This article on **S&T Roadmapping** is a **stub**. You can help the Foresight Wiki by expanding it with new sections on the usage of this method in foresight exercises.

S&T Roadmapping. A roadmap is a layout of paths or routes that exists (or could exist) in some particular geographical space. It is used by travellers to decide among alternative routes towards a physical destination. Roadmaps provide essential understanding of proximity, direction and some degree of certainty in travel planning. As a frequently used method within industry, S&T Roadmapping has proved to be a useful tool for technology management, strategic and operational decision making and action planning. It is a normative and goal oriented method, where attempts are made to achieve a desired future state of development. The method was originally suggested by Motorola in the beginning of the 1980s. Since then it has been used in a wide variety of contexts particularly in the industry at corporate and sectoral levels.

Contents

The FOR-LEARN Guide to S&T Roadmapping

This is a summary of the article on S&T Roadmapping from the FOR-LEARN guide. To read the full article go here.

FOR-LEARN guide summarizes the evolution and uses of S&T Roadmapping in the past few decades. Since the mid-1980s the method has been developing within R&D and strategic planning teams in high-tech companies. Corporate S&T Roadmaps aim at supporting the development of new products by placing a causal or temporal relationship between the technology possibilities/choices and the business objectives thereby highlighting the necessary steps to reach the market with the right products at the right time. As the method matured, its use has been extended and developed to consortia of companies and even entire industrial sectors. The rationale is that an entire industry becomes more competitive in the long run by sharing R&D investments and results in the pre-competitive domain, thereby creating common technology standards and platforms, sharing risks and avoiding duplication of efforts.
S&T Roadmapping is also used for the forecast and development of "trans-disciplinary hi-tech goals" implying collaboration between various partners. These goals may be objects or environments (e.g. the connected home or vehicle, etc.), functional objectives (e.g. reducing manufacturing defects, hazards to workers and environment, time and cost of manufacturing or competitive objectives. More recently, a number of research institutes and think-tanks have made significant efforts to adapt this method for the provision of intelligence to support the policy-making process. In the context of rapid scientific and technological developments, it can contribute by providing strategic intelligence needed to optimise public R&D investments and ensure their relevance to society.

Using the method

S&T Roadmapping is a normative tool aiming to achieve a desired future state. The method is used to fulfil two key interrelated functions:

- It usually includes graphical representations in which "nodes" (past, present or future states of the art in S&T development) are connected by "links" (causal or temporal relations) showing the nature, rate and direction of potential S&T developments from or towards those nodes. As such TRM is a technology forecasting and foresight methodology;
- These representations can be put into practical use to illuminate the way forward and in informing decisions about possible future options to help planning.

Step-by-step

The construction of the roadmap consists of collecting, synthesising and validating the information, and representing the trends within graphical displays associated with support documents. It is neither practical nor desirable to attempt to develop a single, standardised methodology. Rather, the approach should be based on a light and modular process using a "toolbox" with different modules depending on the roadmapping areas, issues, context and objectives.
Schematically, the methodology consists of relating major political or socio-economic challenges, seen as potential outputs of R&D developments, back to the present S&T policies through various technological paths. Traditional TRM tends to focus on the development trajectories of technologies to provide new products (Corporate TRM) or on detailed enabling technologies in the pre-competitive domain (Industry TRM).
FOR-LEARN guide presents a case example, named ?Ambient Intelligence in Everyday Life - AmI@Life roadmap? to demonstrate process of S&T Roadmapping. This IPTS/ESTO (European Science and Technology Observatory network) S&T Roadmapping project, which ran from September 2002 until May 2003, was set up to address three main questions:

- What are the major societal challenges facing Europe?
- What are the emerging technological responses to these challenges?
- What are the pathways between these challenges and responses?

The pilot phase of the project consisted of an overview study to review and develop S&T mapping and to prepare two pilot roadmaps:

- The Ambient Intelligence in Everyday Life Roadmap;
- The Healthcare Technologies Roadmap: Effective Delivery of Healthcare in the Context of an Ageing Society

The aim of this project was therefore to assess the value of this methodology for policy intelligence, whether issue-driven roadmaps could be a valuable and cost-effective tool to inform research and development policy at European level and to support the needs of a range of users including policy-makers. The process consists of the following four successive but interrelated phases:

- Drafting of a Review Paper linking the user needs with key functions where AmI is expected to "make a difference", to capture both foreseeable AmI applications and everyday behaviour (social trends).
- Definition of Key Technologies needed for the development of the AmI applications and/or functions and construction of the Key Functions versus Key Technologies Matrix.

- Mapping of Key Technologies over Time, using an annual time scale and a time horizon of up to 15 to 20 years. This is the Technology Roadmap synthesising the:
    - ♦ Key nodal points;
    - ♦ Potential breakthroughs or disruptions;
    - ♦ Alternative scenarios;
    - ♦ Co-dependencies, i.e. how different technologies need to evolve and come together at a certain point in time in order to allow progress on the macro level.
- From the two previous steps, the potential trajectories of key functions/products over time are derived. This is the Function Roadmap synthesising the:
    - ♦ Key nodal points, milestones or 'rendez-vous' points: the meeting of enabling technologies for the emergence of a new generation of products/services;
    - ♦ Potential breakthroughs or disruptions of varying types (S&T, economy, environment, society, demography, policy);
    - ♦ Critical paths for the development of the key functions;
    - ♦ Alternative scenarios.

Pros and cons

The graphical representations used in S&T Roadmapping are an effective and intuitive way to demonstrate actual and possible causal and temporal relationships between successive or parallel steps or "nodes". They provide assistance to policy makers under severe information overload and time pressure to grasp effectively the most important elements and relations within a complex systems including scientific and technological, economic, political and social dimensions. Some inconsistencies, such as those between estimations from different sources or those arising from technological co-dependencies, can be put into evidence through the construction of respectively the "nodes" or the "links" of the roadmaps.
The drawback is that S&T Roadmaps traditionally focus on scientific and technological developments, applications and products. It is not straightforward to adapt this method for the evaluation of fundamental research for which there is as yet no application nor to take into account the economic, political and social dimensions, and the complex interactions between them. Another drawback of the method is that it is a well-structured method, which does not easily allow for large-scale participation.

Variations

S&T Roadmapping is mainly a normative method where actions are planned to reach a desirable state of the future. The main approach is to start from this future desirable state and come back to the present. Therefore, using S&T Roadmapping method with other exploratory methods can be beneficial.

"Three Horizons" Timeline

Bill Sharpe, Tony Hodgson, and Andrew Curry have worked to create and refine a variant of technology roadmapping called the "three horizons" timeline. It specifically addresses the issues of conflict and turbulence in successive generations of technological innovations as current technologies obsolesce and new technologies emerge and embed themselves in the built environment. In application the approach has broadened to include assumptions, paradigms and mental models, values, and worldviews as well as tangible shifts in technology and the built environment.

Reference articles are here:

Case studies to follow.

See also

Environmental Scanning & Monitoring
System Dynamics
Structural Analysis
Agent Modelling
SWOT Analysis
Trend Intra & Extrapolation
Modelling & Simulation
Gaming
Creativity Methods
Expert Panels
Delphi survey
Backcasting
Critical & Key Technology Study
Scenario Building
Morphological Analysis & Relevance Trees
Cross-Impact Analysis
Multi-Criteria Analysis