

Technology management tools: concept, development and application

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Abstract

Effective systems for managing technology in complex business environments require integrated sets of management tools and processes, underpinned by well-founded conceptual frameworks. Understanding how such systems operate, and how best to implement them, represents an ongoing challenge, especially considering the multidisciplinary and multifunctional nature of technology management. This paper describes the development of a technology and general management tool catalogue, which focuses on the ‘matrix’ class of tools, classified into four generic types. The practical development and application of such tools is discussed, illustrated by two case examples.

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1. Introduction

Industrial and academic interest in how to more effectively manage technology is growing as the complexity, cost and rate of technological innovation increase, at a time of increasing organisational and industrial change on a global scale. Emerging technologies, such as nanotechnology, biotechnology and information and communications technology provide significant opportunities for enabling innovation, profit and growth, but also present a potential threat to firms’ existing activities.

Technology management is a challenging topic, in terms of both theory and practice, owing to its multidisciplinary and multifunctional nature. A number of disciplines are relevant from the academic perspective, such as science, engineering, economics, sociology and psychology. In business, contributions from both the commercial and technological functions are critical if innovative and successful products and services are to be delivered to the market.

The implementation of effective technology management solutions requires a number of elements to be in place. Firstly, practical tools are needed for supporting management decisions and action, together with techniques for their application. Secondly, management processes are required

for combining tools and techniques to address specific business problems. Finally, conceptual frameworks are needed to guide thinking about technology management, based on well-founded theoretical principles.

It is important that the tools, processes and frameworks that are implemented to support technology management should aim to be robust (theoretically sound and reliable); economic and practical to implement (not too complex or resource intensive); integrated (work together, and link to other frameworks, processes and tools deployed in the business); and flexible (adapt to suit the particular context, in terms of business purpose, market environment, available resources and information, and corporate culture).

2. Management tools

A large number of approaches (‘tools’) have been developed by managers, consultants and academics to understand the practical and conceptual issues associated with the management of technology (see, for example, Twiss, 1992; Gaynor, 1986; Cotec, 1998). Such tools can take many forms, including matrices, grids, tables, graphs, checklists, taxonomies, lists and software, together with combinations of these forms. A manager faces a number of challenges when making use of such tools: How to find appropriate tools? How to assess the quality and utility of available tools? How to apply the tools in a practical setting or process? How to integrate tools with other tools, and with business processes and systems?

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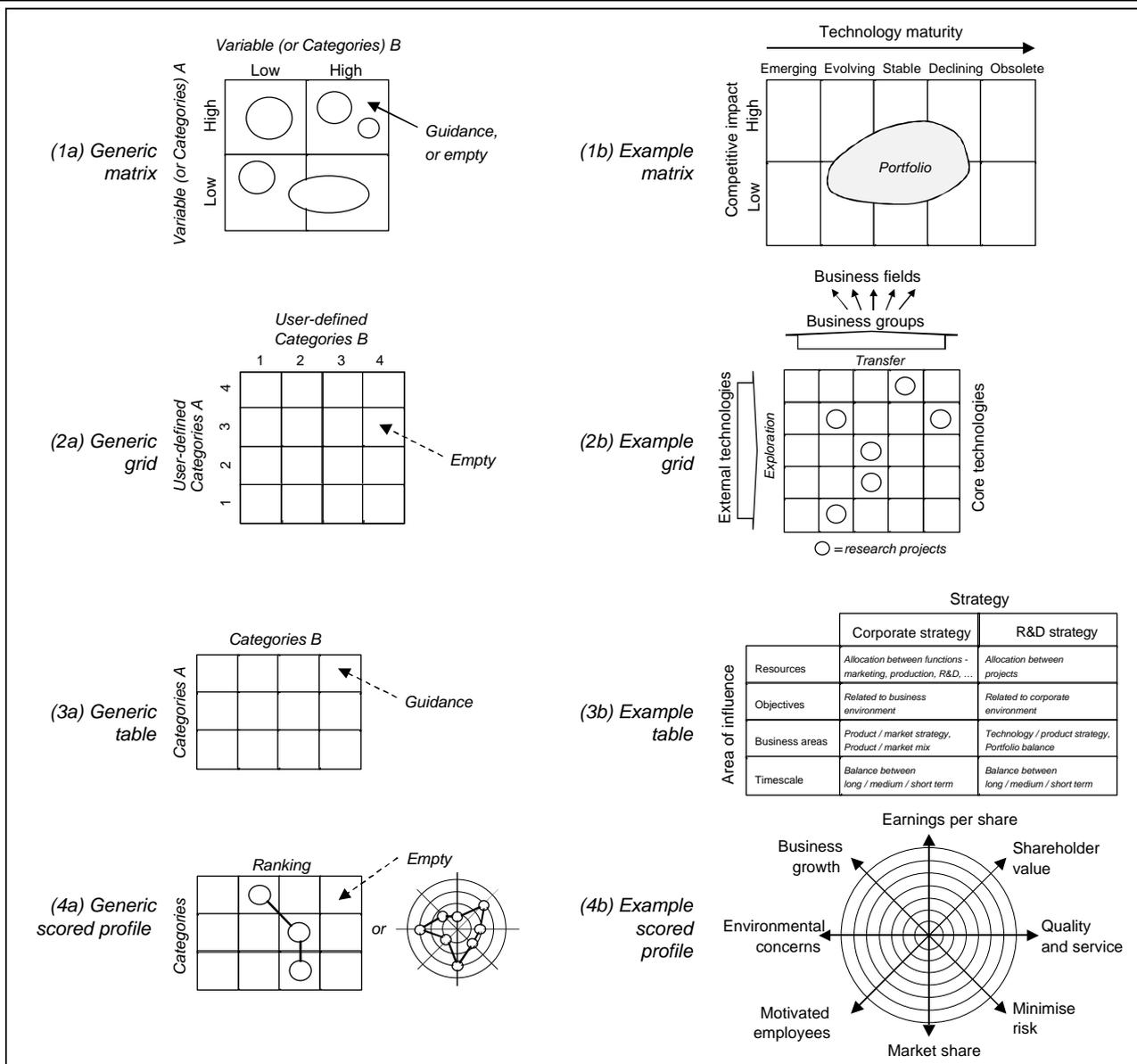
The nature and application of technology management tools have been considered by a number of authors. Brady et al. (1997) define a management tool as ‘a document, framework, procedure, system or method that enables a company to achieve or clarify an objective’. It should be noted that ‘management tools’ in the broadest sense include devices for supporting both action and conception (achievement and clarification, as defined by Brady et al.). More precise definitions for related terms such as ‘tools’, ‘techniques’, ‘procedures’, ‘processes’, ‘models’, ‘maps’ and ‘frameworks’ are provided by Phaal et al. (2001a), with

tools relating to practical application and frameworks to conceptual understanding.

Rigby (1995) has compared overall satisfaction with management and organisational tools to their levels of usage, demonstrating a broad correlation, but with some approaches such as competence-based methods being more widely used than their success seems to warrant. Farrukh et al. (1999) have summarised findings from the literature on technology management tools, together with further research, to define a number of key issues relating to tools, including the characteristics of ‘good’ tools,

Exhibit 1

Types of matrix management tools, showing (a) generic forms of matrix, grid, table and scored profile, together with (b) examples: technology portfolio matrix (Dussauge et al., 1992); Siemens’ central research laboratory grid (Chester, 1994. Reproduced with permission of Siemens); comparison between corporate and R&D strategies (Twiss, 1992); and corporate objectives profile (Doyle, 1992. Reproduced with permission of Westburn Publishers Ltd)



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