Chapter 2 – Technology Identification


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Introduction

The process of technology identification gains high importance in Technology Management. By identifying the appropriate technology, organizations cope with development in technologies, are able to offer the latest and up-to-date technology and services and will produce a high quality and enhanced services with a high quality and competitive prices. Technology identification processes mainly focus on determining the type of technology and nature of the services together, giving organizations the priority at the strategic and operational levels. This process has its significance in forming the strategies of the firm and in selecting the services and technologies.
The identification of the most suitable and appropriate technology is very important to achieve the organizational goals and remain competitive. Hence, technology identification is an important activity of technology management. The technology identification activity must address the following questions:

- Is the identified technology physically compatible?
- What is the impact to the system from the identified technologies?
- What is the readiness, or maturity, of the identified technology?

To address these questions requires diligence and detailed analysis from technical, legal and commercial perspectives. The technical assessment needs to include a sound analysis of the likelihood of success of the introduction of the new technology, and the scope of its application. The legal assessment needs close scrutiny of any intellectual property associated with the new technology and the freedom to operate in developing the idea. Finally, these typically needs to be a reasonable commercial opportunity associated with the technology for the technology to be pursued. In this situation commercial interest is interpreted as a typical private sector opportunity or more broadly, an opportunity where a market is underwritten by a donor agency or government. New technologies can be identified internally through targeted surveillance of literature and public presentations. In addition, technologies may be presented by third parties for opportunity assessment. The key aspect of either mode of presentation is that a robust, transparent and rapid assessment process is in place to provide a business development unit with the information it requires on potential utility to support subsequent negotiations for access to a new technology.

One of the strongest paradoxes to be faced when considering identification of new technologies is an uncertain future, whereas forecasting and prediction are essential for investing in future innovation. The outcome is never predetermined and something of little value today may become priceless tomorrow. Therefore an open mind is fundamental to detect and select new technologies. Innovation frequently comes from unexpected and/or unrelated areas and there is a benefit in looking beyond a particular sector to identify new technologies.

There are two methods of identifying a new technology:

1. Begin with a problem which requires a solution and review the new technologies available to eventually solve it. Several tools are available to detect, evaluate and make a final choice between technology alternatives (mathematics, sociology, economic tools). These tools are useful in a methodology when starting with a problem to solve and comparing different alternatives (old technologies against new ones).
2. Identify an innovative technology originating in a completely different sector which may be of potential interest for an application in other domain and
may create new market opportunities. When looking beyond a specific sector to discover new technologies that might be useful, the exercise is more likely to involve a scanning method through the analysis of published literature and conference proceedings.

Note that the technology identification activity should not be carried out nonchalantly. The identification of appropriate technologies should aimed that

- businesses should capitalize on the intelligence of technology and avail of market surveys so as to assess the business’s technological wants, or ones that may be of significance to the company;
- businesses should stay abreast of advances in technology that are relevant to it.

Businesses must develop activities relating to technology intelligence internally, so that systematically, technology identification can be carried out, qualified candidates should be assigned these duties, and data obtained from these procedures must be assessed and conveyed to all relevant commercial departments. Input factors from the outside environment should support the process of identification. This includes data on clients and competitors, surveying the science base and other such inputs. The identification of these technologies can contribute to answering questions such as:

- How the company’s technological needs are monitored?
- How does the company monitor technological developments and the technologies owned by competitors?
- How can we introduce, as embedded in product, technology to the market?
- Which technologies can be used?
- In relation to competitive advantage, which technologies, competences and capabilities are necessary?
- Is the identified technology physically compatible?
- What is the impact to the system from the identified technologies?
- What is the readiness, or maturity, of the identified technology?

Identifying technology needs is one of the many steps in a strategic technology planning. It embodies a methodical approach of surveying all available technologies that may be of significance to the company. Roussel (1991), like many other management scientist, stresses the value of linking business strategy and long term plans with technology needs identification. Applying this idea, to a service sector, for example the telecommunications sector, a business must articulate its strategic objectives in relation to what goods and services it should provide to the different parts of the population. Technology identification requires adequate external and internal technology analyses, eventually the creation of Technology Radar (Veugelers et al., 2010).
Technical identification
Technical identification process is affected by several factors including (Technological trends and developments, Business requirements, internal technical needs & network assessment, and vendor recommendation).

1. **Technology Trends and Developments:** Technological changes and developments have great effects on the process of choosing the appropriate technology in the organization. Technical department remains keen to keep up with every technological development in their respective domain; they always keep in touch with the vendors and suppliers who demonstrate the roadmap of new technologies in their respective fields. They also search on the internet and look to the achievements of other large and international companies in their domain.

2. **Business requirements:** Business requirement presents in achieving all the items that have been documented in the service description documentation “SDD” which mainly consists the features list of the services that they will offer to the customers. These requirements should be compatible with the technical side as they considered the operator of the new services. Business requirements include the nature and feature of the services, service development strategy, customer service requirement and the ability to enhance and add additional value to it in the future.

3. **Internal Technical Needs and Technology Assessment:** The technical requirements must be fully available in order to operate and provide good products and services to the customers. For this purpose there are four key elements which represent the technical requirements that must be met. There are four basic elements of technical requirements that are being considered seriously:
   - **Technology:** Technical needs modern and last technology that compatible and match the Business plan to provide what needed of products and services. This technology must be scalable, flexible, and reliable; this will help technical to have a full view and Roadmap toward future and company needs.
   - **Tools:** Suitable and powerful tools will enhanced and help organization to reduce all complicated methods (old versions) to overcome all maintenance issue and also facilitate the speed of solving the problem and faults.
   - **Process:** Powerful and automatic procedures and process help organization to decrease all routine procedures and match with new technology and rapid change on life. It help also to speed up providing services and products internal and external in organization.
   - **People:** Well trained and qualified employee inside organization will improve and help it to proceed with new products and service that match with organization’s business plan, in addition to that will decrease the number of employee that are working on such services and divide teams to specialist division that concentrate on study case or deep investigation for technical planning or operation tasks.

4. **Existing Technology Assessment:** Existing Technology Assessment gives a clear understanding to whether the current design, architecture and technology performance is meeting business requirements and needs. It provides a quick snapshot of the current
technology with an examination of the infrastructure, performance, availability, management and security.

**Technology Identification Processes**

Identification of new technologies can be formed from two sides:

1. the first one is from business side who searches for every new services and technologies in the world trying to attract it to be applied in the business community; and
2. the second is from technical side who is responsible for searching for up-to date technology that can operate such new services and technologies.

The business side involves three main processes which are the input, the main process, and the output.

**Input process**

Input process contains some external factors that affect the process of identifying the technology and the decision of choosing the appropriate one. These factors are:

- **Technology trends and developments:** Contemporary technology trends are always changing and new developments are constantly improving. Organizations always try to keep familiar with and stay abreast with current technology trends and developments through attending and arranging exhibitions, seminars, conferences, and other events and resources. At the same time, organizations keep in touch with the vendors to remain informed of everything that is new and aware of the vendor’s roadmap regarding the forthcoming technologies.

- **Customers’ needs and requirements:** Identifying customer needs is an integral element of any organization’s marketing program. Understanding customer needs helps refine product development projects, marketing communication programs and distribution choices. Correctly identifying customers' needs is essential for ensuring customer satisfaction and loyalty. It is considered as one of the most essential elements of customer retention, customer loyalty, and product repurchase. Organizations that launch products without researching and taking account of customer needs run a high risk of failure.

Customer needs and wants are other key input factors that affect the technology identification process. Organizations always conduct necessary studies and market surveys in order to determine the needs of customers so that appropriate technology could be implemented to meet the needs and expectation of the customers and gain their satisfaction.

- **Market competition:** Competitors impinge on the ability of the business to make profits, because competitors constantly seek to gain an advantage over each other, by differentiating their product and service, and by seeking to provide better value for money.

Marketing is about making sure that a business is providing the goods and services that customers want. It involves identifying and anticipating what consumers want today and will want in the future. The marketing department then
plays an important role in taking these goods and services to market through all the channels the business sells through.

- **Regulations**: The political and legal system creates the rules and frameworks within which businesses operate. Government is responsible for putting and formulating laws, rules and regulations that regulate the business community.

**Main Process**

Nowadays in the fast changing environments and technologies developments, most of cos that use technologies keep pace with every changes and development happened in the world. With the existence of many competitors in the business, and with the existence of large organizations and small enterprises, organizations seek to provide their customer with every new and up to dated services in order to keep its customers satisfied. Thus keep pace with technological development is one of the most important key inputs to the process of identification of technology.

Technology identification process begins with searching for these new services in the real world by special operation called scanning and monitoring process, passing through identifying customer’s needs and requirements, then holding the necessary forecasting studies, analysis, testing and reporting, ending with validation and verification for the success of these services in achieving the target of meeting the customer wants and gaining the predictable profit to the organization, taking into account the external and internal factors that will affect the identification process in the business phase, the tools used, the stake holders involved in.

Gregory (1995) states that there are many procedures needed to identify the technology needed now or later by a business. These include

- **Technology Scanning & Monitoring**: to watch, observe, check, and keep up with developments, usually in a well-defined area of interest for a very specific purpose.
- **Technology road mapping**: planing that matches short-term and long-term goals with specific technology solutions to help meet organizational goals. It may be about a new product or process, or an emerging technology.
- **Technology forecasting**: attempts to predict the future characteristics of useful technological machines, procedures or techniques.
- **Technology intelligence**: is an activity that enables companies to identify the technological opportunities and threats that could affect the future growth and survival of their business. It aims to capture and disseminate the technological information needed for strategic planning and decision making. As technology life cycles shorten and business become more globalized having effective TI capabilities is becoming increasingly important.

The identification of appropriate technologies is always crucial to the organizations’ strategic operations. The identification of appropriate and efficient technology helps organizations increase their competitiveness by creating new products or services or processes, improving
current ones, working on patents, innovation and reducing costs. For this purpose, organizations use following processes:

The identification process mainly includes seven processes:
1. Scanning and monitoring
2. Technology Intelligence
3. Technology Roadmapping:
4. Identify customers needs and requirements
5. Identify the technology
6. Making Preliminary studies
7. Validation and verification for the new services and technologies

1. Scanning & Monitoring

As the competition has become wide spread and strong, organizations keep tracking for the new services and technologies in the world and become more aware in providing its customer with new services with the use of up-to date technology in their respective fields in order to keep their customer satisfied.

Product and services department in marketing directorate always seeks to search for these new services in the market, therefore they are continuously scanning for the external environment as it is of high importance for the business unit and the company to distinguish the opportunities and threats.

Scanning or monitoring the external environment on continuous basis is necessary since the external environment change rapidly and continuously.

Product and services department can do the following
1- Developing new service that will offer new challenges for the customers and Keep them pace with technological development
2- Enhancing and maintaining the current service by adding additional features to it that will allow the customer to use it in the good way
3- Following the Regulatory issue

(Bright, 1970) states that technology monitoring should include many activities and not simply “scanning” and gathering data processes. Monitoring includes several activities such as:
1. Checking the environment for signs or signals that could be beneficial in identifying technological advances.
2. Identifying the possible ramifications and consequence of signs.
3. Picking the parameters, policies, events, and decision that should be followed to ensure the correct pace and approach of technology and the impact of using it.
4. The creation of a conclusion based on assessing the modifications in these viewings and observations.

From the perspective of technology intelligence, monitoring is understood as a search whilst surveying is understood as an indirect search. (Lichtenthaler, 2006) explains technology monitoring as a directed, inside-out, outlook, which is most concerned with the attainment of data on known and singled out technologies, all the while surveying is understood to be indirect,
outside-in, search which concentrates on looking for updates technological progressions and technologies that are not presently not known to the business.

Porter et al (1991) suggest general four steps for the monitoring process:
1. Identify the monitoring aims and focus
2. Explain the technology and lay out the relevant context
3. Modify a relevant monitoring strategy
4. Understand and communicate results

2. Technology Intelligence
Current research on technology management have stressed the importance of staying informed of technological advances by adopting technology intelligence (TI) strategies (Kerr, Mortara et al. 2006). Technology Intelligence (TI) can be defined as the activity that facilitates organizations to single out the technological opportunities and obstacles that could have an effect the future progression and existence of their company.

Usually 'technology intelligence' is defended as "the capture and delivery of technological information as part of the process whereby an organization develops an awareness of technological threats and opportunities." (Kerr, 2006). It strives to capture and diffuse the technological data needed for decision-making and strategic planning.

Understanding the importance of these points, many companies have adopted and adapted Technology Intelligence (TI) systems, created to capture data about emerging technologies and trends and to produce it in a useful way for decision makers.

Intelligence is derived from external outlets, but it may also be held internally in the organization - explicitly or implicitly – in the eventuality that was acquired by another body. Companies must source such data swiftly and with relative ease, as well as getting the data they require from external sources.

3. Technology Roadmapping
“Technology Roadmapping” (TRM) normally refers to many types of prediction studies such as visions and detailed expectations of future possible technological advancements, goods or environments [Da Costa 2003]. As far as effective technology planning and cooperation for businesses and their industries, technology roadmapping is a particularly relevant tool. It represents a particular method for technology planning, which works inside a broader framework of planning activities. In order to ensure that the management of technology benefits the business, we are obligated to implement an effective framework of processes and systems that will guarantee that the needs of the company are aligned with the internal technological resources.

TRM is adopted in many environments, including physical and service product planning (Kirchhoff 1998), development of product family tree (Groenveld, 1997), and program planning (Sandia National Laboratories). (Albright and Kappel, 2003) explain that TRMs in a business environment are used to clarify the plan for the progression of a good, connecting commercial strategy to the development of the product features.
4. Identify Customer Needs and Requirements:

Over recent years organizations have placed increasingly emphasis on customer services as a mean of gaining competitive advantage. As a competition has become more global and more intense, many organizations have realized that they cannot compete on price alone. Now-a-days in the market places many companies have developed a strategy of providing a superior customer care to differentiate their product and services.

While the process of meeting those needs and wants may be different for each client, the main goal of the company is to lead the business team in satisfying customer goals and expectations so the company will receive future work.

Organizations seek to win customers satisfaction through providing them with the best of its products and services. The market research department and marketing directorates always make continuous research on the market; determining the needs of the markets for the telecomm services, gather information about as many of customers as possible. Knowing the nature of their companies and their need for such services, trying to find out what the customers are buying, why they are buying and the frequency of their purchases.

Marketing research is the function that links the customer, and public to the marketer through information. This information is used to:

- identify and define marketing opportunities and problems;
- generate, refine, and evaluate marketing actions;
- monitor marketing performance; and improve understanding of marketing as a process.

Marketing research specifies the information required to address these issues, designs the method for collecting information, manages and implements the data collection process, analyzes the results, and communicates the findings and their implications.

Marketing research team works on a regular basis and frequent way preparing researches and studies that examine the market situation and the needs of customers for new services; also marketing team is looking for attracting new customers while maintaining the existing subscribers through regular contact with them to meet their needs and gain their satisfaction. On the other hand they take into consideration the intensity of competition in the market and the impact of competitors.

Finding out what the end customers want, need and expect and how satisfied they are with what they get is very important issue for the success of the firm and it is considered a standard marketing technique. Organizations use the following methods in determining what the customer needs

I. Telephone interviews
II. Questionnaire
III. Face-to-face interviews
IV. Focus group: this involve a small group of people from the marketing meeting with the customer to discuss the complicated issue and Introduce new services to them,
and if the VIP customers like Banks, Governmental and non-governmental organizations needs additional services and features to provides them with what they needs.

5. Identify the technology
After identify the customer needs and requirements organizations try to search for every new technologies and services in the world that enable them to serve the customers and provide them with what they want and need to become fulfilled and happy so organizations keep touch with the vendors to be informed with the last and up to date technologies used in the world.

6. Preliminary study
Market research is one of the vital components of marketing, it plays its part before one makes any policy decisions in the field of marketing and communications. Market research can be defined as "the implementation of subjective and objective research methods. The main role of market research team is to collect information and analyze it. This information constitutes the basis that enables marketers to (re)define and evaluate their strategies".

The information is generally concerning behaviour, attitudes and motivations of a particular target group. Market research is primarily analyzing consumer behavior in order to discover who is buying, what they are buying, where they are buying it, and when people buy products or services and then asking the question why are they buying it? And finding out what you can do to entice customers to buy your product or service.

7. Validation and verification for the new services and technologies
Before introducing any new services and products Market research team in marketing directorate study the market situation and the needs of the customers, formal and informal organizations for the new services. They make the necessary forecasting and predicting studies, analysis studies, and getting the final reports that shows the failure or success of introducing such services in the markets. In summarized, marketing research team do the following:

- Market Analysis
- Forecasting studies
- Analyzing the collected data
- Generating the required reports
- Making feasibility studies
- Pricing the new products

Output process
It includes the results outcome from the identification process and summarized in producing service description documentation (SDD) that includes detailed information which describes the requirements of the services, this document usually reviewed and discussed with both technical and business planning managers in order to check the ability to operate such new services. Service description document mainly describes the services and introduces the list of features that the service will contain.

Service description documentation includes the following main subjects:
Service Definition
Service Description
Service Features
Rationale of the Service
Target Customers
Service Development Strategy
Technical Requirements
Technical Specification
Support Requirements
Customer Service Requirement
Billing Requirements
Documentation
Training

Service Description Documentation

The organization working on technology improvement develop different department in this regard. Usually, two departments are established in this regard: (i) Strategic Planning & Development Department and (ii) Technical Operation Department. The two departments are complementary with each other, the strategic planning and development department is responsible for developing the future technical plans and strategies that will be applied in the near future which mainly includes plans for operating and running new services, expanding the customer networks, increasing the number of serving areas, using modern technologies, etc. On the other hand, technical operational department works on implementing these plans in order to achieve the stated objectives and desired goals from these plans and strategies.

Technical planning team located on themselves the responsibility of putting the strategic and action plans regarding any new products and services, and taking the decisions that ensure the possibility of providing these new services with best quality and high efficiency. They do following main tasks:
- Putting strategic and action plans regarding running any new product and services
- Checking the organization’s readiness
- Determine the technical requirements needed to offer any new product and services.
- Making the necessary studies that clarify The ability of the organization’s available resources to offer any new services by using the current technology, devices and equipments or just making some enhancement and development for the existing one, or go to the use of modern technology.

Technical identification process is concerned of choosing up-to-date, modern and appropriate technology to operate any new services that enable the organization to meet the customers’ needs and get them satisfied and even offering the best quality services. Technical identification process begins with receiving the Business requests for operating new product and services, the business requirements summarized in a document known as “service description documentation (SDD)”, which includes in its content a full definition and description of the new service, the specification, characteristics and features of it, in addition to the technical requirements and other parameters needed to operate it. This documents usually reviewed by both technical and business
planning focusing groups that studying the possibility of running these new services and applying the required features.

To successfully deploy any new services, technical planning managers make the necessary assessment for the existing technology with the assistance of experts and consultants who study and analyze the existing technology and put their recommendation regarding running the new service. The experts and consultants usually identify the extent of the existing technology’s ability to provide the new services and identify the needs and requirements to supply these services, also determine whether there is a need to use new technology, install new devices and equipments or simply to make some improvements and enhancement to the existing one.

Technical team usually working on checking the technical requirements necessary to supply new services and working on:

1. Finding out the technical requirements, specification, criteria needed to run the new services
2. Verifying the ability of the current used technology, network, devices and equipments, to support new services or they needs to make some improvements and enhancement or use new one.
3. Assess the readiness of the existing state from all perspective and sides, including assessment of the following elements:
   - Existing infrastructural design
   - Configuration
   - Accessibility
   - Management and security
   - Devices and equipments
   - Location availability

**Vendors Recommendations**

Vendors are also considered as major players in the process of identifying the appropriate technology, they shape an important factor that affect the decision of choosing the appropriate technology, that because of the new technology is a long-term investment for the organization and the success of new services is directly affected by the vendor selection decision.

Organizations always keep communicate with suppliers to see the roadmap, technology evolution and destination that moving forth suppliers in providing the latest technology. Organizations usually make differentiation and comparisons between vendors by looking to the criteria and specifications of the services and devices they provide. They usually make request for proposal (RFP) that differentiate between the vendors with accordance to several criteria. **RFP** includes an overview of the projects that will be applied at the organization, the statement of the work, the scope, specifications and requirements of the work, vendor information, vendor qualifications, vendor certification, evaluation criteria, technical and financial evaluation criteria, budget& estimated pricing, selection and notification. They usually looking for basic technical criteria that enable them to provide high quality of services and enable them to add additional value to it in the future, in addition to considering the operational and financial criteria.