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Section 1: Summary of past work in Valuation

R&D project selection at BAE Warton (1997)
This started with a set of workshops considering how to develop a more structured method of making a judgement on the relative value of the R&D programmes necessary to meet aircraft project targets. The aim was to allow the company to make robust decisions on where it should focus its own funding on R&D, both long and short term to the benefit of the business. The work resulted in a project portfolio methodology being developed by BAE (Farrukh et al, 2000). The technology selection criteria were divided into two main sets: benefit and cost. The 'benefit set' were further defined in terms of four company values: performance, partnership, technology and people. The 'cost set' were defined by risk and price. A fifth company value, the customer, was included to give a portfolio tool with two axes: Customer Focus aims to capture the value of the R&D in meeting the customer requirements; Technology Benefit/Cost aims to capture the value of R&D to the company as a piece of technology. The value of the technology to the company was addressed by combining the Benefit and Cost criteria via a weighting and scoring method.

MET student project at Marconi Avionics (1999)
This developed a Technology Valuation System (Penney 1999). This calculated the comparative value of technologies as an aid to the R&D investment decision making process. It aimed to provide a technology value index for comparing projects, to enable project managers to assess the commercial impact of their projects and to support a balanced and focused portfolio. The index combined both financial and qualitative data to support the ranking of projects. The financial analysis used DCF but required the consideration of five **scenarios**: baseline, buy-high , buy-low, licence and acquire. Buy-high or low are if the project is granted more or less money than in the baseline. Licence is if no funding is available and acquire is if no labour is available for the project. In addition, the financial aspects required an options type analysis of the project, involving the consideration of at least two project **phases**. The qualitative analysis used portfolio index score sheets for each project scenario, which required assessment of strategic fit, technical feasibility, commercial feasibility and leverage. The final Probable Future Benefit Index is a combination of the portfolio index and NPVopt/investment.

EdF summer student reviewed R&D project valuation systems (2000)
The evaluation and selection of R&D projects report (Colson 2000) aimed to show how a company can choose the most appropriate method for selection and evaluation of R&D projects. Literature was reviewed in the areas of metrics, methods of measurement, and overall system of evaluation and selection. It was suggested that the more fundamental the research, the more appropriate qualitative-subjective or quantitative-subjective metrics are. Examples are not given, however, because it is said that they need to be designed in context. The study reviews 30 examples of quantitative-objective metrics that can be used to evaluate or select R&D projects, including NPV and the theory of real options. The report then categorises methods of measurement in terms of single projects (absolute value) and multiple projects (relative value). The interdependence of different methods is highlighted and it is suggested that use of compatible combinations can improve resource allocation. Key questions for implementing an overall system are defined.

The innovation and adoption of new materials was the subject of a PhD (Maine 2000).
The thesis develops an investment methodology to help identify promising material innovations at an early stage. The methodology was created by adapting existing and emerging predictive tools to materials innovations and linking them to give a practical, comprehensive procedure. The viability of the methodology was demonstrated through a major case study of the introduction of metal foams into cars. The methodology is aimed at SMEs and has three interwoven segments: viability analysis (to reduce risk), market forecast and value capture. A material is viable in an application if the balance between its technical and economic attributes are favourable. Assessing viability involves: technical modelling of the application, cost modelling of the manufacturing, input from the market assessment and value analysis. The market assessment consists of techniques for identifying promising market applications and for forecasting future production volume. Likelihood of value capture is assessed through an analysis of industry structure, organisational structure, IP issues, appropriability, and the planned market approach. Control of IP is seen as a key to value capture in the materials industry.

Real options and hybrid models in venture capital and technology firms was an MPhil (Wong 2002; Hunt et al 2003; Hunt et al 2004).
This thesis is concerned with valuation techniques as applied to the technology sector and focuses on the venture capital and technological industries. Definitions of technology and problems facing valuation of technology are discussed. The decision making process is seen as not only dependent on valuation but also other inputs such as marketing, identification of technologies, portfolio management and the project management team itself. The objective of the thesis is to illustrate the practical application of a hybrid form of real options using easily visualised decision trees rather than complex mathematical models in valuing technology projects. This was done using a spreadsheet model to calculate the compound option value of the project and perform sensitivity analysis for a case example based on a start-up technology firm. Comparisons are made between this method and the widely used discounted cash flow approach. The model is seen as successful as a visual tool for valuing flexibility in decision making for sequential investments in technology projects and for supporting proactive management. However, the problem of reliable input data remains.

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