

Incentive usage on SIP programme

While the chemicals industry's share of successful applications for the SIP programme has fallen (from ~70% to 50%), the chemical industry is a major recipient of this incentives programme. Its key aim is to attract industrial investment into South Africa and create employment opportunities. Successful past SIP applications include:

- ▶ Umkoomas Lignin (Pty) Ltd – development of a lignosulphonates plant mainly for export
- ▶ African Oxygen Ltd – development of a new bulk gas plant
- ▶ Sasol Octene – development of a purer Octene manufacturing plant
- ▶ Sasol DIA – investment in an acrylic acid plant

The following table shows the awards of Strategic Industrial Projects by dti/TEO for 2002 and 2003:

Strategic Industrial Projects		2002		2003	
		Total	Chemicals	Total	Chemicals
Number of successful applications		7	5	8	4
Tax Forfeited		R491 m	R167 m	R381 m	R166 m
Provincial breakdown of successful applications	Western Cape	1	1	1	1
	Gauteng	2	2	4	1
	KwaZulu-Natal	2	1	1	0
	Eastern Cape	1	0	1	1
	Mpumalanga	1	1	2	1
% BEE ownership of all successful applications		0	0	0	0
Number of unsuccessful applicants:		2	0	1	1

5.3 Overview of perceived gaps in incentives and government support by industry participants

Key issues raised in terms of the strategic importance of incentives include the following:

- ▶ Government incentives are seen as critical for supporting individual businesses and the chemicals sector overall
 - As incentives help to counteract some of the competitive challenges vis-à-vis global competitors it is critical that the incentives offered by the South African government are comparable to key competitors (e.g. India or China)
 - However, government support in other areas such as regulation and similar “enabling environment” support measures are equally important
- ▶ Successful applications are seen as highly effective; e.g. the amount of incentives is appropriate to the development need
- ▶ The dti is generally seen as providing relatively good support for larger companies
- ▶ While large corporate players generally have the capacity to develop the incentives application, the process could be simplified

The following gaps in support and improvement opportunities for the provision of government incentives have been identified:

- ▶ Gaps in financial support schemes:
 - (Perceived) fragmentation and gaps, with inadequate accommodation of sector-specific needs e.g. accommodating capital intensity of most chemicals companies²⁶
 - Lack of incentives that help access market information
 - Insufficient incentives to help marketing in export markets
 - Support for start-ups
 - Incentive structure – i.e. tax breaks – more applicable for established industry players vs. start-ups
- ▶ Gaps in incentive administration
 - Lack of awareness of government support and criteria for qualification for incentives are not widely known²⁷
 - Wide range of incentives can be confusing to assess
 - Hard to determine eligibility prior to filling in application
 - No single point of contact that assists in determining most suitable incentives for which to apply
 - Application process is complicated and often cumbersome
 - Hard to determine eligibility prior to filling in application
 - No single point of entry where general details are filled in once
 - Lack of transparency once application submitted
 - Including lack of timely feedback if application not successful

²⁶ Note: It has not been possible to verify this through the incentives usage analysis due to lack of data availability

²⁷ Note: These challenges are stronger for smaller companies and new entrants

C. RECOMMENDATIONS

6 Recommendations to improve overall government support

The following recommendations were made that apply to both innovation and large scale companies, as they pertain mostly to administration, communication and access issues:

- ▶ Incentives administration
 - Streamline and coordinate incentives for the sector across the entire innovation chain
 - Develop tools that enable potential applications to easily assess which incentives fit a given strategic business need and to make a quick first assessment of eligibility
 - Simplify application procedures and tailor to chemicals industry
 - Potentially create “accounts” or “applicants database” so that company information of repeat applicants can be stored
 - Develop a single source of information and application resources on innovation related incentives and support programmes – include information on all programmes, links to relevant incentive entities, information on eligibility and application processes, worked examples and case studies, etc.
 - Provide a “one-stop-shop” service where applicants can present the project and its objectives and be connected with the appropriate incentives entity
 - Improve transparency of application approval process
 - Introduce tracking system where applicants can view progress and timeline for resolution of their application (the dti is currently in the process of developing a similar system)
 - Improve transparency of incentive utilisation records to allow further assessment of the impact of incentives
- ▶ Make existing government incentives more accessible to the chemicals sector
 - Publicise available incentives in key industry publications (e.g. Engineering News) and to industry service providers (e.g. professional service providers, CSIR, universities, etc.)
 - Communicate changes to government innovation support and implications for the chemicals sector once the plans are finalised (e.g. Foundation for Technological Innovation; Small Enterprise Development Agency)
 - Communicate role of Manufacturing Advisory Centres/replacement SEDA access points - potentially provide single point of contact that assists in determining most suitable incentives for which to apply
 - Enhance role of intermediaries/consultants
 - As it is estimated that over 95% of TEO's applications are received through consultants (this is likely to be similar for other incentive applications), improving the role of these consultants could be an effective way to improve process administration and information sharing
 - Develop criteria for preferred suppliers
 - Establish a Code of Practice
 - Provide information for professional advisors to the sector (e.g. business consultants, accountants, research institutions, universities, etc.)

7 Recommendations to improve government support for innovation

Based on the analysis there appear to be the following gaps in support and key improvement opportunities:

- ▶ Innovation incentive strategy
 - Change eligibility criteria – lobby for improvements in government incentive prioritisation to make key growth areas in the chemicals sector a priority area for innovation funding (such as biotechnology), in order to increase the share of innovation incentives that are accessible to the chemicals sector
 - Additional funds
 - Lobby for additional funds to help the discovery and early feasibility testing of new concepts
 - Lobby for additional funds to help accelerate commercial ramp-up after the pilot stage development and initial market entry
 - Accelerate the implementation of government-backed venture capital under the proposed Innovation Fund
 - Focus on human capital
 - Lobby for additional funds or incentive programmes that encourage employment of more research personnel (e.g. grants)
 - Resolve the current policy tension under which development strategies that aim at upskilling staff for production activities are prioritised over strategies that aim at increasing employment in research and development
 - Lobby for programmes that develop entrepreneurial skills for S&T graduates
- ▶ Develop Innovation Centres to foster collaboration and skills development across entire innovation chain
- ▶ Lobby for more public sector investment in infrastructure and skills development
 - Secure additional funding of specialised chemical sector (and related knowledge and know-how) university departments to carry out basic research; this can then be commercialised in partnership with the private sector once new concepts are proven

Given the relatively small size of the South African market it is important to prioritise research areas that are able to sustain investments in innovation. While the market may not sustain major programmes of blue sky/basic research, future innovation support programmes should encourage research into new product development (rather than product modification and process improvement research) in sub-sectors with high growth potential. New product development is particularly important to increasing beneficiation and the higher value added chemicals in the sector.

In addition the study highlighted a range of wider measures to improve innovation in the chemicals sector:

- ▶ Establish an innovation policy for the sector
- ▶ Conduct regular “innovation audits” using key measures of *innovation intensity* and possibly also *innovation direction*

8 Recommendations to improve incentive offering to large enterprises

Based on the analysis there appear to be the following opportunities to improve support for large enterprises:

- ▶ Incentives strategy
 - Encourage development of additional start-up finance schemes as there is a potential market failure amongst private sector lenders to provide adequate funding
 - More support for accessing market information and conducting marketing activities in key export markets
 - Identify qualification criteria and funding requirements for expansion of existing programmes such as EMIA and National Pavilions
 - Review level and terms and conditions of development finance and tax incentives
 - Investigate further the support provision for start-ups including, for example, soft loans (as opposed to tax breaks), funding of technology, subsidies for major capital equipment, etc.
 - Ensure that granting criteria take into account the capital-intensive nature of the chemicals industry

Many of the administration related improvements are not exclusively relevant to the chemicals sector, and might also be applicable to other sectors or incentive offerings in general.

9 Next steps

It is recommended that the request for further statistics on incentive utilisation should be raised through the Trade and Industry Chamber of Nedlac.

Following consideration of the report's recommendations in the Chemicals Sector Summit process, relevant government departments would need to give effect to any agreements reached when reviewing their incentive administration and design.

Annexure 1: R&D indicators used in South Africa's National R&D Strategy

Quality of life

- ▶ Technology Achievement Index (developed by the UNDP)
 - Technology creation index
 - Patent index
 - Royalty and license fee index
 - Diffusion of recent innovations index
 - Internet host index
 - High- and medium-technology export index
 - Diffusion of old innovations index
 - Telephony index
 - Electricity index (based on consumption)
 - Human skills index
 - Mean years of schooling index
 - Gross tertiary science enrolment index

Growth and wealth creation

- ▶ Technology based economic growth

Science, engineering and technology human capital

- ▶ Researchers per thousand of workforce
- ▶ SET demography
- ▶ Technical progress

Technical progress (improvement and innovation)

- ▶ Patents
- ▶ Number of SA originated US patents
- ▶ High-tech start-ups
- ▶ Business innovation investment
- ▶ Key technology missions

Business performance and key industrial sectors

- ▶ Technology/trade mix
- ▶ Proportion of high-tech firms
- ▶ Sectoral performance

Future R&D capacity

- ▶ University enrolments (S&T)
- ▶ Proportion of S&T tertiary students
 - Of all tertiary students
 - Of age group
- ▶ S&T post-graduate degrees
- ▶ Matriculants with Maths and Science

Current R&D capacity

- ▶ Publications
 - Citations per article
- ▶ Global share of publications
- ▶ R&D intensity (investment)
 - Business R&D intensity
 - Government R&D intensity
 - Government R&D expenditure/ GDP

Imported know-how

- ▶ Technology balance of payments
- ▶ Imported high-tech equipment

Annexure 2: Overview of incentives available to chemicals industry

The following table provides an overview of existing incentives applicable to manufacturing sectors in general and other support mechanisms that are applicable to the chemicals sector²⁸. Darker cells denote financial support/incentives, while lighter cells represent wider support mechanisms.

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
The Enterprise Organisation	Critical infrastructure Fund	<p>A cash grant of up to 30% of the costs of any project to improve critical infrastructure.</p> <p>Aims to improve competitiveness, create economic development and jobs, support activities that have strategic economic advantages for South Africa, and achieve a more even geographical spread of economic activities</p>	<p>Broad range of entities to which this is available, including:</p> <ul style="list-style-type: none"> ▶ local government ▶ provincial government ▶ private sector ▶ private public partnerships ▶ industrial development project operators ▶ Strategic Investment Programme applications ▶ investors in strategic economic projects 	All sectors which operate in sectors that develop infrastructure	<p>Qualifying infrastructure includes:</p> <ul style="list-style-type: none"> ▶ Transport systems ▶ Electricity transmission and distribution ▶ Telecommunication networks ▶ Sewage systems ▶ Waste storage and disposal ▶ Fuel supply systems <p>Qualifying costs include:</p> <ul style="list-style-type: none"> ▶ Direct installation, construction and erection of infrastructure costs ▶ Remuneration costs paid to employees ▶ Direct material costs ▶ Cost of new capital items

²⁸ Please note that this overview focuses on support mechanisms available to large corporate ventures; Blueprint conducted an analysis of support mechanisms available to SMME businesses in parallel to the work of Kaiser Associates.

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Accelerated depreciation allowance	<p>Allowance to write off manufacturing assets over 4 years. +40% of cost in first year and +20% for the next three years</p> <p>Aims to promote acquisition of new assets in manufacturing sector.</p>	All entities in South Africa that meet qualifying criteria	All	<ul style="list-style-type: none"> ▶ Must have acquired assets after 1 March 2002 ▶ Must be establishing new manufacturing plant or expanding existing plant ▶ Available to local and foreign firms

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Industrial Development Zone	<p>Purpose-built, industrial estate designed to encourage international competitiveness in South Africa's manufacturing sector</p> <p>Advantages include import tariff exemptions, VAT incentives and transport linkages:</p> <ul style="list-style-type: none"> ▶ Direct links to an international port or airport. ▶ Dedicated customs support services to expedite excise inspection and clearing ▶ Duty-free importation of production-related raw materials and inputs ▶ A zero rate of VAT on supplies procured from South African sources ▶ Import status for finished goods which are sold into South Africa ▶ Government incentive schemes ▶ Reduced taxation and exemption for some activities/products ▶ Access to the latest information technology for global communications 	Targeted at companies focused on manufacturing for export	All manufacturing	Note: There is currently suspension on any new IDZ designations

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Foreign Investment Grant	A cash incentive that compensates foreign investors up to 15% of moving new machinery and equipment (excluding vehicles) from abroad, up to a maximum of R3m	Large enterprises	Manufacturing	<p>The grant applies to qualifying transfer, freight, travel, statutory, local and foreign costs for new machinery.</p> <p>The scheme is available to foreign investors with a shareholding of at least 50%, where applicants also qualify for the SMEDP.</p>
	Strategic Industrial Projects	<p>Provides industrial investment allowances in the form of tax relief for costs relating to industrial assets.</p> <p>The allowance is either 50% with a maximum value of R300m or 100% with a maximum of R6m, depending on evaluation according to qualification criteria</p>	Focuses on large businesses as minimum investment considered is R50 m	Manufacturing (excluding tobacco), computer and computer-related activities, research and development activities	<p>Investment in qualifying activities should not be less than R50m, and the project should:</p> <ul style="list-style-type: none"> ▶ increase annual production of the relevant sector ▶ not substantially displace jobs ▶ promote employment in the sector ▶ not be benefiting from certain other schemes <p>Projects are evaluated for qualification according to:</p> <ul style="list-style-type: none"> ▶ introduction of new processes or product ▶ filling a critical gap in an industrial cluster ▶ involvement of a process that represents at least 35% value added ▶ sourcing of inputs from SMMEs ▶ provision of infrastructure freely accessible to general public ▶ job creation
	Sector Partnership Fund	Grant (max R 1 million) covering up to 65% of preparation costs for technical and marketing programmes	Large enterprises	Manufacturing and Agro-processing	<ul style="list-style-type: none"> ▶ Initiative must focus on new investments/ skills/ research and development

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Small and Medium Enterprise Development Programme	Two year cash incentive on qualifying assets and 3 rd year if labour requirement is met. Aim is to create wealth, generate employment and develop entrepreneurship	Small and medium enterprises	<ul style="list-style-type: none"> ▶ Manufacturing ▶ Tourism 	<ul style="list-style-type: none"> ▶ Must invest a maximum of R100 million in land, buildings, plant, and equipment as part of new projects or of the expansion of existing ones ▶ Open to foreign and local firms
	Skills Support Programme	50% grant of the actual training costs, the development of a training curriculum, and land and buildings related to training Up to 30% of firm's annual wage bill granted if training programme is approved	General	All	<ul style="list-style-type: none"> ▶ Must qualify for SMEDP or SIP first in order to apply ▶ Training programme must be certifiable
	EMIA	Contributes to exhibition costs, travel and transport costs, subsistence allowance for exhibitors at selected trade fairs and exhibitions	PDIs and SMMEs	All	<p>Granted on the basis of the expected demand for the product in foreign markets, as well as:</p> <ul style="list-style-type: none"> ▶ product range on RSA pavilion ▶ quality of product ▶ number of possible participants ▶ size of exhibition products/material ▶ timely application
TISA	Registration of patents, trademarks and quality marks				

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Sector specific assistance (export councils, industry associations, Joint Action Groups etc)				
CIPRO	Registration of CC's and companies				
SABS	Product testing	Subsidy for SMMEs testing products.			
	Product certification (Mark scheme) and Capability Assessments				
	System Certification (ISO 9000, 14000, OHSAS 18000, HACCP)				
IDC	Finance for the expansion of the manufacturing sector	Finance provided in the form of equity, quasi equity, suspensive sales or loans at competitive rates		Manufacturing	Awarded according to: <ul style="list-style-type: none"> ▶ economic merit ▶ contribution of at least 33 – 40% ▶ emphasis on projects that will have a significant developmental impact

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Support Programme for Industrial Innovation	<p>The Matching Scheme</p> <ul style="list-style-type: none"> ▶ grant of 50% of the actual direct cost incurred in development activity, up to a maximum grant amount of R1.5 million per project. <p>The Feasibility Scheme</p> <ul style="list-style-type: none"> ▶ supports the preparation of a feasibility study for potentially innovative projects by means of a grant of 50% of the costs of a consultant. The grant is limited to R30 000 and only small, medium or micro enterprises qualify for support. <p>The Partnership Scheme</p> <ul style="list-style-type: none"> ▶ gives a grant of 50% of the actual direct cost incurred in development activity with no upper limit. This scheme aims to recover the grant to make the scheme self-sustaining, through a levy on the sales resulting from funded projects. 	Available to all private sector companies	Manufacturing	<p>Applicants for the Matching Scheme and the Feasibility scheme are assessed according to their potential to successfully launch a new product/process, including:</p> <ul style="list-style-type: none"> ▶ managerial ability ▶ financial ability to successfully complete the proposed development and commercialisation ▶ ability to manufacture and market products <p>Further assessment involves the degree to which innovation has been used and the potential for success of the product/process:</p> <ul style="list-style-type: none"> ▶ the innovation of the proposed product/process must represent a significant technological advance ▶ the innovation should provide a commercial advantage over existing products ▶ the marketability of the product (or the product manufactured as a result of the process), ▶ compliance with international standards <p>Applications to the Feasibility Scheme are limited further by the following:</p> <ul style="list-style-type: none"> ▶ a significant portion of development and subsequent production must take place within South Africa. ▶ product developments for a single client do not generally qualify for support. ▶ basic and applied research do not qualify for support

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
					<ul style="list-style-type: none"> ▶ projects already receiving support from government institutions do not qualify for support in terms of this scheme projects exempted from this latter requirement that at the time of application are more than 50% complete do not generally qualify for funding, although small firms (assets less than R1 million) may
	Risk Capital facility				
Technology for Women in Business	Identification, recognition and celebration of women owned enterprises	This is done through the Twib awards, an annual event where women are invited to fill in nomination forms or nominate other women who have shown application of innovative technology in their businesses	Women in the private sector		
	Technology access	Assists in technology access through partnership with technology experts in the various sectors	Women in the private sector		
	Science, technology, engineering and entrepreneurship career guidance for young women	Provincial workshops for young women, targeting mainly rural areas, motivating and guiding them in science careers through psychologists and mentors	Women in the private sector		

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
Khula	Technology Transfer Guarantee Fund	Provides loan guarantees to facilitate access to manufacturing technologies	Small, medium and micro enterprises	No specific sector	Technology must be approved by the CSIR
CSIR	Material and manufacturing support	Centres that support technology and commercialisation initiatives		Materials and manufacturing	
	Technology for Development Programme	Aims to transfer developed technologies to existing communities with a focus on community facilitation and SMME development		Food, biological, chemical sectors	
	Technology and Human Resources for Industry Programme (THRIP)	Funds projects that have a technological focus and include human resource development			
Dept Science & Technology (with the dti)	Godisa incubator programme	Aims to enhance competitiveness, productivity and sustainability through technological innovation, facilitated by Technology Incubator Centres – see Chemin below	Small, medium and micro businesses		

Entity	Support mechanism	Type of support and key aims	Target organisations		Granting criteria
			Type	Sector	
	Innovation Fund		Available to a broad range of entities including: <ul style="list-style-type: none"> ▶ NGOs ▶ science councils ▶ private companies ▶ SMMEs ▶ tertiary institutions involved in research, science, engineering and technology 	Focus areas are new materials and advanced manufacturing, ICT, biotechnology, fauna and flora and crime prevention	Preference is given to proposals that have potential to: <ul style="list-style-type: none"> ▶ expand existing commodity sectors ▶ facilitate the migration of existing industries to new added value areas, or create new leveraged industries from existing industries ▶ enable the establishment of new or emerging high R & D intensive industries ▶ create new opportunities for historically disadvantaged groups ▶ involve within a consortium arrangement the appropriate combination of research, business, NGO & BEE partners
National Treasury	Tax concessions	Capital investments on buildings and equipment may be written off on a straight line basis at 25% per year.			<ul style="list-style-type: none"> ▶ Must be approved by the CSIR (Council for Scientific and Industrial Research) ▶ Buildings and equipment must be used exclusively for scientific research
Business Partners	Innovation Investment Product	A customised debt and equity investment of up to R1m	<ul style="list-style-type: none"> ▶ Small and medium enterprises ▶ Excludes non-profit organisations 	All sectors, except: <ul style="list-style-type: none"> ▶ on-lending ▶ farming 	<ul style="list-style-type: none"> ▶ Economic merit of business idea ▶ Levels of contribution by entrepreneur
ChemIn	Incubator	Technology incubator that supports process and product technologies, provides technical and business services, training, sourcing of funding, limited financial support	<ul style="list-style-type: none"> ▶ Small and medium enterprises, start-ups, chemical allied industries, science councils, higher education institutions 	Downstream chemicals industry, specifically fine and performance chemicals	<ul style="list-style-type: none"> ▶ Project must involve chemistry, and the product or process must impact on the downstream chemical sector ▶ The technology must be post-research phase, i.e. proven at laboratory scale ▶ Market potential must be demonstrated ▶ At least one entrepreneur involved
Salmar	Commercial support	Assists in the establishment of consumer or industrial chemical companies or plants – plant design, marketing etc	Greenfield/ start-up	Consumer and industrial chemicals	

Annexure 3: Overview of innovation chain models

Robert Cooper's stage gate process

Robert Cooper's stage gate process is one of the most widely used innovation chain models. For example, according to a best-practices study by the Product Development & Management Association (PDMA), 68% of leading US product developers now use some type of Stage-Gate process²⁹. Fundamentally it aims to provide a more effective, efficient, faster innovation process that produces more successful new product developments.

Its great appeal to management stems from its systems of checks and controls that it specifies – essentially, further investment in the next stage of development is restricted until management is comfortable with the outcome of the current stage. The gate can therefore be effective in controlling product quality and development expense.

The stage-gate process aims to also increase time-to-market through:

- ▶ Encourages more up-front research resulting in better and sharper product definition which in turn speeds up the development phase and ensures less reiteration and wasted time
- ▶ Clearly defined gates with pre-specified deliverables mean faster decision-making
- ▶ Stimulates cross-functional, parallel processing

The model has been continuously updated. However, despite modifications to address situations where speed-to-market is paramount, there is still some concern that the stage and gate process encourages processes to be sequential and slow. Stages-and-gates processes break work up into sequential phases, and thereby discourage parallel, overlapping activities, especially when they cross the decision points. Such processes do not encourage completing tasks in earlier phases to keep them off of the critical path. In fact, they foster a mindset in which the work proceeds sequentially step by step, so it becomes difficult to even conceive of highly overlapped, iterative processes. Although one of the features of the Robert Cooper's third-generation process is "fuzzy gates", this does not clarify to management or the developers just which activities are supposed to proceed or stop at these decision points³⁰.

The following figure shows Cooper's stage gate process and a short description of the gates is also provided³¹:



Figure 6: Cooper's stage gate process

Preceding each stage is a decision point or gate which serves as a Go/Kill and prioritisation decision point. Gates provide the funnels where mediocre projects are culled out and resources are allocated to the best projects. Gates deal with three quality issues: quality of execution; business rationale; and the quality of the action plan.

²⁹ Source: R. Cooper; "Winning at New Products" (2001)

³⁰ Source: New Product Dynamics

³¹ Source: R. Cooper (2001) - ibid

The structure of each gate is similar and considers three key issues:

- ▶ **Deliverables:** inputs into the gate review - what the project leader and team deliver to the meeting. These are defined in advance and are the results of actions from the preceding stage. A standard menu of deliverables is specified for each gate.
- ▶ **Criteria:** what the project is judged against in order to make the go/kill and prioritisation decisions. These criteria are usually organized into a standard list containing both financial and qualitative criteria but change somewhat from gate to gate.
- ▶ **Outputs:** results of the gate review. Gates must have clearly articulated outputs including: a decision (go/kill/hold/recycle) and a path forward (approved project plan, date and deliverables for the next gate agreed upon).

Overall, the benefits of the Stage-Gate process include the following³²:

- ▶ Puts discipline into a somewhat ad-hoc, chaotic process
- ▶ Provides improved focus via gates, where poor projects are killed and efforts can be redirected to more promising projects and products
- ▶ Ensures a complete process - no critical errors of omission and no missing steps
- ▶ Builds the voice of the customer into new product projects
- ▶ The process is visible, relatively simple, and easy to understand and communicate
- ▶ The requirements are clear: expectations of a project team and leader at each stage and gate are spelled out
- ▶ Stage-Gate manages business risk by breaking resource commitments into increments or stages and more money spent up-front greatly improves the odds of success.

Many similar “roadmaps” for New Product Development, R&D and innovation have been developed. While the individual steps may differ slightly, such roadmaps are tools that can help companies and organisations to successfully develop new products or upgrade existing ones through a series of logical steps, starting from the process of idea generation and ending at the launch of the product into a market.

Some of these roadmaps are now designed to be more flexible – for example, the development stages are overlapped; no design is locked-down earlier than absolutely necessary in order not to miss out on any emerging technology. These types of flexible innovation process models are particularly suited to rapidly changing business environments where the time for changes in the business environment to take hold may be shorter than the typical time required to innovate.

The Oklahoma model

In the US many states are sponsoring funds for economic development and innovation in particular in the life sciences. These state-sponsored seed and venture capital (VC) programmes fall into the following basic categories³³:

- ▶ Direct investment by state agencies
- ▶ Investment in privately managed, geographically restricted funds
- ▶ Investment in a portfolio of private seed and venture capital partnerships

The Oklahoma Model is an example of the latter. Investments are made in several private partnerships, along with other investors. The strategy is to select partnerships that are expected to make excellent market returns, while contributing to the growth of a healthy, local venture capital industry. This model provides a good way to manage risk and helps to focus a rich variety of experienced investors on the legitimate capital needs of local

³² Product Development Institute Inc.; Cooper & Edgett

³³ National Association of Seed and Venture Capitalists (www.nasfv.org); “Growing new businesses with seed and venture capital: state experiences and options: State-sponsored funds” (2000)

businesses. Oklahoma is not the only state to have adopted this approach; successful investment programmes have also been developed in Maryland, New Mexico, California and many other states in the US.

Following is a brief overview of the Oklahoma Model that was implemented in the state from 1993 onwards³⁴:

- ▶ **VC:** Oklahoma Capital Investment Board (OCIB) Venture Capital Programme
- ▶ **Category:** An institutional VC investor (non-pension fund), fulfilling fiduciary obligations while catalysing local economic development
- ▶ **Programme:** OCIB created by the state to mobilise equity and near-equity capital for investment in such a manner that will result in a significant potential to create jobs and diversify and stabilise the economy of Oklahoma. To achieve this OCIB encourages and supports the growth of a local risk capital industry capable of financing companies from early-stage start-ups to later stage expansions. The objective is to raise over \$240m of new capital for Oklahoma businesses.

The Goldsmith technology commercialisation model

The Goldsmith technology commercialisation model³⁵ provides a roadmap to developing strategic plans and actions for the commercialisation of advanced technologies. The model breaks the process down into a sequence of three major phases, six stages, 18 significant steps and large number of critical activities that maximize the chances for success. Each phase has technical, marketing and business activities that must be considered as you move through the process. The model provides a comprehensive framework to develop progress measures, to identify information and technical assistance needs, to project development costs, and to forecast financing requirements.

The diagram below shows Goldsmith's model. For each step and activity the model sets out the key objective of the step, technical activities to be completed, technical information to be developed and also a set of criteria by which the output of this step can be evaluated.

	Technical	Market	Business
Discovery Phase			
Investigation	Technology concept analysis	Market needs assessment	Venture assessment
Development Phase			
Feasibility	Technology feasibility	Market study	Economic feasibility
Planning	Engineering prototype	Strategic marketing	Strategic business plan
Introduction	Pre-production prototype	Market Validation	Business start-up
Commercial Phase			
Full scale production	Production	Sales and distribution	Business growth
Maturity	Production support	Market diversification	Business maturity

Bounding Box

A newer alternative to stage and gate processes is the bounding box approach, which is essentially a "management by exceptions" technique in which certain critical parameters of the project, such as profit margin, project budget, product performance level, and launch date, are negotiated as the bounding box. The bounding box therefore defines the zone or boundaries within which a development team can operate in terms of relevant, objective and measurable parameters. These parameters are established jointly by the development team

³⁴ City of Portland Economic Development Strategy "Strategy for economic vitality – Bioscience report" (2002)

³⁵ Source: H. Randall Goldsmith, Goldsmith Commercialization Model

and other decision-makers at outset (e.g. deliver prototype to one lead customer by date X; financial/resource assumptions/forecast).

Then the team is free to move ahead unimpeded as long as it stays within the box. Management regularly checks that the team remains within bounds, and it is also the team's responsibility to notify management quickly if it finds that it is leaving the box. If the team leaves the box, then a management review considers whether the project should continue, and if so, the box's limits are reset³⁶.

It is a useful innovation model if:

- ▶ Time to market critical (particularly in the early phases)
- ▶ Programme is complex
- ▶ Dynamic and unpredictable environments

EU Innovation Scoreboard

Beyond innovation process chains there are also innovation indices used by governments around the world to drive and evaluate their innovation policies. These contain some interesting ideas on measures that can be used to track innovation performance and progress. We have included the EU Innovation Scoreboard as an example:

1. Human resources

- ▶ Science & Engineering graduates (% of 20 - 29 years age class)
- ▶ Population with tertiary education (% of 25 - 64 years age class)
- ▶ Participation in life-long learning (% of 25 - 64 years age class)
- ▶ Employment in medium-high and high-tech manufacturing (% of total workforce)
- ▶ Employment in high-tech services (% of total workforce)

2. Knowledge creation

- ▶ Public R&D expenditures (GERD - BERD) (% of GDP)
- ▶ Business expenditures on R&D (BERD) (% of GDP)
- ▶ EPO high-tech patent applications (per million population)
- ▶ USPTO high-tech patent applications (per million population)
- ▶ EPO patent applications (per million population)
- ▶ USPTO patents granted (per million population)

3. Transmission and application of knowledge

- ▶ SMEs innovating in-house (% of manufacturing SMEs and % of services SMEs)
- ▶ SMEs involved in innovation co-operation (% of manufacturing SMEs and % of services SMEs)
- ▶ Innovation expenditures (% of all turnover in manufacturing and % of all turnover in services)

4. Innovation finance, output and markets

- ▶ Share of high-tech venture capital investment
- ▶ Share of early stage venture capital in GDP
- ▶ SMEs sales of 'new to market' products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs)

³⁶ Laura Doyle, "Inside the bounding box" (2002)

- ▶ SME sales of 'new to the firm but not new to the market' products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs)
- ▶ Internet access/use
- ▶ ICT expenditures (% of GDP)
- ▶ Share of manufacturing value-added in high-tech sectors
- ▶ Volatility-rates of SMEs (% of manufacturing SMEs and % of services SMEs)