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Technology Roadmapping

HANDBOOK

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DEFINITION

Technology Roadmaps were originally developed by MOTOROLA in the 70's in order to align the development of their products and their supporting technologies.

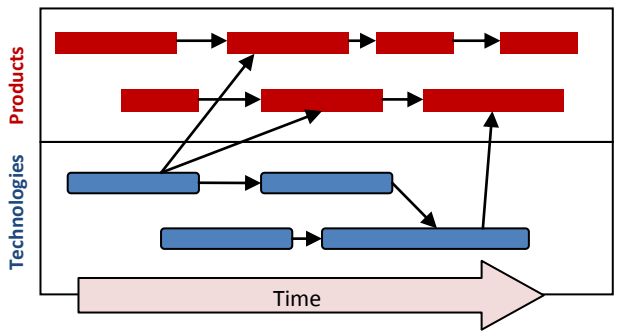
The Technology Roadmaps (TRM) are part of a methodology that guarantees the alignment of investments in technology and the new development of capabilities, so that they are able to make capital out of future market needs.

This is a tool that brings important support to the innovation manager, letting them define the firm's technological evolution in advance. The tool takes the relationship between technologies, their products and services as well as the relationship with the target markets into account. As a result, the firm's technological status can be maintained or improved.

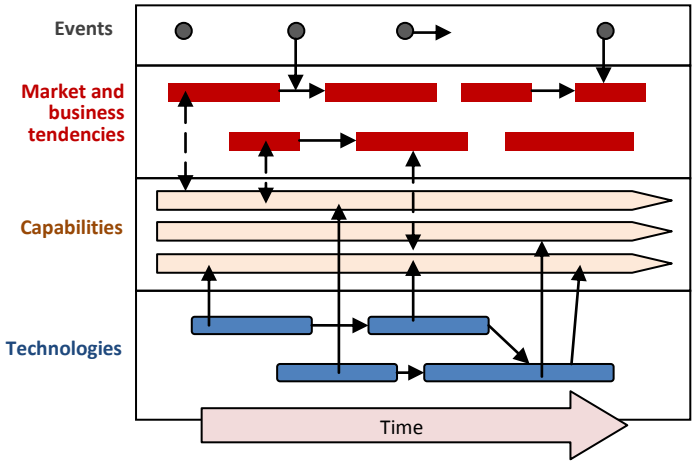
Fields of use

Roadmaps can have different applications. According to Phaal et ál. (2001), these can be classified into 8 areas:

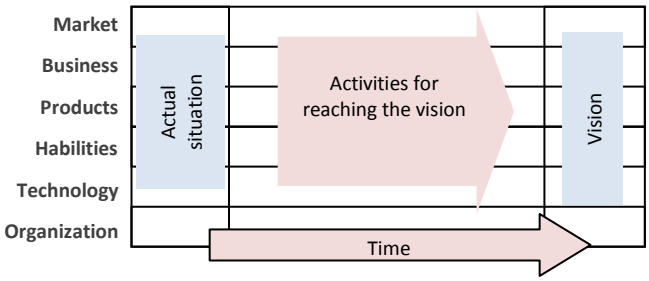
Planning of products: This is the most common Technology Roadmap. In this case, the different generations of manufactured products are tied to the necessary technologies for their development.



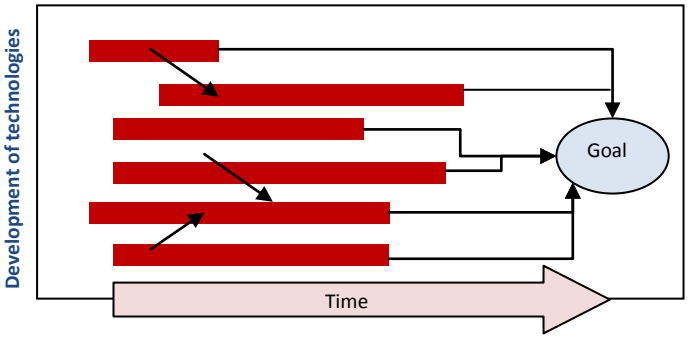
Planning of services and capabilities: The focus is on how the technologies foster the firm's development of capabilities that permit the rendering of the service.



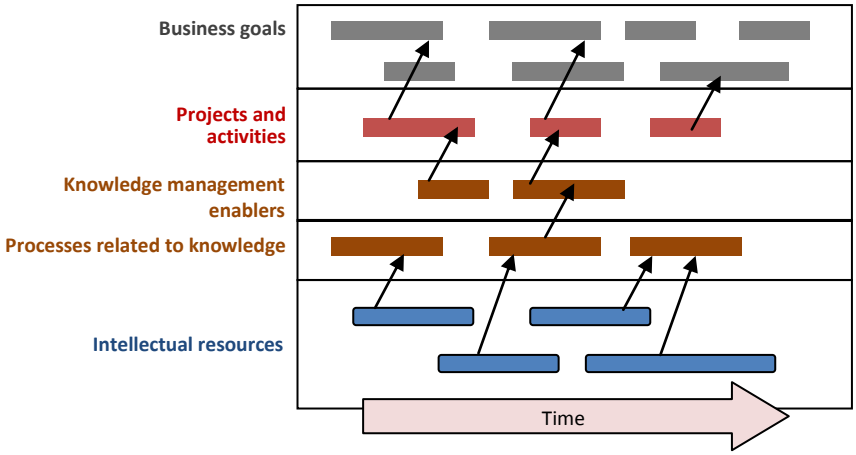
Strategic planning: This kind of Roadmap assesses the different opportunities that markets and business tendencies can offer, at strategic level.



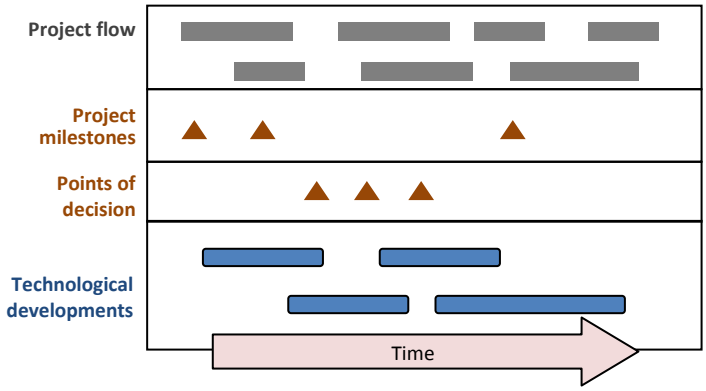
Long run planning: In this case, Roadmaps are often used at regional and national levels, where planning is projected long-term.



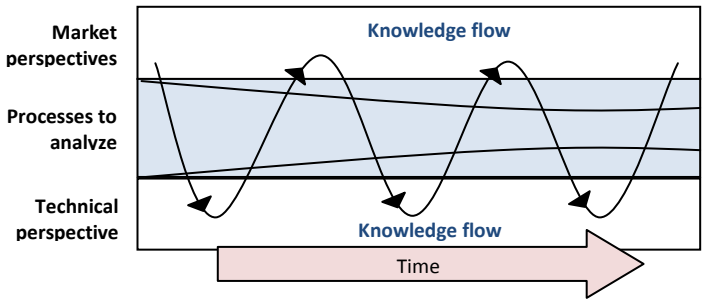
Capabilities and knowledge planning: Here, Roadmaps let the firm align its knowledge capabilities and business goals.



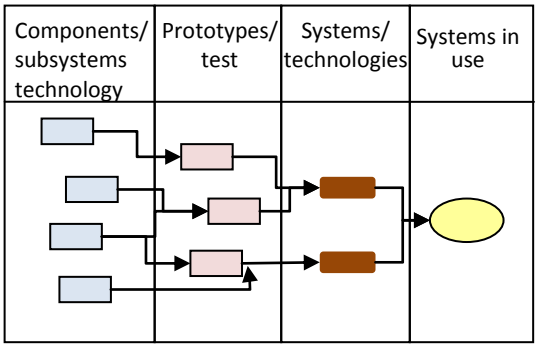
Project planning: The Roadmap can also align the different project activities, e.g. R&D projects with technologies development.



Process planning: Roadmapping permits managing knowledge, focusing on a particular area of the firm.



Integration planning: Through this Roadmap, it is possible to have a vision about integration and evolution of the technology, and how they combine with products and systems in order to create new technologies.



INNOVATION ROADMAP'S DEVELOPMENT PROCESS

The objective of this guide is to illustrate the methodology for developing Technology Roadmaps. As previously seen, there are different kinds of Roadmaps; nevertheless, this handbook will focus on the design of a Technology Roadmap for planning products, which will be named Innovation Roadmap because of its capital use. These Roadmaps are formed by six core steps:

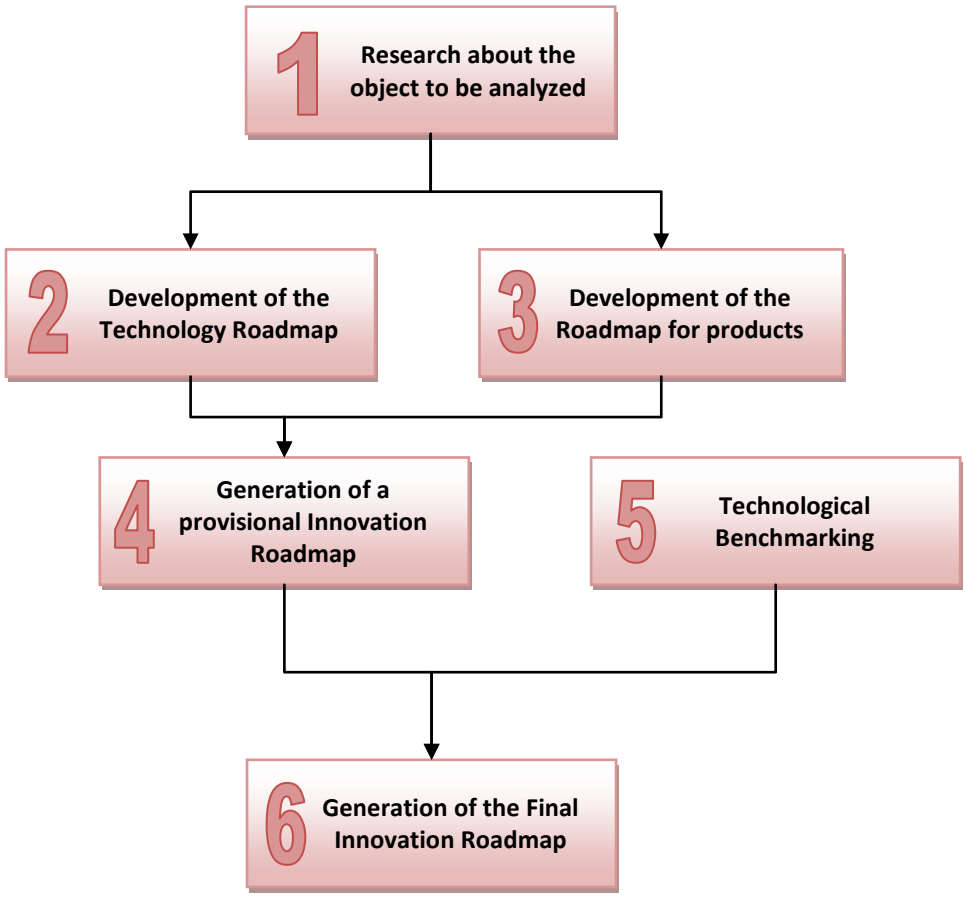
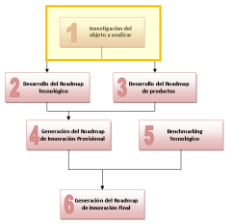


Figure 1. Generation process of an Innovation Roadmap, according to Nippa & Labriola (2008)

Step 1. Restricting the scope of research



This is the first step of Roadmapping. Through this process the objective is defined: which future development will be analyzed with the Roadmapping methodological framework. The object to be analyzed will be linked to relevant technologies for its development, as well as to the related products that the firm aims to offer in the future.

Step 2. Development of the Technology Roadmap

The Technology Roadmap shows the most relevant technologies that permit the development of the analyzed object, while taking time into account. For this analysis, technologies must be taken into account, especially the ones available within the Roadmap's time scope. Accordingly, future developmental approaches must be established for three technological categories:

- Current technologies in the firm, which are included or serve as base for other products, or which are part of previous innovation plans.
- Technologies intended to be developed in the medium and long run.
- Technologies able to be developed by external providers of technology.

In addition, dynamics of technology development, like technologies' life cycles, must be taken into account. Particularly, relevant tendencies of the market as well as the tendencies of consumers' needs are dynamics that can deeply influence the rhythm of development of these technologies.

It must be taken into account that with time, technologies can stick together or separate for generating different streams of technological development (see Figure 2).

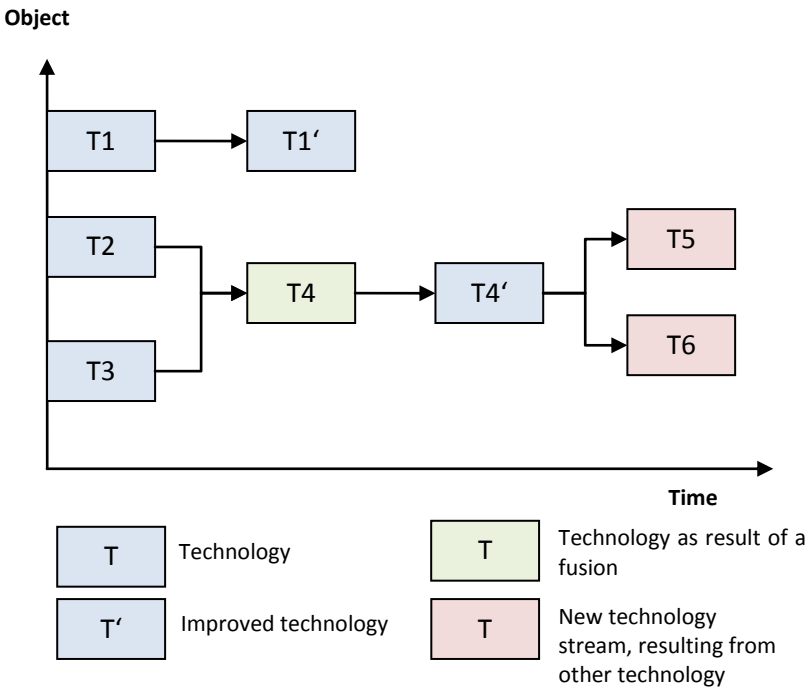


Figure 2. Basic structure of a Technology Roadmap

Step 3. Development of the Roadmap for Products

Because of their closeness to the market, the sales and marketing department must develop the Roadmap for Products simultaneously with the Technology Roadmap.

As in the Technology Roadmap, where the presence of an expert in marketing accompanying the development is necessary, the Roadmap for Products must have an expert in technology for collaborating with the development of the Roadmap present.

The Roadmap for Products should even consider the development of products that could have a relation to a determined technology, though it is not possible to know exactly if such a technology could contribute to the development of the product's functions.

In the development of the future scenario for the product analysis, two groups must be considered:

- The concepts of the firm's products: which parts can be improved in the future as result of some related technological development? The products' use to be based on the concept of incremental innovation.
- The concepts as result of the analysis of future market and client's requirements. This kind of product use to be related to radical innovations.

The dynamics of the market is another factor to think about when developing the Roadmap for Products. Although this dynamic depends on several factors, the development of clients is the most important one. This dynamic has a direct influence on the product development speed. Research, developed by Nippa y Labriola (2008), where 20 experts from technology-based firms, showed that the market launch of products based on incremental innovations must be faster than for products based on radical innovations. This happens because this kind of innovation is being "waited for" by consumers, thus, they must be immediately available for the clients.

As in the Technology Roadmap, it must be considered that the products could merge or separate for forming different categories of products (see Figure 3).

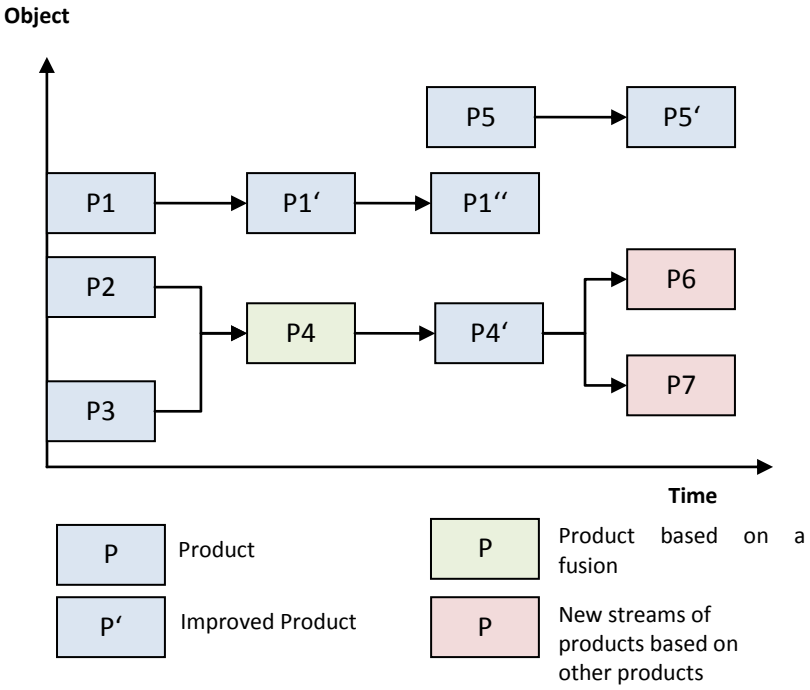
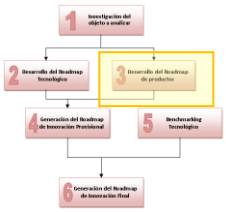
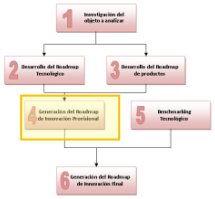


Figure 3. Basic structure of a Roadmap for Products



Step 4. Generation of a provisional Innovation Roadmap



In this step, the synchronization of the Technology Roadmap and the Roadmap for Products is accomplished. Generally, this task must be carried out by the marketing department or any equivalent area.

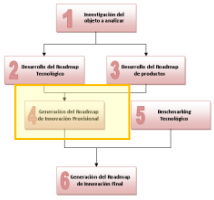
There are two core ways to synchronize:

- In the first case, the time point in the distant future for the materialization of technology development plans is defined, but not the definitive relations between technology and products. Then, products and technologies that do not have a technological complement must be found, and respectively eliminated.
- A second way of synchronization is based on adjusting the time period of the development of technologies, to the planned point of launch to the market of the related products. In the event that the time for developing the technology that supports the product to be launched is not enough, the development of this product can be eliminated or market launch can be postponed to the future.

According to Labriola (2007), the synchronization of these two Roadmaps can result in the following consequences:

- The acceleration of critical technologies development
- The deceleration of not-so-important technologies
- Start up of external technologies acquisition activities
- Removal of technological developments that are not so significant for the firm
- Advance on the development of products, which technological development has occurred before it was expected.
- Postponement of innovation plans that are associated to important technologies, which will be developed and acquired later than expected.
- Amplification of product development plans.

- Removal of product concepts, from the non-viable technologies



Finally, the objective of synchronization is to define what technologies are going to develop the product's functions, which will make it possible to satisfy specific needs of clients. In the following figure, after the synchronization, it has been established that to develop the product P4' it is necessary to have the T1, T5, and T6 technologies. T1 technology is necessary for generating the FP4 function, and T5 and T6 technologies are necessary for generating the FP4' function.

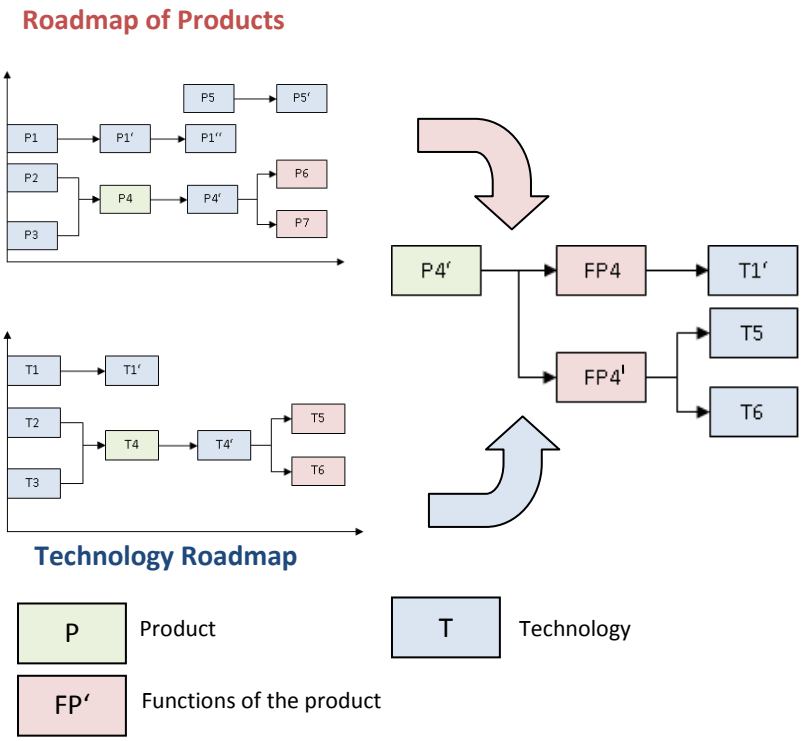
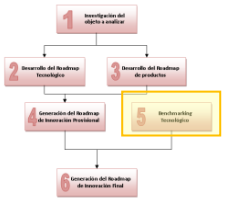


Figure 4. Example of Technology and Product Roadmaps' synchronization

Step 5. Analysis of the competitors' technology and innovations



This analysis intends to identify the time point in which the competitors will probably launch innovations that are similar to the ones planned by the firm.

Though, this is not an easy task, due to security norms related to business secrets. In some economic sectors it is very difficult to find information related to the time points for the launch of innovative products.

Nevertheless, some "signals" could be detected, which indicate in an indirect way how the competing technology is developing. For example, patents published by competitors or the presentation of their products' prototypes.

Another source of information is formed by the mutual providers and clients. A lot of times, competitors conduct customer and provider surveys in order to identify the right point to launch their innovative products to the market. They use surveys to prove their own Technology Roadmaps. This is how the firm can indirectly access this data.

On the other side, the firm must not abandon the efforts for obtaining direct information about the time points for launching to the market. As an example, many firms communicate to their partners and clients their technology development plans as an instrument of their marketing strategy. In addition, information about firms' innovation plans is exchanged during fairs and standardization trade shows. The search for development standards is an important source of information for the analysis of technological competition, especially in products that are developed in networks (e.g. in the telecommunication sector).

Step 6. Generation of the final Innovation Roadmap

With the collected information from the competitors' technology and innovation analysis, it is possible to make adjustments that have an influence on the development of in-house technologies and products to the provisional Roadmap.

Once the adjustments are done, the final Innovation Roadmap can be divided into innovation plans (projected to the medium run) and innovation projects (projected to the short run).

LITERATURE

Kostoff, R. and Schaller, R. (2001). Science and Technology Roadmaps. IEEE Transactions on Engineering Management, 48 (2), May 2001.

Labriola, F. (2007). Strategisches “Time-to-Market”-Management. En Engel, K. y Nippa, M., Innovationsmanagement (pg. 193-213). Heidelberg: Physica.

Nippa, M. and Labriola, F. (2008). Roadmapping als integrative Planungsmethode im Rahmen eines situationsgerechten Time-to-Market Management. En Möhrle, M. and Isenman, R., Technologie-Roadmapping (pg. 297-324). Berlin: Srpinger.

Phaal, R. et ál.(2001). Technology Roadmapping: linking technology resources to business objectives. Centre for Technology Management, University of Cambridge.

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