

*SHA*

*S Hudson & Associates Pty Ltd*

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Inquiry into the Business  
Commitment to research &  
Development in Australia

Compiled  
S Hudson & Associates

August 2002

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# Executive Summary

The following report delivers to the committee a differentiated view on the reasons for limited private industry investment for R&D within Australia.

The report has been formulated based upon research conducted on a random sample of 500 Australian companies as well as interviews of the business and investor market and global international data research.

In general the report focuses on 3 key drivers:-

Driver 1 The need to develop within private industry and financial markets a concept that R&D is a value asset not an expense through EVA concept

Driver 2 **Marketability** to be addressed within the R&D process

Driver 3 Knowledge management platform as a driver to support improved skills in managing new product development within Australia

To conclude the report the team who have contributed to the content express their willingness to meet with the committee and discuss any issues or support delivery of any of the conclusions as required.

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Introducing to the Committee

S Hudson & Associates, Director Suzanne Hudson completed a Post Graduate study on R&D expenditure by small/medium businesses in Australia. Her team has also worked extensively with business and R&D within Australian businesses.

The following paper is based on a combination of that research activity, experience, working with the R&D start programs in Queensland and NSW for the past 10 years and recent research studies conducted by other institutions.

## Driver 1 – Financial considerations for business effecting R&D

The financial environment affecting R&D has been transformed dramatically since the mid 1980's. New patterns of funding have evolved, attitudes toward risk and value are more sophisticated and analysts are armed with new tools for measuring intellectual capital.

## Accounting Trends for R & D

Overseas Financial thinking about R&D has evolved well beyond basic discounted cash flow models. Better tools have been developed to value intellectual capital, including the quantitative assessment of the value added by R&D. The dissection of the elements of risk and the application of real options theory are new features of the R&D landscape. Financing vehicles have also changed a enormous surge of venture capital and private equity funds. The analyst's toolbox has been enhanced by electronic spreadsheets, online databases, Monte Carlo software, the Internet and the ubiquitous personal computer.

*However, none of these measures are part of the Australian R & D financial evaluations and so has limited the “investability” attractiveness of R & D for both Shareholders, Directors as well as banking Institutions.*

Whilst it is true to say the Government has recognised this problem and developed the Innovation Investment Fund and R & D Start, both these programs miss the mark when it comes to the most crucial funding .ie at the “**marketability stage**”. There is no funding available for established companies with new product innovation that will fund the rollout of the product into the market. Without this funding there is no R O I on the R & D investment and thus that key profit driver for R & D investment is diminished.

During 2002 within Australia, the UNSW survey identified that 87% of R & D rollouts were under funded and this was the primary reason for failure of R & D. In these days of risk management, shareholder return maximisation and bank lending only against security – the area that often suffers is R & D expenditure.

*The following is a case example of the Manufacturing Industry in Australia and how Australia's very limited New Product Management Skills and access to funding through correct valuation of the marketability stage has impacted on R & D investment by this sector*

## Manufacturing Sector – R&D investment is an issue

Industrial R&D is characterised by a high risk investment with a deferred payoff. Its importance to industrial societies and to individual firms within these economies, is paramount; Lawrence Lau has estimated that more than 50% of the wealth creation in developed countries originates from technology, which is typically a product of R&D. However, R&D comes at a cost and it is as capable of destroying value as creating it. Knowing the difference is crucial; the penalties for under investment can be a deteriorating competitive position and lost opportunity, while for over investment it will be a slow erosion of the firm's capital base. But measuring the difference between value creation and value destruction is not easy. One source of confusion is that accounting conversions treat R&D as an expense, not an investment. An even more fundamental issue is that past performance is not a reliable guide to future performance.

Faced by a measurement problem that is both difficult and important, the business, financial and academic communities have continued improving their tools. As a result R&D analysis and management have evolved dramatically over the past 50 years and that evolution is far from over.

As a valuable financial metric, *Economic Value Added* reinforces the role of R&D as an investment in the future of the corporation.

## EVA needs to be understood by the banking community

The new methods of valuing capital, cash flow, risk and business assets in Australia has remained very primitive compared to overseas efforts.

When 500 Australian businesses were interviewed on the reasons for minimum R&D investment ( ie less than 2% of sales) ,over 75% of businesses interviewed identified the following issues at a rate three times higher than issues of access to technology or innovation culture within the organisation. The minimising drivers were from two sources:-

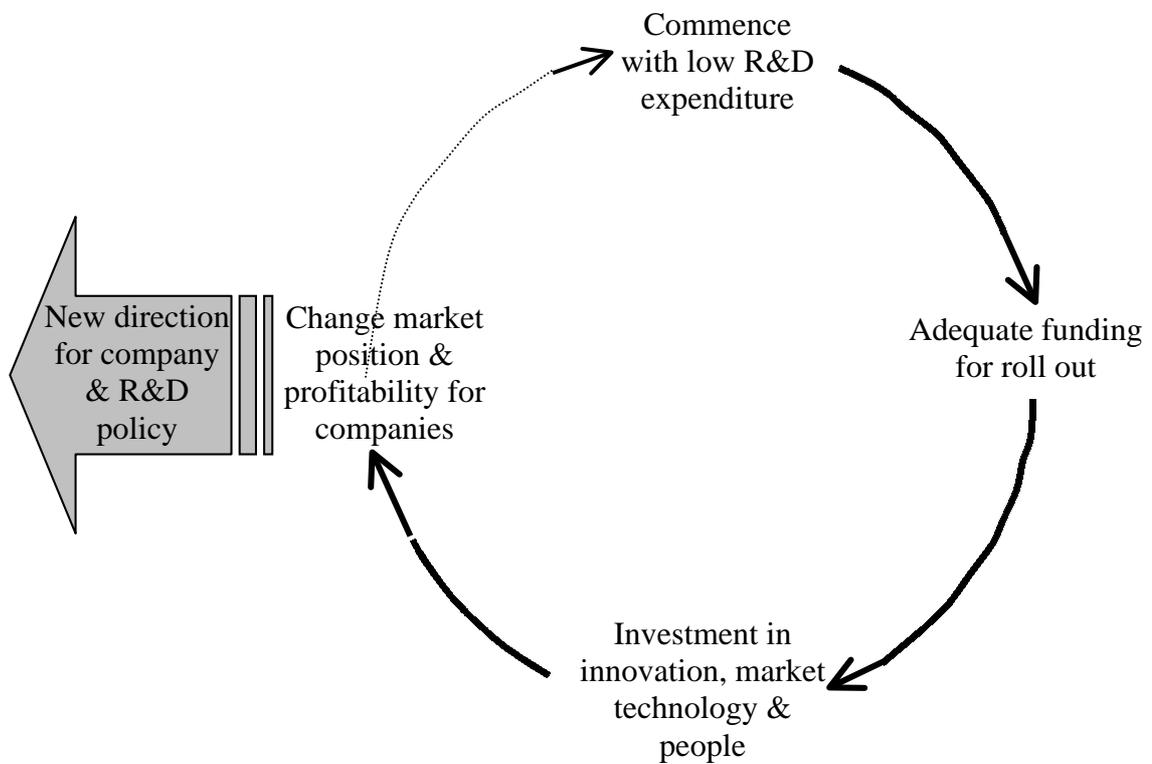
1. R&D is not given its true 'value' in accounting terms and therefore Directors and Shareholders required 'major' convincing to approve funding in R&D
2. Australian financial institutions do not fund R&D except against security. They have no mechanisms or ability to value and thus provide insufficient funding to complete the R&D/ new product process.

*As a result 87% of R&D does not get to ‘marketability’ stage due to under funding and thus no value is demonstrated to shareholders and directors and so the ‘R&D cringe’ continues in private industry.*

Over 65% of those businesses interviewed said that by noting possible grant funding to minimise the R&D risk, the chances of a project being funded improved by 30%.

**To demonstrate this phenomenon the following manufacturing example of the process from innovation to marketability and its impact on R&D investment is provided.**

With marketability strategy



# Australian Issues for Manufacturing

The following is a summary of thoughts on **marketability** within the R & D strategy that needs to be addressed to assist with the – *increase in investment*.

The key objectives of the **Marketability** Strategy from the readings of government material and research undertaken by SHA is to encourage:

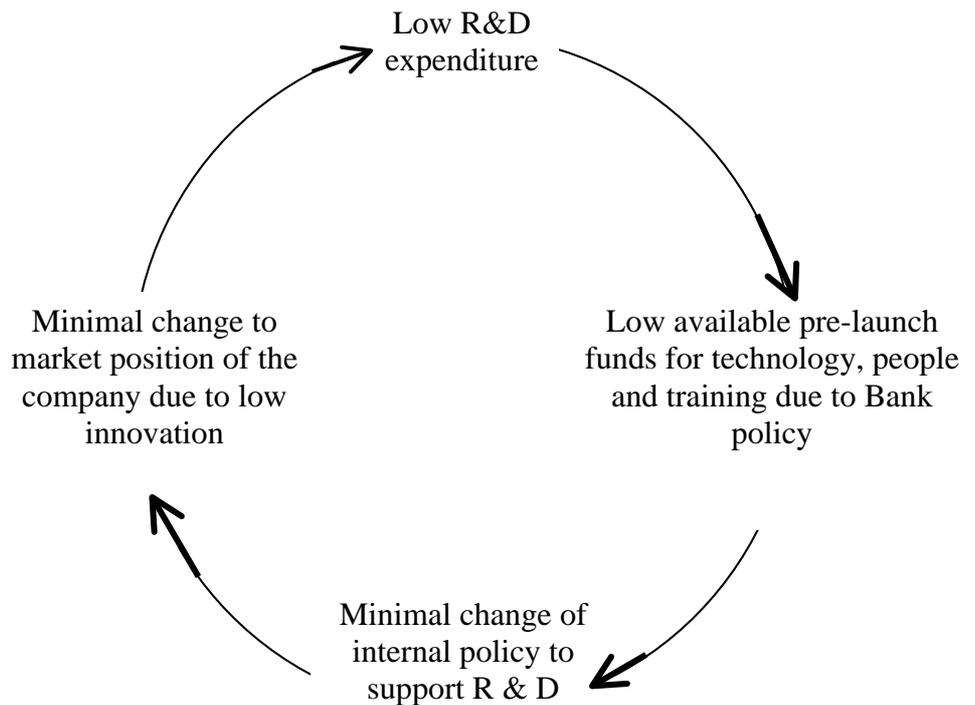
- Innovation
- Exports, and
- Sustainability of business for Australian manufacturing

However a recent study identified that manufacturing needed two key elements for such an outcome



In general the “vicious circle model” for Australia’s manufacturing industry can be simplified as following

## Pre Marketability Strategy



## 2.0 The Key Driver 2 - *Marketability*

**Marketability** is that important stage of corporate change prior to “meeting the market” with Innovation. This stage is the key difference between a successful rollout or unsuccessful. This process of R & D innovation is sometimes referred to as “pre launch” and forms the basis of the ROI for the project.

**Marketability** is the stage that is the key to a company obtaining a return on all their efforts in innovation, export preparations or other sustainable activities. Without effective **marketability** the dream goes unrealised. In Australia over 87% of companies fail at this stage due to under funded rollouts. This is mainly due to funding policies only allowing for secured lending and funding for **Marketability** of a project is a higher acceptable risk than banks are willing to assume.

The combined factors of limited funding and increased risk of low ROI leads to management being hesitant to invest in a project and thus much R & D is never invested in by companies who have limited resources ( many of Australia’s SME’s) or those that have a mandate for maximising shareholder return.

### 2.1 What is Marketability?

**Marketability** is a name given to that stage of development that occurs prior to gaining the first order.

For *Innovation* this is also known as pre launch and includes the activities of:

- Gearing up for production
- Implementation of the marketing and sales plans
- Investment in people, services and systems to ensure a successful launch

With *Export* this includes:

- Stocking up
- Product modification
- Export marketing
- Distribution establishment
- Technology and training

These processes require funding that will enable the manufacturing sector to break their current vicious circle of *no margin*  $\Rightarrow$  *no capital*

## 2.2 Logic

According to management interviewed “*Without the funds for **marketability** activities manufacturing may as well not bother undertaking R&D and Commercialisation activities as they are unable to gear up for the market.*”

Nor for that matter any other form of major corporate shift, as without the company having the resources and ability to take the new paradigm to market there is no return and thus no real tangible benefits to the company.

It is often said that manufacturing should be able to afford these changes or be able to secure funding from market sources for the activity. Both are fallacies which are a “wide berth” from reality.

The reasons for such follow

## 3.0 Why is Funding Scarce?

Despite the cultural and global trade changes, there are now several reasons why Australian Manufacturing R&D activity is seen as a poor investment by lending institutions in Australia.

### 1. Threat of Overseas Competition

Australian investors do not believe that Australian firms have the ability to compete.

### 2. Lack of Scale

Australian industry has been viewed as a small business operation due to our limited domestic market. This is linked with the perception that Australian manufacturers cannot compete with overseas operators. The perception by investors is that the competitive nature of the international labour market and the tyranny of distance — transport times and cost result in a perception by the investor market that Australian products are less competitive in large scale foreign markets.

### 4. Uncoordinated New Product Management Approach

Most private SME Australian business lack the ability, resources or know how to move a concept from R& D to a successful launch with confidence. Skills in actual New Product Management are often left to the Manufacturing Manager and the Accountant which has its own inherent problems due to differing focuses

## 3.1 What Stops Investment in Individual Firms?

### 1. Inefficient Management Structures and Processes for new Product Innovation

The use of New Product Innovation Systems and analytical tools to evaluate R & D options in a modern format (such as EVA) have not been implemented into the Australian Manufacturing Industry.

Much R & D is conducted in an ad-hoc fashion and pre launch rollouts are under funded and fail in 87% of cases. Management, especially in Australia's many SME's do not have the skills to Manage the process nor the contacts to access mentors to assist with the process.

### 2. Not Sexy

Australian investors — from banks to small investors and large fund managers do not see Australian manufacturing as 'interesting'. They look to the 'new economy' business in technology and communications that promise high returns in the short run.

Investors and risk takers perceive manufacturing as low margin high risk, this is certainly the attitude of the major banks in this country. They have this opinion due to the focus of their business units on import credit enhancement products where the returns and risk are generally with the larger retailers / wholesalers. Additionally, there is the impression that overseas competition, poor industrial relations and old techniques and equipment will continue in this segment and will not be altered.

Venture capital groups view this market segment as unattractive because the investment returns are not high enough (20-30% compound return pa) for the placement of their investment capital.

### 3. Non Performance — Management in New Product Innovation

Manufacturing firms have generally not performed well in the 1980's and 1990's. This is directly attributed to a stagnation in management — highly skilled managers have strayed away from manufacturing. R & D has often been trialled, but funding is not available for implementation of the concepts to a real world environment.

### 4. Limited Manufacturing Scope

According to Bank Policy, Australian Manufacturers are only recognised globally in food, telecommunication and environmental while TCF and Building are seen as “propped up industries”. Whitegoods and Motor Vehicles have been exceptions.

### 5. Lack of 'Real Property' Security

Like many other consumers of funding, Australian manufacturing industry is not seen by debt financiers or equity participants as a 'safe bet'. Financial Institutions will not advance capital or finance any venture that does not have 100% real estate security cover for their debt. These institutions see the only security in appreciating property markets. Therefore manufacturing does not meet their criteria.

Existing major banks do not understand the risk of business, they are content to simply advance funds up to their internal limits against real estate assets only. Delving into the structure of the business, the competency of management and EVA measurement is beyond the ability of the credit lending managers of the banks. They understand residential housing proposals only because of the perceived increase per annum of the value of the housing market.

The implied threat of losing their job if they stray outside the box is too great. Commonplace is the sheep attitude, “no one else is doing this business — why should I take this risk?”

## 6. Lack of Business and Market Plans

Many Australian businesses have not prepared *sound* practical New Business and R& D Blue Print Business Plans or Marketing Plans, which show strong evidence of **implementation** through management and controls. Without these they cannot expect investors to leap their way. While COMET goes along way to assist with this- the program is only available to new start ups and not established businesses.

## 4.0 Solutions

To revitalise investment in Australian for R & D in the manufacturing sector or for any market sector in Australian, the R&D concept its business positioning and valuation must be seen to be renewed and in fact be reborn.

R & D must be seen as a good investment — able to generate good returns. Having the ‘Quality’ seal is not enough. There must be a new management regime that insists on efficiency and returns on investment that is evaluated through tools such as EVA and conducted by management that have access to skills in New Product Management.

**Solution 1** Provide a **New Product Business Management** framework supporting appropriate funding. Where real property does not exist but a business has good potential to grow through R & D — investors are assured by the adoption of the **New Product Business Management program and subsequent funding opportunities as identified in this report**. This includes expert financial management mentoring, new Product Management Skills Resources and an understanding of EVA financial considerations.

**Solution 2** **A Marketability Fund** — providing adequate funds to support businesses with appropriate innovative business plans and growth potential. The funding would be grown through organic means and by extending funding from private and public sector sources. Funds are lent on a commercial basis, so only viable businesses would be involved. Grant funding from existing sources would only compliment lending by the fund. The qualities of the fund manager is also an essential consideration and must include

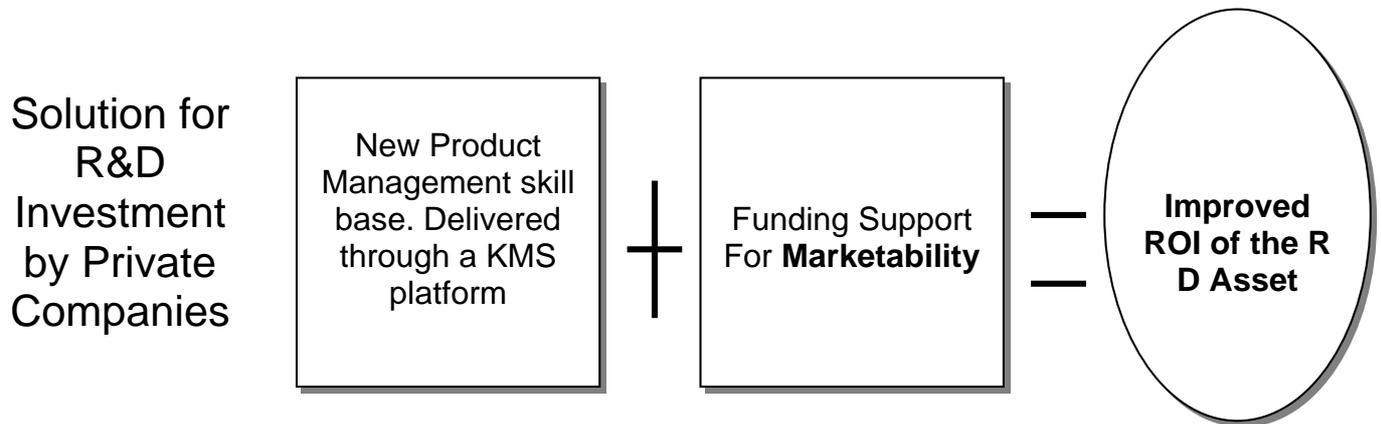
- Disciplined structured plans
- Funding against milestones
- Monitoring performance, both internal to the process and external to the generation of revenue from a successful conclusion
- Provide support and access to networks to assist in the project- not just provide the funds and hope for the best

Solution 3 By placing an **E-Commerce Knowledge Management** platform under the businesses in the program, we would see an integrated R & D knowledge based R&D program and mentoring support that is crucial to many businesses in Australia.

Solution 4 It may be beneficial to suggest some additional tax incentives for replacing existing equipment with technology based capital expenditure.

**The bottom line is that three things need to happen.**

1. Experienced business people need to make the financial decisions based upon a culture that R & D is an asset not an expense, they therefore must understand business and business risk.
2. A Knowledge Management Platform that integrates and co ordinates the Australian skill base in various areas of New Product Management and supported by a Mentoring process to assist Australian companies with the R & D process
3. The access to Australian companies to funding at the **Marketability** stage of the R & D process and not to cease at the development of the technology stage (the commercialisation loan only allows for pilot applications and not full pre-launch funding)



## 4.1 Solution incorporating Knowledge Management Strategy

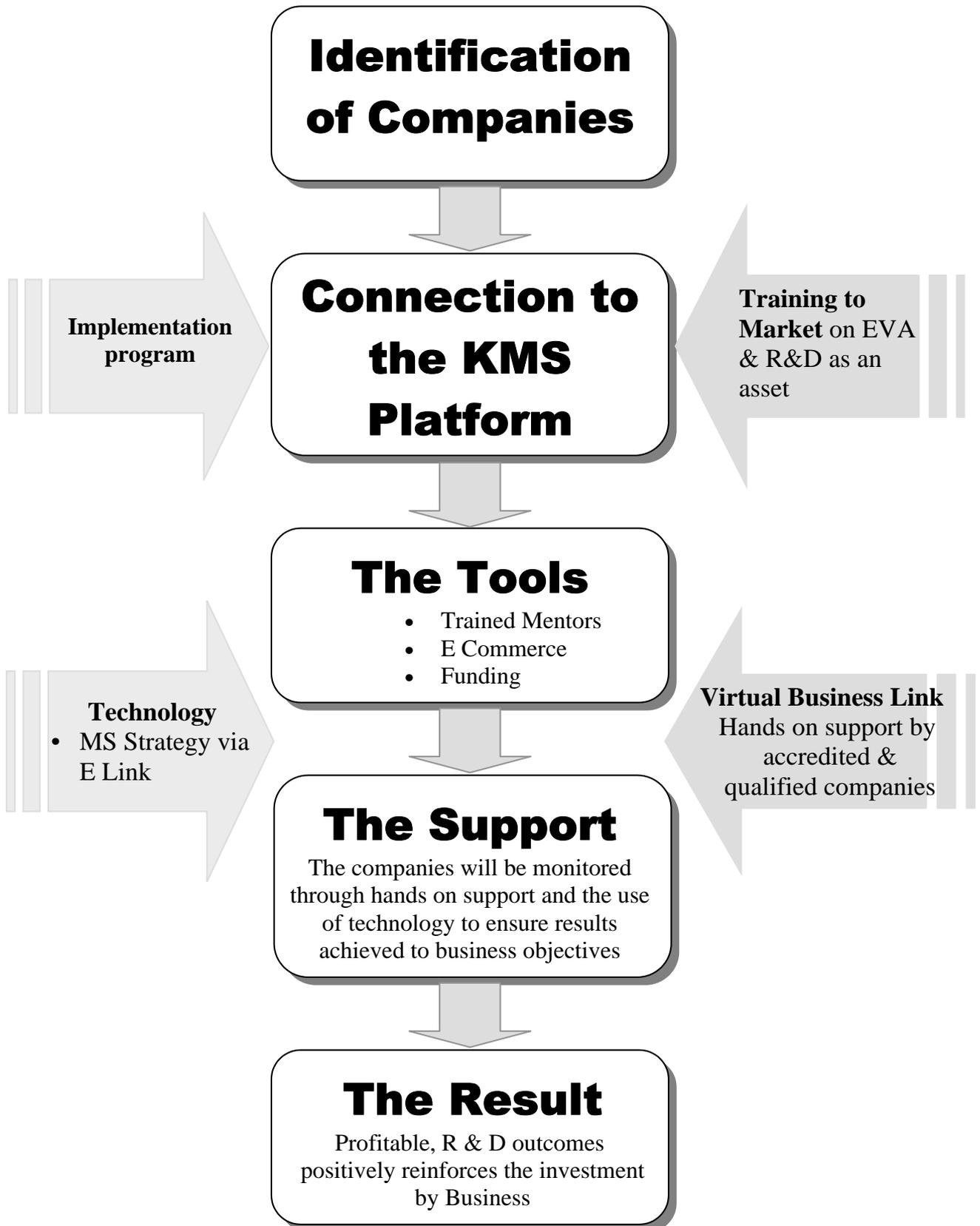
The **New Product Development Process KMS platform** is put into place to ensure initiatives are not ‘thrown’ at the business but rather form part of an overall business development strategy that occurs at a micro level and translates to a macro level of change and support.

Although the tools have been utilised in various forms and ways in the past via Small Business Services and AusIndustry, *never* have they been coordinated in such a way that will ensure success through such an emphasis on implementation, monitoring and control procedures. Thus instead of throwing money to restore and support existing industry, the funds are invested in developing a ‘clever industry’ from the ground up.

The KMS platform will be a vital link for all these companies involved in the program for funding and include:-

- Access to quality market research
- Mentoring
- Access to specialised support
- Access to other resources by government
- New product development
- Management training through the highly credited Kazmarski new product and R&D program
- The EVA calculation for use by participants

### 4.1 The Diagrammatic overview of the R&D marketability program



## 5.0 The 'Marketability' Fund Solution

### 5.1 Introduction

The reasons for such a fund are very well recognised by any person or group who have had any dealings in funding R & D.

These include:

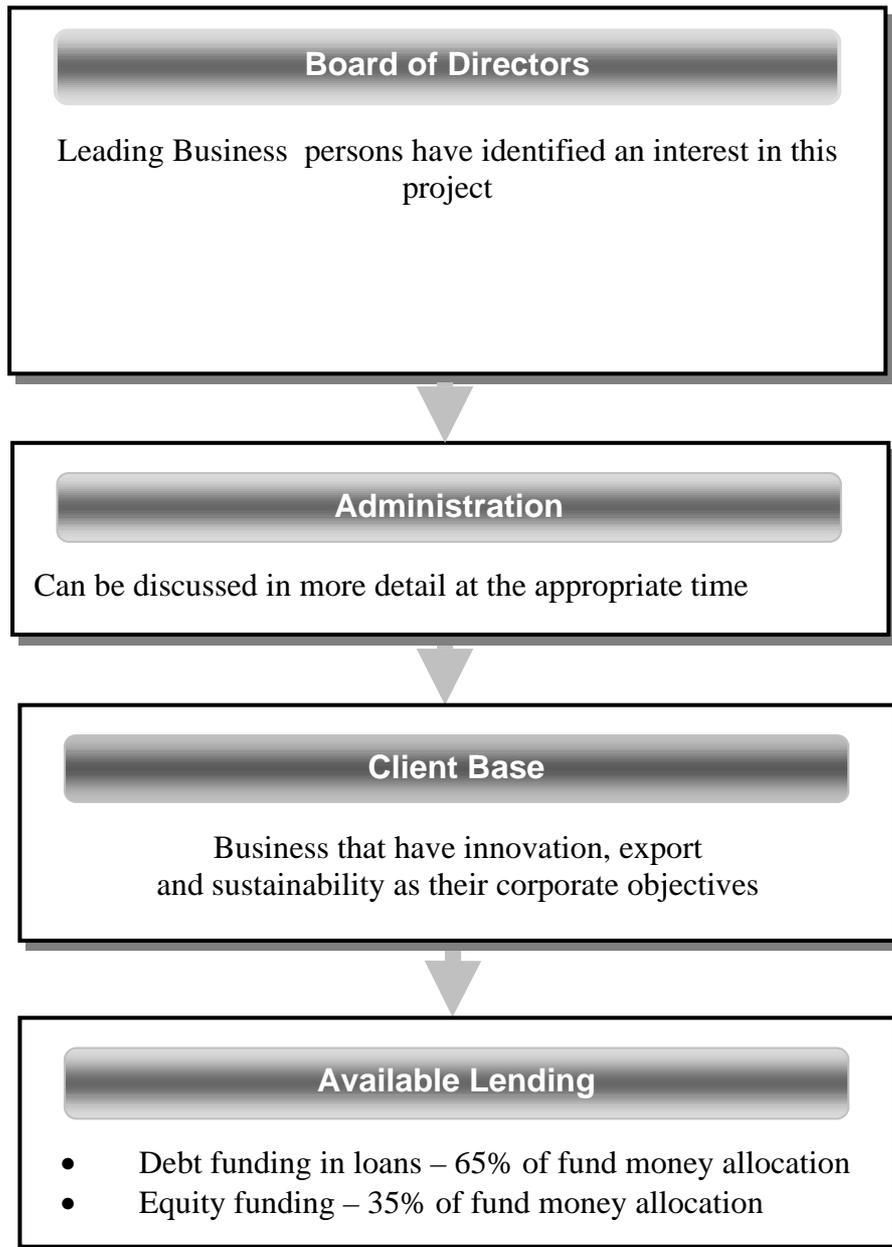
- Provide funding for growth businesses that have limited access to traditional lending.
- 'Anti R & D' sentiments from the major banks
- Non banking lenders have limited skills to provide 'true' and complete financial EVA assessments.

The objective of this fund is not only to provide sensible affordable and accessible lending to business at the R & D **marketability** stage but also to co ordinate it with a New Product Management resources and mentoring program to increase success for business and break the current perceptions of R & D investment.

**In Pennsylvania USA, such a concept has been in pilot stage with results of increased R & D investment by SME's (\$5-\$30m turnover businesses) from 2.7% to 35% for the pilot program participants.**

The Fund is similar to what is being currently supported by Government under the Commercialisation Loan and Innovation Investment Fund however, moves to support the essential '**marketability**' activity that is not covered by traditional lenders and current Government funds.

## 5.2 The Fund Management Suggested Format



### 5.2.1 Conditions

- No one facility will represent more than 10% of funds under management
- The Fund will be a corporate structure with funds in trust for the Government
- Approvals:
  - 2 Directors for \$1.00 to \$1m
  - 3 Directors for \$1m plus
- Funds available to be reinvested to provide continual creation of credit to manufacturing businesses
- Funds are advanced against agreed milestones

### 5.2.2 Benchmarks for Monitoring

- Growth and profitability of business
- Benefit to company through EVA calculation
- Benefit to the National objectives
- Reinvestment return to fund – net return on assets 6%

**SEE RDI**

### 5.2.3 Development Benefits for the Manufacturing Business

- Access to qualified lender to support in financial risk management decisions
- Undertake process of New Product Business Development for improved management which is accessed through the KMS platform
- Input of monitoring and control through advanced E-Commerce systems on a monthly basis
- Member of 'Fund Club' providing:
  - Training in key business functions
  - Access to professional persons for any needs
  - Access to Mentoring on a monthly basis
  - Co ordinate the dissemination of data to technology parks, University Research Units and other interested parties to foster the R&D process further.

*These services will be provided a free service for all loan/equity recipients*

## 5.3 Loan Process

- Application fees and charges must be borne by the potential borrowers. These fees will be prescribed
- Much of the work required for an application to progress will be undertaken at least in the first instance by registered service providers, increasing the business activity for them and the manufacturing sector
- Approved external independent consultants will utilise the pre designed information format for completion of key information for Board evaluation

## 5.4 Loan Structure

The fund will have a mix of debt and equity funding available to the client. It is suggested that the fund have a break up of fund disbursement of 35% equity and 65% debt. The evaluation of the client's needs will be made by the Board.

- The investment ranks ahead of all other unsecured creditors and the shareholders
- As a secured provider the fund is unlikely to become caught in, should they occur, shareholder (or owner) disputes or issues arising from the break up and succession planning of held private companies with whom loans are advanced
- Proprietorship/internal loans will be subordinated

## 5.5 Criteria

The fundamental purpose of the **Marketability** Fund is to provide implementation finance to businesses during the **Marketability** stage that cannot be accessed through normal commercial channels. Emphasis will be placed on the management ability of the applicant and their product/service growth potential.

In Particular:

- This must be supported by the Kazmarski New Product Development Program ( leading program used by World Bank, 3M and USA Small Business Development Unit R & D). There must also be a return on investment to the Commonwealth by way of increased jobs, increased turnover and increased profitability along the lines currently assessed for existing programs (innovation, exporting and sustainability)
- The applicants must be able to demonstrate a national benefit and a genuine need for support. The fund will be restricted to SME's with a turnover below \$50m and they must be an Australian tax paying entity

The criteria for the loan advances would be developed by the board in line with current Government support policies and would invariably include criteria such as:

- Proven and established business performance and acceptance of being part of the KMS platform
- A demonstrated level of competent business management, R&D blue print and innovation business analysis
- Core business in an area which if supported could in turn attract and develop satellite businesses as vendors and purchasers of its product thereby extending in effect the reach of the fund
- Appropriate security will be taken to support the loan including company charges, liens and directors/personal guarantees each application will have its own security structure
- Demonstrable potential to grow, given the opportunity of funding.
- Potential to export and potential to create workforce positions
- Monthly reporting via E-Commerce to the fund on the key business risk elements identified in the business and marketing plans
- External verification of the business performance as compared with budgets on a quarterly basis

### 5.5.1 Red Tape Management

The writers have considered and minimise the red tape issues that typically delay the decision making process in existing financial institutions, the two most common areas of red tape delay in supporting regional applications are:

- Having the experience in understanding and vetting the applications within the fund
- Speedily identifying and progressing commercial worthy applications that are within the criteria of the funds' scope

The fund will facilitate the approval process through to the knowledge and experience of the board members who have many years of working in a spectrum of financing fields. Their proven experience will allow for the successful development of existing businesses in manufacturing Australia through extended R & D programs.

Coupled with the Board's experiences will be the support from the registered service providers who will strategically ally themselves with the fund by identifying and "sifting" initial requests for loan support from the fund.

Additionally, an EVA model has been developed for evaluation of the R&D project.

## 5.6 Requirements to Commence

- Approval to commence Pilot Program from Government Authority
- Development of the Knowledge Management Virtual Site (KMS Platform)
- Agreement on fund criteria
- Completion of budget for the operation of the Fund

## 6.0 Conclusion

**Marketability** is the most recognised area of “lack” that the R & D process and New Product Management process faces.

To truly administer change and achieve the type of sustainable R & D investment desired by all interested stake holders, **Marketability** is a very important component of the strategy.

Two distinct elements are needed for this strategy to work:-

1. A New Product Development process that has the elements of real and tangible support, planning, implementation and control driven by quality information and technology managed by a KMS platform
2. Funding to support the change within an area not currently addressed by market forces

*The benefits are very real and substantiated:-*

- Australia needs increased R & D investment that is Privately driven
- For every \$1 of turnover earned by a manufacturer 60%<sup>1</sup> is recirculated to other businesses to provide goods and service. Thus development of R & D for this sector has strong national benefits. As opposed to IT and services which only recirculates 25%
- **Marketability** funding will create continual successes in R & D and be the change driver towards a greater appreciation for R & D as an asset investment rather than simply looking at it as an expense and risk focus for management and lenders
- *Australia needs R & D and improved New Product Management Skills. This will be achieved through such an approach as discussed in this document.*

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<sup>1</sup> USA Dept of Manufacturing and Construction 1999

# Appendix I

# Further Comment on EVA and changes to our Accounting methods

A new financial metric called Economic Value added, or EVA, is gaining momentum both on Wall Street and among company managers. For the scientist, it is tempting to view EVA as simply one more financial metric. However, this is not the case. EVA fundamentally changes the accounting landscape by treating R&D as a strategic capital cost rather than an expense. This induces a number of interesting changes that affect R&D. Some are strictly financial, such as changing the way that R&D is budgeted. However, others impact a wide variety of aspects central to R&D success. For example, EVA can provide a framework for technology valuation, affect R&D portfolio management, influence technical idea generation the cost and availability of funding and reinforce the role of R&D as an investment in the future of the company. For small business this is a critical issue.

The valuation of R&D has been the subject of numerous publications and recently, a comprehensive book by F Peter Boer. Most of these publications use a variety of financial metrics such as net present value and return on investment. Some also treat the so called “soft side” behavioural issues that are associated with applying such metrics to technology.

EVA (registered trademark of Stem Stewart & Co) is a financial tool that has been gaining adherents among company managers and investors. Fortune magazine called it “today’s hottest financial idea and getting hotter”. The investment house Goldman Sachs cites EVA models as being “reliable indicators in:-

1. assessing overall enterprise performance
2. identifying the primary drivers that enhance shareholder value
3. determining the capital efficiency of a company
4. aiding the equity valuation process

However, expensing R&D outlays indicates that their value is exhausted in the period incurred. This strikes against common sense because R&D is usually viewed as an on going investment to the future. This is, perhaps, another case of economic vs accounting reality. Along these lines, it is interesting to note that during the acquisition of an R&D intensive company, accountants will sometimes record R&D as “goodwill” for the buyer even though it has been expensed to the seller. When this happens, R&D is effectively an asset when acquired, but not when it is home grown.

## EVA & R&D Portfolio Management

In addition to providing a framework for measuring a company's financial performance. EVA provides an excellent tool for R&D portfolio management. To increase EVA corporations must invest in projects that yield after tax operating profits that exceed the cost of capital committed over the life of the project. There are basically 3 ways to increase EVA:-

1. Earn more profit without using more capital – 2 classic examples of getting more return from the same capital infrastructure are simply selling more and upgrading the product mix to focus on higher margin products
2. Use less capital – ways of employing less capital range from selling off under performing assets to negotiating consignment inventories with suppliers
3. Invest in high return products – examples of investments that are expected to provide a high rate of return include seed money for investing in new business models (eg e-commerce) and acquisitions

R&D is a primary driver for EVA growth because it contributes to EVA in each of these 3 areas. In each case the goal is to invest R&D time and money in order to receive an expected payback (eg improved processes, new products, new technologies etc). Measuring the return on this investment can be done in a number of ways, such as manufacturing cost savings, income from new product sales, residuals from licensing agreements and so on. As is always the case with R&D portfolio management, the key to success is choosing the right number and mix of projects to succeed against some measure or set of measures. In this case, the measure is EVA.

### EVA, R&D & cultural issues

Becoming an EVA driven company is not as simple as keeping an EVA score card. It requires that EVA become part of the corporate culture. Making this transition is not simple. If a focus on EVA has been ingrained into the culture, it should not only change financial performance, but affect behaviour as well.

The most obvious behaviour change that might be expected is one of fiscal responsibility. As an example, consider what often happens in a budget driven organisation. As the end of the year draws near, a department might find itself well below or well above budget. These instances can often induce knee jerk reactions, such as cutting all travel to eliminate costs or sudden spending to use up excess funds in the budget. Many scientists can tell tales about being suddenly asked by management to cut expenditure an extra \$100,000 in March to June to meet budget. This type of spending strikes against common sense. However, if performance against budget is your financial metric, the “cost” of spending that disappears the following year. Under EVA, the effect of R&D spending will not only be felt in decreased financial performance, but it will continue to be felt for the next 5 years since all R&D costs are capitalised and amortised.

It is important to stress that a focus on EVA can induce cultural changes beyond financial ones. One EVA induced cultural change that can affect scientists and engineers is a potential shift in the type of projects pursued. This can occur in numerous ways, from influencing idea generation at the grass roots level to direct management of the R&D portfolio. For example, on the negative side EVA might make certain managers hesitant to propose capital intensive projects since the exposure becomes greater. This, in turn, might result in too much focus on adjusting the current product portfolio and not enough on new investments or step out technologies. If this occurs often enough EVA might effectively “de capitalise” a company and potentially destabilised a company that is a target for a competitor or its staff are lost.

R&D leaders from 5 different companies felt that a focus on EVA had affected portfolio management to some degree. In particular:-

4 of the 5 felt that EVA had changed the perspective of bench level scientists and engineers regarding project prioritisation, 2 to “substantial” levels. It is interesting to note that the lone dissenter was also the one who did not employ EVA based compensation at all levels.

- ⇒ The same 4 felt that EVA had also changed the product portfolio made by R&D management, 2 to “substantial” levels
- ⇒ 4 of the 5 (but a different set of 4) felt that EVA had changed the type of technical ideas generated by the organisation.
- ⇒ These same 5 R&D leaders were also asked about the effect of an EVA focus on the perceived value and role of R&D. One company had reported that EVA affected portfolio management minimally . The remaining 4 R&D leaders all viewed that a corporate focus on EVA had affected the perceived value and role of R&D. In particular 3 of the 4 viewed that EVA had changed the perceived value of R&D within the technical organisation itself, 2 to “substantial” levels

- ⇒ All 4 felt that EVA had changed the perceived value of R&D at the senior executive level, by the sales and marketing organisation and by the manufacturing organisation

## R&D drivers for EVA growth

1. Earn more profit without using more capital
  - developing new products that don't require capital investments
  - developing more efficient processes
  - identifying cheaper alternatives for raw materials
  - finding applications for by products
  - Increase global market opportunities
2. Use less capital
  - improve process efficiencies
  - redesigning processes
3. Invest in high return projects
  - new product development
  - creating a new and / or discontinuous technologies

## Values – from EVA to total shareholder return

The word 'value' has become a fixture of the business lexicon during the past 2 decades. Unfortunately, this omnipresent word is being used in two very different contexts: economic value and market value. The two forms of value are not at all the same. The distinction is profound for R&D, because innovation initially comes at a cost in economic value, but is equally often a driver for market value the failure of the .com's emphasise this.

## Economic value

The term Economic Value is invoked in much current business jargon, explicitly in such concepts as EVA and implicitly in discussions of 'value chains' and 'value propositions.' The economic value of an enterprise is determined by the projects sum of its free cash flows, discounted by its cost of capital. It is synonymous with present value as used in finance texts.

## Market value

For professional investors in securities, the bottom line is not economic return but total shareholder return (TSR), defined as the appreciation of the stock price plus dividend payments. This is ‘cash is king’ reasoning, because liquid securities and cash dividends mean cash to an investor. To money managers, total return is also their report card. In such a world, the Market Value of a stock is the final metric and Economic Value is but one of its components. Investors also gauge each firm’s strategic position, plus other factors contributing to Market Value such as investor sentiment and macroeconomic trends. Shareholders value has largely come to be synonymous with current market value stock price and executives or directors who ignore this reality do so at considerable peril.

## The intellectual capital ‘solution’

During the 1990’s as the valuation gap was growing, a host of articles began to extend the venerable concept of intellectual property to the concept of intellectual or knowledge capital, which added an important new dimension to intangible assets.

Some writers even chose to define intellectual capital as the difference between market value and the value of the tangible assets. This approach is exemplified by this quotation: “The greatest challenge facing any organisation today is in understanding the huge differential between its balance sheet and market valuation. This gap represents the core value of the company – its Intellectual Capital.”

## Strategic capital

We are now ready to turn to the alignment of strategic value with economic value via real options the goal of Stewart Myers. With real options, the strategic link between R&D and corporate strategy can be measured, giving a quantitative solution to the problems discussed subjectively in third generation R&D. Strategy has long been recognised as central to practitioners of industrial R&D, since much of their purpose is to create strategic value for their employers.

The key is to define Strategic Capital as the value of a firm’s real options. The total value of the firm thus becomes the sum of its economic capital and its strategic capital. Strategic Capital becomes the missing element described above in our discussion of the crisis in valuation and in this view strategy becomes the framing of an attractive portfolio of real options. Not all Strategic Capital is R&D, but surely R&D that creates new investment opportunities for the corporation will be an important contributor to strategic value.

## R&D effectiveness

R&D managers are regularly asked to justify their budgets with backward looking questions like “What payoff can I expect from our R&D programs?” these have been difficult questions to answer, especially since profitability measures in real firms are usually aggregated at the strategic business unit (SBU) level, not by individual products or technologies. In addition, the question of profits is tied directly to issues of how indirect costs and capital are allocated, which can be complicated, arbitrary and contentious.

With the wide spread adoption of ERP (enterprise resource planning) systems, such as those marketed by SAP, it is becoming increasingly easy to identify profitability at the product and even the customer level. Direct measurement of profitability, product by product, will be feasible and will be the wave of the future. In its absence, the R&D manager should use data that are readily available, such as product revenues and SBU profits. This writer recommends that aggregate profitability levels for the SBU, such as return on sales & return on capital, be used. Because newer products typically command higher margins than older ones, the estimate is not only easy to make, but is likely to be conservative. It then becomes straight forward to evaluate the economic value created by the R&D investment vs the cost of the R&D program.

The forward looking question differs in two respects. Firstly, it requires estimates of unique risk, which can be obtained from an internal corporate database, by industry benchmarking, or by expert opinion. The pharmaceutical industry, for example, has a very good handle on the probability of commercial success for yields a DCF model of the projected profits & the economic value (NPV) of the program, assuming commercial success. The expected value of a total R&D program can then be calculated as the products of the project NPV's and the probabilities of success. More sophisticated calculations can be made using Decision Tree, Monte Carlo and Real Option Model.

## The manager's new tool kit

New tools inevitably affect the way managers think and behave with regard to R&D finance. I shall focus on three: the spreadsheet, the electronic database and the Internet.

With the assistance of several colleagues at Dow Chemicals, I wrote my first business plan in 1977. It took several days to hand crank the numbers and at the end of the exercise, when the results were apparent, the business team would have liked to make several adjustments, but the deadline was upon us. Just a year later, Robert Frankston and Don Bricklin created the first spreadsheet program, Visicalc, an electronic ledger book, which replaced the accountant's columnar pad, pencil and calculator. While financial analysis software was then available on mainframes, Visicalc ran on an early personal computer (the Apple II), its results could be seen immediately and the analyses could be done over and over again. It was ideal for financial modelling. User friendly graphics capabilities soon added additional power to the spreadsheet program. Both spreadsheets and personal computers became increasingly feature rich.

Lotus 123, derived from Visicalc, was introduced by Mitch Kapor in 1983 and became the single leading software for micro computers. By 1984, my colleagues and I were using Lotus to build pro-forma business models to evaluate the attractiveness of R&D products using DCF methodology. In 1987, new spreadsheets such as Excel started to emerge, which took advantage of the graphical user interface (GUI) and improved graphics. Soon spreadsheets were incorporated into 'office suites' allowing fast integration of tables and charts into work processing documents and presentation software.

Two other enhancements of spreadsheet software are extremely useful for dealing with the uncertainties inherent in R&D modelling. One is the basic statistical / mathematical package incorporated in Excel and Lotus. It allows the easy manipulation of probability functions, such as the normal distribution and the Black Scholes option formula. Even more powerful are Monte Carlo bolt on programs, such as Crystal Ball, which allow the user to run many thousands of iterations of an Excel spreadsheet, in which sensitive variables are given predetermined probability distributions. The modern microprocessor's capabilities are such that 100,000 iterations of a detailed spreadsheet can be run while the analyst is making a cup of coffee.

The second major innovation during this period has been the growth of electronic databases. Databases may be private and confidential, available to the public for a fee, or within the public domain. Among the most useful private databases are the financial and technical histories of R&D projects, which enable companies to calculate probabilities of success and to project future costs and revenues. An abundance of data suitable for benchmarking has been compiled in the IRI/CIMS database.

One caveat for the R&D practitioner: a traditional approach to R&D risk management has been the view that R&D projects may fail for either technical reasons (unique risk) or for commercial reason (which can combine unique and market risk). We have seen that probability is not the best tool for dealing with market risk, so the interpretation of historical data may need revision in terms of what we now understand about risk, so the interpretation of historical data may need revision in terms of what we now understand about risk. For example, while I was at WR Grace, we had a portfolio of projects in the areas of advanced environmental technology. Nearly all of the projects were to fail for 'commercial reasons.' However, failure occurred during a period when environmental firms as a whole were having extreme difficulty earning the cost of capital. Hence, it may have been inappropriate to attribute the failed projects to unique (diversifiable) commercial risk, but rather to broader, undiversifiable, market risk. This observation is obviously applicable to other technical sectors subject to market forces: energy, health care and telecommunications have all hit rough patches in recent memory.

The Internet is also increasingly powerful resource for financial analysis related to R&D. Enormous financial databases are updated daily on free Internet sites such as Yahoo, Big Charts and the Chicago Board Options Exchange ([www.cboe.com](http://www.cboe.com)), while Bloomberg and Reuters market proprietary data systems for financial professionals. The information is far more current and in a more useful format, than the paper based databases of 20 years ago. Public financial documents from competitors, customers and suppliers are also available on the Security and Exchange Commission's Edgar online website. Search engines such as Google facilitate online research and uncover new sources of information of which professionals may have been barely aware. Obviously, the development of cheap and powerful microprocessors and growing broadband capabilities have made information resources more affordable and often more productive than the specialised commercial databases on which professionals relied in the 1982's.

While none of these individual developments was enabling in its own right, the cumulative impact of the new tool kit has been a revolutionary increase in the quantity, quality and productivity of financial analysis for R&D managers.

## New trends in R&D finance

New trends in corporate finance and a new toolkit are naturally to be expected to cause structural changes in industry R&D. In fact, the changes that have taken place in the past 2 decades have been remarkably far reaching.

## Impact of leveraged buyouts and Growing role of venture capital

These fund groups only have a short term outlook which included sell of and return within 7 years on the investment and thus valued on market value rather than long term economic value

The key is to define strategic capital as the value of a firm's real options

R&D costs at a cost and it is as capable of destroying value as creating it. Our thinking will not return to where it was in the 1980's. Shareholder value has largely come to be synonymous with stock price. With options thinking comes the perspective that risk can be a source of advantage.

Many Internet investors forgot that there are well defined limits to the value of options and also that options expire.

Direct measurement of profitability, product by product, will be feasible and will be the wave of the future.

Long term R&D was often curtailed to shore up short term cash flow.