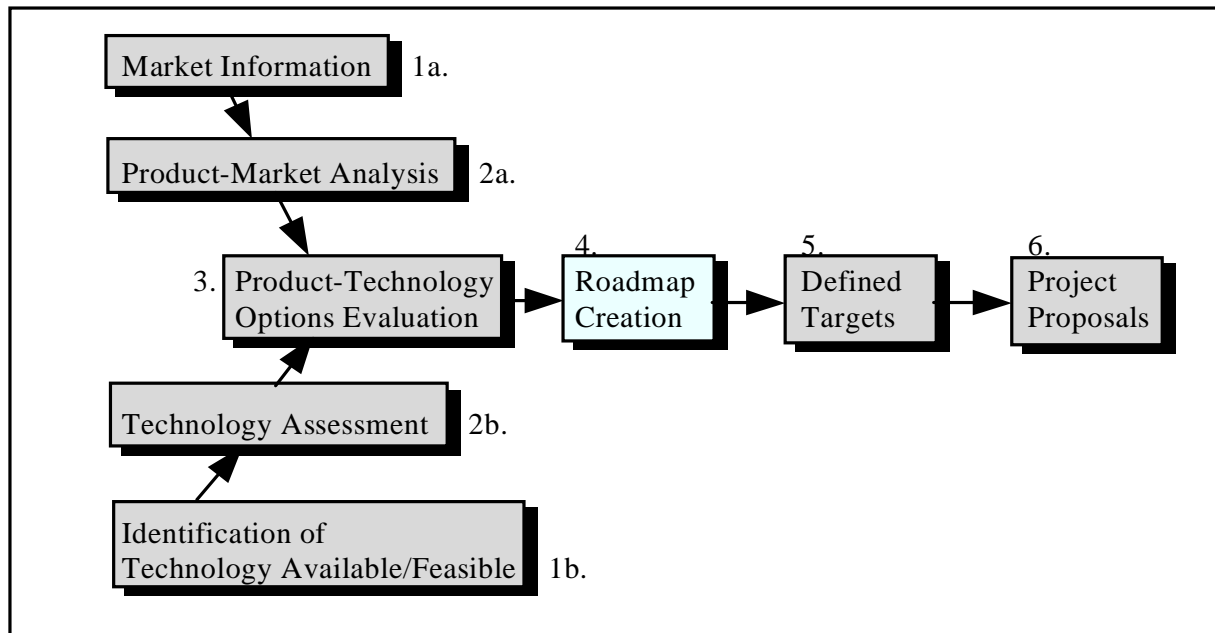


## Technology Roadmapping Delivering Business Vision

### Introduction

The successful company concentrates on its customers and markets, the technologies on which its products and services are based, and the continual improvement of the business processes it uses to deliver value to the customers. It has a long term perspective, and strives to deliver what the unformed markets may not yet realise they will require. Industrial companies are both participants in, and creators of, the future, and therefore the correct anticipation and exploitation of events in time gives them a significant competitive advantage.

The techniques known collectively as Roadmapping are increasingly used by companies to both derive and express their business visions, and to describe the linkages and actions necessary for delivery through time.



### ***The essential elements of a Technology Roadmap (TRM)***

The essential elements of a TRM can be summarised as follows :

**i) Time.** A TRM must have predictive value and the Working Group therefore regards time (present and future) as the prime parameter of a TRM.

**ii) Deliverables** (*Product or process characteristics*). The desired or expected performance characteristics of the product, or process, from the current performance to some future performance, and the intermediate targets. Associated with this will be knowledge of the benefits of achieving the targets and recognition of the impact of external influences on the company.

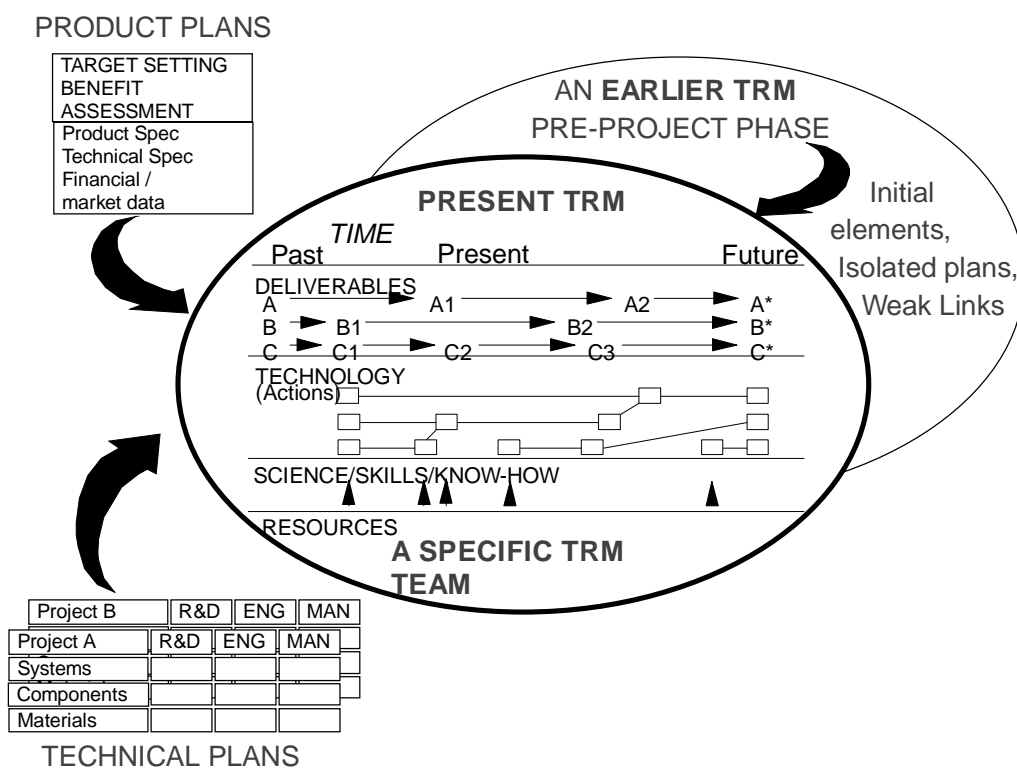
**iii) Technologies.** The groupings and interactions of technologies needed to permit the deliverables to be attained. Each in its turn will provide the objectives of the programme of supporting projects, either directly or through a hierarchy of sub-TRM's. The technologies

need not be resident in the organisation. Their identification effectively defines the actions required.

**iv) Skills/Science/Know-how** required to deliver the technologies. Again these may or may not be resident within the organisation. The issue is one of access.

**v) Resources.** All aspects of human, intellectual, physical and financial assets, together with the identification of the internal and external sourcing requirements. This part of the TRM is the expression of the costs.

Many companies will have individual elements in existence, e.g. production plans and technical plans. The figure below shows how these elements can be brought together in a structured fashion to create a TRM. In many companies, early TRM's were generally produced by the engineering function and tended to consist of isolated plans with little linkage.



### The Value of a TRM

A Technology Roadmap (TRM) provides a framework for discussion between the component functions of a business (e.g. Marketing, Manufacturing and Technical) that leads to the conscious integration of all aspects of technology into business strategy. In bringing together the critical business processes it enables realistic decisions to be taken more quickly and implemented with more confidence. It is an effective mechanism for gaining commitment to the chosen strategy throughout an organisation. The greatest value of a TRM comes from the business processes that have to be put in place to create it, rather than the possession of a TRM in itself. The TRM must be the output of an empowered team activity, supported by commitment from senior management.

The essence of a TRM is exploring possible future scenarios and at the same time identifying, quantifying and minimising the risks and uncertainties of that future view. These futures are linked to immediate requirements for action by the Technical, Marketing and Manufacturing functions. Missing science and technology becomes evident and the need

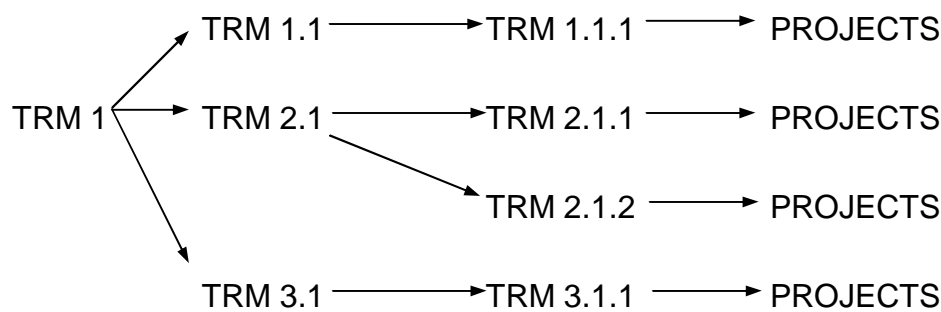
for its acquisition will be highlighted. Working with a TRM ensures that the longer term projects are viewed with a realistic perspective in the total portfolio of activities of a business.

### **Characteristics**

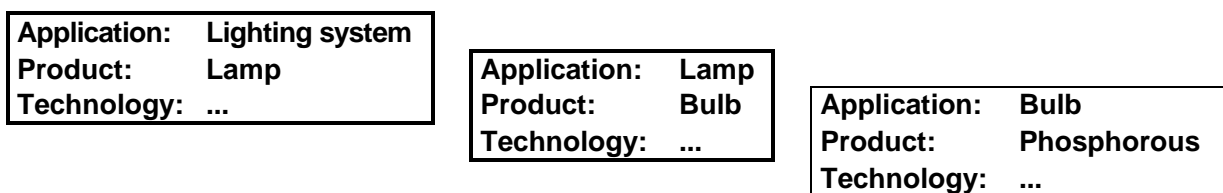
Different industry sectors are more or less market (customer) or technology driven and will therefore have different processes to draw up TRM's. They will also use them differently.

- industries close to the consumer respond to targets set by the market place and use TRM's predominantly in a "needs driven (backwards)" fashion, i.e. they must define the technologies needed to meet these targets.
- industries further from the consumer set their own targets as a consequence of developing scientific knowledge and use TRM's predominantly in a "needs searching (forwards)" fashion, i.e. they must define the targets that the available technologies make achievable.

In all cases, the form of the TRM is likely to be very similar, though companies in different industry sectors may focus on different levels of the TRM. At the same time, there will be a hierarchy of TRM's at different levels, and these will be spanned by a single umbrella TRM :



An illustration of the scope of TRM's at different hierarchical levels is given below:



The distinction between projects and roadmaps is important. The project is the level of highly specified activities, well defined in time, usually over a shorter time period, and with a low level of uncertainty. Roadmaps are used as one progresses up the strategic hierarchy in terms of complexity, and where there may be more than one available option to follow.

### ***The place of technology roadmapping in the formulation and delivery of strategy***

Business strategy can be considered to arise from the fusion of market, technology and financial strategies, supported by human resource and Information Technology / Information System strategies. In its turn, the technology strategy encompasses R&D with its knowledge base, enabling skills and intellectual property, Engineering with its design and project management capabilities and special skills, and Manufacturing with its operations and the related asset performance. At the interfaces between R&D, Engineering and Manufacturing activities such as product/process development, maintenance and project

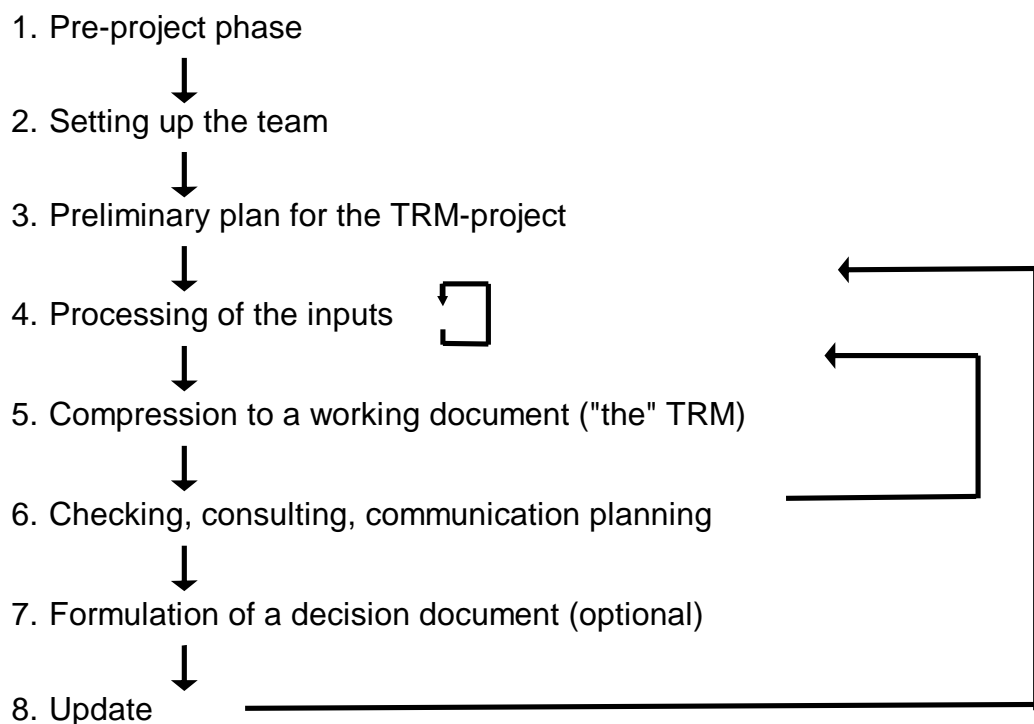
implementation, and process improvement and process analysis will occur. Here, the TRM can be thought of as addressing :

- the interfaces between the Technology, Marketing and Financial strategies
- the interfaces of the R&D, Engineering and Manufacturing functions

and clearly the more the composition of the team drawing up the TRM reflects this fusion of functional interests, the higher the quality of the business processes and the greater the value of the TRM.

### **Methodology**

The report sets out a methodology which is intended to help those who plan to introduce TRM or those who try to improve their established method of technology roadmapping. The essential steps are seen to be :



The scheme encompasses all the general aspects of TRM, without giving too much attention to very special cases. The methodology's step by step presentation should make it easier to find answers to particular problems.

The use of TRM as a tool should be a recognised and supported business process with total management support. To gain commitment when TRM is being introduced, it may be preferable to start on a small scale as a pilot with a case where the initiator expects a maximum of new insights for the company.

The report goes into all eight steps of the methodology in detail. Real life examples of the creation and use of TRM's are provided in the form of case studies.

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Previous EIRMA reports on related topics:

Working Group N° 47 "Evaluation of R&D Projects" (1995)

Working Group N° 50 "Long-term planning in a continuously changing world" (1996)

Workshop N° VII "Core competences and R&D" (1996)