

ENSURING A VALUE ADDING FOCUS FOR TECHNOLOGY DEVELOPMENT IN A GLOBAL WASTE MANAGEMENT BUSINESS

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ABSTRACT

BNFL has in the past five years experienced a major change in its business portfolio. In response to this change, BNFL has formed an integrated waste management and decommissioning business out of various already ongoing business activities. The pursuit of world class performance within BNFL has required confirmation of the links between capability groupings with a proven record of technical excellence and the needs of specific technology applications in the operating businesses. This has been achieved through the development and dissemination of a new value driven approach to technology strategy. This approach has given BNFL the opportunity:

- to maintain the excellence of its technology base
- to identify the key technologies required in major markets worldwide
- to prioritize technology investments so as to maximize the return on investment
- to develop an integrated technology program, based on these priorities, which explicitly and visibly supports the whole of the company's waste management business,
- to provide a robust, strategic framework for delivering the complete technology portfolio in a manner which adds value both to the customer and to BNFL
- to institute a transparency of decision making at all levels, from the strategic level to the level of the individual project.

This paper will discuss the principles underlying such a strategic approach to technological investment and the issues that need to be considered implementing a value driven technology strategy.

INTRODUCTION

BNFL has in the past five years experienced a major change in its corporate structure and business portfolio, reflecting the increasing internationalization of its operations, particularly within the United States. Throughout this period, the company has maintained its commitment to a significant ongoing investment in technology development. In financial year 1996/97 BNFL was ranked within the top 30 British companies in terms of the level of R&D expenditure, and first within the UK electricity industry. In 1997/98 the total investment made by BNFL in technology exceeded £69M, and covered a wide range of activities from plant support to new science and technology. Within this budget, BNFL's clean-up business was the area showing the greatest investment in research and technology.

Integral to ensuring business unit commitment to this high level of technology investment has been the identification and evaluation of those technical capabilities with the highest value added potential and the associated levels of technical uncertainty. The process adopted for the evaluation exercise is based on the decision analysis approach developed by Strategic Decisions Group^a (1, 2). This approach enables business units to critically evaluate and prioritize their technology needs and to determine which projects they should invest in. Through such a focusing of business group needs, the R&D community is able to provide a sharply targeted technology portfolio which aligns closely with the company's business drivers. As a result, direct business sponsorship of the technology portfolio has risen from 50% to an average of 80%.

An overview of the process, the outcomes of the review and the challenges faced in implementing those outcomes is presented below.

THE EVALUATION PROCESS

The objectives underlying the development of a value driven strategy are:

- to provide a framework for investments in maintaining a company's existing centers of excellence; and
- to bring other capability areas up to the same level of service; while
- ensuring that this excellence is focused on delivering value adding solutions to its customers.

The development of such a framework comprises three phases: strategic option evaluation, detailed capability assessments and project level implementation.

Strategic Option Evaluation

The principles underlying the option evaluation process within BNFL are:

- the assignment of discounted values to all technology investment projects, both current commitments and potential opportunities; and
- the identification of those projects offering the greatest net financial return and their associated technical risk.

The evaluation process is carried out by a joint techno-commercial team that operates at four levels:

- a core analytical team
- a wider working group comprising members qualified to comment on both the needs of key markets and on the technological competencies needed to satisfy those needs
- a senior management steering group charged with ensuring linkage into and consistency with other initiatives directed at achieving world class business performance
- contacts who help with information gathering and expert advice

The strategic option evaluation process is based on an iterative process of working group analysis, feedback to, discussion with and guidance from the steering group (fig. 1). The steps involved in the evaluation are listed below.

1. Compilation of a mapping of the key technical capabilities required by the business to identify both those capabilities in which the company is recognized to have achieved a proven level of excellence, and those in which investment is required to bring service quality up to the level required by the market concerned. An example of such a mapping is presented below (fig. 2).
2. Evaluation of the degree of technical uncertainty associated with those capabilities where investment in raising or maintaining a given capability level is justified by a specific market opportunity. Such a rating reflects whether:
 - work is focused on proving a basic scientific idea,
 - whether the need is for engineering demonstration of a scientific concept already proven at laboratory scale,
 - whether there is a requirement for integration of the engineered solution into an overall systems package, or
 - whether the technology is being routinely applied to a high degree of excellence.
3. Discounting and ranking of order of magnitude values for each of the business opportunities concerned to compile an initial shortlist of priority investment opportunities, and to highlight those opportunities that are essentially speculative in nature.
4. Detailed modeling of each of the capabilities and business applications, including:
 - confirmation by project managers of which technologies are required by the projects for which they are responsible
 - ascertaining project managers' judgements on the extent of technical risk associated with each of these technologies, and on the level of commercial risk associated with the applications;
 - incorporation of these judgements in the decision model to derive a probability adjusted net present value.

The output from the detailed modeling exercise is used to construct two risk/return matrices, one for capabilities, one for market applications. The matrices highlight the principal technical risks and technology challenges for the business, and form the foundation of a value focused technology strategy (fig. 3).

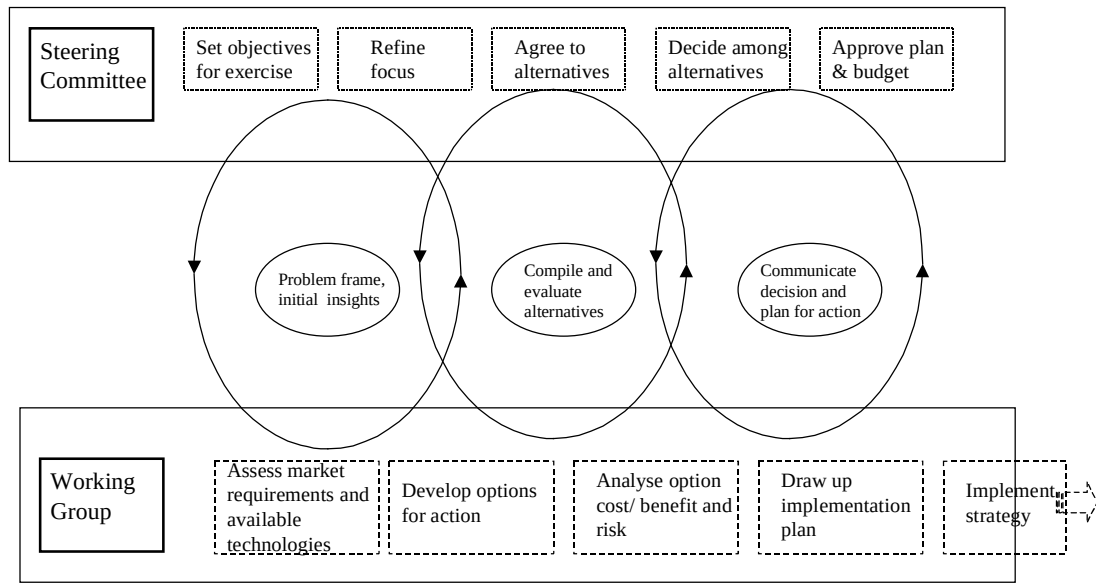
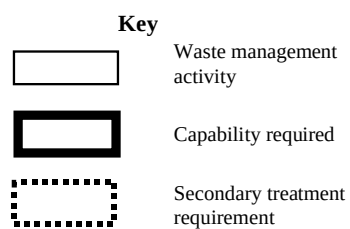
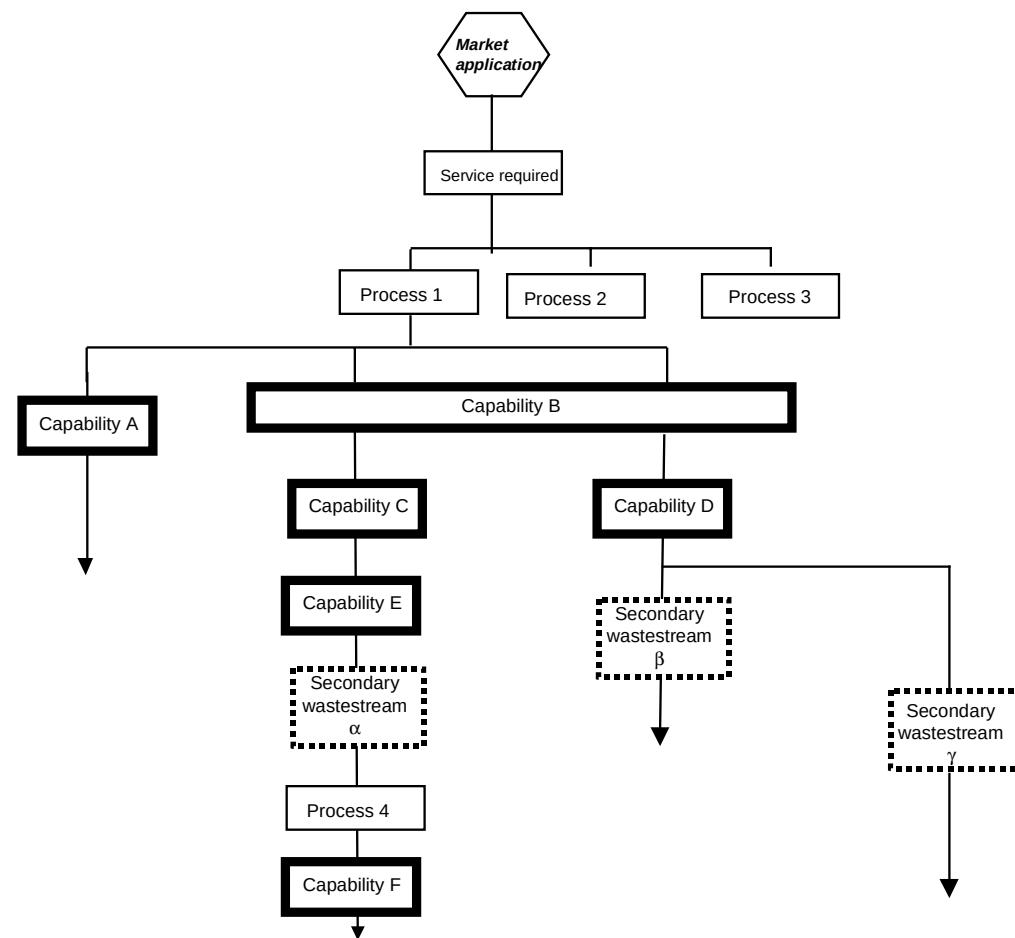


Fig. 1. Decision analysis: the process of building consensus and agreeing a common perspective on the way forward



Capability scores	
Score 3:	Organisation recognised as world leader in market concerned
Score 2:	Organisation has proven experience but lacks leadership
Score 1:	Organisation has limited capability, significant development required
Score 0:	Organisation lacks capability required by market

Fig. 2. Example outline capability map

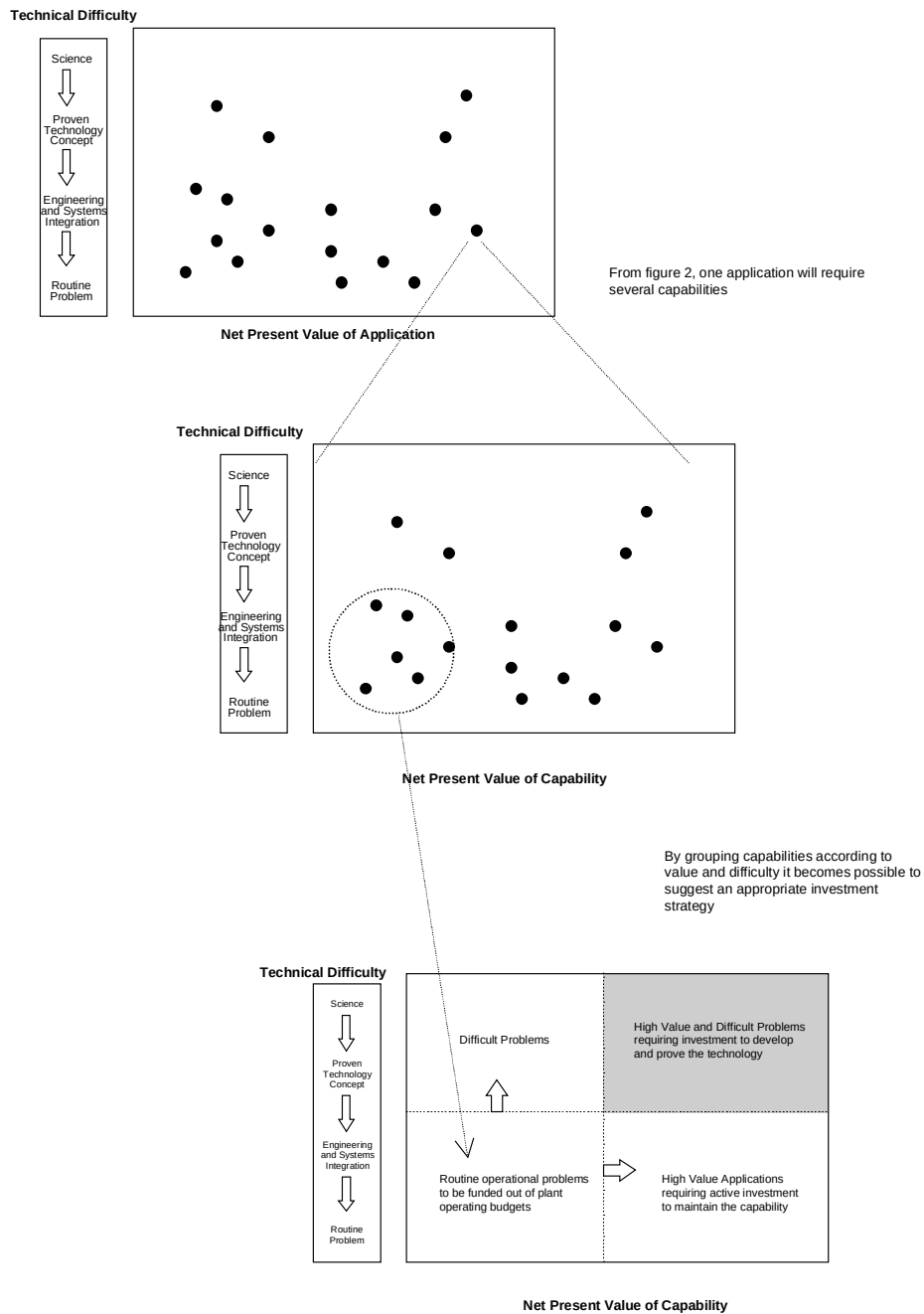


Fig. 3. Classifying applications and capabilities so as to determine investment strategy

Within BNFL, the pursuit of world class performance influences both the internal and the external activities of a business. Challenges are however posed by the need to value internal liabilities, for which there are no associated income streams. This problem is overcome by repeating the above analysis by discounting project costs alone (i.e. excluding revenues). Some justification for this can be found in the argument that when BNFL wins an external contract, that contract becomes a commitment, which can be assessed on a consistent basis alongside other, internal, liabilities (i.e. on cost grounds alone).

In summary, among the conclusions of this phase of the analysis are findings on:

- the degree of fit between the current development pipeline profile and the commercial needs of the business, in terms of:
 - the capabilities in which the organization has a proven track record, and
 - in which of those capabilities the organization has achieved world class performance in all key markets
- which capability areas are associated with the highest degree of technological challenge, and
- the optimum balance between basic research, development, engineering & systems integration.

In line with the principles illustrated in figure 1, these results are fed back up to the senior management steering committee for endorsement. The steering committee then carry out a qualitative review of the strategic options for investment, leading to the development and agreement of a value focused technology strategy for the business (table 1).

Table 1: Strategic Options Analysis Table

Strategic theme	Key Decisions					
	Theme A	Theme B	Theme C	Theme D	Theme E	Theme F
	Option A1	Option B1	Option C1	Option D1	Option E1	Option F1
	Option A2	Option B2	Option C2	Option D2	Option E2	Option F2
	Option A3	Option B3	Option C3	Option D3		Option F3
	Option A4		Option C4	Option D4		Option F4
	Option A5			Option D5		

Note: after identifying the strategic options for each theme, the steering group agree which options form the basis of value driven technology strategy; these are here indicated by bold text

Typical components of such a strategy include the following statements:

- Technology funding decisions will be made on a value basis.
- Funding decisions will be driven by the business.
- R&D resources will be focused on the highest value capabilities and the highest priority business applications.

- Technology can and will be sourced by a variety of internal and external routes.
- For speculative business applications, the priority will be on validating the business opportunity rather than on R&D.

Detailed Capability Assessments

Following endorsement of the new technology strategy by the steering group, a further round of analysis takes place, focusing on those capabilities which have previously assessed as being of high commercial potential. These analyses enable the organization to implement a focused and detailed technology investment strategy directed at specific, high value business opportunities. The analyses are again carried out by a joint techno-commercial team using the principles and techniques of decision analysis. Information generated for each capability includes the following:

- confirmation of the size and nature of the market requirement
- market structure and segmentation
- expected market share
- timing of demand
- technology trends, risks and opportunities
- extent of technology development required
- degree of technical uncertainty
- when the technology will be commercially available
- competitor profiles – both commercial and technological
- regulatory and other stakeholder influences
- other influences on commercial value
- overall probability of success
- overall expected net present value of the capability across all business applications
- qualitative insights concerning the technology and its market applications which may be relevant to technology strategy formulation

Project Level Implementation

Key to the successful implementation of the strategy is ensuring that the principles of the strategy and the results of the detailed analyses are reflected in all major decisions relating to R&D project selection and funding. This results in the strengthened strategic customer focus of the organization being reflected at the operational level.

BNFL has achieved successful implementation of its customer focused technology strategy through the adoption of a project evaluation framework called the “BNFL Innovation Process”. This framework adopts the principles of the Stage Gate process developed by Professor R G Cooper (3).

Although the decision criteria in the Process become increasingly quantitative and stringent as a project moves through its stages, key throughout are issues of strategic fit and market demand. Integral to the strategic fit assessment are the value assessments derived through the detailed

capability analyses. In addition, the various insights gained during the analyses provide useful support for the more qualitative assessments required in the early stages of an R&D project's life.

Communication throughout the business and the R&D community of the results of the analyses, together with the principles governing the strategy, is key to the success of a value focused technology strategy. The achievement of such a partnership with the business has, within BNFL, allowed the R&D function to integrate technology strategy into the wider strategic planning process. In particular, this has enabled:

- the identification of specific financial or commercial benefits for each technology investment
- the consideration of the implications of business development activities within BNFL's technology plan,
- the business to highlight specific technological challenges for the R&D community, and
- the commercial function of the business to initiate specific product development initiatives

THE VALUE DRIVEN TECHNOLOGY STRATEGY AS A 'LIVING' PROCESS

A value focused technology strategy sets the general principles for technology development in support of a business. As such, the focus is a long term one and regular, fundamental revision should not, in general, be needed. Detailed capability assessments will tend to be one-off exercises aimed at establishing the benchline for subsequent decision making, and should not need to be frequently repeated.

It is however possible that major changes in the business environment may so change the scope and nature of the business that revision of the technology strategy and repetition of certain analyses is required. Such a requirement will be flagged up by changes in the planning assumptions used by the business. It is also possible that there may be a need to revisit certain analyses to judge the extent to which subsequent technology development has served to deliver the capability and strategic positioning required by the business. Such a review would consist of a verification of the original assumptions and probability judgments, leading to a re-run of the associated financial model, rather than to a new assessment exercise.

Apart from these relatively rare instances, there should be no reason for revision of the technology strategy. There will, however, tend to be a need for incremental revision of the detailed capability development strategy and the associated technology plan. Within BNFL, the requirement for such changes is identified by individual business units and considered through appropriate review bodies.

CONCLUSIONS

Through applying the process described in this paper, BNFL has been able to develop a focused technology investment strategy that:

- is robust to the varied and evolving needs of the global clean-up market,
- identifies all the principal technology needs of that market,
- provides a framework for investing in the delivery of the required technology portfolio,
- supports the company in its pursuit of service excellence in all its markets, and thereby
- adds value to both BNFL and to its customers

FOOTNOTES

- a The authors of this paper wish to acknowledge the contribution of Strategic Decisions Group to the ideas inherent in the decision analysis approach described in this paper.

REFERENCES

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