



CIMA

Chartered Institute of
Management Accountants

The role of management accounting in new product design and development decisions

Research executive summary series

Volume 9 | Issue 1



Bill Nixon
University of Dundee
School of Business

John Burns
University of Exeter
School of Business

Mostafa Jazayeri
Manchester Metropolitan
University

Key findings:

- This CIMA-sponsored case study focuses on a company in the premium auto group (PAG) sector. It highlights the pivotal role of management accounting in the communication essential to the co-ordination of the activities among multi-disciplinary teams and an extended network of participants in the new product design and development (NPD&D) process.
- The case also reveals that management accounting, including in particular a balanced targets book (BTB) for each project, has evolved with and is embedded in six reinforcing components of the company's management process: its team-based matrix-type organisational structure, comprehensive information system, iterative top-down-bottom-up project management style, greater emphasis on planning rather than on control, informal system and culture.
- The complementary, interaction among these six features and activities of the company's NPD&D process demonstrates the importance of integration and the high cost of functional silos. This can be seen especially in the context of communication and synchronisation of activities.
- From the evidence of this case the conventional cost management advice to 'control tomorrow's costs through today's designs'¹ is too late and too narrow. Target costing in this PAG company has moved upstream to an earlier strategy and concept development phase that precedes design. The technical and financial scope of target costing has also evolved to more explicitly link the company's 'pedigree, performance and profit' design criteria.

1 Cooper, R., Chew, WB. (1996) *Control tomorrow's costs through today's designs*, Harvard Business Review, Volume 74(1), January – February, pp88–97.

Introduction

Intensification of competition has made a steady stream of new and improved products a pre-requisite for survival in most business sectors. The risks of not adequately investing in NPD&D may be a loss of competitiveness and greater pressure to compete on low-margin prices. The consequences of not investing in NPD&D are frequently easier to quantify compared to the benefits. The NPD&D investment decision is very much about balancing the risks of 'missing the boat' and 'sinking the boat'.² An indication of the rising cost and relative importance of the NPD&D activity is that global research and development (R&D) as a percentage of sales varies from about 2.7% in industrial engineering to 16.1% in the pharmaceutical and biotechnology sector. The automotive and car parts sector spends 4.2% of sales on R&D, which amounts to more than £30 billion per annum for the top ten companies (by R&D spend). These amounts do not include the cost of market research and promotion for launching new products.

The financial management of NPD&D uncertainties reflects the transformational changes that occurred in the last decade. These changes are still on-going in the technology and management of the NPD&D process, in the nature of products and services, and in competitive and NPD&D strategies. The main question addressed by this research is, 'How is management accounting practice responding to these changes in the NPD&D process and strategy?' In particular, the focus of this empirical research is how the concepts, tools and practice of management accounting activities, such as investment appraisal, risk management, cost and value management and performance measurement, are supporting the changes in the NPD&D management process and strategy.

Research method

This research took a case study approach in view of the ongoing changes in the technologies, the nature of products and the management of the NPD&D process. The automotive industry seemed a suitable focus for this research because it is extremely competitive and its NPD&D process has traditionally pioneered the most sophisticated NPD&D management systems, especially supporting software systems. A long-established, successful motor vehicles company was chosen, referred to herein as ABY for reasons of confidentiality. A special appeal of ABY to the researchers was that, prior to a request for case study access, we had learned that the dominant design parameters for all its models are unequivocally pedigree, performance and profit.

Case findings

Competitive bases

The increase in competition especially in the last 20 years, has meant a unique pedigree and performance are still necessary

but no longer sufficient for survival in the PAG segment. Price, sales volumes and costs, including operating costs for owners are explicit, detailed components of the comprehensive data, assembled in the early stages of ABY's strategy and concept definition phase. These data are the basis for the business case and feasibility assessment of a new model.

The competitive pressures that forced most companies in the PAG sector to adopt a price-led costing approach to NPD&D is one reason why the management accounting role begins with the annual planning round (APR). This determines the total amount available for expenditure on all new product platforms, generations, models, modules, options and changes to existing models. The APR of ABY, and of all business units within the group, is part of the parent company's multi-year product portfolio plan.

Unpacking pedigree, performance and profit criteria

The synthesis of the pedigree, performance and profit design criteria within the business case is explicit and is facilitated by detailed definitions and measures for the attributes of each design parameter.

Marketers and industrial designers are primarily responsible for defining pedigree in each target segment. Pedigree includes all aspects of exterior and interior design as well as service support. Performance involves a good deal of benchmarking and is mostly the responsibility of the design engineers to analyse for each customer group. Marketing also plays a very proactive role in defining customer performance requirements. For example:

- safety
- reliability
- fuel consumption
- emissions
- acceleration
- top speed
- traction
- driver and passenger experiences.

The specification of pedigree and performance are the basis of a technical concept description (TCD).

Much of the cost, value engineering and risk assessments associated with industrial and engineering designs and technology trajectories, are undertaken in the strategy and target setting (S&TS) section by 21 engineers, who report directly to a management accountant. The S&TS section plays the pivotal role in producing the BTB in the first, strategy and concept development, phase of the NPD&D process. The BTB balances the pedigree and performance details of the TCD with the profit requirements of the company together with the price and ownership cost requirements of customers. The balancing process is described below (Developing the BTB).

2 Mullins, JW., Forlani, D. (2005) *Missing the boat or sinking the boat: a study of new venture decision making*, Journal of Business Venturing, Volume 20, pp47–69.

Matrix and team structure

An important feature of ABY's structure is its matrix-type system of responsibility. For example, the management accountant has a dual responsibility to the financial and managing directors for strategy and target setting. The relative autonomy and authority of the S&TS section means management accounting has an important influence in the iterative top-down-bottom-up process. This process balances the pedigree, performance and profit criteria. However, NPD&D projects within ABY are a team effort that involves intensive and extensive communication among disparate functions, module leaders and representatives of all NPD&D participants. The period of technology trajectories covers: the four to five years it may take to develop a new vehicle platform; the 10-15 years life expectancy of a platform; the five to eight years of each generation supported by a platform; and the 20-25 years of customer ownership. This long planning period is essential to support a comprehensive after-sales service business that is important to customers, ABY, its suppliers and dealers. The planning horizon of 25-30 years is also necessary to support the multi-year, product portfolio management of both ABY and its parent company.

The prescribed NPD&D process

Most companies have well-defined phases, relating to the definition, design, development and delivery of new products and services. The NPD&D process of ABY is remarkable because

of the detailed template and structure it provides. These relate to the activities and outcomes of each of the 14 stages in the five phases that may be involved in a major project. The five phases are strategy and concept development; concept approval; design and validate; volume ramp; and market entry.

Although the 14 stages appear to occur in a sequential order, they are actually managed in ABY in a parallel way. For example in each phase the potential obstacles and critical success factors (CSFs) in subsequent phases are carefully considered. One reason the detail of the late development and delivery phases is considered in the early preceding phases is because the teams that begin a NPD&D project are responsible for all phases; no change-over occurs, for example, between the design phase and the development phase.

Developing the BTB

The BTB for the project (see Figure 1) supports and reflects this parallel development approach. The BTB is agreed, usually after multiple top-down-bottom-up iterations, by all project participants in stage four (project feasibility) of the early strategy and concept definition phase. Above all, management of the process reflects an inclusive, participative approach to NPD&D. This approach emphasises a degree of structure, control and order not usually associated with the creativity and uncertainty that are an essential part of the NPD&D process, especially for more innovative projects.

Figure 1. Developing balanced targets

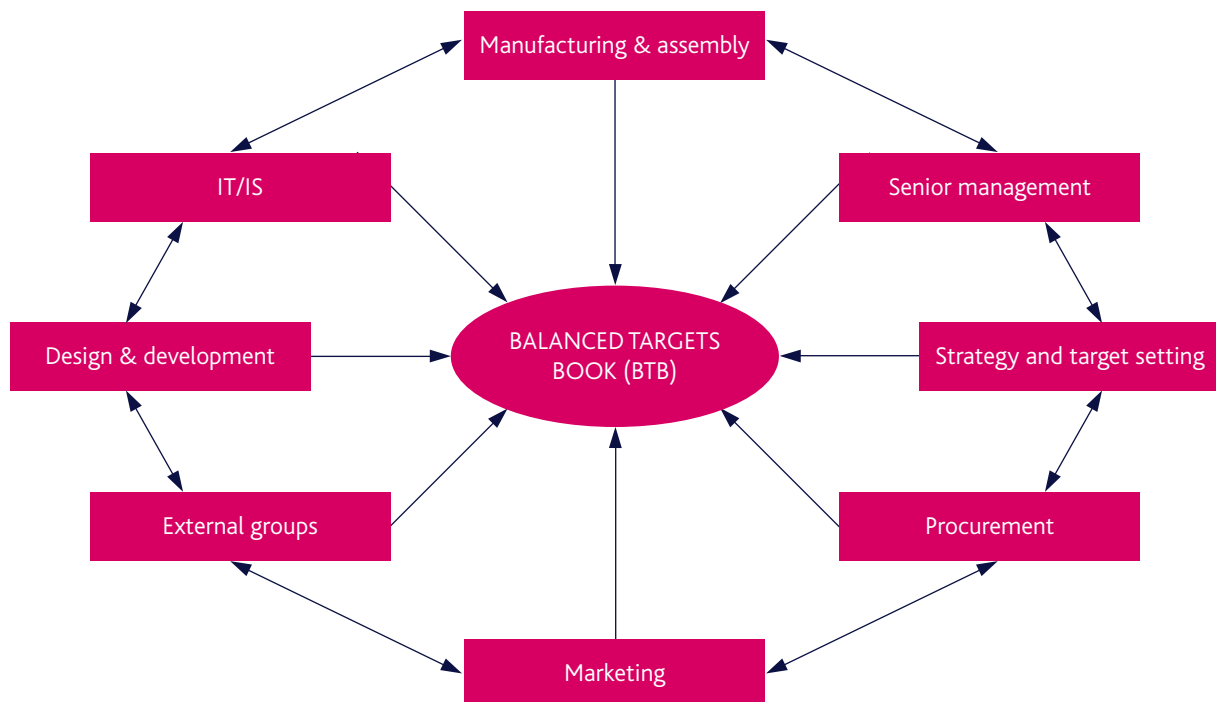
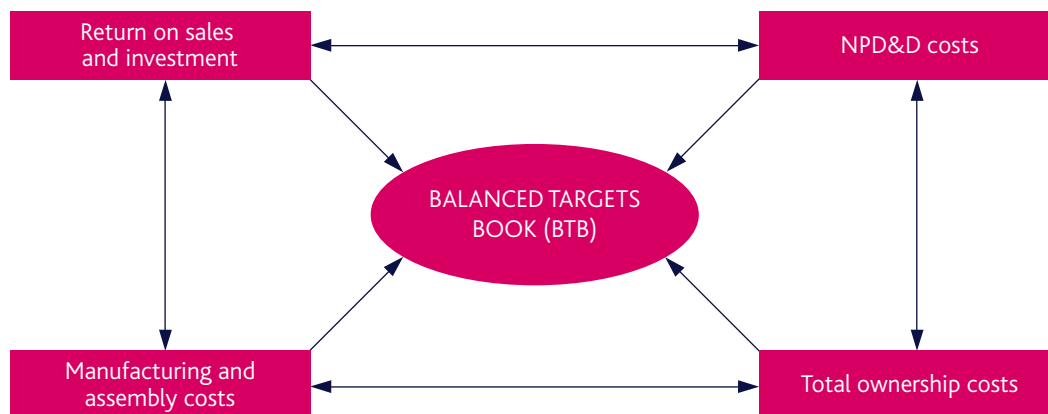


Figure 2. Balanced target book financial target groups



The initial BTB sets out financial and non-financial targets, consistent with the generic pedigree, performance and profit design parameters for two competing vehicle designs. The BTB signifies commitment by all project participants to the targets for the selected design. The financial targets of the BTB fall into four categories: return on sales and investment; design and development costs; manufacturing and assembly costs; and the total cost of ownership – price, fuel consumption, maintenance less re-sale value – (see Figure 2). These targets are explained further below (Phases within the process). ABY’s BTB suggests the conventional cost management imperative, ‘control tomorrow’s costs through today’s designs’, is too narrow and too late in the NPD&D cycle. The BTB’s financial, technical, quality and time targets, agreed in phase one, are the basis of ABY’s NPD&D management process. They are also the dominant influence on all subsequent stage-gate and phase-gate decisions. The pervasive influence of the BTB on the management of the NPD&D process is, however, very dependent on its position within a comprehensive information system that has evolved with ABY’s team-based structure, its iterative top-down-bottom-up project management style and culture.

Phases within the process

The structure and content of ABY’s NPD&D process has evolved over the last decade to integrate and manage all strategic and operational aspects. It has also changed to simultaneously manage the pedigree, performance and profit dimensions of discrete projects with the company’s competitive bases and the group’s corporate strategy. Each of the 14 stages in the five phases of ABY’s NPD&D process is a key step in linking strategic aims with operational details.

1. Strategy and concept definition phase

This phase involves five stages and it starts with strategic project planning and ends with the selection of a single vehicle

concept and agreement on the accompanying business case and feasibility. The phase is informed by an ongoing market monitoring system that benchmarks the pedigree, performance, price and service expectations of existing and potential customers against those provided by ABY and its competitors. Almost all of the internal and external NPD&D participants in this phase engage in an iterative top-down-bottom-up process that may take 15 months for a major 54-month project. Once the product and project brief, assumptions and life-cycle plan are agreed, a project leader is appointed. Next, aggregate targets are established based in large part on market data, product characteristics and features, and the TCD. The early, high-level targets are the basis for the detailed bottom-up targets. A process of intensive communication and negotiation usually reconciles top-down and bottom-up targets by stage four, project feasibility, of phase one, and the BTB will be agreed with all functions, module leaders and suppliers.

The S&TS section plays a pivotal role in reconciling and integrating data, information and the judgements of project participants (Figure 1) in order to balance the financial targets (Figure 2). These financial targets are the integrating vernacular of project participants. The BTB also includes precise productivity and quality measures. Each stage of the strategy and concept definition phase is approved by ABY’s senior management product strategy committee, and two of the five stages (project premises and project feasibility) require the additional approval of the group product strategy committee in order to progress further.

2. Concept approval phase

In this phase additional customer and market research is undertaken, targets are defined more precisely, assumptions are checked and the business case confirmed. The design model is detailed further to a stage where the concept is approved by both the ABY and group product strategy committees. This

phase is an important part of the risk management and strategy implementation process.

3. Design and validate phase

The approved vehicle concept of phase two is developed in line with the project's BTB of phase one. Once approved by the product strategy committees of both ABY and the group, it is released for production. The design freeze stage of this design phase is carefully evaluated to identify the risks involved in lock in and irreversible decisions. Then a cost/benefit analysis is conducted, including the real option value, of building flexibility into the design architecture. An array of software techniques is applied to manage life-cycle production and assembly costs as well as owner operating and maintenance costs. The techniques are complemented by the control system and retrospective measures are used mostly for learning purposes and knowledge management that informs subsequent re-design and new design projects.

4. Volume ramp phase

This phase has four stages that prepare for the production and sales of the released design from phase three. The emphasis of the NPD&D management process and of the S&TS section in particular shifts from planning to control of targets for the investment expenditure, unit costs, sales and after-sales service revenues. The S&TS section is also well placed to assess the likely financial impact of progress against non-financial, technical, quality and time targets because of its representation in the product planning committee, the project, module and simultaneous engineering teams. The technical background of the cost and value engineers in the S&TS section helps this assessment.

5. Market entry phase

In the market entry phase, vehicles are manufactured and distributed to launch markets. Achieving estimated sales volumes and uptake of options are crucial to achieving targets for cash flow, costs, contribution, return on sales and investment. Every aspect of sales, customer relationship management, vehicle and ownership is carefully planned and aligned.

Operation of the prescribed NPD&D process

ABY's prescribed NPD&D process defines the activities, deliverables and approval forum (the product strategy committee of ABY and, also, for some stages, that of the group). The same 14-stage, five phase NPD&D management process is applied to all projects. Only the time scale is adjusted according to the relative degree of innovation (platform, generation, model, model re-design, module, new option).

In order to better understand the NPD&D process and its actual operation, the researchers examined documents relating to a 15-month, 60 million euro project ('the project') for three

2009/10 models. Interviews were conducted with the project leader and project participants from finance, strategy and target setting, design and product planning sections. The project involved a new flexi-fuel system, ongoing improvements to fuel economy and emissions, some re-styling as well as necessary changes to comply with legal requirements in different countries.

The project exemplified the extensive and intensive communication required among project participants (Figure 1) in order to define and reach a consensus on the TCD and the BTB. For this project, 11 separate TCD and BTB versions were worked through before a final decision was reached. This number of top-down-bottom-up iterations is normal within ABY for this type of project. The TCD and the BTB are the links between strategy and operations. The difficulty of balancing the components of pedigree, performance and profit parameters is illustrated by the number of iterations and the extensive amount of data and information impounded in decisions.

ABY's industrial and design engineers must balance not only the conventional form (appearance), function (performance) and fit (ergonomic) parameters but also identity, emotional (customer response to performance and pedigree features) and ecological dimensions.

Experiential design relating to customer interaction with the company, its communications, events and representatives, is also important in the context of complementary support services and marketing. All of these design dimensions must be balanced with each other within the financial requirements of both customers and ABY (Figure 2). Value engineering assessments help the balancing process but decisions relating to failure mode effect analyses, design/re-design flexibility, options and the cost of not providing certain features still require circumspection and judgement relating to possible commercial, technological and legal developments. Above all ABY's pedigree, performance and profit targets are managed with a degree of structure and integration not normally associated with a high level of creativity and innovation.³

Discussion

The formal structure that integrates processes within the business model, phases within the NPD&D process, stages within the phases and activities within stages is designed to facilitate vertical communication within stages and horizontal communication over the 14 stages of a NPD&D project that may take up to 54 months. This communication is intended to translate competitive and NPD&D strategic objectives into operational details. The very precise financial and non-financial data that exist for each project and the company's excellent commercial and financial record in the last decade are a strong indication of the effectiveness of ABY's organisational

3 Verganti, R. (2009) *Design-driven innovation: changing the rules of competition by radically innovating what things mean*, Harvard Business School Press; and Christensen, CM., Raynor, ME. (2003) *The innovator's solution: creating and sustaining successful growth*, Harvard Business School Press.

arrangements. These arrangements also work to align internal processes with each other and all with the pedigree, performance, price and service requirements of customers. The role of management accounting in balancing financial targets with pedigree and performance targets can only be understood in the context of the dynamic interaction among all of the elements that support and sustain communication among so many NPD&D participants.

The analysis of the empirical data for this case highlights six complementary elements that reinforce each other to manage uncertainty and implement strategy. These elements, or organisational components, are:

1. Structure. The composition of the product strategy committee, the project, module and simultaneous engineering teams is very inclusive and reflects a participative approach to NPD&D. Vertical communication is encouraged partly through matrix-type responsibility and the representation at all levels of participant groups. Although the role of different project team participants and functions changes over the 14 stages and five phases of a NPD&D project, the same team is responsible for the entire project. This latter arrangement increases the sense of ownership and identity with projects that participants have. However, the main reason for the arrangement is that, in the company's experience, it enhances horizontal communication over all the stages and phases of the NPD&D process.

The financial management/management accounting dimension is represented at each level – the senior management product strategy committee, and in the project, module and simultaneous engineering teams – and in each stage by members of the S&TS section. This relationship between S&TS and other NPD&D participants contrasts sharply with the more peripheral involvement of the finance function in NPD&D and the adversarial relationship between the two activities that

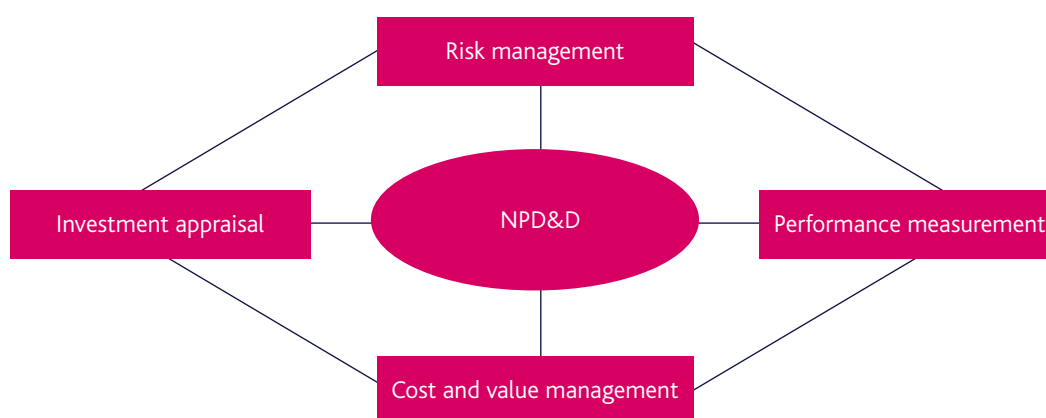
was common for a long time. Clearly, one case study is no basis for generalisation but the role of management accounting and the management accountant in ABY strongly suggests that the advice of Robert McNamara, CFO of the Ford Motor corporation in the 1950s, is no longer relevant or sustainable although it still resonates with many non-financial NPD&D participants:

*'Whatever the product men and the manufacturing men want, deny it. Make them sweat and then make them present it again, and once again delay it as long as possible. If in the end it has to be granted, cut it in half. Always make them fight the balance sheet, and always put the burden of truth on them. That way they will always be on the defensive and will think twice about asking for anything.'*⁴

2. Formal information system. ABY's formal information system, including the management accounting and BTB activities, is explicitly designed to support both the formulation and implementation of competitive and NPD&D strategies. The structure and content of the information system supports the prospective, concurrent and retrospective use of the detailed pedigree, performance and financial measures of each BTB.

The information system is under the direct responsibility of ABY's finance director, who has a functional responsibility to the group's chief information officer (CIO). An indication of the key role of the formal information system in this motor manufacturing company is that the group CIO is a main board director. Integration extends to activities within functions. For example, the four related activities of investment appraisal, risk management, cost and value management, and performance measurement are conducted in a mostly simultaneous manner for planning and control purposes (see Figure 3).

Figure 3. Concurrent financial management of new product design and development



4 Halberstam, D. (1987) *The Reckoning*, Bloomsbury Publishing Ltd, p236.

3. Management style. The top-down-bottom-up iterative management of the NPD&D process and of the strategy and concept development phase, in particular, reflect the uncertainty inherent in the many stages of innovation. The circuitous process by which high level strategic goals are aligned and balanced with operations helps to reduce uncertainty and avoid strategy-implementation gaps.

4. Planning and control. The financial and non-financial targets and measures of the BTB, approved in the early strategy and concept development phase, are used to both plan and control activities in all NPD&D phases. However, the emphasis is on planning in order to avoid the cost of delays and errors. The organisational arrangements for vertical communication and a pervasive simultaneous engineering approach to activities means that control is a more concurrent than retrospective, after the event, activity. Conventional historic control measures and variance analyses are used mostly to discourage over-optimistic forecasts and for learning purposes.

5. Informal information system. The structured and semi-structured components of the formal information system are complemented by a strong informal system that includes a community of customers, suppliers, dealers and others associated with the motor industry. Many intra and inter-firm, informal collaborative networks inform both NPD&D strategy formulation and operations.

6. The ABY culture. In terms of behaviour or, 'the way things are done,' multi-disciplinary project teams play a big part in the activities of ABY. Culture, defined in terms of beliefs and values, is epitomised by the sense of history and heritage that so many artefacts in ABY manifest and the emphasis on pedigree and performance that are associated with the brand. Most ABY employees are long-serving and are proud of the history and identity of the vehicles they help create. However, the history of ABY has also established the firm belief that engineering and design excellence do not automatically lead to financial sustainability. No NPD&D project will proceed beyond the first phase unless the links among the pedigree, performance and profit criteria are strong and explicit.

These six features of ABY (structure, formal information system, iterative top-down-bottom-up management style, emphasis on planning and concurrent development, informal information system and culture) help to explain how integration is maintained among and within the company's processes, phases and stages. They also help to explain how the vertical and horizontal communication that is crucial to co-ordination of all NPD&D activities is achieved. Management accounting is a key part of the shared language of this communication that is influenced by, and influences in turn, each of the six elements. This is the context of management accounting in ABY that is essential to understanding its role in the NPD&D process.

The BTB is the basis of much of the management accounting activity in ABY. The development and management of the BTB's financial and non-financial measures are different in important respects from those of Kaplan and Norton's balanced scorecard (BSC).⁵ A fundamental premise of the BSC is that strategy is the prerogative of senior management and the approach is predominantly top-down. In Kaplan and Norton's view, 'organisations build strategy maps from the top down, starting with the destination and then charting the routes that lead there.'⁶

By contrast, the BTB is premised on the belief that ABY's NPD&D activities are knowledge-intensive and that the related knowledge is both dynamic and widely dispersed. Therefore the approach is an iterative top-down-bottom-up one that draws upon collaborative networks and is very inclusive. The links between high level strategic goals and operational activities are clear and precise, partly because of their narrow project-level focus and the intensive communication process by which they are agreed. Another perspective of ABY's 14-stage, five-phase NPD&D process is that it is about reducing uncertainty and managing commercial and technological risks. The risk perspective has until recently been mostly neglected by the BSC. The more macro-level, generic nature of the BSC's corporate and competitive strategies and 'strategy maps,' inevitably obscure the links between strategy and operations.

A further difference between the BTB and the BSC relates to the use of the respective measures. The BTB measures are used more prospectively to identify opportunities, blue ocean segments and threats, to benchmark and plan rather than retrospectively to control activities. An indication of the relative emphasis is that in ABY plans are reviewed every four weeks compared to the formal reviews of progress every 12 weeks. By contrast, the BSC is less team-based and much more of the command and control approach.

Conclusion

The need for ongoing NPD&D is becoming more acute in every sector including services. Very few sectors are immune from globalisation, technology diffusion and intensification of competition. The number of technologies in products and services is also increasing. New and improved software systems are helping to transform the management of the NPD&D process. Therefore the overarching question addressed by the research reported here, was 'how is management accounting responding to the changes in the context and management of the NPD&D activity?'

Most organisations attempt to link the marketing, engineering and financial dimensions of the NPD&D activity. The historic difference among companies has related to the relative emphasis placed on each of these dimensions. The case for little

5 Kaplan, RS., Norton, DP. (2008) *The execution premium: linking strategy to operations for competitive advantage*, Harvard Business Press.

6 Kaplan, RS., Norton, DP. (2001) Commentary, *Transforming the balanced scorecard from performance measurement to strategic management: part 1*, Accounting Horizons, Volume 15(1), March, pp87–104.

or no financial involvement in the early stages may have been justified so long as organisations could rely upon differentiation earning a price premium and a cost-plus approach to pricing was possible. However, very few firms can sustain a price premium for long and most companies must now compete on several bases including price, simultaneously. ABY undoubtedly has a unique history and a distinct pedigree that cannot be replicated, yet ABY competes on the bases of pedigree, performance, price and service.

Notwithstanding ABY's acknowledged engineering excellence and the unique identity of its vehicles, all the company's NPD&D projects are closely linked to well-defined market segments. The organisational position and role of management accounting in ABY are intended to support a very explicit, carefully defined balance of commercial, engineering and financial criteria. The location of the management accounting activity in a separate S&TS section, that is led by the management accountant, who is responsible to both the CEO and the financial director, is an arrangement that, in ABY's case at least, is very important to the influence of the management accounting function. This dual responsibility also reflects the importance attached to management accounting in linking high level strategic goals with operational targets. The balance among competitive bases and design parameters is developed and managed through the financial and non-financial measures of the BTB that is established in the pre-design, strategy and concept development phase. The S&TS section is represented on the senior management product strategy committee, project, module and simultaneous engineering teams. Management accounting is very much the single, most-used language to co-ordinate the activities of all NPD&D project participants.

This case demonstrates many of the changes that are transforming competitive and NPD&D strategies, the nature of products and the product-service relationship, product lifecycles, and the NPD&D process, especially the use of multi-disciplinary teams. Although tensions inevitably exist among disciplines, their perspectives and requirements, this case highlights a major change in the relationship between the NPD&D and finance

functions. It seems, paradoxically, that finance is not directly involved with NPD&D in ABY, rather the relationship is between NPD&D and the S&TS section. Management accounting is involved before NPD&D projects begin with product portfolio and strategic planning, directly with projects and also in the management of the important after-sales customer service activities. Above all, management accounting, including the BTB, is grounded in the strategy, structure, processes and culture of ABY. Everyone has a financial perspective – shareholders, senior management, engineers, designers, marketers, customers, suppliers and dealers. Management accounting is a vital part of the communication needed to negotiate, link and balance all of the perspectives.

Authors

Bill Nixon

University of Dundee
School of Business
Accounting & Finance
1 Perth Road
Dundee DD1 4HN
Scotland

John Burns

Exeter University
Business School
Streatham Court
Rennes Drive
Exeter

Mostafa Jazayeri

Dept. Of Business & Management Studies
Manchester Metropolitan University
Crewe Campus
Crewe Green Road
Crewe
Cheshire CW1 5DU

ISSN 1744-702X (print)

**Chartered Institute of
Management Accountants**

26 Chapter Street
London SW1P 4NP

United Kingdom

T. +44 (0)20 7663 5441

E. research@cimaglobal.com

www.cimaglobal.com

© November 2011, Chartered Institute of Management Accountants