in patent data are common.
Reliable Data: Uses official, searchable patent databases.	Limited Scope: Primarily for business intelligence, not national security.
Analysis Tools: Software helps analyze and visualize patent data.	Concealment: Companies may hide tech to avoid patents.

Types of Patent Analysis

- *Internal Patent Analysis* → A company assessing its own technological portfolio to understand its position within a technology class or industry. Internal analysis can also help companies identify unused technologies that could be sold or leased for profit.
- *External Patent Analysis* → Allows a company to predict the direction of its competitors, identify potential collaborations between competitors in technology development, and determine the possibility of patent infringements (by either the company or its competitors).

Steps to Conduct Patent Analysis

1. *Define Purpose* - Clearly establish the goals of the analysis.
2. *Plan Data Collection* - Identify relevant data sources.
3. *Select Tool* - Choose the appropriate patent analysis software.
4. *Collect Data* - Gather the necessary patent information.
5. *Address Gaps* - Fill in any missing data.
6. *Analyze Data* - Interpret the collected information.
7. *Share Findings* - Communicate the results to decision-makers.
8. *Create Database* - Develop a custom in-house patent database.
9. *Stay Updated* - Keep abreast of new patent services and databases.