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BRITISH STANDARD

Design management systems –
Part 1: Guide to managing innovation

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Contents

List of figures

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 85 and a back cover.

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Foreword

Publishing information

This part of BS 7000 is published by BSI and came into effect on 30 April 2008. It was prepared by Technical Committee MS/4, *Design management systems*. A list of organizations represented on this committee can be requested from its secretary.

Supersession

This part of BS 7000 supersedes BS 7000-1:1999, which is withdrawn.

Relationship with other publications

BS 7000, *Design management systems* currently comprises the following parts:

- *Part 1: Guide to managing innovation* (this part);
- *Part 2: Guide to managing the design of manufactured products;*
- *Part 3: Guide to managing service design;*
- *Part 4: Guide to managing design in construction;*
- *Part 6: Guide to managing inclusive design;*
- *Part 10: Vocabulary of terms used in design management.*

Other parts might be added.

The Technical Committee, MS/4, invites users to submit technical comments, observations and suggestions to the Committee Secretary at BSI (see address on back cover). This will assist the Committee when it reviews the standard in due course and when it considers the preparation of further parts of BS 7000.

Use of this document

BS 7000-1 takes the form of guidance and recommendations. It is conceived as a coherent whole. Yet, as a guide rather than a specification, the guidance need not be adopted in total. Effective use can be achieved through the smart selection of relevant clauses and adapting them to an organization's particular circumstances.

This revision incorporates many suggestions from users and non-users to make the standard more accessible and immediately useful. Research has revealed that a careful read through repays the time spent, for detail and relevance are missed when skimming through the text.

Users also reported value in re-visiting the standard after first use, say at intervals of a year, as organizations gain experience and become more adept at managing innovation, executives' needs and attitudes change, so they look for different guidance and gain fresh insights from the text after appropriate intervals.

Readers who restrict their attention to the project level might be able to take advantage of guidance quickly, however full benefits will not be gained as changes confined there rarely establish deep roots. Work at the organization level, especially by principals, is vital for success; so this needs to be planned in either at the start or fairly quickly thereafter.

As a guide, this part of BS 7000 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 7000 is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this standard. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

0 Introduction

0.1 General

This standard was developed to enable senior executives or principals of organizations to plan products, services and processes a significant time into the future: at least a generation after the generation currently under development.

NOTE 1 For brevity, the term "principals" is used in most instances to denote owner-managers, partners, board directors and other top executives in private sector organizations, as well as senior officers in public sector and not-for-profit organizations.

NOTE 2 In line with the convention adopted by British Standards, the term "product" also encompasses services, processes and business models.

It provides a richer language and framework of issues and procedures that organizations, especially those that are new, small or relative novices at innovation (see **3.13**), can adopt to upgrade their innovative performance then use as the basis of collaborative initiatives with suitable partners to promote innovation. All or selected clauses could form the basis of contracts between organizations. Several clauses could be used as bases for metrics to monitor and evaluate performance. These are highlighted for consideration with the following icon **METRIC?** in the margin.

Research has revealed that organizations that evolve a framework for long-term innovation react faster to threats or surprises, are more likely to take effective action, and are better at sustaining the momentum of change. As such, they are more likely to succeed.

Organizations also appreciated the generic and comprehensive guidance provided by this standard.

NOTE 3 Research was undertaken as groundwork for the original standard and again for this revision. This took the form of in-depth interviews with senior executives and others on the front line of innovation and use of standards in selected organizations throughout Great Britain offering a wide spectrum of products and services. All were considered to be innovative and many had won awards for design, technology or innovation. The largest employed 58 000 people around the world; the smallest consisted of just three individuals. Annual turnovers ranged from £1 000 to £8.4 billion.

0.2 Survival of the fittest

A key priority of an organization is to survive and prosper. Survival usually depends on the expansion of existing markets, withdrawal from stagnant markets and taking advantage of new opportunities.

The accumulation of market intelligence and a researched knowledge base of customer requirements are also critical when formulating realistic business strategies and delivering products that generate growth.

One reality in life is that not much remains the same for long. Customer needs and interest change so what was considered a highly desirable luxury at one time gradually becomes a mainstream feature, then a basic requirement for entry into a market. Consequently, organizations that fail to upgrade processes and develop their products and services are unlikely to remain viable, especially with increased competition world-wide that often has to be countered on uneven terms. Eventually they might be forced to cease trading.

0.3 Innovation goes beyond technology

Innovation is not confined to research and development in technology (often characterized as adding features and functions to products). It can occur in all parts of an organization, throughout the value chain, and at all stages of product/service lifecycles; research, design, manufacture, distribution and marketing, servicing, maintenance, withdrawal, the eventual disposal and recycling of products (see **4.9** and Figure 8).

NOTE Worthwhile contributions through innovation will not necessarily relate to financial outcomes, particularly where public sector and not-for-profit organizations are concerned.

0.4 Innovation is not for all

Although this standard is aimed at those who have determined that innovation is right for them and wish to innovate, it is important to underline that innovation might not be right for every organization, or for every product of innovative organizations. Furthermore, customers and markets do not always welcome innovation unless the benefits are obvious.

Typically, innovation takes longer, costs more, and is riskier than product improvement. Therefore, the continual improvement of products, and making licensing arrangements with innovators, might be preferable options.

Figures 1 and 2 (self-assessment questionnaires) and Figure 6 provides some insights into where an organization is positioned along the innovation spectrum.

0.5 Designing total experiences for products, services and processes

Customer satisfaction arises out of overall experiences with products and services, including the way organizations respond when contacted. Therefore, careful attention should be paid to all factors that contribute to these total experiences.

During the past decade, particularly in advanced economies, the proportion of gross domestic product deriving from services has risen dramatically, as has the proportion of people employed in the service sector. In several instances, both figures exceed 70%. Another strong trend has been the introduction of services by manufacturers to support their products. These complementary services provide more rounded offerings to customers and, often, give rise to competitive advantages. As such, they achieve higher margins and raise profitability.

Sensitivity analyses can help determine the priorities set by customers and users, and the effects of each component on the attractiveness of the total product.

It is also important to ensure continuity between generations of products and appropriate integration within product systems and ranges. Some organizations consider different generations of products as separate products, not least in terms of project management. However, the development of one generation into the next will suffer if there is no continuity in project team members, archiving of experience is inadequate or such archives are not referred to regularly.

Figure 1 **Innovation self-assessment questionnaire – The organization**

Where is your organization on these issues? Mark an 'x' in the relevant box on the scale.

	1	2	3	4	5	
Innovation is inherently chaotic, so not amenable to management or planning	☐	☐	☐	☐	☐	Innovation is a powerful means of creating the future, so we make every effort to harness it for the benefit of our organization
It is very difficult to forecast the future so we concentrate on what can be done in the immediate future	☐	☐	☐	☐	☐	There is little that cannot be planned in the longer-term, so we ensure projects are sanctioned with sufficient information on the terrain to be covered
Change is inconvenient and too much of it is not good for us or our customers	☐	☐	☐	☐	☐	We pursue whatever change is necessary to deliver attractive competitive products
We concentrate on continual improvement of existing products	☐	☐	☐	☐	☐	We ensure that a fair proportion of turnover is generated from completely new products introduced in the last three years
Our time and energies are taken up entirely with fire-fighting, debugging and responding to what competitors do	☐	☐	☐	☐	☐	We have a reputation to sustain: stakeholders would be disappointed if we did not regularly introduce innovative offerings
We cannot afford failure so avoid it at all costs	☐	☐	☐	☐	☐	We accept failure as part of striving for newness and place great stress on learning from experience
We only consider short-term projects with quick paybacks because of our general aversion to risk	☐	☐	☐	☐	☐	We relish long-term challenges with clear aims and outcomes as important to profitable survival
We leave it to individual staff to deal with innovation as they see best	☐	☐	☐	☐	☐	We have a documented, rigorous yet flexible system for handling innovation
We focus on technical innovation on products	☐	☐	☐	☐	☐	Our holistic perspective seeks innovation in all aspects of the value chain
We plan no further than three years ahead and this horizon is shortening	☐	☐	☐	☐	☐	We invest considerable effort in gaining a long-term vision 10-plus years ahead to inform on what we do today
Product development and design are not identified during our planning cycle nor do they feature in plans	☐	☐	☐	☐	☐	Design/development of long-term products are clearly identified during the planning cycle and feature in plans at all levels
We do not deviate from agreed plans	☐	☐	☐	☐	☐	We pursue carefully conceived plans while developing our agility to take advantage of unforeseen opportunities

NOTE The term "product" encompasses services, processes and business models.

Figure 1 **Innovation self-assessment questionnaire – The organization**

Where is your organization on these issues? Mark an 'x' in the relevant box on the scale						
	1	2	3	4	5	
Innovation is the responsibility of specialists and happens lower down the organization	☐	☐	☐	☐	☐	Top executives acknowledge their responsibility in relation to innovation, communicate policy, drive activities and provide guidance
No budgets are allocated to innovation or long-term product development	☐	☐	☐	☐	☐	Special care is taken to ensure that we invest continuously in the long-term future and allocate funds specifically for innovation
All skills needed to succeed exist within our organization	☐	☐	☐	☐	☐	We constantly seek new skills, especially those relating to innovation, through skills audits
Our innovative work is undertaken in-house and we expect to retain control throughout; such work is tailored to what can be achieved with internal resources	☐	☐	☐	☐	☐	We bring together whatever skills are required by project briefs; alliances are established to harness expertise outside the organization, sharing responsibility and control
We do not use leading technologies so have no need to protect intellectual property	☐	☐	☐	☐	☐	We always look for intellectual property that might lead to competitive advantages, and make every effort to protect such assets
Staff do not go beyond their remits or stray across disciplines and responsibilities	☐	☐	☐	☐	☐	Staff feel a personal commitment to providing complete solutions seamlessly through generations
An elite core of individuals in R&D and design departments deal with our innovative activities	☐	☐	☐	☐	☐	All our staff are on the front line of innovation and contribute without prompting
Specifications for product updates are extrapolated from current models	☐	☐	☐	☐	☐	We strive to develop products that stretch customers just beyond their needs at launch
Opportunities to innovate are difficult to find and very few development projects progress through to launch	☐	☐	☐	☐	☐	We are never short of great opportunities to innovate, and it is rare for projects not to go successfully to launch
Our reliance on internal funds and difficulties in selling technological advances limit our innovative activities	☐	☐	☐	☐	☐	We rely on our ability to formulate convincing business cases to attract funds from a wide range of sources
Our engineers and sales teams come up with ideas for innovation; customers and suppliers are not involved	☐	☐	☐	☐	☐	Customers, suppliers, competitors, standards, research institutions, trade associations and legislation all provide triggers for innovation
We are not sure how to evaluate the impact of innovation and cannot afford that luxury	☐	☐	☐	☐	☐	Our master innovation programme incorporates formal reviews. It is essential for us to evaluate its contribution and continued relevance

NOTE The term "product" encompasses services, processes and business models.

Figure 2 **Innovation self-assessment questionnaire – Products, services, processes and projects**

Where is your organization on these issues? Mark an 'x' in the relevant box on the scale.

	1	2	3	4	5	
We respond to ad hoc requests for change to existing products from our sales and engineering departments	☐	☐	☐	☐	☐	We map out horizons three generations forward for most products but will extend beyond that to exploit new technologies and markets
Staff rarely come up with innovative ideas; few are taken forward and most of those get dropped before launch	☐	☐	☐	☐	☐	Staff constantly generate innovative ideas, then follow most of them successfully through implementation to launch
New product briefs tend to be straightforward extrapolations of previous projects; innovation is a luxury we cannot afford	☐	☐	☐	☐	☐	Considerable effort goes into formulating project briefs, always challenging assumptions and previous work and highlighting the need for innovation
Changes are confined to the tangible product and these tend to be minor improvements	☐	☐	☐	☐	☐	Project briefs embrace appropriate changes throughout the value chain; relatively small changes can, together, constitute radical innovation
Project teams tend to be self-selecting as we do not have much choice. Staff are stretched and rarely volunteer for extra challenging work	☐	☐	☐	☐	☐	We ensure that project teams encompass the required skills and stakeholders selected from the best talent available, inside and outside
Project teams are left to get on with projects with little involvement from senior executives	☐	☐	☐	☐	☐	A top executive is assigned to champion each sanctioned project
Team members use whatever techniques they see fit to undertake their work	☐	☐	☐	☐	☐	A wide variety of techniques is used to help project teams to think 'outside the box'
Development teams review projects as resources allow; senior executives are rarely involved	☐	☐	☐	☐	☐	Our proven innovation management system enables us to monitor and review development projects rigorously in an enlightened way
Product development teams tend to respond to ideas for product changes from a few familiar sources	☐	☐	☐	☐	☐	We actively seek triggers for new development projects from a wide range of sources, within and outside our markets/industry
Our products are essentially commodities with no significant distinguishing features	☐	☐	☐	☐	☐	Our products have distinctive characteristics that are key to our positioning and reputation
We use familiar technologies and techniques with no proprietary intellectual property to protect	☐	☐	☐	☐	☐	Our products incorporate a fair deal of unique intellectual property, all of which is protected
We are not sure how to evaluate the impact of innovation and cannot afford that luxury	☐	☐	☐	☐	☐	All projects are set up with the express intention of evaluating performance and outcomes to enable us to improve performance

NOTE The term "product" encompasses services, processes and business models.

1 Scope

This part of BS 7000 gives guidance on managing innovation, specifically the design and development of innovative and competitive products that satisfy customers' perceived needs and aspirations in the long-term future. It stretches the planning horizon to at least two generations after that currently under development.

NOTE 1 In line with the convention adopted by British Standards, the term "product" also encompasses services, processes and business models.

Guidance covers the total experience and benefits of innovating, as well as the application of general principles and techniques to the management of innovation, from conception, creation, fabrication, delivery and sustenance in markets, right through to withdrawal, final disposal, recycling and the development of subsequent generations of offerings.

The standard applies to all types of organizations (not least small and medium-size enterprises that seek to grow) in manufacturing, process, service and construction industries as well as in the public and not-for-profit sectors.

The guidance in this standard covers all levels of staff and management. It dovetails with that in other design management guides: BS 7000-2, BS 7000-3, BS 7000-4 and BS 7000-6. Insights are provided into what can be attained at all levels of an organization.

This standard complements BS EN ISO 9001. Innovation is critical to sustaining customer satisfaction over the longer term, and considerable skill is required to design quality into products, services and processes. All innovation, bar none, is designed. No innovation can be implemented or brought to market without going through at least one design phase. Detailed guidance is provided, relating to innovation management systems, which help to achieve the desired quality and customer satisfaction (see Clauses **5** and **6**). Notes throughout indicate clauses that facilitate fulfilling the requirements of this widely-adopted specification.

NOTE 2 See Bibliography for other documents providing guidance on general management techniques.

NOTE 3 Guidance on procedures needed to meet statutory requirements (such as health and safety, or product certification and liability) are not intended to be comprehensive.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 3811, *Glossary of terms used in terotechnology*

BS 4778-3.1, *Quality vocabulary – Availability, reliability and maintainability terms – Guide to concepts and related definitions*

BS 4778-3.2, *Quality vocabulary – Availability, reliability and maintainability terms – Glossary of international terms*

BS 6079 (all parts), *Guide to project management*

BS 7000-10, *Design management systems – Vocabulary of terms used in design management*

BS EN ISO 9000, *Quality management systems – Fundamentals and vocabulary*

BS ISO 10007, *Quality management – Guidelines for configuration management*

3 Terms and definitions

For the purposes of this part of BS 7000, the terms and definitions given in BS 7000-10, BS 3811, BS 4778-3 (all parts), BS 6079 (all parts), BS EN ISO 9000, BS ISO 10007 and the following apply.

Multiple definitions provided for some terms cover use relating to different aspects and traditions (e.g. engineering and industrial design). Awareness of these multiple interpretations, e.g. innovation and innovation leader, is critical when working in the multi-disciplinary teams essential to deliver innovative solutions.

3.1 3-Gen product
long-term product or service that becomes available, typically two generations after the generation currently being developed

3.2 backcasting
process by which attainment of a desired vision in the long-term future is plotted progressively back to the present through a series of milestone achievements which effectively map out the way forward

NOTE Could apply to markets, products, services, processes and organizations.

3.3 blue-sky thinking
unbounded exploration of ideas without concern as to their practicality, applicability or marketability

NOTE Thinking that seems impractical and without application can trigger insights that lead to successful innovations.

3.4 breakthrough innovation
change that breaches a previously perceived limit in configuration, performance or technology

NOTE Typically opens up important new options to deliver significant advances in outcomes.

3.5 corporate software
knowledge, skills, experience, intellectual property and other intangible attributes within an organization

NOTE Incorporates corporate memory and the folklore of an organization.

3.6 disruptive innovation
innovation with a significant adverse effect within and/or outside an organization that cannot be influenced or controlled in the short term

NOTE Often relates to organizations that exploit low-cost technologies, techniques and procedures in ways unfettered by conventional thinking and perspectives to enter a new field/market and displace established players.

3.7 empathetic design
variant of user-centred design where the ideas for change and innovation arise from careful observation of how target customers use currently available products in actual live situations

NOTE The findings of ethnographic research can form key inputs of such design.

3.8 envisioning
capacity to conceive a future state

3.9 expertise
accumulation of knowledge, skills and experience relating to a specific topic or field

3.10 "if only" analysis
prescription of what could or would be done if certain materials, processes or technologies were available, or specified events were to take place

NOTE 1 "If only" propositions are critical enablers of, or pathways to, the achievement of a new vision.

*NOTE 2 Differs from "what if" analysis in that the starting point is a specified desired future state, not the present. See **3.41**.*

3.11 inclusive design
design of mainstream products and/or services that are accessible to, and usable by, people with the widest range of abilities within the widest range of situations without the need for special adaptation or design

3.12 incremental innovation
change that involves one or more relatively minor innovations that are predictable extrapolations from the present state

3.13 innovation
<ideas> successful exploitation of new ideas

NOTE 1 Definition widely promoted by the UK Government Department for Business, Enterprise and Regulatory Reform.

<process> introduction of changes that are significant departures from the usual way of doing things

<product> transformation of an idea into a novel product, operational process or new service

NOTE 2 Consists of all scientific, technological, commercial and financial steps necessary for the successful development and marketing of novel manufactured products, the commercial use of new or improved processes and equipment.

<techniques, materials> employment of design or construction techniques, or materials, that do not have a proven history of performance or are not covered by an organization's current practice

NOTE 3 Applies mainly to the construction industry.

3.14 innovation brief
statement that describes the purpose, development and required characteristics (including performance) of a product, service or process, particularly how these will differ significantly from what exists currently.

3.15 innovation champion
person dedicated to the promotion of, and strategic thinking behind, innovative initiatives

NOTE Such individuals will be involved in, or influence, the formative stage of the process as well as the final decision-making. However, they might not be responsible for any aspect of work.

3.16 innovation highway
permissible route over which long-term future products and services will be planned

*NOTE See also **3.27**, **3.42** and Figure 4.*

3.17 innovation leader
<activities> person who takes the lead in innovative activities

<authority> person accepted as being the key authority where matters relating to innovation are concerned

<driving> person who consistently drives innovation and has an acknowledged record of achievement through innovation

<initiation> person who is first to introduce a particular innovation

NOTE 1 Definition could also refer to organizations.

<trend-setting> person who sets trends in markets and industries and is acknowledged to be at the forefront of innovation practice

NOTE 2 Definition could also refer to organizations.

3.18 innovation management system
formal infrastructure encompassing objectives, strategies and processes, organizational structures and values by which an organization administers innovation

3.19 innovation philosophy
general stance of an organization towards innovation and the value attached to the contribution it makes to business performance

NOTE The innovation equivalent of a business mission that articulates the basic reason for innovating within the organization and formalizes its role.

3.20 innovation pipeline (or funnel)
supply of innovative ideas and opportunities that have been through a formal generation, vetting and sanctioning/filtering system for subsequent exploitation

NOTE A full pipeline, continuously replenished, is usually considered a healthy state.

3.21 innovation plan
sub-section of the overall business or corporate plan that brings together all elements relating to innovation whether dealing with inputs, outputs, processes or parts of an organization

3.22 innovation review
formal, documented, comprehensive and systematic examination of an innovation to evaluate its capacity to fulfil stated requirements, identify problems (if any) and propose the development of solutions

NOTE 1 Can take the form of meetings constituted of those most closely concerned with innovation, or affected by the innovations that arise; ideally chaired by an individual not directly connected with the project.

NOTE 2 Might take place several times during the progress of an innovative project. Aims are to:

a) ensure the innovation continues to conform with set briefs;

b) modify (through the originator) the innovation brief to meet reasonable economic or practical difficulties wherever they might be perceived.

NOTE 3 Can be conducted at any stage of the innovation process, and should definitely be conducted on completion of this process.

3.23 innovation spiral
process of building innovations effectively on their predecessors

NOTE This requires that:

a) the innovations are exploited fully;

b) subsequent innovations develop from a more advanced foundation;

c) resources are not wasted retracing ground covered before.

3.24 innovation strategy
chosen path formulated to achieve business and innovation objectives supported by an indication of how resources will be committed

3.25 innovative alliance
formal collaboration between two or more individuals and/or organizations in order to generate innovative ideas and/or exploit the opportunities that follow

3.26 lead (or expert) user
individual considered to be among the most competent users of a product, or who exploits the potential of a product most

NOTE 1 Potential could be as conceived by the originating organization, or extend beyond that with applications and ways of operating that were never imagined at launch.

NOTE 2 Could be an organization.

3.27 length of the innovation highway
period of time over which new long-term products and services are planned

NOTE 1 Extends from the time when existing products and services go into decline forward to three product generations ahead.

*NOTE 2 See also **3.16**, **3.42** and Figure 4.*

3.28 master innovation programme
programme that integrates all innovation activities and investments to be undertaken by an organization over a specified period, broken down into stages, with resources to be committed and associated timescales

3.29 parametric product brief
limitations as specified in the length and width of an innovation highway

NOTE Includes products to be developed by the organization over a specified time. Also provides the primary determinants against which long-term new product and service ideas are vetted.

3.30 product generation
<advantage> advance that results in a significant competitive advantage

<attitude> advance that forces a significant change in perception and the way things are done

<organization> step advance for an organization or industry

<obsolescence> advance that makes old products obsolete

<platform> advance that establishes a new platform from which to build future output

<progressive change> integration of several changes introduced separately over time to offer a new, upgraded product that is perceived to be of higher value

<simultaneous change> change or cluster of changes incorporated into a product at the same time

<standard> advance that establishes a new standard that others adopt

<transformation> change that transforms a market (changes rules, direction, opens up new avenues, etc.)

3.31 radical innovation
innovation resulting in significant (sometimes step) changes that could not have been extrapolated from present state

NOTE 1 Could result in large and/or fundamental change in one or two factors; or from smaller changes in several factors that, together, lead to a surprising outcome that breaks the mould or sets a new benchmark

NOTE 2 Might relate to products, services, processes, techniques and technologies; to positioning, practices, performance, expectations and possibilities

3.32 risk assessment
process for identifying and estimating possible adverse project outcomes then, if they cannot be avoided or alleviated, balancing and covering for the impact they might have

3.33 road map (or route map)
description of an anticipated series of developments and milestones that provides guidance on the way forward to an envisioned future

NOTE 1 Roadmapping can be applied to products, services, processes, techniques and technologies.

NOTE 2 With judicious planning, new products, etc. can be conceived to use anticipated developments (technological, etc.) as they become available.

3.34 sensitivity analysis
<constituent factors> determination of the relative impacts of equal variations in different constituent factors on the situation under examination

NOTE Factors and constraints can be added or removed to produce "best", "worst" and "most probable" cases.

<degrees of change> estimation of impact of different degrees of change in a particular factor on the overall situation (performance, outcomes, etc.) under consideration

3.35 serial innovation
group of interrelated innovations that need to be effected together in order to achieve desired innovative outcome

NOTE Often arises as a result of groundwork or follow-through necessary in the value chain to enable the target innovation.

3.36 serial innovator
person or organization with a successful record of several innovations that are not necessarily inter-related

3.37 user-centred
<experience> designing a product or service experience around the life and behaviour of consumers or users

<people> design approach that engages users and places them at the heart of the design process

NOTE Sometimes called "user-focused", "human-centred", "empathetic" or "co-design" (especially in architecture and planning).

3.38 user-friendly
outcomes incorporating features that are easily comprehensible, and operations that are intuitive and quickly mastered

NOTE Sometimes called "user-sensitive", "age-friendly" or "disability-friendly".

3.39 value chain
all factors and activities undertaken by, or on behalf of, an organization that contribute to the value of its products as perceived by stakeholders (particularly customers and users), from first conception through to final disposal and recycling

3.40 visual imagery
visual rendition of ideas and concepts

3.41 visualization
process by which ideas and concepts are expressed or represented more vividly, and with greater tangibility, using visual imagery

3.42 "what if?" analysis
exploration of a problem or opportunity to determine how performance and outcomes might alter should circumstances change, particularly if constraints and barriers could be removed

*NOTE Differs from "if only" analysis in that they progress forward from the known present rather than a desired future state. See **3.10**.*

3.43 width of the innovation highway
parameters (including financial) to be met that might constrain future plans and the terrain to be covered when developing long-term products

*NOTE See also **3.16**, **3.27** and Figure 4.*

4 Innovation, newness and an overview of the basics of innovation management

4.1 Flow chart of the complete innovation management framework

A framework for managing innovation is outlined in its entirety in Figure 3. In practice, iteration is likely between stages for clarification or as fuller information becomes available. Opportunities for concurrent processing should be considered, not least to reduce the time-to-market for new product introductions.

It is possible to implement all the stages of this framework immediately. The stages apply equally to small and large organizations, though the former might be able to compress stages due to fewer employees, simpler and flatter structures. The procedures adopted are similar except for differences in degree and scale.

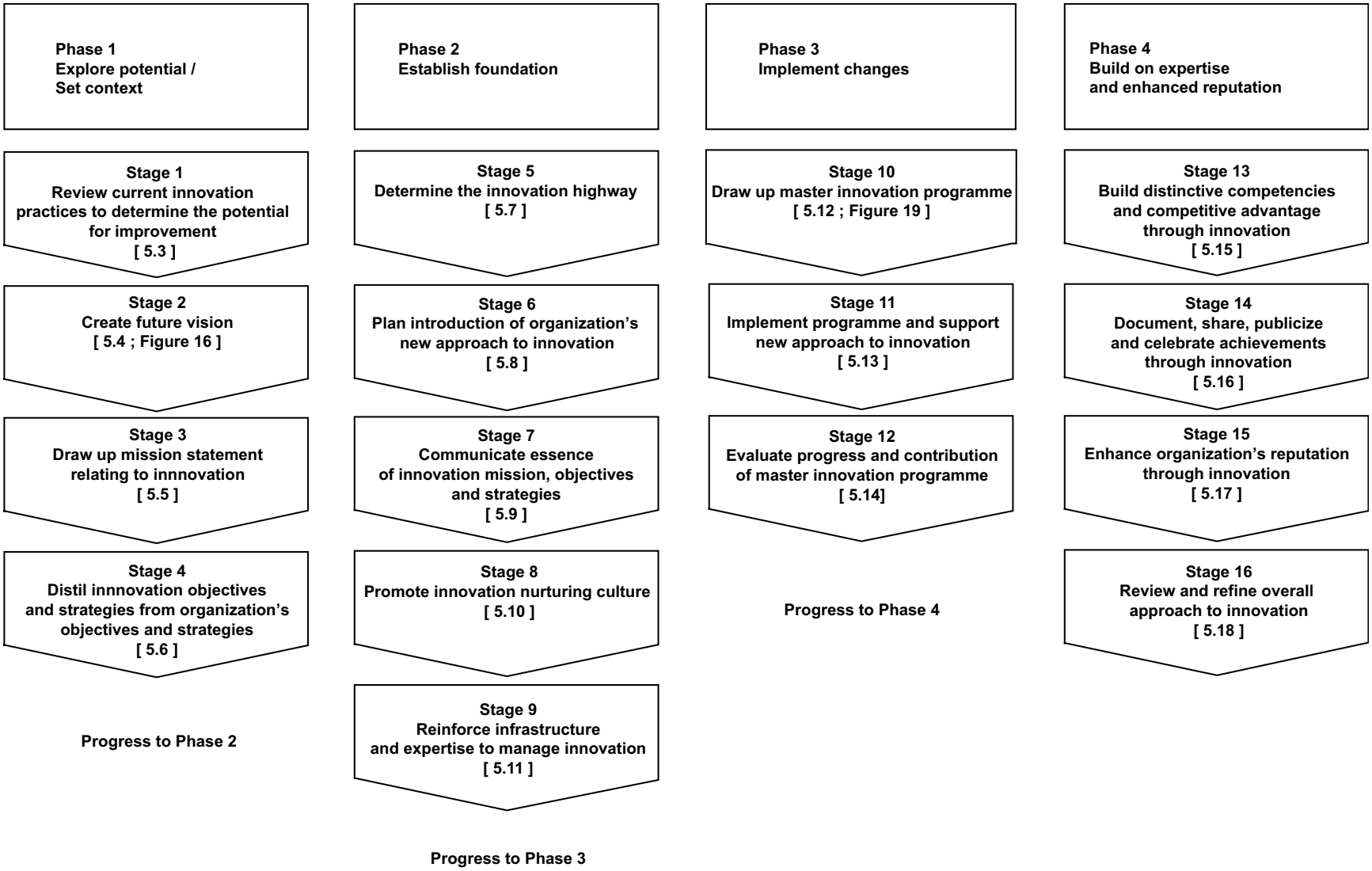
Terms used in this framework (and elsewhere) are defined in Clause **3**.

4.2 Planning beyond current horizons

Research revealed that there is very little that cannot be planned up to three product generations into the future. This span varies depending on the type of products, but might be ten or so years ahead. Many organizations in the United Kingdom and abroad already have processes in place for the management of their new products over that horizon. However they constitute a tiny proportion of the total.

This time span is not especially long. Most people would like to ensure the survival of their organizations as well as secure their employment for at least ten years into the future. This can only be achieved with a constant supply of well-designed products. Introductions and withdrawals need to be planned. Furthermore, new products need to be developed along an identified highway into the future. This sets the direction and terrain an organization will follow over a specified period as well as the milestones to be achieved in order to develop and launch those products to plan (see Figure 4 and **5.7**, **6.8.2** and **6.8.3**).

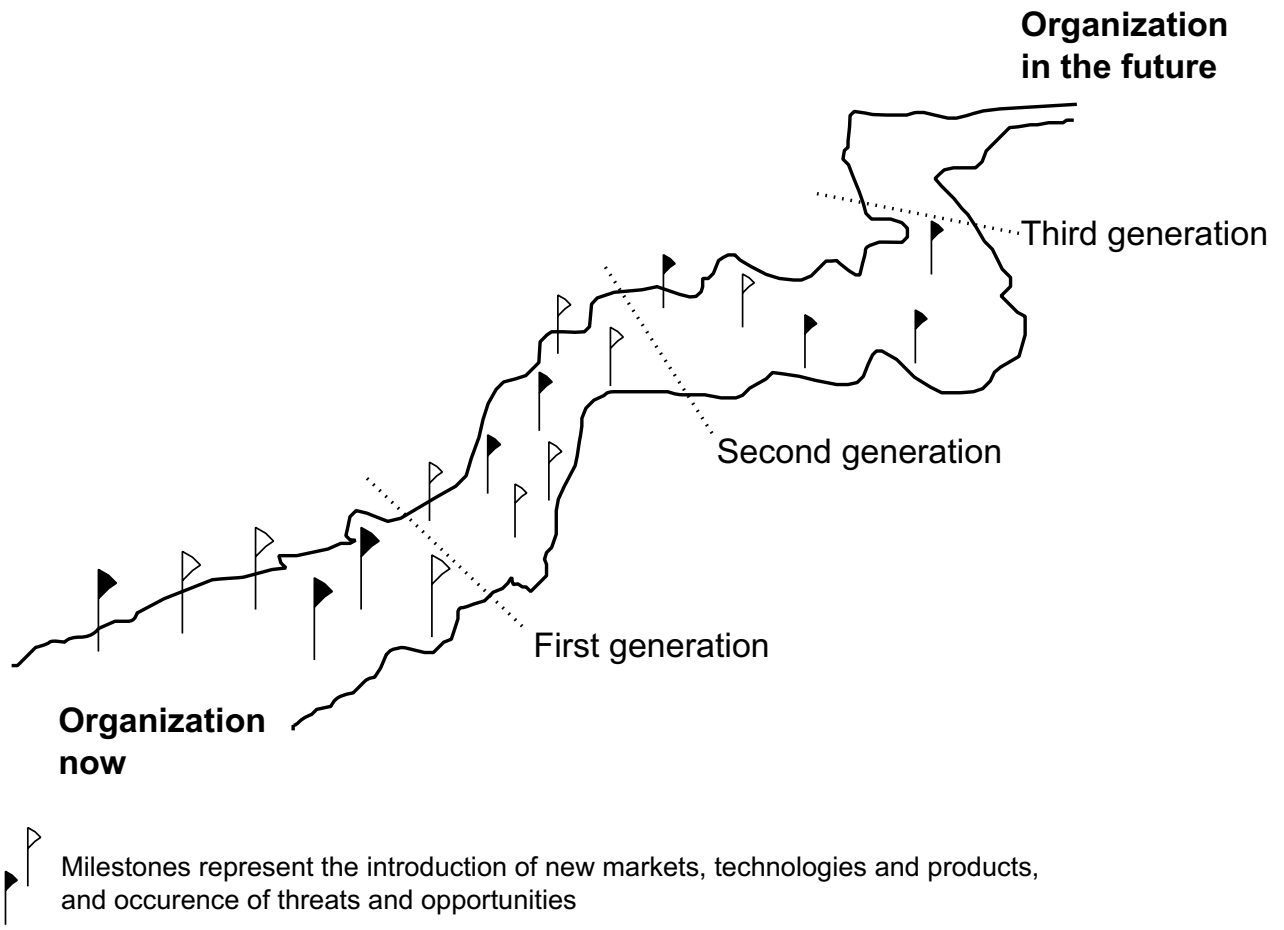
Figure 3 **Overview of complete process for managing innovation at the organization level**



NOTE 1 *This figure sets out the forward momentum of the process. Several stages might be undertaken concurrently and iteration is likely between all stages.*

NOTE 2 *Bracketed numbers in the chevrons denote sub-clauses in the main text that flesh out details of those stages.*

Figure 4 **Innovation highway with milestones**



NOTE Progress along the highway is likely to be iterative.

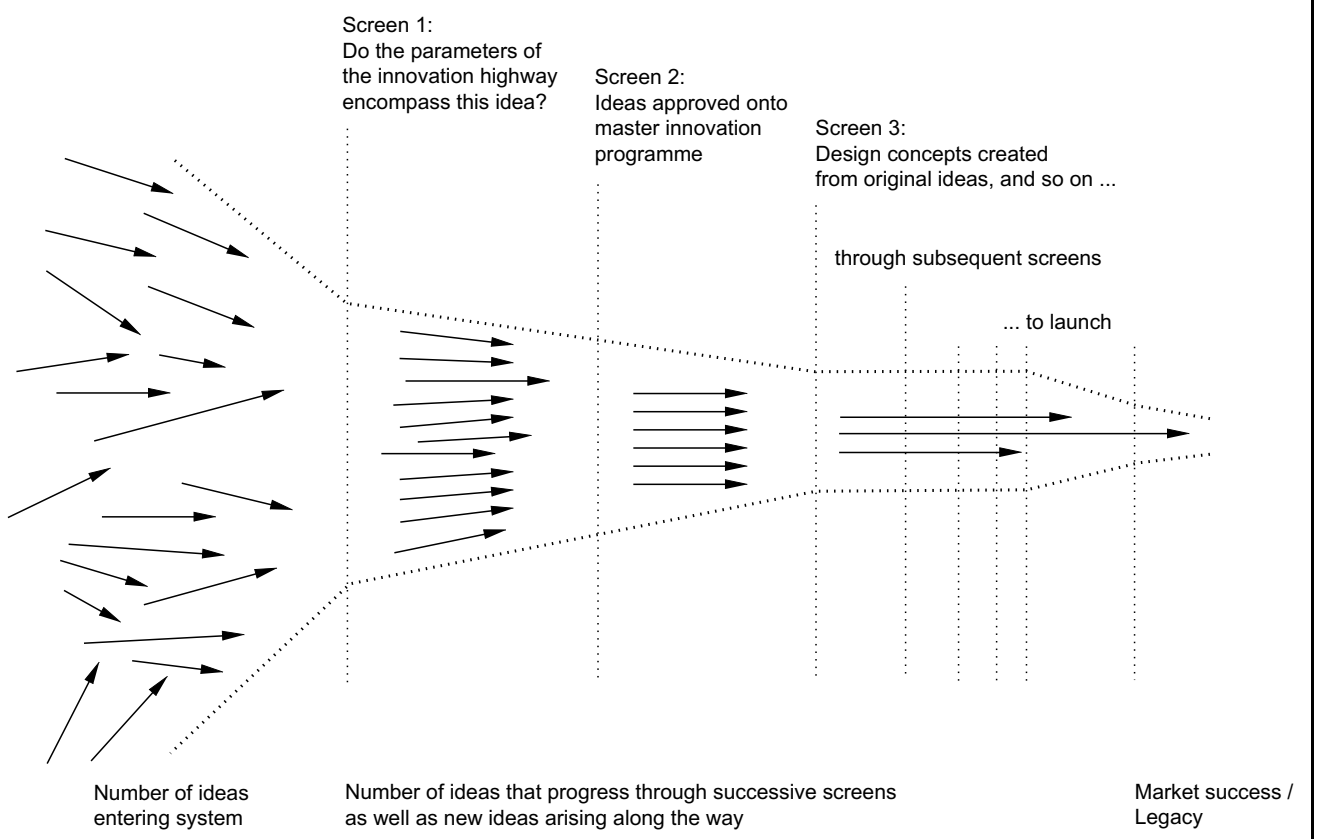
4.3 Co-ordinating short-term and long-term work

By ensuring a constant stream of ideas for innovation, principals help to ensure continuity and the sustainability of their organizations (see Figure 5).

Recent research indicates that organizations increasingly rate the agility to react to opportunities above the ability to see and prepare further into the future (see **6.18**). Speed of reaction is influenced by where an organization positions itself along a spectrum that informs on its stance on innovation, the strategies likely to be adopted, response to proposals submitted, and so on (see Figure 6). Is the organization a self-starter that likes to be the first mover with innovations, getting to market first? Or does it prefer to be a fast follower, delivering innovations after checking market reactions to pioneers? Laggards that steer clear of innovation might find innovations imposed on them in due course, if they survive.

However, it is misleading to suggest that organizations raise their chances of survival by concentrating attention on the immediate future in response to the demands of markets and the financial community. Both the ability to anticipate change and the agility to react fast to change are developed through foresight.

Figure 5 **The innovation pipeline – Screening ideas through to launch**



NOTE Also called "innovation funnel".

Foresight is acquired through creativity in analysis, envisioning different future states over extended planning horizons, and the organization's position within those states. This foresight then informs on appropriate strategies to get from the present to desired futures.

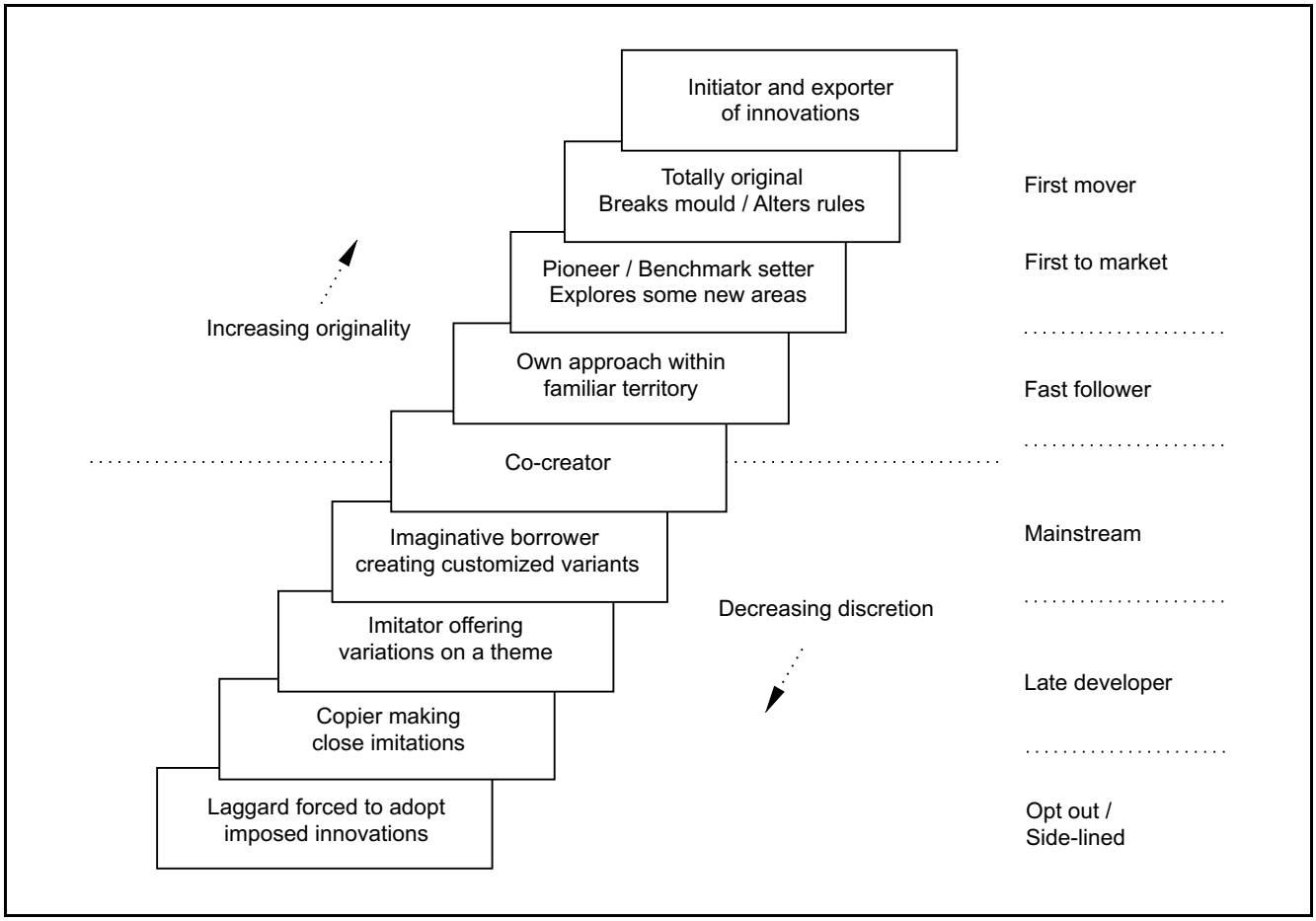
In reality, effectiveness over the short- and long-term is inter-linked and mutually-reinforcing. Organizations that concentrate on one, while ignoring the other, jeopardize their performance and survival. For example, by setting too short a planning horizon, organizations are likely to:

- miss opportunities that cannot be seen without a long perspective;
- reject opportunities as cannot be completed within the short time span available, or allow appropriate resources to be brought together;
- get a sub-optimal balance between short- and long-term projects (so transitions between, say, generations of products could be less convenient to customers, etc.).

4.4 Nature of innovation

Innovation is the creation of change that introduces a significant element of novelty in thought (for example, through blue-sky thinking) and action.

Figure 6 **Position of an organization on the change/innovation spectrum**



Changes brought about by innovation might relate to a wide spectrum of factors such as knowledge, perceptions, values, understanding needs, technology, design and business processes. They tend to be unusual, perhaps unexpected advances that are not always obvious when first encountered, though stakeholders affected might accept them quickly. Some arise as knock-on effects of what customers, competitors and suppliers do.

A close link between idea and action is essential. Ideas need to be interpreted into practical solutions, implemented and delivered successfully, then followed-through with refinements and subsequent developments. As such, success involves far more than a flash of inspiration. In all cases, the outcome should be seen to be beneficial to stakeholders, though the benefits need not be evaluated solely in financial terms.

An innovation might be a single step change or comprise an imaginative combination of changes, some involving a better use of existing knowledge and practices, new combinations of familiar elements, introductions of smaller evolutionary advances, mixes of all-new elements, as well as major leaps forward.

Innovation rarely results from operating in customary ways. It almost always involves doing things differently, with new perspectives and approaches leading to distinctive solutions. Innovation is frequently guided by new insights that enable a crucial restructuring of problems. Other differences can occur in the:

- people brought together to address problems;
- environment in which people work and how they interact;
- language, approaches and techniques used;
- presentation and implementation of solutions, and how their benefits are communicated;
- way solutions are launched and supported in markets.

Innovation might be the achievement of a critical cost reduction, hence price point, which opens up the market. It might lead to technical advances being brought to market much faster than anticipated, thus providing substantial competitive advantage.

Innovation might lead to the transformation of products and the redefinition of customer expectations. An organization might change the way it operates which, in turn, might lead to a restructuring of a market; new standards and legislation might also be brought in to elevate performance and safeguard users' and the general public's interests.

The step nature of radical innovations might result in uncomfortable discontinuities. However, even dramatic change can be brought about smoothly if planned properly. In most instances, success is determined by factors other than technical content, not least the manner in which an innovation is launched and supported after delivery.

In some instances, serial innovation might occur with complementary changes through the value chain, for example, in relationships with customers and suppliers. Resulting spirals of innovation should help reinforce technical and market leadership.

4.5 Reasons to innovate

Many reasons make innovation an imperative for organizations, particularly those of small and medium sizes. Its importance is linked to survival, sometimes expressed as the only sustainable strategy for growth. Others consider innovation a vital force that motivates staff and gives them a considerable sense of pride.

Research also confirms that the most frequent catalysts of innovation are customers and partners in the value chain. Addressing their needs, seeking to make life easier for them and helping to improve their businesses, all act as drivers of innovation. However, observed difficulties, declared requirements and complaints have to be translated into intelligence that helps generate sensible solutions.

The principal reasons why innovation should be among an organization's core competencies are summarized below:

a) To improve current situation:

- reduce costs and raise margins, hence profitability;
- protect market share and survive adverse operating circumstances;
- stimulate staff with interesting and challenging work;
- provide stability for the workforce.

b) To open new horizons:

- reposition and alter perceptions of an organization;
- exploit avenues with greater potential;
- gain competitive advantage and lead the market;
- reduce the influence of competitors.

c) To reinforce compliance:

- comply with legislation (current or anticipated);
- fulfil social and environmental responsibilities.

d) To enhance organization's profile:

- enhance reputation and raise its market profile;
- attract extra funding;
- to attract those with good ideas and potential alliance partners;
- to attract and retain higher calibre staff.

4.6 High productivity innovation

To gain competitive advantage in circumstances where resources are necessarily constrained, it is crucial for organizations to focus efforts on opportunities that yield greatest operational, psychological and financial benefits.

The curiosity of staff members, customer requests (or dissatisfaction), and competitive pressures all act as spurs to do things differently and better. However, special efforts should be made to generate high productivity innovations that:

a) solve more problems than originally envisaged;

b) spawn further innovations;

c) set new benchmarks, price points, etc. that competitors struggle to match;

d) interest and inspire more people;

e) are easy to sell, internally and externally;

f) colleagues grasp quickly and make their own;

g) present real and enjoyable challenges to those who develop them;

h) arise out of trouble-free development;

i) are more readily implemented and integrated into host organizations;

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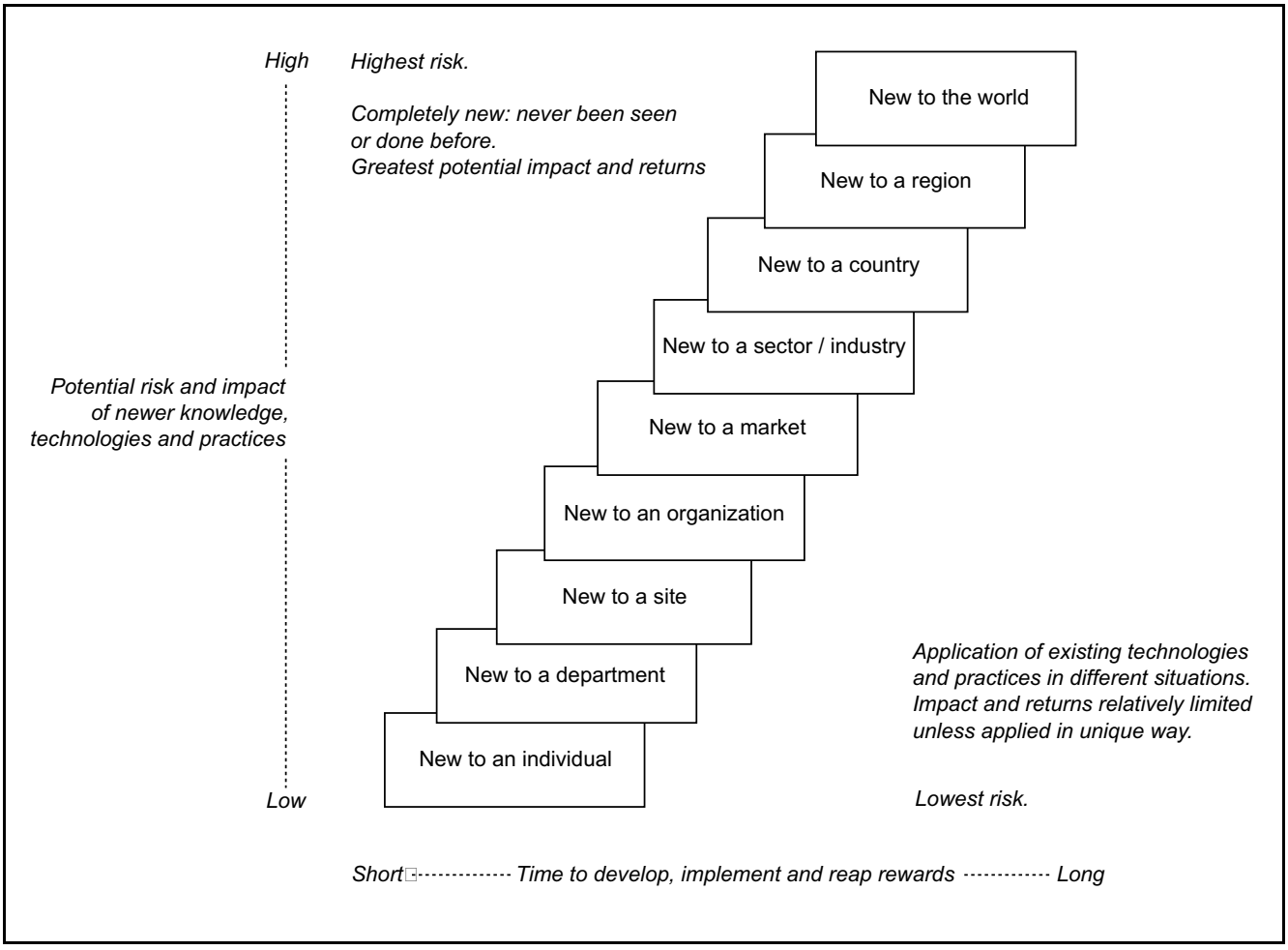
j) have fewer shortcomings that are rectified easily at minimal cost.

4.7 Degrees of newness

The spectrum of changes that might be introduced through innovation extends from "new to the world" at one extreme through to "new to an individual" at the other (see Figure 7).

Figure 7 **Spectrum of newness**



The former encompasses changes that have never been seen or done before as far as can be ascertained. The latter might encompass existing technologies and practices that are familiar to others or common in different situations.

The former also holds the potential to generate the greatest impact and returns; while those arising out of the latter can be severely limited. As change in the former is relatively greater and less familiar, the risks in seeking and implementing such newness are considerably greater; those associated with the latter are commensurately lower. These are crucial factors when determining the kinds of innovations to be pursued.

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4.8 Sources of newness

The sources of newness might be personal to individuals, relate to one or more groups within an organization, or derive from whole organizations.

Broadly, change and newness should not be anticipated if there is no motivation to do things better and differently. If an organization makes no changes in the way it goes about its work, it should not expect innovation to result.

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Sources of newness should be sought in the following:

a) Perceptions and ambitions:

- vision of the future and willingness to extend planning horizon;
- how the future is linked to the present;
- attitude towards opportunities, constraints and threats;
- where boundaries are placed;
- commitment and drive at top levels.

b) What is done:

- areas of interest;
- class of problems tackled;
- where boundaries are placed.

c) How things are done:

- project configurations;
- mix and calibre of people involved, disciplines and bodies of knowledge brought to bear, how they interact and networks tapped;
- language, processes and techniques used;
- assignment of resources (equipment, etc. used);
- innovation management infrastructure;
- way work is financed and outcome is evaluated.

Newness might be at the core of a product or process and suffuse it; or it might be superficial and confined to a minor part. For example, the adoption of a new manufacturing process might require radical changes to the design and assembly of a product's components. However, these significant changes might be invisible as the external appearance of the product and the way it is operated might remain unaltered. By contrast, simply changing the materials and colours of a product casing to ones that are unique in the market might transform it in the customers' eyes.

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4.9 The value chain

Research reveals consistently that success with innovation requires attention to far more than the technical content of products, for it is the experiences with products and the originating organization that form a customer's satisfaction. Though technology is often critical to the success of products, it is not always understood by customers or they might take it for granted; technology is rarely uppermost in their minds.

Potential innovations should be sought throughout the value chain, not just in the technical aspects of product development, for example, by examining how an organization operates, the way it creates new products, its sourcing and fabrication processes, marketing and after-sales support, through to final disposal and recycling of products.

Such a perspective is essential to evolve carefully integrated solutions that are increasingly essential in highly competitive markets. Working throughout the value chain is often the best way to safeguard the integrity of solutions through to launch and on to disposal.

Third parties in the value chain (suppliers, contractors, sales outlets, etc.) can have a major impact on the overall customer experience. They could be encouraged to become partners in innovation which would expand expertise and resources brought to bear in exploiting opportunities, sharing work and costs, facilitating buy-in, and reducing time to delivery.

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Opportunities for innovative exploitation across the value chain are listed in Figure 8.

4.10 How change is introduced over time

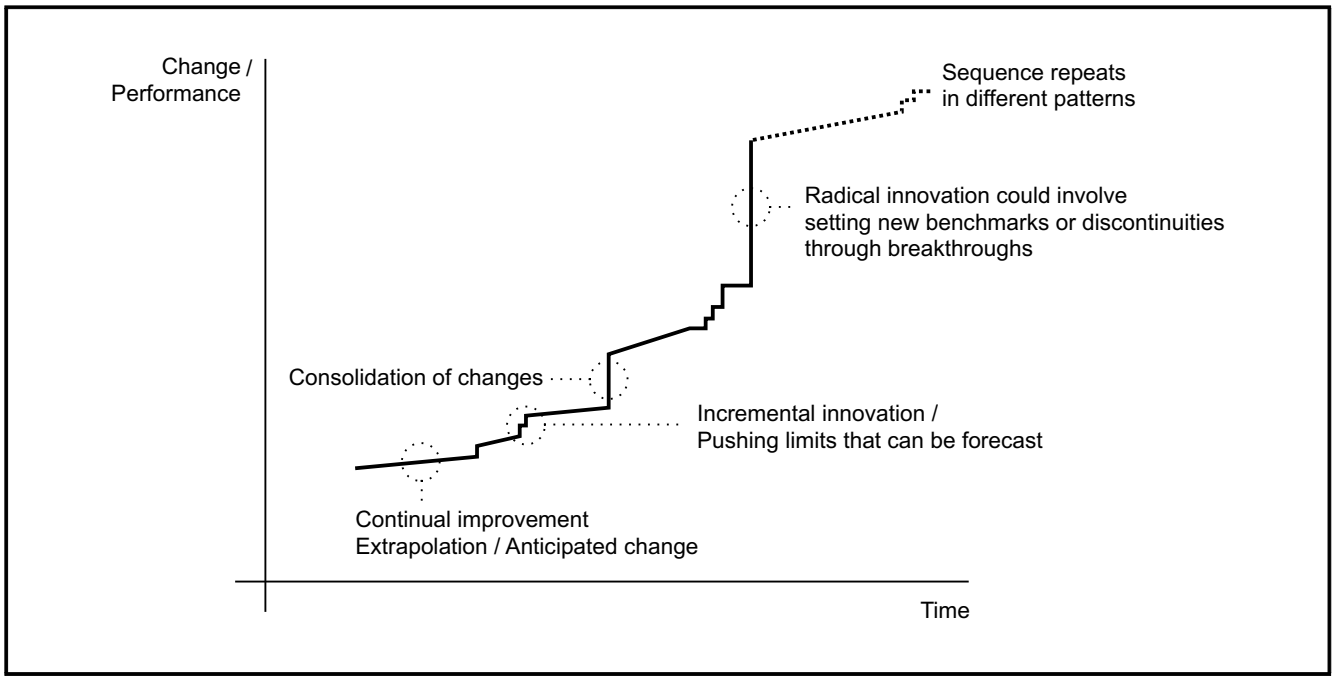
Organizations should always be open to newness. However, critical judgements have to be made on when, the extent of, and how change is introduced. Often, these are among the most difficult decisions in business.

Products tend to be upgraded over time. Within an existing product concept, there are periods when a series of relatively minor changes are introduced which constitute predictable improvements (for example in the ergonomics of a product or its aesthetics). After a period, these changes are consolidated into a major change (such as a new concept). Such continual improvement might include some incremental innovation that extrapolates the current configuration and performance (see Figure 9).

Figure 8 **Opportunities to innovate throughout the value chain**

Strategic development	**Creation of right offerings and processes**	**Procurement of expertise and inputs**	**Preparation / Fabrication of offerings**	**Distribution / Access**	**Marketing / Sales / Customer experience**	**Customer and market support**
Get organization into shape, then maintain its fitness to innovate	*Select and transform the right ideas into viable product opportunities to achieve objectives and deliver plan*	*Process inputs to organization*	*Actual production of products / preparation to deliver services*	*Get the product safely to the right points of sale, and deliver services without adding unnecessary costs*	*Present offerings effectively so as to widen appeal and maximize revenue potential*	*Support products and customers in the market*
- Future vision - Innovation planning - Innovation highway - Culture / values - Policies / practices - Research and development of critical competencies - Alliances - Generating / capturing / vetting / archiving ideas - Training / development of new skills sets - Intellectual property - Corporate software / - Knowledge Management - Competitors	- Opportunities selected for exploitation - Customer-Product - Experience Cycles - New product creation / development procedures - Project configuration - Harnessing external expertise - Design origination - Design development and detailing - Prototyping / testing - Whole-life assessment - Customer satisfaction - Safety - Sustainability - Business model - Competitors	- Availability / access to expertise - Sourcing supplies - Delivery / timing - Storing - Internal handling - Quality control - Relationships with suppliers and other partners - Shrinkage / waste / obsolescence - Buying department - Negotiation - Contracts - Licensing	- Fabrication - Assembly / Bringing together all components of service - Testing - Packing - Storing - Operations management - Quality control - Protection of intellectual property - Minimization of waste and effluents - Enhancing efficiency of energy use - Negotiation - Contracts - Licensing and other revenue streams	- Order placement and processing - Selection of channels - Options for delivery - Delivery environment - Accessibility - Scheduling - Warehousing - Delivery to market - Backup during delivery - Chain of command - Training	- Marketing - Display - Pricing - Selection of outlets - Product presentation / point of Sales material - Relationships with retailers / partners - Advertising - Incentive schemes - Negotiation - Contracts - Intellectual property / licensing - Training - Buying experience - Out-of-box experience - First use experience - On-going use - Re-purchase pattern - Customization - Influence on user practices - Next generation wishlist - Competitor response	- After-sales service - Query and complaint processing - Spares supply - Training - Analysis of customer processes / practices - Anticipate customer needs and aspirations - Customization - Observation / Customer feedback - Build on lessons learnt - Reliability / safety record - Termination / Phasing out / Disposal - Waste reduction - Disassembly and recycling - Re-use - Intellectual property / licensing

Figure 9 **How change is introduced over time**



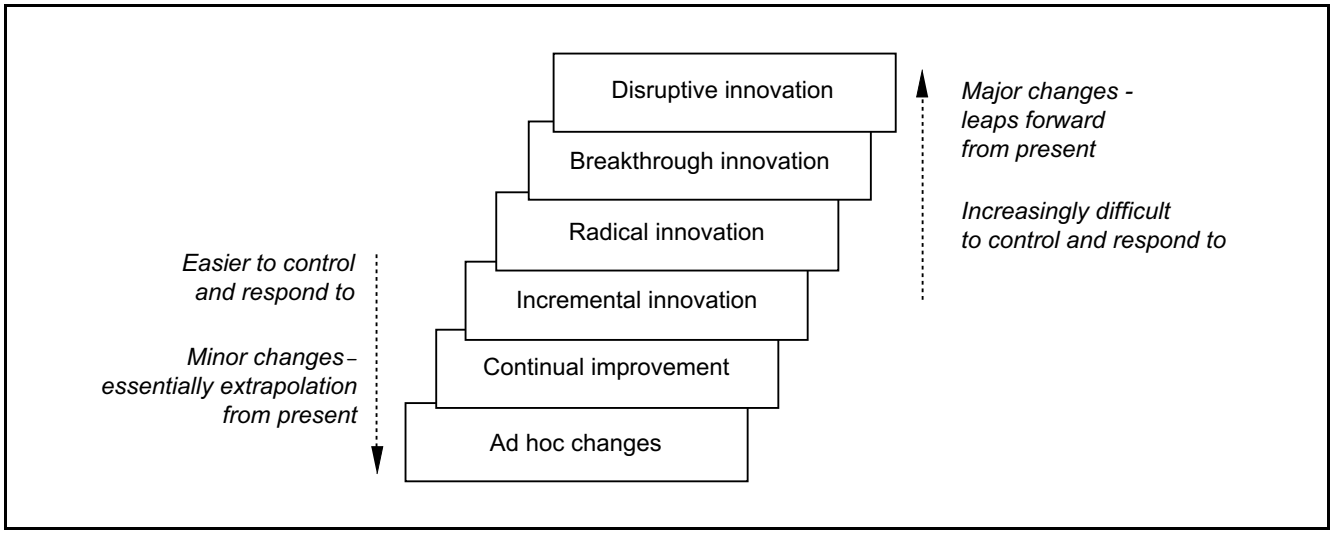
Occasionally, step changes in performance are achieved through advances in existing technologies, ergonomics and business practices, or the introduction of new technologies and procedures. Such phases of radical innovation tend to be followed by stable phases where incremental enhancements are introduced until a further radical change becomes necessary.

Radical phases might herald new generations of products though, in reality, most innovations are sub-innovations that do not transform the overall product even when one or more components are substantially altered.

4.11 Innovation and change management

Managing innovation is often about creating and managing the most challenging change in business and society, not least ensuring that change does not degenerate into chaos or its implications overwhelm an organization (see Figure 10).

Figure 10 **Hierarchy of change and innovation**

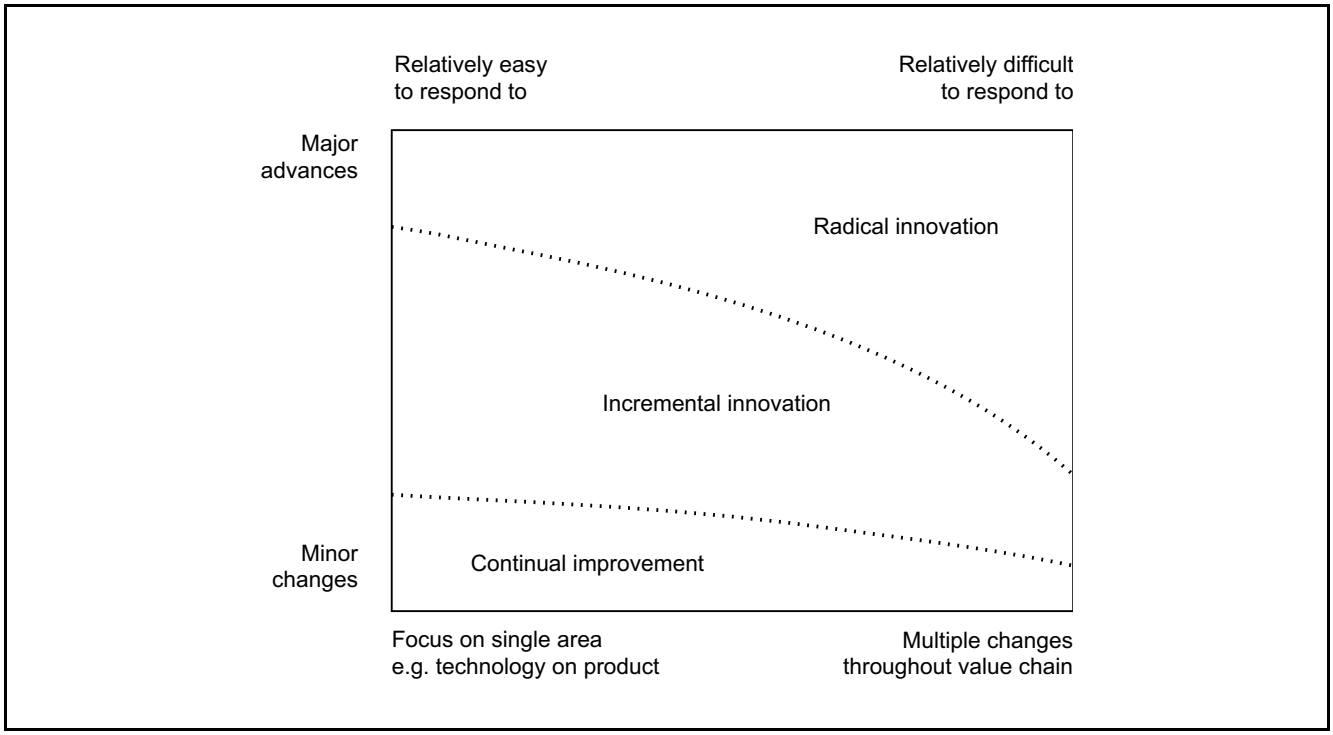


The extent of change introduced depends on technical and business proficiency, as well as what customers and others in the value chain will accept. This, in turn, depends on how visible changes are and its felt impact on performance and reputation.

There is also a change threshold below which an improvement does not register, either because users do not sense it or because it is not significant enough to impress.

Where change is pursued in just one or two areas of a product, it would take a significant improvement or difference to achieve radical innovation. However, where change is planned in several areas, relatively small improvements and differences can add up to a radically new proposition (see Figure 11).

Figure 11 **Impact on response to change**



Introducing many changes all at once can be tricky. Considerable co-ordination is required to meet deadlines within budget. When implemented successfully, competitors find such combinations much more difficult to counter, especially where changes occur throughout the value chain.

When change is imposed and not valued, a lack of co-operation from stakeholders can seriously affect the chances of success. In extreme cases, resistance and subversion occur. Appropriate consultation could help gain early buy-in, raise co-operation and minimize resistance. Change is more likely to be embraced and embedded within organizations over time when stakeholders influence changes and make them their own.

Where stakeholders want change, they tend to push for rapid implementation; a distinct advantage when seeking early buy-in, unimpeded implementation and continuing development. In these instances, transitions should be undertaken according to agreed plans, without rushing or taking unnecessary shortcuts (see **6.14**).

NOTE Some factors that affect responses to change are shown in Figure 12.

Figure 12 **Factors that affect stakeholders' response to change**

Where is the change you propose to introduce on these issues? Mark an 'x' in the relevant box on the scale.

Change likely to draw negative response	1	2	3	4	5	**Change likely to be embraced**
Change presented by organization to customers/users	☐	☐	☐	☐	☐	Change demanded by customers/users
Forced on organization (by competitors, etc.)	☐	☐	☐	☐	☐	Self initiated to stay ahead of the field
Customer/user needs not considered	☐	☐	☐	☐	☐	Resonates with all stakeholders
Poor fit with organization's objectives and circumstances	☐	☐	☐	☐	☐	Tailored to organization's objectives and circumstances
Need for change not obvious so considered a low priority	☐	☐	☐	☐	☐	Change acknowledged as necessary and assigned a high priority
Change perceived to be a disruptive burden that hinders progress	☐	☐	☐	☐	☐	Change perceived to be a timely challenge that will help organization/staff to advance
Aims and benefits not understood	☐	☐	☐	☐	☐	Aims understood and benefits valued
No effort made to involve staff in groundwork; they have no influence on what happens	☐	☐	☐	☐	☐	High level of consultation with staff who influence actions taken
Staff see no obvious relevance to their work; change likely to benefit others in distant future	☐	☐	☐	☐	☐	Staff see direct relevance to their work and benefits arise as project progresses
No commitment to effective implementation or sustained follow-through	☐	☐	☐	☐	☐	Implementation planned rigorously with sustained follow-through
Staff are thrust unprepared into alien territory and left to cope on their own	☐	☐	☐	☐	☐	Staff are prepared to embark on the change and are supported throughout implementation
Staff avoid involvement as change is not part of their remit	☐	☐	☐	☐	☐	Staff adopt change as their own and contribute fully to further developments
No lasting benefit from a great deal of effort that many think is mis-directed and competitors quickly replicate the change	☐	☐	☐	☐	☐	Considerable effort seen to be worthwhile after competitors are left floundering and organization's profile rises

4.12 Basis of effective innovation management

The following list summarizes key actions in effective innovation management:

a) Organizational stance:

- Acknowledge responsibilities then drive innovation policy and activities from the top.
- Formulate a clear long-term vision plus specific tangible innovation objectives and strategies closely aligned to organization's objectives and strategies, then ensure that short-term work ties in seamlessly with long-term investments.
- Maintain a genuine and visible commitment to effective innovation through quality and reliable design, and ensure that innovations are exploited to their full potential.
- Establish an innovation-nurturing culture with the fundamental belief that the future can be planned then created over the long term.
- Evolve a blame-free environment that underlines the power of learning from failure.
- Place staff on the front line of innovation and promote their ability to contribute to the organization's innovation programme.

b) Scanning the environment:

- Be aware of competitors' innovative activities as well as relevant activities relating to innovation in other fields.
- Monitor progress and trends in markets, technologies and intellectual property.
- Develop and/or harness appropriate technologies.

c) Problem-solving approach:

- Adopt an holistic approach to products.
- Encourage the generation and efficient processing of ideas even where there is minimal competition by providing a stimulating work environment that allows some personalization of work and spaces.
- Seek to be innovative when articulating customers' needs, interests, aspirations and defining problems. Creative briefing goes a long way towards the formulation of creative solutions.
- Encourage imaginative configurations of projects, not least in the expertise and resources brought to bear on a problem.
- Promote innovative, comprehensive solutions to consumer and business needs. Copying becomes considerably more difficult when creative solutions cover greater ground and engage target audiences emotionally.
- Plan and rehearse customer experiences over complete product lifecycles as the basis for design work.
- Assess opportunities and risks, particularly in relation to timing and degree of innovation.

d) Management system:

- Understand organizational capabilities and limitations.
- Introduce a system for undertaking innovative work that is accessible to, and understood by, all employees.
- Establish a gateway review system to monitor progress at opportune intervals, allow opt-outs, revisit previous failed initiatives, and tailor work to changing circumstances.
- Plan introduction and sustenance of innovations.
- Maintain confidentiality of innovation plans and programmes.
- Determine, protect and exploit intellectual property.

e) Resources allocated:

- Make effective use of the skills, knowledge and experience within the organization (the corporate software).
- Develop skills needed to put together innovative projects; set up training programmes to upgrade innovation management skills and innovation performance.
- Use advances in information technology to raise the effectiveness of communication throughout the organization in terms of speed and wider exposure.
- Ensure innovations are properly supported, and adequate resources (personnel, funding and facilities) are committed throughout the value chain.
- Promote innovation through teamwork to expand opportunities tackled and increase overall benefits; encourage internal and external networking.
- Form innovative alliances to reinforce market positioning and reduce the impact of competition; establish protocols for sharing information (see **5.11.2** and **6.9**).

f) Build on experience:

- Evaluate the contribution of innovation to an organization's performance.
- Capture experience to draw greater insights and build a distinctive competency in managing innovation.
- Build a reputation for achievement as a serial innovator to encourage outsiders to submit ideas and predispose them favourably to collaborating when approached.
- Undertake reviews of innovation and innovation management practices periodically and refine as appropriate.

5 Managing innovation at the organization level

5.1 General

This clause addresses issues that relate to the management of innovation from the perspective of an organization as a whole. It focuses on the direction and guidance provided by owner-managers and partners in small firms; board directors and senior executives in larger companies; as well as senior officers in public sector and not-for-profit organizations.

NOTE 1 For the sake of brevity, the term "principals" is used throughout this standard to denote these individuals.

Organizations progress through stages when developing their competencies in managing innovation, from novice to world-class performer. The way principals' progress through these stages is strongly influenced by their personal interests, the specific circumstances of their organizations and markets served.

NOTE 2 The term "corporate" in this standard relates to the top-level perspective in an organization as well as issues that span the entire organization.

5.2 Assign responsibilities for innovation

*NOTE This sub-clause will facilitate the fulfilment of **5.1**, **5.5.1** and **5.5.2** in BS EN ISO 9001:2000.*

An organization's capacity to innovate is affected far more by those who manage innovative activities and set the environment in which they take place than the specialists brought together into innovative teams to undertake the creative work. Therefore, it is essential that competent and experienced executives are assigned responsibility to oversee innovative activities.

In large organizations, tasks and responsibilities relating to innovation are probably discharged by different individuals. In small organizations, they are likely to be undertaken by a single person.

Ultimate responsibility for promoting and sustaining innovative activity in an organization rests with principals. These individuals are responsible for ensuring that their organizations have a clear stance and direction so that full benefits might be reaped through innovation. Principals, together with senior executives in larger organizations, are responsible for ensuring that this direction is followed effectively and that innovation does, indeed, make a full contribution to their organizations' performance.

It is critical that principals drive innovation to ensure their organizations survive profitably well into the future. Colleagues at lower levels in the organization inevitably focus more on the present and short- to medium-term futures; as such, they are less likely to have time or resources to explore the long-term future. Moreover, staff take their cue from senior colleagues. If principals do not demonstrate a willingness to take risks, why should staff risk innovation?

Principals can assign day-to-day executive responsibility for innovation to colleagues who report directly to them. All these individuals should demonstrate a clear understanding of their responsibilities and commitment to innovation through their statements and actions. It is important that job descriptions clearly state their roles and responsibilities in promoting innovation. These should be reviewed and updated periodically.

Aspects of responsibility for innovation should be clearly communicated to junior colleagues so that they know where to seek guidance, submit ideas for assessment, gain authorization to proceed with particular ideas or projects, or get other decisions relating to innovation.

Broadly, those who have responsibility for and/or champion innovation should:

a) convince colleagues that their organization can influence and create the future;

b) ensure that planning products and activities for the long-term future is undertaken seriously;

c) provide a future vision that drives their organization's innovation effort;

d) instil values and understanding of the organization's mission and objectives relating to innovation in a way that all employees can personalize;

e) provide an innovation management framework by which colleagues can tolerate, and operate with, greater freedom of action to allow innovation to flourish;

f) develop their organization's culture to nurture innovation and commit to long-term development;

g) provide role models with tangible records of repeated achievement through innovation that inspires colleagues;

h) have the facility to navigate through all business disciplines, processes, projects and change programmes within the organization;

i) act as experts who bring together the right skills, teams and resources, and create alliances to address appropriate opportunities;

j) promote the best use of their organization's intellectual property and make legitimate use of what others have;

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k) promote their organization's reputation for successful innovation.

5.3 Stage 1 – Review current innovation practices to determine potential for improvement

Before planning the future, the current situation should be identified and quantified (wherever possible) in a broad-ranging review led by principals, covering all an organization does in relation to innovation, e.g. its activities, procedures, culture, resources assigned, financial commitments, and achievements. Reviews should also analyse:

- market trends, anticipated demand, positions of current products in their lifecycles;
- future turnover and profits, hence potential gaps in overall performance;
- strengths, weaknesses, opportunities and threats;
- existing intellectual property that could be exploited to better effect; as well as existing skill sets.

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Results can then be compared with competitors and the best organizations in an industry or particular activity to gauge the potential for improvement. As such, they provide the context and indicate the groundwork and infrastructure necessary to enhance performance.

All reviews (internal and external) help to build, and communicate, the business case for adopting a more professional approach to innovation. This identifies the prime reasons for change and the likely costs of maintaining the status quo. It also provides preliminary assessments of the opportunities to exploit, resources to be committed and anticipated benefits.

The assistance of experts (and lead users of products) might be required to flesh out key issues, develop the necessary skills, complete assessments and support internal champions.

NOTE 1 Further guidance on the scope of internal and external reviews is given in ***6.7****.*

NOTE 2 BS EN ISO 19011 and BS EN 61160 provide further guidance on general review procedures.

5.4 Stage 2 – Create future vision

The creation of a future vision should follow the wide-ranging review of an organization's current capabilities and potential for improvement. This helps to formulate a clear, challenging innovation brief that guides and inspires colleagues throughout the organization to come forward with appropriate propositions for improvements and development into long-term products.

A vision of the future which, perhaps, principals evolve over a series of brainstorming sessions, should be informed by:

- how people go about their lives, as well as changes in the natural and built environments;
- core technologies as well as developments in business practice and society generally;
- key characteristics of target markets;
- main drivers of customer needs and activities, perceptions and expectations, purchase decisions, satisfaction and loyalty;

- analyses of customer experience with the organization and its products;
- development of leading best practices;
- competitor analyses;
- anticipated changes in legislation;
- scenarios envisioning desirable futures (events, markets, technologies) as well as potential adverse factors; and
- how the organization intends to position itself in that future and contribute to making it a reality.

The outcome of these top-level brainstorming sessions helps to determine the innovation highway to take the organization to its desired future (see **6.8** to **6.12** for more detail).

5.5 Stage 3 – Draw up mission statement relating to innovation

Principals should formulate a statement of their organization's innovation mission to enhance and give greater practical meaning to their business mission. This should articulate the organization's general stance, or philosophy, towards innovation, the prime reasons for promoting innovation, and its contribution to overall performance. This statement, together with the organization's innovation objectives and strategies, are prime determinants of what is acceptable to an organization in terms of innovative activities and investments.

5.6 Stage 4 – Distil innovation objectives and strategies from organization's overall objectives and strategies

Principals should ensure that relevant innovation and innovation management issues are addressed during the planning cycle. Innovation objectives and strategies should be distilled from the organization's overall business objectives, future vision and strategies, together with the criteria against which new opportunities and performance are gauged. This ensures that corporate objectives provide the foundation and main thrust for all innovation and that resources are co-ordinated across disciplines and harnessed to their full potential to achieve those objectives.

The results of deliberations should be documented in all key plans, e.g. strategic, business, operating, and departmental. If a separate section on innovation cannot be created within plans, these issues should be clearly identified in other sections.

5.7 Stage 5 – Determine the innovation highway

The innovation highway sets the direction an organization takes to develop its next three product generations. It should illustrate how market demand, specific customer needs, technological advances, etc. can be brought together in the range of products offered by the organization.

The highway also establishes the parameters within which development work on long-term products will be undertaken through two key components:

- the time into the future to be planned, i.e. the length of the highway;
- the terrain, business and operating constraints within which innovative opportunities will be sought and developed, i.e. the width of the highway (see **6.8.3**).

As such, highways form part of the first vetting review to check whether proposed ideas align with an organization's innovation objectives and strategies. Those that do not, and cannot be amended appropriately, should be eliminated or archived for future reference.

5.8 Stage 6 – Plan introduction of new approach to innovation

Managing innovation is sometimes likened to managing chaos. If handled inappropriately, much of the groundwork could be wasted as innovation programmes are stifled soon after launch. The resulting ill-will could stymie future change programmes.

Innovation thrives on a degree of freedom, therefore attitudes and methods appropriate for routine operations are inappropriate. An ability to control innovation with a light and enlightened touch, based on trust and confidence, is a distinct advantage.

Introducing significant change into organizations, especially when core values and culture are affected, requires careful planning to ensure smooth implementation and full benefits are realized.

Innovation champions should be identified to spearhead the transformation (ideally assisted by a change team) and gain an appropriate level of buy-in before a programme is launched.

Often, staff feel they have minimal influence on the outcomes of change programmes: generating and implementing ideas for change are the prerogative of senior colleagues. Principals should quickly dispel such limiting perceptions by convincing staff that they are key players in innovation, and essential to the successful implementation of change programmes.

Introducing a new approach to innovation should encompass:

a) Setting the context:

- Establishing a shared need to embrace innovation based on a business case that informs why change is necessary and highlights opportunities to create competitive advantage and raise the organization's reputation.
- Communicating an inspiring vision of the future with guiding principles and values.
- Clear guidance on who to go to with queries, for support and decisions.

b) Establishing mechanisms:

- Formulating a transition programme, preferably with a formal launch.
- Ensuring all those affected understand how the programme will unfold over time, are clear about their involvement, and fully prepared to make their contribution.
- Creating an innovation infrastructure (formal procedures, guidelines on approved practice, facilities, etc.) that is aligned with that of other disciplines in the organization.
- Sustaining momentum of the change programme.

c) Knowing what has been done:

- Documenting experience and evaluating progress.
- Celebrating achievements.
- Learning lessons on how to improve the handling of future innovative initiatives.

d) Refining for the future:

- Mobilizing commitment to embed changes.
- Establishing the foundation for serial innovation.

*NOTE For further guidance, refer to BS 6079-1:2002, **5.5.***

5.9 Stage 7 – Communicate essence of innovation mission, objectives and strategies

*NOTE This sub-clause will facilitate the fulfilment of **4.2**, **5.1**, **5.3** and **5.5.3** in BS EN ISO 9001:2000.*

Principals and staff need to be fully aware of the parameters that define the innovation highway. Being familiar with the rules, terrain and game plan enables them all to focus efforts and work in unison.

Where appropriate, all innovation and innovation management issues, planned activities and range of products should be brought together in a separate reference that is circulated widely around the organization.

Considerable benefits can be derived from communicating the essence of plans widely through:

- team briefings and notice boards;
- intranets;
- newsletters and magazines;
- staff conferences and training.

Stakeholders outside the organization should also be kept appropriately informed to reassure them that there is clear direction and leadership to turn visions of the future into reality. Principals should take advantage of all communication channels to publicize and explain their organizations' innovation philosophy, objectives and strategy through:

- websites;
- annual reports and corporate literature;
- briefings to financial institutions, customers and partners in the supply chain;
- advertising, product publicity, trade shows and professional conferences.

The language and terms used in all instances should be appropriate to the targeted audiences. Visualization and the use of design might do much to bring to life textual and quantitative information by providing fresh perspectives and vivid presentation using stimulating and easily comprehensible visual imagery.

It is essential that informal communication is maintained alongside formal channels. Internal politics are always significant components of the process and networking should be encouraged as it tends to reduce the burden of bureaucratic paperwork.

5.10 Stage 8 – Promote an innovation-nurturing culture

Those who lead innovation should take account of the identity and culture of their organizations, i.e. the physical, operational and human features and values that make up an organization's personality.

It is essential to evolve a culture that nurtures innovation and for innovation to enhance the organization's identity and culture. Such cultures are characterized by the following:

a) The foundations:

- Core belief that the future can be influenced and planning over the long-term is worthwhile.
- Clear vision of the future and the role of the organization and its products in that future.
- Restlessness with the status quo and constant striving to improve operations and products.
- Openness to ideas from any source that point to different interpretations of requirements, new approaches to problems, as well as distinctive solutions to enhance customer experiences.
- Holistic perspective of products/opportunities.
- Tenacity and stamina to achieve visionary objectives.
- Greater tolerance of uncertainty and willingness to take bigger risks, albeit on a better informed basis.
- Higher level of experimentation and an acceptance that, when staff are really stretched, not all attempts succeed.

b) Acknowledgement and leading from the top:

- Innovation has a high profile and features in the folklore of the organization because its value in enhancing corporate performance is acknowledged.
- Principals drive innovation and insist that it is administered to the highest standards, without concession.
- Principals demonstrate pro-active support and enlightened commitment over the long term so innovation establishes firm roots and flourishes.
- Acknowledgement and celebration of innovative achievements and success.

c) Involvement of staff:

- All staff believe they can contribute to change within their organization focused on the attainment of clear stakeholder benefits.
- Staff devote reasonable time working on ideas to improve current products and create future generations of offerings.
- Staff have direct access to corporate software to make best use of knowledge, skills and experience.
- Emphasis on appropriate teamwork and networking.

d) Enlightened systems and rigorous application:

- Rigorous yet enlightened system for vetting innovative ideas with fast decision-making.
- Meticulous planning for the introduction and efficient implementation of innovations.

e) Making the most of experience:

- Passion to learn from all experiences, internal and elsewhere, especially failures.
- Training to upgrade innovative performance.

5.11 Stage 9 – Reinforce infrastructure and expertise to manage innovation

*NOTE This sub-clause will facilitate the fulfilment of **6.3** and **6.4** in BS EN ISO 9001:2000.*

5.11.1 Need for rigorous innovation management system

Enlightened innovation management requires an infrastructure to make the innovation mission more tangible, administer the master programme and embed innovation throughout the organization.

It is a key responsibility of principals to create and promote such an infrastructure to the point where the innovation management system operates smoothly, is openly appreciated and is closely linked to the systems of other business disciplines (see **4.12**).

Broadly, an organization's system for managing innovation encompasses:

- values;
- policies;
- procedures;
- systems;
- physical environment;
- facilities;
- equipment; and
- support services.

5.11.2 Augment internal competencies with external expertise

With the increased complexity of technology and scarcity of resources, organizations should harness the expertise of external parties around the world, involving employees as well as key user groups in an active search to improve their customer offerings. Suppliers, distributors and even competitors might become members of an organization's innovation team whether or not collaborative initiatives are undertaken (see **6.9**).

5.12 Stage 10 – Draw up master innovation programme

*NOTE This sub-clause will facilitate the fulfilment of **7.5** in BS EN ISO 9001:2000.*

All innovative activities (long- and short-term) should be co-ordinated within a master innovation programme that details work on each potential product, technology or process broken down into stages (with deliverables, budgets, schedules and reviews) (see **6.6**).

Work to be executed entirely in-house should be identified together with that requiring external help (bought-in, out-sourced or possible bases of alliances). Skills and other resources to be committed should be set out under each stage, together with outcomes and contributions towards attaining the organization's objectives.

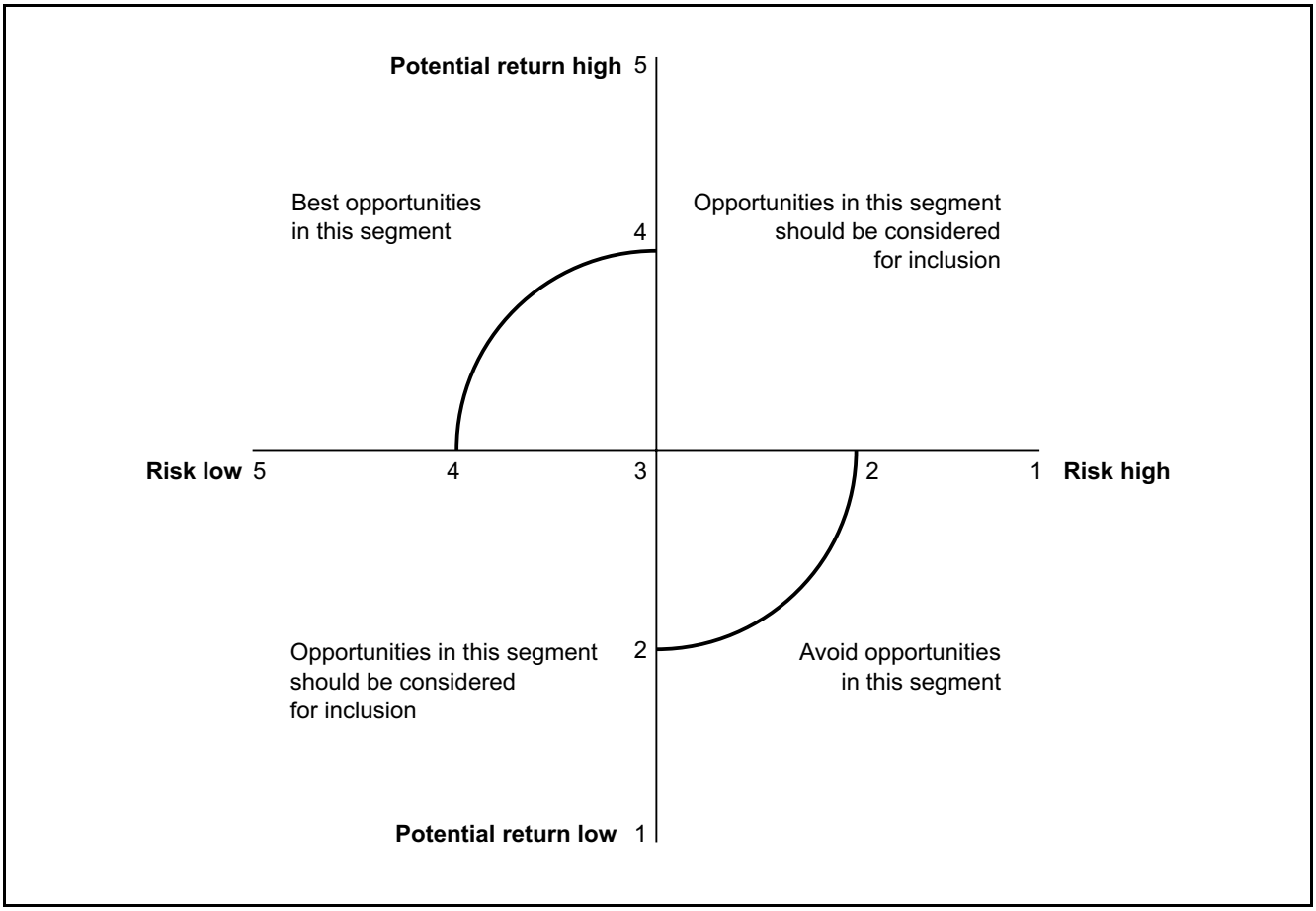
To reinforce context and direction, the programme could usefully summarize the organization's innovation mission statement, objectives and strategies. It is important that all those involved and interested in innovation have access to this programme in a formal, easily accessible working reference.

The criteria that guide the search for innovative ideas should be clearly stated and familiar across the organization. Initiatives should be approved onto the master innovation programme by means of a formal procedure that is transparent and fair.

It is essential that principals nurture a pro-active attitude among colleagues, for example, staff should have an open invitation to put forward innovative suggestions. Guidance should also be provided to assist staff to formulate proposals and gain appropriate backing. Timely, meaningful responses from superiors are further encouragement for staff to invest time formulating proposals; wherever practicable, users and specialists should be consulted to validate them.

It is advisable to maintain a balanced-risk portfolio of longer-term development projects with a good mix of high risk/high return and low risk/lower return projects (see Figure 13). Projects with low risks and high returns are most favoured; those with high risks and low returns should be avoided.

Figure 13 **Risk and potential returns in balanced project portfolios**



Principals should allocate the necessary finance and other resources to ensure the master innovation programme (encompassing research, design, development work as well as training) is implemented when required, to the highest standards, with their active support (see **6.13**). This goes beyond releasing existing funds or generating additional funding for specific projects. Continuity of resources at sensible levels is essential to raise and sustain standards.

Public sector organizations should ensure they gain approval for such investments from appropriate government departments, while voluntary agencies need to satisfy their governing bodies.

5.13 Stage 11 – Implement programme and support new approach to innovation

*NOTE This sub-clause will facilitate the fulfilment of Clause **6** in BS EN ISO 9001:2000.*

Principals and staff need to be fully aware of the direction and objectives set for innovation, as well as the parameters of the innovation highway, so efforts are focused and all work in unison.

Ideally, projects should start at the earliest opportunity allowed by the master innovation programme to develop thinking, get closer to target audiences, gain greater insights into requirements and conceive options. It could be several years, and many iterations of modelling, before an outline product specification is fleshed out into a

configuration that simulates the end product or a working prototype fabricated for testing. Wherever possible, completion should be held back to the last allowable moment in the programme to take advantage of all advances that occur.

In between, innovation leaders should ensure that momentum is maintained throughout projects not only to deliver to deadline, but also to build on the energy of team members. The opinions of those who have to deliver innovation and will benefit from the outcomes of projects need to be heard and practical lessons learnt to enhance the effectiveness of subsequent product refinements.

Innovation leaders should remain properly informed of the progress of projects to ensure that innovation is not sidelined. They should never assume that project teams will deliver innovation simply because an inspiring brief was set. There is a constant need to reinforce the principles that underpin the new stance towards innovation.

Leaders should encourage teams to push boundaries, especially during the highly iterative early stages. They should insist that stage gateway reviews are undertaken rigorously, supporting innovative options as outline product specifications are fleshed out over stages. The option to avoid is when the indecision of superiors effectively imposes a stop-start regime that saps the enthusiasm of team members.

Another role of innovation leaders is to make sure that projects in the master programme are fully co-ordinated with beneficial inter-changes between teams.

Principals should also ensure that funds are spent as intended and not withheld or diverted unless there are clear over-riding reasons that have been carefully checked. If funds have to be re-allocated, the impact on individual initiatives and the overall innovation programme should be taken into consideration and the plans adjusted.

Different ways of working (especially alliances) should be checked to ensure they actually contribute to improved performance and outcomes (see **4.4** and **6.9**).

It is advisable to strengthen networks with specialists and users, perhaps as part of a corporate social responsibility programme (where appropriate to include older users and others with special needs).

If an innovation is not successful when first introduced, efforts should be made to gain appropriate feedback to understand the contributory reasons. If the product is revealed to be viable, it should be improved according to the lessons learnt, then re-launched as soon as possible to maintain market position and goodwill.

Principals and innovation leaders are responsible for ensuring that their organizations are not exposed to excessive risk that might lead to fatal failures. Moreover, they should instil in team members a resilience that enables them to recover fast from failure to fight again, turning negatives into positives.

5.14 Stage 12 – Evaluate progress and contribution of master innovation programme

*NOTE This sub-clause will facilitate the fulfilment of **5.1**, **5.2**, **5.6**, **7.3**, **7.4**, **8.1**, **8.2.2** to **8.2.4** and **8.5** in BS EN ISO 9001:2000.*

Principals are responsible for overseeing and evaluating the innovative work undertaken by, or on behalf of, their organizations. Regular reviews should be scheduled into the master innovation programme.

Investments in innovation should be evaluated by means of a formal procedure that is documented, transparent and familiar to a wide range of personnel within the organization.

The three most significant assessments to be undertaken relate to the:

1) contribution of innovation to an organization's performance, especially the outcomes of innovative activities, and the achievement of innovation goals and the organization's overall objectives, and the financial results.

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2) master innovation programme (including targeting of organization's innovation requirements, sanctioning of proposals, portfolio of innovation projects, commitment of resources, integration of all disciplines in innovative activities, control of progress and reinforcement of innovation's importance within the organization).

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3) overall cost of the master innovation programme assessed against the whole-life returns from innovations as well as capital and opportunity costs. Compare contributions and returns with investments in other business disciplines.

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Reviews of projects in progress verify the fit of work with the organization's future vision and parameters set by the innovation highway. They also check the creativity of ideas and quality of their execution, before assessing outcomes from different departments, facilities, subsidiaries and agents. Staff involved in innovative activities should assist in these reviews.

Annual reviews of innovation management procedures and facilities that might help nurture innovation (location and quality of work environment, amenities, equipment and so on) are also recommended. These can provide insights into corrective actions necessary.

Principals should check expenditure against plans and the returns on investment on all resources committed to innovation (not just capital). Divergence from programme and fragmentation of effort need to be detected as soon as possible. Principals should be kept informed of intended remedial actions.

Innovation objectives, strategies and programmes should be reviewed periodically to check their continuing relevance and effectiveness, not least in sustaining the challenge they present in taking the organization forward. Annual reviews are normally adequate, though six-monthly intervals might be preferred in organizations using fast developing technologies or in formative markets.

Evaluation should always be a means to more effective performance, never an end in itself. It should not disrupt the momentum of innovative activity, nor become a burden on those who innovate. Responsibility for carrying out appropriate assessments lies squarely with innovation leaders.

Principals should ensure that the results of reviews are documented properly and circulated widely within the organization so lessons distilled help to improve performance. Sharing experiences can help to avoid repeated mistakes and work being duplicated unnecessarily. Another likely benefit is that problems are anticipated or diagnosed earlier; this often leads to prompter, more effective action. It is advisable that all these results and lessons are recorded in appropriate archives and consulted regularly so as to make the most of the captured experience (see **7.1** and **7.8**).

Finally, the performance of those with responsibilities for innovation should be evaluated at appropriate intervals. This could lead to revisions of job descriptions; adjustments in responsibilities, seniority, reporting lines; and the upgrading of skills.

5.15 Stage 13 – Build distinctive competencies and competitive advantage through innovation

Organizations that develop distinctive competencies in innovation are likely to be at a competitive advantage where sustained performance in constantly changing circumstances is at a premium. Such competencies are brought about by:

- identifying key players (especially innovation champions) and reviewing the composition of innovation teams;
- constantly reinforcing innovation mission statements, extending objectives and refreshing master innovation programmes to maintain the challenges presented;
- seeking unique insights and methods to enhance intellectual property and product development, especially from elsewhere, and generally leveraging expertise;
- organizing innovation events where approaches and achievements are shared and ideas sought for further improvements. These are likely to raise the profile of, and pride in, innovation;
- appointing appropriate staff to a select group of innovators who have enhanced status and wider powers to propose and push through innovative initiatives. Other bonuses could include a share of the extra revenues they generate from successful innovations for future work, an open choice of visits to exhibitions, events, etc.;
- establishing a mentoring scheme whereby innovation leaders and academy members help bring on their successors;
- designating units in medium-size and large organizations that focus on particular areas or products as centres of excellence with relatively greater autonomy;
- enhancing training programmes for executives, staff and any partners in alliances and the value chain, with constantly refreshed input that explicitly promotes the right attitude and skills relating to innovation.

5.16 Stage 14 – Document, share, publicize and celebrate achievements through innovation

It is essential that organizations distil and capture the essence of innovative work undertaken internally or by others on their behalf through documentation and rigorous analysis. Distinctive performance through innovation, especially outcomes beyond expectation, would be prime subjects.

Such references help to make contributions to corporate performance more tangible, not least by underlining the benefits gained (quantified or otherwise) in the short and medium terms. They should be shared widely around an organization and, perhaps, its partners.

Collating evidence across an organization provides a better basis for assessing the vibrancy and impact of innovation, and how deeply rooted it is in an organization's culture. This is best accomplished by means of a knowledge management system that makes the most of accumulated expertise, and a strong tradition of setting up projects with the intention to evaluate rigorously, and learn the lessons of experience (see **7.8**). Credit can then be properly assigned where due, achievements celebrated then weaved into the folklore of the organization.

NOTE For more guidance on knowledge management systems, refer to PAS 11000.

Records should extend beyond successes. Many powerful lessons from experience arise out of failures and provide unique insights because they are rarely publicized (so unavailable to competitors).

Finally, documented experience based on hard evidence (especially contemporaneous accounts) is ideal for refreshingly credible publicity material. This can also be developed into case studies for staff training and management development programmes.

5.17 Stage 15 – Enhance organization's reputation through innovation

The value of innovation could be enhanced further by building it into a core component of an organization's reputation; a key driver and highly visible deliverer of corporate performance. Showing that innovation makes a valuable contribution to sustainability and the communities where facilities are located also helps.

Other means by which corporate reputation could be reinforced are:

- statements in all major publications and plans describing how innovation contributes to the organization's performance;
- documentation that celebrates achievements through innovation;
- appropriate messages in internal and external briefings, publicity and advertising;
- innovation confirmed as a core value in the organization's identity.

Organizations with reputations as innovators tend to be kept informed about innovation so have a greater chance of getting support when needed, not least when seeking finance and applying for grants. Other likely benefits include attracting higher calibre recruits and those with innovative ideas for development, as well as favourable responses when approaching others with collaborative propositions.

5.18 Stage 16 – Review and refine overall approach to innovation

Success from innovation should be repeated on a regular basis. Past successes fade fast and standing still is not a sensible option. This places particular responsibilities on principals and their innovation teams to gain a multiplier effect from replicating their approach in all other business units and facilities, as well as in alliance and supply chain partners.

Principals should also reinforce the regime of continually improving their organizations' approaches and innovation management systems with more substantial longer-term reviews that reflect increased confidence and credibility as a result of mounting quantified achievements.

6 Operating the innovation management framework: Further detail

6.1 General

This clause provides greater detail on the background thinking and work required at various stages when operating the innovation management framework.

Principals are likely to draw in colleagues from different parts and levels of the organization to make individual and collective inputs, especially those selected for the core innovation team.

6.2 Identification of innovation leaders

One or more executives need to take charge of planning for the long-term future of organizations. Innovation champions should be identified to introduce and oversee innovation programmes as well as the development of longer-term products. Ideally, these should be senior executives who think strategically and are likely to remain with the organization long enough to ensure continuity of work through to market and beyond.

Innovation leaders should:

- raise awareness of what is possible through a professional approach to innovation;
- legitimize innovation to break out of the conventional world by challenging traditional assumptions and ways of doing things;
- tolerate higher levels of uncertainty and take more risks, albeit on a better-informed basis;
- help those with ideas to formulate proposals that are more likely to be approved so they develop as serial innovators;
- ensure that there is a constant stream of innovative ideas coming forward for consideration and that sanctioned initiatives get off the mark fast;

- harness available talent to better effect;
- programme a judicious mix of innovative initiatives;
- demand that innovative initiatives are handled professionally and decisions are made rigorously;
- follow initiatives through to maintain an appropriate momentum and generate innovation spirals;
- be repositories of corporate memory in relation to innovation (knowledge and experience);
- support others in shouldering their innovation responsibilities; and
- raise visibility of, and integrate, innovation with other disciplines.

6.3 Selection of core innovation team

Change programmes, such as those promoting a comprehensive approach to innovation, require core change teams to facilitate their introduction and progress.

Potential team members can be identified with the help of skills audits (see **5.13** and Figure 14). In smaller organizations, the same people are likely to be involved in both short- and long-term product development; in larger organizations, different (though equally important) groups of people might be involved.

Where separate groups are established, harmony should be fostered between them so a sense of common ownership is nurtured. Principals should make clear that those involved in longer-term activities do not divest themselves of responsibilities in projects once they have played their part, otherwise there might be antagonism between long-term innovators and short-term developers. When work is passed from one team to the other, open communication and some common members can enhance working relationships.

Care should be taken not to load core innovation teams with members who confine themselves to familiar territory and stick rigidly to rules. It is preferable to select individuals who relish the challenge of addressing unusual problems and working with new people in new ways. In particular, individuals who:

- thrive on being stretched and sparking off each other;
- work with higher levels of uncertainty on several options without closing any off till the last possible moment;
- introduce changes in direction and follow through to satisfactory completion;
- are tenacious in pursuing ideas and somewhat irreverent of the status quo.

6.4 Making time for the longer-term future

The best way to a more desirable future is to create it.

Employees are often fully occupied coping with the demands of the present, so they rarely think about the future; nor is it obvious to them that long-term products could be fundamentally different from those an organization currently offers.

A major limiting factor on innovation budgets often reported by organizations is the lack of people to undertake the work, both in terms of headcount and skills. Having the right people in place talking to the right people within their own and other organizations (particularly clients and partners), helps staff to see opportunities that others do not, then check that there is real value for shareholders and demand for solutions that might result. This tends to facilitate risk assessment and budget allocation.

Networks of colleagues and external experts, who have a facility to envision the future then turn it into reality, often stimulate employees to think beyond their day-to-day jobs or short-term projects.

Time allowances in job descriptions for appropriate employees to engage in long-term activities are helpful so long as these are not shunted out of hours. Research suggests that between 5% and 15% of an employee's work time is a useful guideline.

Principals and staff need to think in a less constrained manner and challenge conventional boundaries. Ideas that emerge should be submitted to qualitative and quantitative examination, not least to ensure that their potential is exploited fully through innovation. Brainstorming sessions help to identify wider uses of the innovations generated.

Figure 14 **Roles and responsibilities matrix**

Job title / function	**Stage of design / innovation project**						
	First awareness of opportunity	**Feasibility study**	**Generation of options**	**Detail design and testing**	**Execution / Launch**	**Product improvement / Development of range**	**Withdrawal / Life-time review**
Principals							
Innovation champion							
Market research							
Research & Development							
Project Manager							
Design / Engineering							
Finance							
Quality assurance							
Procurement							
Manufacture / Operations							
Marketing							
Suppliers							
Distributors / Agents							
Sales							
Customer support							
Training							
Add as appropriate							
	Enter names, roles and responsibilities in boxes. Where individuals have not been identified, enter numbers required.						

6.5 Job security

Staff are unlikely to innovate over the long term if they feel insecure in their jobs or foresee that innovations generated will threaten their employment. Enlightened organizations make considerable efforts to guarantee job security for key staff.

Other things being equal, an organization that plans well into the future should provide greater job security to employees. It is more likely to identify the skills necessary to exploit the opportunities arising out of its innovation highway, whether planned from the start or encountered along the way.

Recruitment, training and archiving of experience ensure that the organization has the right expertise to fulfil its future product plans.

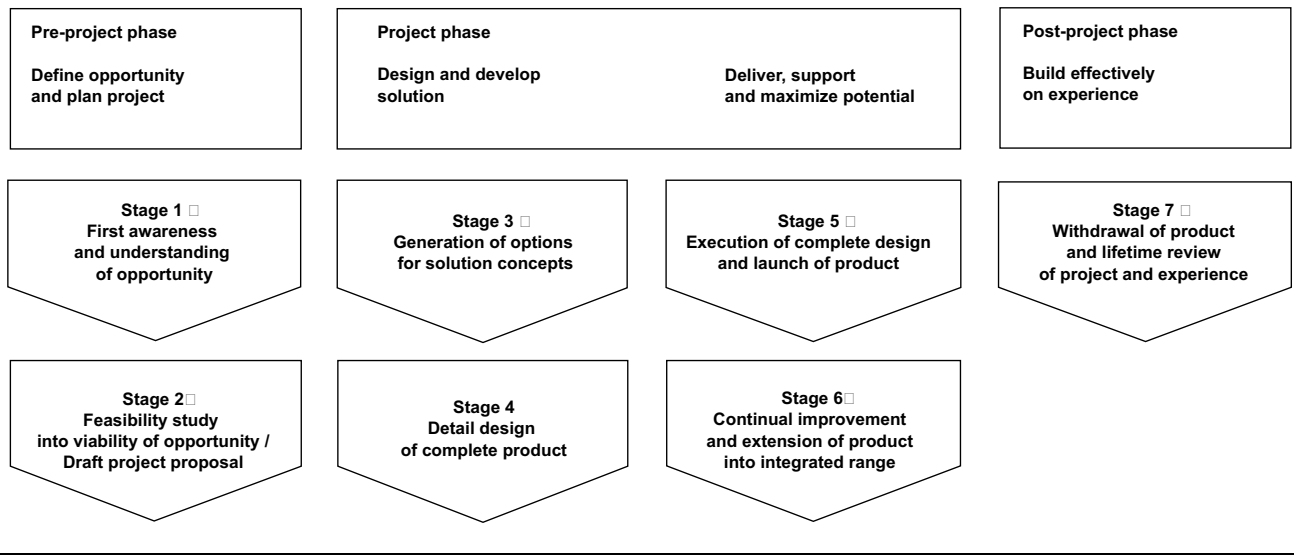
6.6 Managing innovation projects with clear stages and gateway reviews

It is now widespread practice for organizations, small and large, to manage innovation projects with a stage/gateway review system, a format that has been common in professional design practice for several decades. Interestingly, research indicates that organizations set up relatively complex project management systems, often incorporating well over ten stages. Clearly, experience reveals many important issues to address. The difficult decision is when to introduce that complexity, for there is no question of hiding it; misleading novices on the length and intensity of the journey they embark on is one of the quickest ways to failure.

The primary stages of design, development and innovation projects are outlined in Figure 15. These reflect a holistic, complete lifecycle perspective of product creation and development, from first awareness through to disposal and lifetime review. This basic model can be developed into a system tailored closely to an organization's particular circumstances.

NOTE More detailed versions are given in BS 7000-2, BS 7000-3 and BS 7000-6.

Figure 15 **Primary stages of design/innovation projects**



NOTE This figure sets out the forward momentum of projects. Several stages might be undertaken concurrently and iteration occurs between all stages.

When configuring innovation projects, it is helpful to set out the following details relating to innovation for each stage:

- an overview of the purpose of the stage;
- objectives set;
- main tasks to be undertaken;
- who is assigned to those tasks and where responsibility lies;
- probable start and required completion dates;
- resources and facilities to be committed;
- tools and techniques that might facilitate innovation (thinking, execution, etc.);
- key outputs to be delivered;
- criteria for stage gateway review.

The prime benefit of adopting a stage/gateway review system is the discipline it imposes on setting a sensibly detailed project plan with clear objectives and deliverables that is monitored as the project unfolds.

Progression from one project stage to the next, confirming satisfactory completion of work in any particular stage should be marked by formal gateway reviews that cover the following:

a) Checks on that work in the immediately preceding stage (and prior stages if appropriate), especially reinforcement of achievements to that point.

b) Confirmation that the organization context and operating environment are unchanged, and project objectives and strategies remain relevant with specific reference to innovation and consumer expectations.

c) Refocusing the project if divergence from aims or fragmentation is detected.

Review decisions include:

1) Approval of stage work and go-ahead to proceed immediately to next stage.
2) Sanctioning progress to the next stage but with specified amendments (perhaps relating to output generated, stated aims, strategies, resources, etc.).
3) Demanding amendments and re-submission before progressing further.
4) Referring the project team back to an earlier stage for reworking (perhaps because some factor has altered).
5) Rejection of stage work and instruction that the stage is repeated.
6) Putting the project on hold either indefinitely or to review/continue at a specified date.
7) Stopping work and abandoning the project.

6.7 Scope of review of current innovation practices

An organization's preliminary review in relation to innovation should cover the factors listed below plus others arising out of its particular circumstances:

a) Internal reviews:

- products, services, processes and business model (market share, stage in lifecycle, distinctive characteristics, projected turnover and margins, etc.);
- associated outputs (for example packaging, promotional literature and user manuals, point-of-sale material), assistance with installation, use, and servicing;
- facilities (such as exterior and interior environments of workshops, showrooms, offices, warehouses, sites);
- equipment, other design aids (hardware and software) and ancillary support;
- attitudes and commitment towards innovation at various levels of the organization;
- range of expertise (especially relating to design and design management) available in-house, through alliances or outsourced;
- implications of gaps with respect to innovation for recruitment and training;
- design/innovation management procedures;
- technologies (currently used in operations and of interest for future, already available or under development);
- performance and achievements over the recent past (e.g. number of innovative ideas created, opportunities developed, new product introductions, patents registered, how intellectual property was exploited to generate extra revenue streams, reputation as an innovative organization, etc.);
- legislation and standards (internally generated or externally imposed, documentation, compliance, sanctions applied to ensure conformity), as well as their impact on organization's operations, output and reputation.

b) External reviews:

- key issues and the core body of knowledge on managing innovation, what should be taken on board and tailored to the organization, where additional expertise might be accessed;
- competitors' products, services and associated outputs, intellectual property, facilities, equipment and other aids to innovation;
- standards, expertise, practices and achievements of organizations that are the best in an industry or specific activities;
- existing and emerging markets and technologies, trends (e.g. in demographics and shifting customer expectations) and development work;
- likely changes in legislation and standards (and sanctions on non-conformity) in the foreseeable future; and

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- potential candidates for strategic alliances.

6.8 Top-level review and brainstorming sessions on innovation / Opportunity scanning

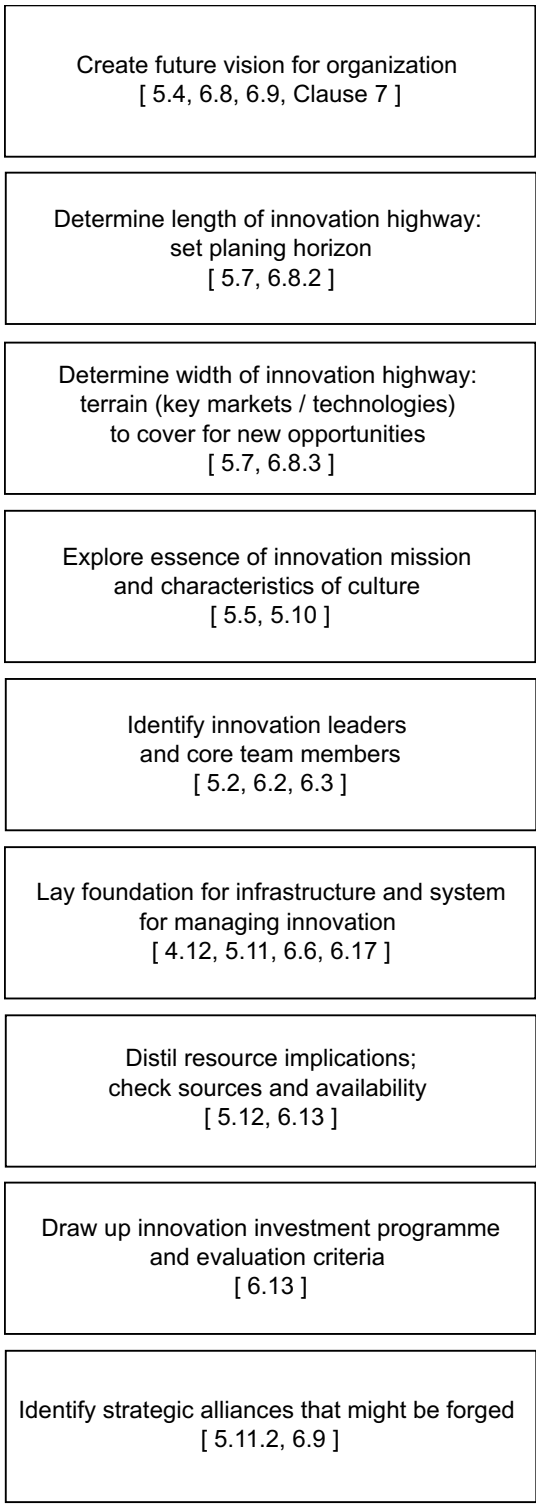
6.8.1 General

At this pivotal point, principals' attention transfers from the past and present to creating their organizations' preferred future, rather than stumbling into one largely determined by others. They start on the journey to make their organization predominantly pro-active rather than being essentially reactive.

Principals can address the many key issues during a series of top-level brainstorming sessions, which bring together selected people over a period of months to explore, articulate thoughts, express ideas, agree approaches, distil the essence of characteristics, lay foundations to actions, configure programmes and work through their implications (in terms of resource requirements and corporate reputation, etc.). Sessions can focus on a single issue or several (see Figure 16) though it is inevitable that discussions will spill into other issues. These are interspersed with a fair amount of individual thinking and work at various levels.

A great deal of information is processed to unravel gradually the ambiguity that surrounds these key issues. The objective is to end with a logical, mutually-reinforcing progression of straight thinking, grounded in reality, that connects the preliminary reviews with the future vision, mission statement and so on through to the master innovation programme.

Figure 16 **Key activities during top-level review, brainstorming and opportunity scanning sessions on innovation**



NOTE 1 Several activities are likely to be undertaken concurrently with iteration between them.

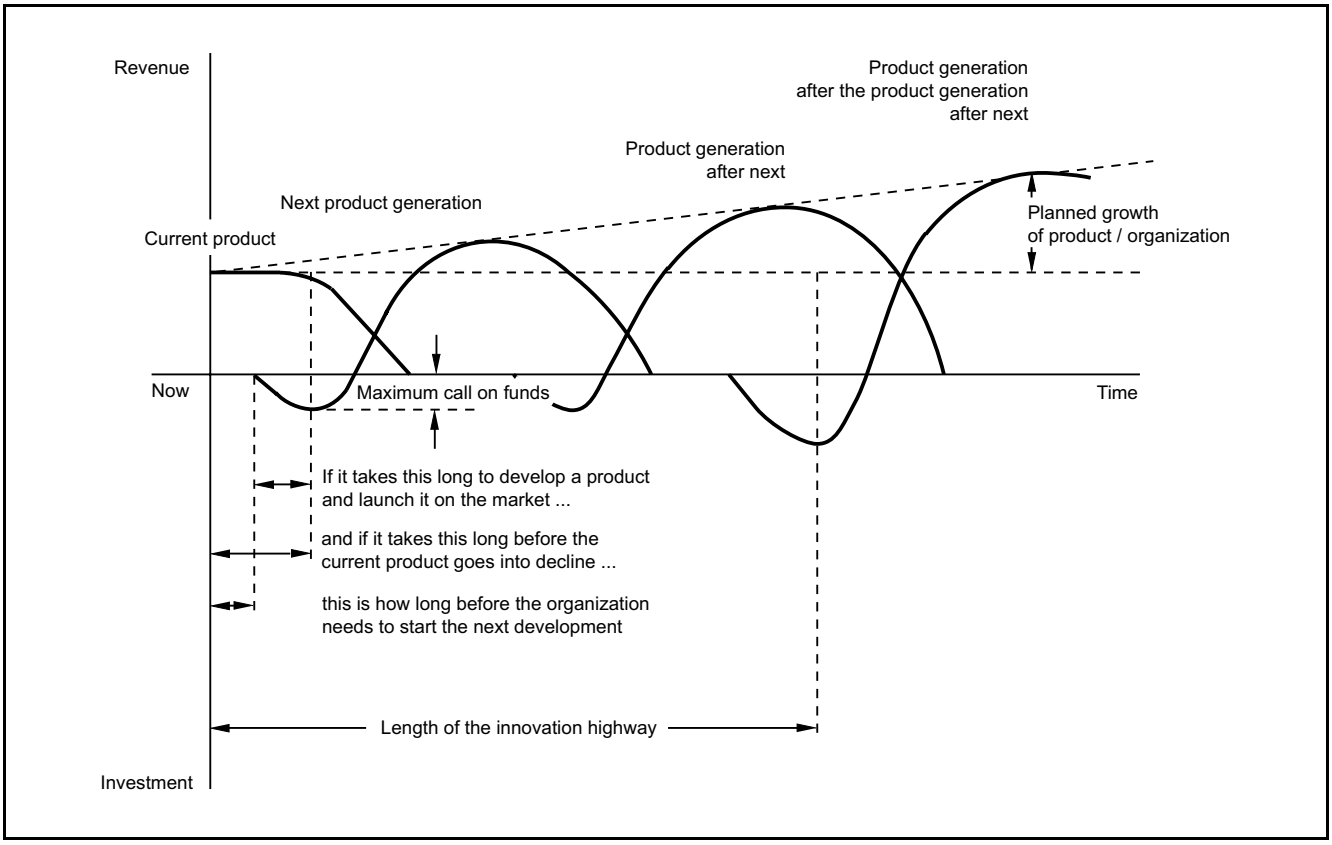
NOTE 2 Numbers denote sub-clauses in the main text that flesh out details of tasks in those activities.

6.8.2 Setting the planning horizon by determining length of the innovation highway

The time horizon when planning three product generations ahead can vary according to products and markets. The length of the innovation highway should be carefully planned to allow relatively smooth transitions between product generations even when radical innovation is introduced (see Figure 17).

In established markets with mature technologies and procedures, the horizon might be relatively long (ten years plus) because of development time and extended gaps between introductions of new product generations. By contrast, with emerging technologies and markets in flux, a three-generations horizon could be less than three years. Ideas should be abandoned or archived for future reference if development cannot be completed, or effective milestones achieved, within the planning horizon.

Figure 17 **Length of the innovation highway**



6.8.3 Determining the width of the innovation highway

The width of the innovation highway identifies the terrain to be covered, e.g. industries, markets, technologies and specific niches where attention and resources should be concentrated, as well as the kinds of products that might be targeted for development. It might even provide parametric product briefs.

The parameters that circumscribe the development of longer-term products might include:

a) financial factors such as the maximum that can be invested in any project, minimum return on investment or maximum payback period (see Figure 18);

b) maximum development time to bring a product to market;

c) performance and risk measures against which ideas and project proposals are judged (see **7.10**);

d) target customers, basic means of satisfying their needs, price points, production costs and margins;

e) specific benefits sought, perhaps to enhance customers' experiences of the organization and its products;

f) emerging technologies and practices that hold particular interest and promise;

g) statutory requirements in different countries and standards in different markets;

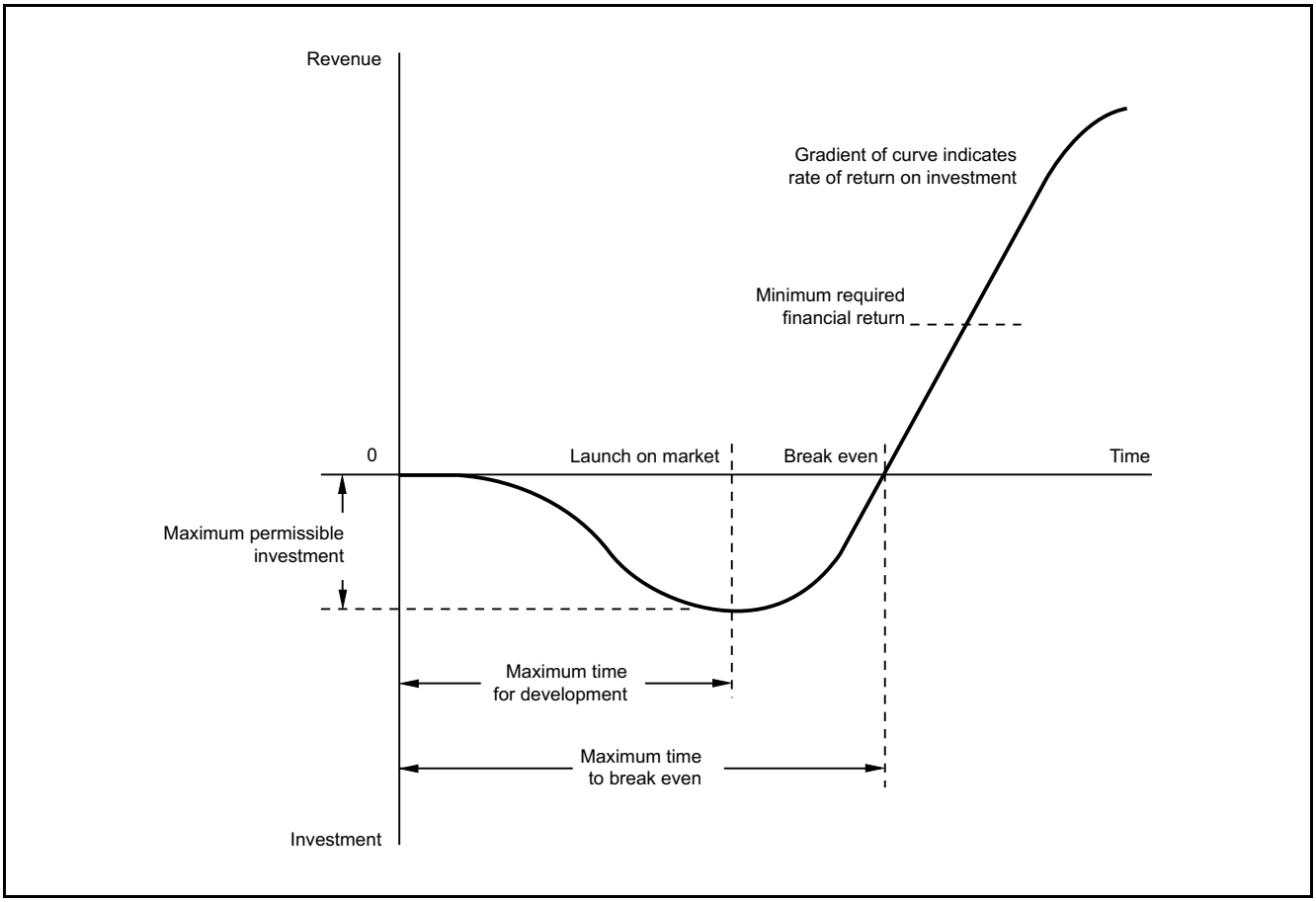
h) strengths to build on, e.g. core technologies and practices that need to be boosted and protected;

i) weaknesses to be eliminated;

j) sources of likely threats and counter strategies.

Care should be taken when specifying parameters. If too restrictive, they might stifle opportunities to innovate; if too vague, those in development have insufficient direction.

Figure 18 **Some financial aspects of the width of innovation highways**



The highway width can also reveal where alliances might be forged for mutual benefit, perhaps to deal with research or marketing processes, attract funding or boost sales (see **6.9**). Where beneficial, internal alliances should be formed in addition to those with external parties. Different departments or subsidiaries within an organization with relevant skills, resources and attitudes could be brought together in innovation teams or centres of excellence (see **5.15**).

6.8.4 Mapping out future markets

Innovations that address market needs have the best record of success. Therefore, it is essential to identify future markets along the innovation highway and then plan products to deliver clear customer benefits to exploit foreseen opportunities.

When dealing with the longer term, plans based substantially on current customer needs and market trends should be avoided. Extrapolation of such factors is equivalent to a technology push approach that could significantly limit the potential for success and prove irrelevant if markets are overtaken or die out. Often customers and markets are not obvious, perhaps because the latter have yet to be created and the former have not been born.

A vision of the future, backed by various scenarios, provides guidance on market relevance and customer value based on a deep understanding of the main drivers of change in markets, work and lifestyles, relevant technologies used, etc.

Brainstorming sessions and detailed analyses of customer-product experience cycles can help to identify possible product enhancements and new offerings. Significant research might be required to ascertain the viability of ideas. Sessions and analyses are likely to alternate with work assigned to individuals around identified issues.

NOTE When the focus of work progresses to more specific customer offerings, it might be possible to design a product according to guidance provided in BS 7000-2, BS 7000-3, BS 7000-4 and BS 7000-6.

The following marketing strategies should be considered:

- Create new markets, sectors and niches.
- Reconfigure existing markets.
- Set new benchmarks and/or change rules in existing markets.
- Take in adjacent market sectors and niches.
- Create a different product range that is handled by a separate team.
- Create a complementary range to fill out product range.
- Reposition products (and organization).
- Augment current offerings with accessories that extend range.
- Reinforce current positioning of products (and organization).

6.8.5 Mapping out future technology

It is important to anticipate technological advances and plan how they might be harnessed. The development of certain products could depend upon new technologies becoming available, and how targeted markets are likely to respond to applications. Other products could be created through advances in current technologies by using familiar technologies in new ways, or introducing technologies from other industries not considered before.

Organizations can proceed in two ways:

1) Identify products that could be developed along the innovation highway, then strive to develop the required technologies. If this cannot be accomplished in-house, other organizations might be encouraged to undertake that work, perhaps through alliances. If a joint venture could become a customer, the additional sales potential could make development worthwhile.
2) Identify technologies used or in development elsewhere, then check how these might be applied. Seeking out emerging technologies should be written into the job description of relevant employees, using search procedures that help accomplish this task effectively. Investments are more likely to be approved when they occur in favoured areas of technology.

Maps of future technology incorporated into the innovation highway (often called road maps or route maps) could reveal gaps in techniques, materials and processes, which might be filled by improved products and new offerings when the relevant information becomes available.

As such, maps help to plan when products need to be enhanced (through short-term product repositioning and upgrades) or replaced (through longer-term product creation) perhaps as the appeal, competitiveness and profitability of the current range declines.

6.9 Forming innovative alliances

Innovative alliances can be formed at any stage of product development or the rest of the value chain. They might involve expert consultants, universities, research institutions and trade representative bodies in gaining a deeper understanding of market dynamics, advancing the technologies needed for future products, or testing solution concepts. They might involve organizations with reputations as innovators or leaders in particular business techniques or areas (e.g. roadmapping, knowledge management or customer care).

Research reveals that the following are the most frequently mentioned reasons for establishing innovative alliances:

a) Share risk/raise performance:

- Lighten the burden of financial investment.
- Distribute workload.
- Speed processing of innovations.
- Build a better understanding of customers, suppliers, technologies and practices.

b) Widen opportunities and access:

- Gain access to knowledge, skills, and experience, and extend geographic reach.
- Put together more extensive, better integrated offerings to customers.
- Generate new initiatives that would not be possible otherwise.
- Gain access to vital additional resources.
- Attract extra funding.
- Surmount barriers and speed entry to markets and value chain.

c) Enhance organization:

- Reposition and raise profile of organization.
- Transform organization by adopting practices and standards of partners.
- Gain competitive advantage through critical mass (size, resources, market share, etc.).
- Reconfigure products or markets.
- Promote early buy-in thus achieving smoother implementation and longer-term survival of innovations.

Apart from setting clear objectives, there should be agreement on the scope and duration of alliances. Smaller organizations should also weigh carefully the benefits of entering into very close working relationships with substantially larger organizations, not least to ensure an equivalence of contributions and a sensible separation of assets. Finally, particular care should be taken to specify how ownership of intellectual property is assigned, then protected, when an alliance is terminated for whatever reason.

6.10 Innovation team brainstorming sessions and project reviews

6.10.1 General

*NOTE This sub-clause will facilitate the fulfilment of **7.2** and **7.3** in BS EN ISO 9001:2000.*

A second series of brainstorming sessions can help to establish the master innovation programme through which products are created to fulfil an organization's future vision (see Figure 19).

The core innovation team should be involved, supplemented with appropriate colleagues from within the organization and external specialists (for example, academics, futurists, specialists, consultants, customers, suppliers and partners in alliances).

Follow-up sessions need to occur regularly, say every four months or so, depending on the type of products under consideration. As the outcomes of these sessions might be referred to over many years, it is necessary to archive the ideas generated; tools and techniques that help to develop ideas are outlined in Clause **7**.

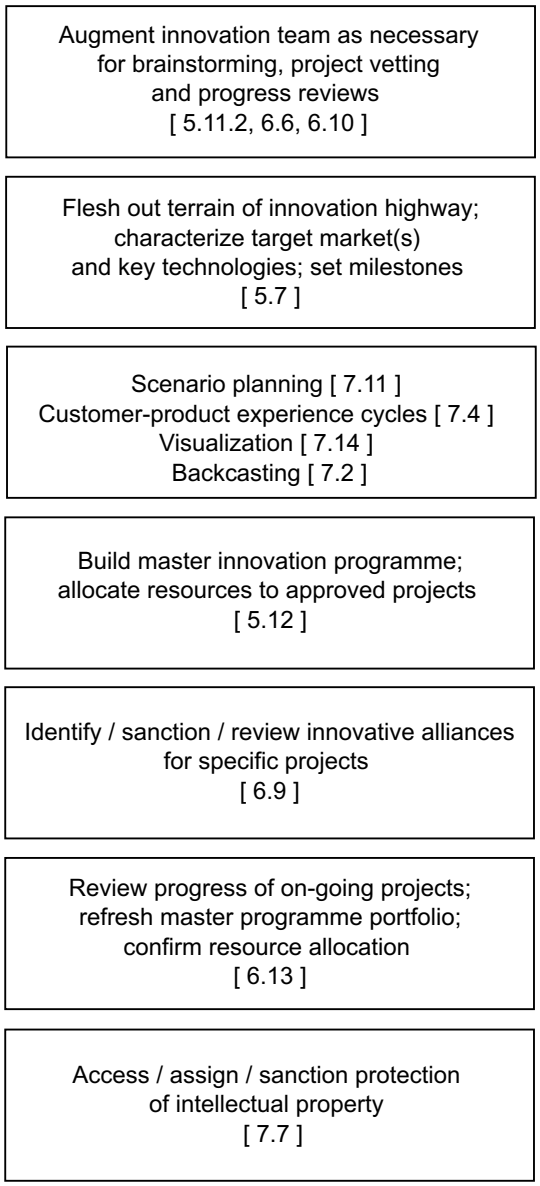
6.10.2 Assess and filter new ideas

New ideas should be assessed quickly to select the best option(s) to pursue. Ideas that do not fit the innovation highway specified by principals should be eliminated. Some of the basic questions to be answered are set out in Figure 20.

It might be possible to identify product opportunities to develop immediately that are significantly different or more advanced than those currently on the market. Such products can enable an organization to overtake competitors.

The pursuit of innovations that no-one else appears to be tackling should yield considerable rewards, so long as customers understand and value the resulting benefits. This is especially so where competitors are unable to copy innovations quickly.

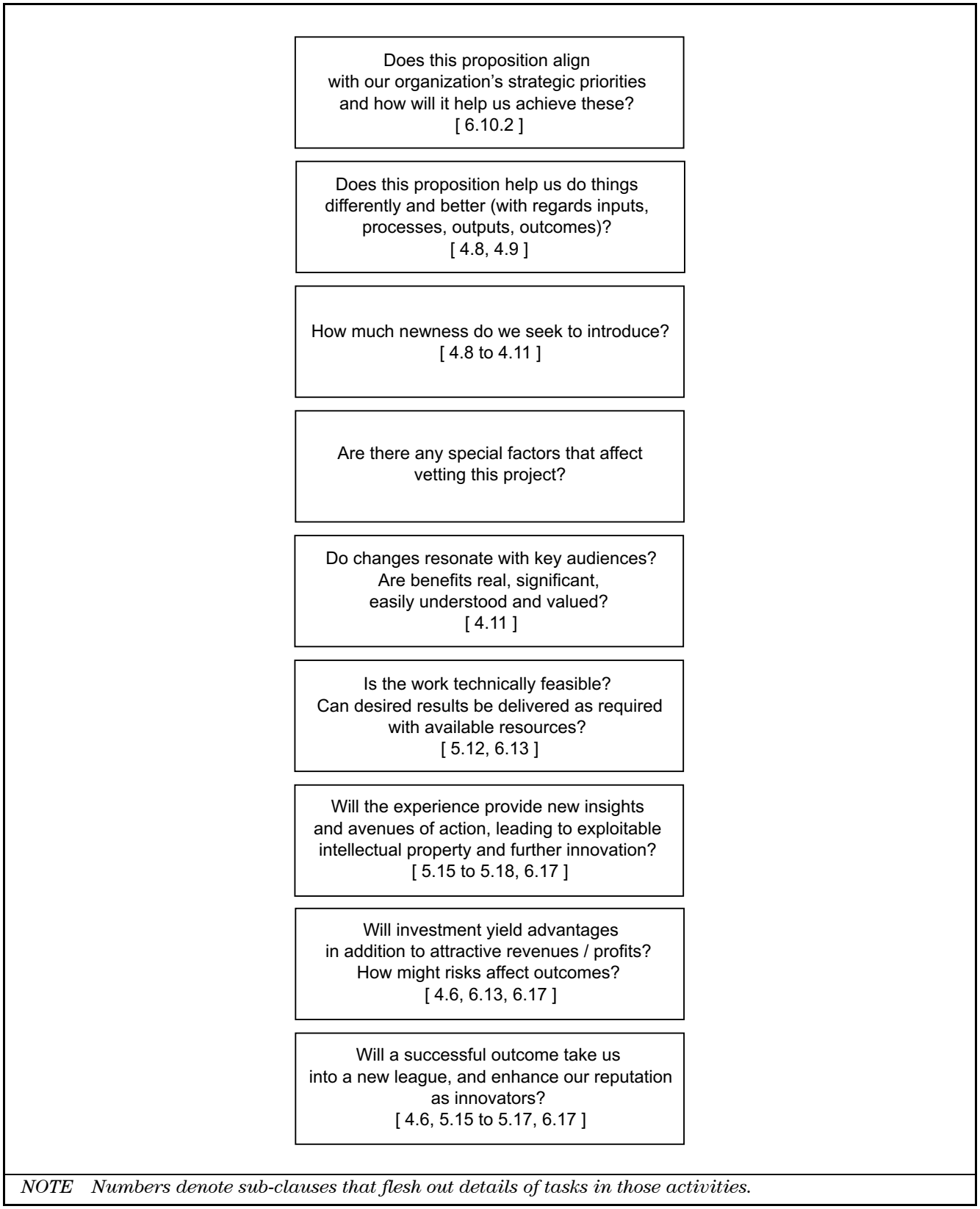
Figure 19 **Key activities during innovation team brainstorming sessions and subsequent project reviews**



NOTE 1 Several activities are likely to be undertaken concurrently with iteration between them.

NOTE 2 Numbers denote sub-clauses in the main text that flesh out details of tasks in those activities.

Figure 20 **Some basic questions when vetting proposals**



NOTE Numbers denote sub-clauses that flesh out details of tasks in those activities.

6.11 Environmental dimension of innovation management

The environmental dimension of product development and business processes should be given significant attention. There is increasing legislation and consumers often appreciate buying from organizations known to be responsible members of the community.

Organizations should address environmental and sustainability issues continuously to:

a) increase efficiency of operations and facilities/reduce consumption of energy in their processes;

b) increase efficiency of their products in use;

c) reduce material waste (for example, during manufacture and in packaging);

d) reduce adverse impact on the environment through emissions and waste;

e) eliminate complexity in fabrication (e.g. by reducing unnecessary variety in materials and components) and simplify assembly;

f) introduce recycling of products and spent consumables;

g) ensure compatibility when upgrading products so avoiding unnecessary replacement;

h) extend useful life of products by designing out unnecessary obsolescence and short periods between model launches;

i) increase efficiency of distribution by reducing size, and improving stack-ability and storage, better route planning;

j) contain or reduce costs (including obsolescence, recycling and disposal of products).

NOTE Refer to BS ISO 14001 for more detailed guidance on environmental issues.

6.12 Legal dimension of innovation management

Considerable care and vigilance are needed to ensure that an organization remains within the law wherever it operates, protects its intellectual assets and maximizes profits from them for as long as possible.

The legal aspects of managing innovation are critically important because of mounting statutory regulations in different industries and countries, as well as increased litigation by those affected adversely by products, production processes and business environment.

Innovation often introduces the unfamiliar, pushes boundaries and challenges what is considered to be acceptable. These can raise suspicion and generate antagonism, not least when upsetting arrangements and relationships that have evolved over many years. All these factors could lead to legal action.

Copying innovations is much easier and faster with the global reach of business, higher rate of development, convergence and accessibility of technologies. Counterfeiting is widespread and there is also more frequent infringement of intellectual property rights (IPR).

Consequently, formal procedures should be in place to:

a) search the internet and patent registries to monitor the state of the art and competitor activity, stimulate own research, and ensure that the intellectual property of others is not infringed;

b) register designs, patents, trade and service marks;

c) create legal circumstances from which new revenue streams can be generated (perhaps through licence and alliance agreements);

d) detect counterfeiting and other IPR infringements quickly, take strong action to stop them, and extract appropriate compensation;

e) pick out fundamental flaws in design that might trigger recalls from market;

f) deal with product defects and complaints;

g) check compliance with all existing and anticipated standards, testing procedures, regulations relating to health and safety at work, and disposal of packaging and products after use;

h) keep track of new legislation in all countries where an organization has interests;

i) make appropriate representations to influence the debate about proposed new regulations and laws;

j) ensure an organization is ready to comply with new legislation whenever necessary.

6.13 Resourcing the long term: Investment in innovation

*NOTE This sub-clause will facilitate the fulfilment of Clause **6** in BS EN ISO 9001:2000.*

6.13.1 General

Products and associated services are the lifeblood of organizations. Skimping investment in their renewal can jeopardize future competitiveness and profitability.

Administering imaginative projects in an undisciplined manner with an ad hoc allocation of resources rarely yields successful outcomes. Therefore, it is vital that the resource requirements and cash-flow implications of conceiving and developing long-term products are forecast and set out in business and operating plans.

The budget allocated to new product design and development varies with products, market sectors and positioning. Research suggests such budgets range between 3% and 20% of annual turnover. The proportion of this budget set aside for longer-term products also depends on similar factors. Typically, this will be around 5% of the budget for new product development, or between 0.15% and 1% of annual turnover. This modest investment, made up almost entirely of people's time, is unlikely to affect share value.

Organizations that use arguments about the short-term perspectives of financial analysts and investing institutions to justify maximizing short-term profitability from current products ("cash cows") are unlikely to invest sufficiently in long-term product planning. Yet longer-term product development often yields valuable shorter-term benefits along the way.

It is rare for organizations to allocate budgets specifically for innovation. Many suggest research and development (R&D) budgets indicate their investment in innovation and statistics produced internationally reinforce this technology-biased perception. However, the governments of economically advanced nations now express concern about the perceived dearth of innovation in the services sector given its increasing contribution to their gross domestic products.

The prime reason for establishing innovation budgets is to facilitate innovation, for there is no guarantee that existing development budgets will deliver innovation without additional incentives. Innovation budgets underline commitment and raise the profile of innovation within an organization.

Other spurs to expanding budgets include finding external co-sponsors for longer-term development work and being aware of the activities of competitors, especially their level of investment.

Principals and core innovation teams should constantly strive to attract grants and other funding for innovative work, as well as benefit from tax credits for investments in product design and development.

Innovation budgets might be earmarked for:

- projects or additional work that would not otherwise be sanctioned;
- pilot projects, say, with universities or potential alliance partners;
- ethnographic research to gain greater understanding of markets served and the way customers' needs are likely to develop;
- trials of techniques never used before;
- surveys of new markets, technologies, etc.;
- experts to assist in development work, or outsourcing certain work to specialists;
- recruiting higher calibre staff and/or enlarging project teams to meet tighter deadlines;
- upgrades of equipment and facilities for innovation;
- visiting new suppliers to explore new developments, etc.;
- checks at trade shows on what is new in own and allied fields, float ideas and test exhibitors' reactions, etc.

Another key component of an innovation investment programme is training which:

a) raises awareness of innovation and tolerance to uncertainty, while enhancing the capacity of all staff to be innovative;

b) upgrades innovation management skills.

Principals seeking to sustain close working relationships with customers and suppliers should consider offering them the opportunity to join in such training. Those who share training often work together more effectively afterwards. Substantial benefits could also derive from a better understanding between the parties, plus a convergence of language, attitudes and approaches.

6.13.2 Financial plans

*NOTE This sub-clause will facilitate the fulfilment of Clause **6** in BS EN ISO 9001:2000.*

A proper balance should be established between funding activities from, say, departmental revenues and making new funds available from central funds. Principals have to make clear which activities are to be sustained entirely from central funds; which are to be financed entirely from departmental budgets; and which parts of an organization are expected to contribute a proportion of the budget. These should be agreed beforehand.

Moreover, the required funding should be split between capital and revenue accounts. Capital allocations should be made for anticipated changes in facilities and equipment to take advantage of enhancements in technology and systems.

All these factors should feature in the master innovation programme setting out clearly when funds will be required. Where appropriate, figures should be discounted to allow for the passage of time and reveal net present values.

Capital assets earmarked for innovation should not be utilized for operational purposes if such use jeopardizes the innovation programme. However, where feasible, sharing facilities and expenses can help to offset the capital cost of, and optimize the returns from, innovation activities.

Costing and financial planning should be facilitated by an easily comprehensible system of budgeting. Guidelines on appropriate expenditure on different elements and the fair allocation of overheads also help.

Financial plans should include details of:

a) level, timing and nature of cash demands;

b) size of markets and anticipated shares;

c) revenues to be generated over a specified time;

d) anticipated margins to be achieved;

e) profits or surpluses to be generated;

f) payback periods;

g) rating of risks involved;

h) budgetary constraints;

i) cost-benefit analyses;

j) returns on investment and/or capital employed;

k) maximum project budgets;

l) monitoring of expenditure;

METRIC?

m) budget revisions where necessary.

*NOTE For further guidance on financial control of projects, refer to BS 6079-1:2002, **6.6.5** and **6.6.6**.*

6.13.3 Resource plans

*NOTE This sub-clause will facilitate the fulfilment of Clause **6** in BS EN ISO 9001:2000.*

Resource plans should specify the resources to be committed to addressing innovation and innovation management issues. Particular attention should be given to the following questions:

a) Does the proposed activity make good use of, and stretch, in-house expertise?

b) Will new technologies be developed, bought in or contracted out to specialists and suppliers?

c) Will new equipment or design aids be developed specifically for the organization or could standard versions be used, perhaps with minor customization?

d) Is adequate accommodation available (for example, space, location and controlled work environments) to allow team members to operate effectively?

e) Are administrative systems in place to enable the activity to progress smoothly to completion? Are these systems adequately coordinated across the different functions and disciplines of the organization?

f) Are ancillary resources and activities planned to avoid cross-functional difficulties, especially at the transitions between stages where responsibilities might transfer between functions?

6.14 Fast-tracking

Considerable increases in pace might be achieved by undertaking several activities at the same time wherever possible. Such concurrent processing could extend to project stages. The likely increase in revenues from implementing innovations in a shorter time (especially getting to market first) might justify allocating extra resources, too.

Overall time scales can also be compressed by reducing the slack and redundancies in schedules, and preventing administration from slowing the momentum of projects. Principals who intervene so prompt decisions are made, provide a powerful demonstration of their commitment.

Another innovation strategy to cut out waste is to ensure that existing knowledge is not forgotten then re-discovered, and past achievements are not re-worked unnecessarily. It is also essential that all innovations pursued are valued by target customers. If others offer better solutions, considerable time can be saved by learning from their experience and, perhaps, emulating their approach. Where legitimately possible, organizations should endeavour to replicate the distinctive features of products found elsewhere into their own. Ideally, such borrowings should act as springboards from which to leap ahead of competitors.

Any fast-track procedure that involves omitting stages or tackling them less rigorously should be avoided as it is likely to increase the risks of failure.

6.15 Cannibalization

Preparing for cannibalization, one of the hazards of innovation, is important. When an organization introduces an improved product and keeps its existing product range without any changes, the new product is likely to draw sales away from the rest. This is critical where the new product does not expand the market fast enough and affects the product that generates the majority of an organization's sales and profits. Overall sales might drop significantly which can delay recovery of investments, restrict options for manoeuvre, and affect its reputation.

When planning new product introductions, it is important to get the positioning right so there is a perceived fit with the existing range. If the addition targets exactly the same audiences, there could be a case for re-positioning older products in different (perhaps lower price) market sectors. Minor variants could be offered to large retailers as exclusive models under a different brand name (or their own label) to generate new revenue streams that replace the sales lost from the mainstream product. Such strategies could be innovations in their own right.

6.16 Plan product withdrawals and replacements

After identifying products along the innovation highway, organizations should assess their likely lifespan and when they might be withdrawn, even before development. A seamless transition between models is increasingly important for customers, so upgrades present minimal inconvenience (if any). Continued supply of spare parts and support services are important considerations in withdrawal plans to ensure that customers with earlier versions are not abandoned; these are statutory requirements in certain markets.

Research has shown a strong trend of organizations increasing product lifecycles while reducing the time to market and intervals between new model introductions. The life of products can be extended (perhaps doubled) with judicious, incremental improvements that fill gaps on the innovation highway before an innovative replacement is ready for launch.

Decisions on introductions, withdrawals and extensions in lifecycles should follow careful analyses of costs and returns on resources.

6.17 Evaluation of processes and infrastructure

*NOTE This sub-clause will facilitate the fulfilment of **8.1**, **8.2.2** to **8.2.4** and **8.5** in BS EN ISO 9001:2000.*

All innovation programmes should be set up with the intention of regular evaluation to help reveal the contribution of innovation to an organization's performance. Outcomes of evaluations of the entire project portfolio should be collated. Wherever possible, the actual and potential whole-life financial returns from ideas generated should be compared with analyses of the costs of operating an innovation management system, as well as the opportunity cost of not undertaking other activities.

Evaluations can also reveal where financial potential has been over- or under-estimated, and highlight where procedures and facilities might be improved, and risks reduced. Steps should then be taken to improve forecasts and performance.

Compiling case studies of lessons learnt from failures as well as good practice, highlighting how key issues were handled in different circumstances and the impact on outcomes of investments, expand the corporate memory and help to improve the development of subsequent products.

6.18 Agility to exploit opportunities quickly and flexibility to change course as necessary

Research has revealed that agility to react fast to new opportunities is rated above the ability to foresee and plan further into the future; this reflects the short-term perspective of most organizations. Paradoxically, agility is enhanced by a longer perspective; those who are vigilant in scanning their operating environments and plan further ahead, tend to be better prepared and more agile.

If initiatives veer in inappropriate directions not anticipated, or new opportunities are found that offer more attractive prospects than those programmed, principals should be quick to consider alternatives.

However, tenacity in pursuing innovative ideas is also valuable. Changes in development programmes can be very disruptive and add significantly to costs, especially in later stages; therefore, alterations should not be made without compelling reasons.

Agility should be sought both in thinking and action. It can result from intuitive reaction or careful analysis, and is demonstrated by:

- seeing opportunities and threats before others (through acute observation);
- distilling insights through analysis;
- having up-to-date, effective sources and contacts;
- judging when change is essential then acting without delay;
- covering groundwork/building a business case quickly;
- gaining formal approval for initiatives in less time;
- rapid configuration of projects and marshalling the necessary resources;
- progressing projects more efficiently;
- greater proficiency at decision-making;
- coping better with change during the course of projects;
- staff and the organization seeking to be serial innovators.

7 Tools and techniques for managing innovation

7.1 Recording and archiving ideas

It is not always possible to develop ideas immediately because current technologies or resources cannot deliver desired changes; so it might be many years before serious development work starts on them. During that time, people change positions, retire, find jobs elsewhere or simply forget. Ideas, discussions and processes are likely to be lost if they are not archived with an effective index for easy retrieval. Mistakes that are not analysed and documented for wider reference tend to recur.

Therefore, it is essential to establish an effective system for recording, organizing and retrieving ideas and experience arising out of the long-term development process, or elsewhere. This central innovation archive should be part of a knowledge management system and widely accessible, ideally through an organization's intranet (see **7.8**).

Particular care is needed to future-proof archives against obsolescence in information technology (see **7.12**).

7.2 Backcasting

Whenever a future vision is determined as a desirable long-term destination (for an organization or the outcome of a project, perhaps as a result of "if only" analyses) it is important to speculate on the journey that can turn that vision into reality. This can be done by backcasting; mapping out a blueprint of key events and stages from the desired future back to the present. This then suggests sensible start points and milestones along the way.

A useful way of working out the journey backwards is to assess what information and decisions are needed at each stage. These, in turn, indicate what should have been accomplished and communicated beforehand to provide the necessary foundation for properly-informed decisions.

Mapping out such information has the added bonus of helping to co-ordinate the work across disciplines and sections of an organization; should facilitate progress.

7.3 Brainstorming

Brainstorming is a pivotal activity in the identification of future innovations (see **6.8** and **6.10**).

Teams tend to generate more effective ideas than individuals, and brainstorming sessions are effective in drawing out new ideas from teams.

A leader should facilitate sessions, ideally involving no more than nine participants, held in comfortable surroundings away from distractions. Participants should receive clear written objectives, together with guidelines (for example, parameters of the innovation highway), then ensure that focus is maintained throughout sessions.

To start, participants should be put into the right frame of mind by undertaking a task that challenges conventional boundaries and encourages less constrained thinking.

Generating a high flow of ideas is important early on. Criticism of ideas or people should be suspended or banned altogether. Old and obvious ideas put forward can be discarded later. Reticent members should be encouraged to contribute and no individual allowed to dominate proceedings, especially senior members. The quality of ideas is not necessarily related to seniority, and vociferous superiors can dampen discussion. Participants should also be reassured that unpopular proposals and those that threaten the status quo, will not lead to recriminations.

All suggestions should be treated as group ideas. Participants' different perspectives ought to help increase understanding and improve ideas, then draw out their maximum potential. Sufficient time should be allowed for all ideas to be given adequate consideration. If necessary, ideas could be revisited in subsequent sessions months or even years later.

When ideas appear to dry up, participants could be given a break or the session ended. A period of gestation is often beneficial as participants tend to come up with fresher, more useful ideas when sessions are reconvened.

Rich results can be achieved from exploring how ideas parked for the time being might be exploited to generate additional revenue streams through third parties.

The archiving system should be configured and used to avoid brainstorming sessions unnecessarily going over ground covered in earlier sessions unless new angles are proposed (see **7.1** and **7.8**).

7.4 Customer-product experience cycles

*NOTE This sub-clause will facilitate the fulfilment of **5.2** and **7.2** in BS EN ISO 9001:2000.*

Customer satisfaction arises out of experiences of a product, from first awareness through to final disposal. Success, for industrial and consumer products alike, is achieved by conceiving and managing those experiences.

All customer-product experience cycles have common phases such as awareness, interest and information gathering, purchase, first use, on-going use with developing proficiency, and disposal/recycling. Each phase has considerable potential to delight or antagonize customers and users. All can be analysed in detail to map out likely sequences of key events and range of responses.

Understanding those experiences forms the soundest foundation for designing products that resonate with target audiences with valued highs planned in and debilitating lows eliminated as far as possible.

Rehearsing the acquisition, ownership and use experiences, ideally through role-playing featuring all relevant parties, can help distil how and at what points innovation and design can facilitate and enhance those experiences. The way target audiences (particularly key customers) react to proposed new product concepts, features and improvements can provide insights into how they value those propositions as well as their perceived priorities.

Analyses of experience cycles provide powerful triggers for developing technologies that contribute to successful product design, manufacture and delivery. The dialogue that is established and nurtured between the innovation team, users, suppliers, distributors and other specialists gets to the root of current perceptions, thinking and practices. It also encourages exploration of the ideal future, the "if only" world. Future products that match needs and aspirations closely, and deliver favourable customer use and ownership experiences, are more likely to come from such analyses than from technology push strategies. Moreover, the creation process will probably be more involving and inspiring because it is more human, fun and rewarding. Experiences represented through visualization provide the most vivid briefs to work to. The design and innovation processes are effectively dialogues with the future that seek to create the future now (see **7.14**).

7.5 Ethnographic research

Recording and analysis of the way different groups of targeted individuals behave and live so as to understand better their needs and motivations, and gain insights into how better to fulfil their future needs, influence purchases and strengthen loyalty.

Such research is undertaken through a variety of means; observation, questionnaire surveys, recording (audio and video) by target groups, diary keeping, living with/experiencing the lives of targets, and so on.

Some of the work is done with the researchers present. Where appropriate, other records are made by the subjects on their own or in groups. These might relate to everyday life, or exercises set to draw out perceptions and motivations: for example, the subjects might be asked to visit shops to select products that they rate highly and would like to own, all the while commenting on why they are making those choices. Alternatively, subjects in a particular country might be asked to record images of what they consider to be particularly characteristic of their country. In the latter case, the recordings are collected for analysis back in the studio.

7.6 Inclusive design

Inclusive design is comprehensive, integrated design which encompasses all aspects of a product used by consumers of diverse ages and capability in a wide range of contexts. Its prime goal is to meet the needs of all such consumers (without stigma) and is based on the principle that appropriate access to information, products and facilities is a fundamental human right. Inclusive design needs to be a key element in an inclusive business strategy.

NOTE BS 7000-6 provides a strategic framework and associated processes by which business executives and design practitioners can understand and respond to the needs of diverse users without stigma or limitations.

By determining the capability demands of a product on users, it is possible to identify and quantify those who have difficulty with, or cannot use it. Designing products to lessen such demands can attract valuable additional market sectors often excluded by competitors. Indeed, satisfaction is more likely throughout the customer base when usability is ensured for all in the target market population.

The true accessibility of products is determined by the accessibility of their weakest component whether packaging, instructions, interface, after-sales service and so on. Concentrating attention on one or two components, while neglecting others, is likely to result in a product that is weak overall.

7.7 Intellectual property

Innovation is likely to generate many ideas that should be protected. Apart from clarifying ownership of these ideas with employees so as to ensure its own unhindered use, an organization can exploit intellectual property rights (IPR) through licensing or sale to others.

Those involved in innovative activities need to safeguard the confidentiality of discussions that could prove problematic when outsiders are involved. Sometimes confidentiality agreements with staff and third parties are necessary.

In other circumstances, a period of secrecy can be obtained by applying for a patent even if ideas are not developed sufficiently. If the period of grace nears expiry before development work necessary for granting a patent is completed, the application can be withdrawn at the last moment and a fresh application lodged immediately. This effectively extends the period of secrecy.

New aspects of technology already developed could be patented for use in future products. However, the loss in life of, and cost of maintaining, a patent while other aspects of a product are developed might suggest a patent application is delayed to keep the idea secure within the organization.

Monitoring R&D among competitors can provide insights into the avenues they consider important and how their products might be upgraded. If it were suspected that a competitor was undertaking similar development work, it would be worth patenting aspects of likely future products. This might prevent competitors blocking others benefiting from advances in these areas.

Protecting IPR involves considerable effort and can be expensive. Larger organizations with greater funds and legal expertise often test the resolve of smaller rivals, especially outside home markets. Activities in emerging nations also require substantial monitoring as the legal framework to reinforce such rights might be absent.

Legal action to protect IPR is not always straightforward. Principals need to weigh options carefully and should always follow through if notice is given to miscreants. IPR is a complex area of the law and it is recommended that specialist advice is sought.

7.8 Knowledge management

Knowledge management enables an organization to make the most of the expertise it encompasses. Staff capture, access and direct this expertise when and where needed, then document the experience to improve future performance. In this way, the organization avoids wasting resources on re-discovering knowledge, re-working past achievements or seeking outside help at higher cost. A reputation can be built for being efficient and well connected (internally and externally).

Two further features of knowledge management systems are the creation of directories of expertise and communities of interest:

- The first is a central reference listing the expertise of appropriate members of staff, particular areas of interest (including hobbies) that might contribute to innovation, and significant/pioneering work undertaken in the past. This might be accessible on a secure intranet or administered centrally through specially assigned executives.
- The second are networks of staff, in similar positions operating in related fields, who seek to benefit from being in touch to exchange knowledge and experience, and meet regularly to explore ideas and issues of common interest.

Leveraging expertise in this way, valuable in itself, also helps to raise staff morale and pride both in their work and organization.

Probably the most important contribution of knowledge management is to enable organizations to bring together new mixes of skills in unusual teams. The fresh perspectives on problems they evolve open the way to creating pioneering products, services and approaches that enhance competitive advantage and raise long-term performance.

NOTE For further guidance, refer to PAS 11000.

7.9 Rapid prototyping

One of the most powerful aids to innovation is to produce a physical representation of the final output to make the goal more tangible. Many innovative organizations produce block models and prototypes at the earliest opportunity, then update them as thinking progresses. Clearly, the more accurate the representation, the more helpful it is.

Design and animation software provide a vivid impression of the final output when used to create product concepts digitally that are then viewed on screen from every angle. Rapid prototyping uses such digital references to execute designs as physical entities in three dimensions using various processes and materials, with output built up of successive layers according to specified cross-sections. For example, with stereolithography a computer-controlled laser cures a photo-sensitive resin. This technique enables just about any configuration to be replicated accurately within a few hours.

7.10 Risk assessment

Innovative ideas should be examined for what might go wrong, the likelihood of adverse outcomes and the impact these would have. Such assessments are often difficult because there tends to be limited knowledge of innovative activities before work starts, especially when organizations enter unfamiliar territory.

Basic risk analysis involves judgements on risks, failing outright or unwanted outcomes occurring, against potential returns. Risks are not confined to single major failures within an organization. The knock-on effects of a series of relatively minor shortcomings elsewhere, or changes in markets, can have a catastrophic impact.

Speed and effectiveness of action in responding to adverse outcomes tend to increase significantly when arrangements are pre-planned and tested. The effectiveness of those arrangements is maintained by monitoring what goes on within and around innovative activities to update knowledge and develop competencies in assessing risks.

Risks are associated with activities, components, projects, investment portfolios, organizations and their value chains (including alliances). They arise in relation to people and facilities employed, sources of materials and components, distribution, sales outlets, technologies, intellectual property, legislation and reputation.

It is rare for risk to be eliminated, even in routine activities. Therefore, unnecessary risk should be avoided and the rest minimized; prevention is cheaper than remedy. To cut down risk, the first step is to eliminate ideas and activities that do not fit the parameters specified in an organization's innovation highway.

Next, the risk of failure should be minimized before work starts and during a project's progress. Frequently, it is not the technical problems that scupper initiatives, but a lack of resonance with stakeholders (predominantly customers, users and supply chain partners) who do not understand or value the changes proposed. So assessments of factors such as likely acceptance, ease of switching and adoption are critical. Moreover, what reassurance does the innovator give that it will grow with its customers, always coming up with stretching solutions needed to sustain performance?

For example, risks are reduced (sometimes dramatically) when a market is predisposed to adopt the proposed innovation, as might happen when targeting existing customers (see Figure 21). Validation from identified stakeholders is a valuable safeguard. Getting involved with customers early enough to have innovations included as part of their own product specifications is another powerful strategy. If this is achieved, purchasing departments, say, will have considerably less discretion to source from elsewhere.

Accurate, inspiring briefs are essential to ensure work is focused on what counts and efforts are not dissipated on side issues. Formal sign-offs from senior executives contribute to maintaining pressure and progress. Replicating, or scaling up, innovations created for one customer for a wider target market, is another strategy that might limit risk.

A fuller picture of exposure to risk is gained by examining the complete lifecycles of products, not merely the technology development and design phases. These extend to consideration of whole-life costs; time-scales, safety and the likely effect on the environment (see **6.11** and Figure 13).

*NOTE For further guidance refer to BS 6079-1:2002, **6.6.3**, BS 25999-2,*[1)] *BS IEC 62198* [1)] *and BS 31100.*[1)]

1) In preparation.

Figure 21 **Characteristics of innovative projects and level of associated risks**

Where is your project positioned? Mark an 'x' in the relevant box on the scale.

Characteristics of projects carrying lower risks	1	2	3	4	5	**Characteristics of projects carrying higher risks**
Market is dissatisfied with available products; customers know what they want and seek improved products	☐	☐	☐	☐	☐	Market broadly satisfied with available products; customers have no clear views on improvements and are not looking for change
Scope of project is easy to define and does not change through to completion	☐	☐	☐	☐	☐	Project scope difficult to define and likely to expand as problems prove more difficult to solve and customers make extra demands
Innovation will be a critical advance that helps customers to improve their businesses	☐	☐	☐	☐	☐	Customers perceive proposed innovation to be relatively unimportant
Change represents a low profile advance and is relatively invisible	☐	☐	☐	☐	☐	Proposed change will be very visible and represents a high-profile advance
Project can be undertaken by the organization on its own	☐	☐	☐	☐	☐	Project objectives will only be fulfilled by forming external alliances
Project can be executed within agreed deadlines	☐	☐	☐	☐	☐	Project time-scales are much tighter than normal
Resource requirements can be estimated with confidence (as relatively familiar territory)	☐	☐	☐	☐	☐	Estimates of resources required are very tentative so likely to be widely inaccurate
Organization can undertake the project entirely using in-house expertise (all knowledge, skills and experience are familiar)	☐	☐	☐	☐	☐	Organization lacks critical expertise that is unfamiliar and has not been used before
Project can be executed with available technologies, processes and practices	☐	☐	☐	☐	☐	Project requires new technologies, processes and practices
Large over-runs on schedule and budget will have small effect on project's profitability	☐	☐	☐	☐	☐	Small variations could have immediate big impact on project's profitability
High likelihood of achieving target innovation and anticipated project outcome	☐	☐	☐	☐	☐	Low chance of achieving target innovation and anticipated project outcome
It will be relatively straightforward to gain market acceptance of the innovation	☐	☐	☐	☐	☐	It will be difficult to gain market acceptance of the innovation
Will be able to apply resulting innovation and/or distribute as planned	☐	☐	☐	☐	☐	It will be very difficult to implement innovation on completion of development project
Risks can be identified, avoided or consequences contained within acceptable limits	☐	☐	☐	☐	☐	Difficult to define problem and determine impact of the solution
Unlikely that competitors are undertaking similar work or will get to market first	☐	☐	☐	☐	☐	Others are working on similar innovations and have a record of getting to market first
Performance standards of project team and contractors can be specified, monitored and swift remedial action taken	☐	☐	☐	☐	☐	Performance standards are difficult to set and monitor
Extensive knowledge of what might go wrong with innovative projects, and careful preparations on responding to critical failures	☐	☐	☐	☐	☐	No knowledge of what might go wrong so cannot anticipate critical failures and plan responses

Customer-product experience cycle analyses are helpful when checking for potential vulnerabilities and testing stakeholder reactions to remedial action (see **7.4**). Such analyses reveal the integration between components that need to work seamlessly together, as well as the slack and flexibility in systems. They should also highlight how an organization might cope with non-standard (or extreme) behaviour, and learn from experience to improve performance.

Demands on resources can extend beyond the immediate aftermath of an adverse occurrence. Considerable calls might continue for quite some time as an organization redresses the damage (e.g. to corporate reputation).

7.11 Scenario planning

It is a common perception that the future brings more frequent and increasingly radical changes. Except in areas of rapid development, such as new technologies and emerging markets, change tends to be slow, incremental and so comparatively easy to predict.

Envisioning the future might focus on improvements in lifestyles, effects on the environment, forthcoming legislation, or radical transformations in work methods.

The future presents multiple possibilities, some beneficial, some threatening. These eventualities should be mapped out and strategies formulated to avoid or deal with them effectively. Such planning (and much of the subsequent actions) is fundamentally a design process: desired futures, and the means to bring them about, are all designed.

Visualization is a key tool for previewing these futures (see **7.14**), typically through scenarios and concepts for specific products, services and environments. These enable stakeholders to gain a more tangible hold on "what might be" and this facilitates implementation. The facility to create the future today is a characteristic of innovation leaders.

Care should be taken not to limit perceptions of satisfaction of needs to current use in defined circumstances; future needs and circumstances, and the ways of satisfying them, could be very different.

7.12 The internet, intranets, extranets and wikis

The internet is a rich source of information which, research confirms, is often the first source tapped when information is required. All organizations interested in introducing newness into their products should help staff to search the web effectively, not least to determine the current state of the art in areas of interest, including intellectual property in the form of registered patents, etc. Such guidance is likely to save considerable time.

Search routines might be set up and favourite sites specified to be visited regularly or whenever updated. Subscribing to Really Simple Syndication (RSS) feeds will notify users of changes. A procedure should be instituted for disseminating information to all who might make use of it (see **7.8**).

Another important step for organizations is to establish intranets and websites to encourage staff (and select external users) to share information and exchange ideas, particularly with colleagues they would not normally meet or consult. The aim is to make these the first point of contact for staff seeking information or help.

The main reasons for setting up intranets and websites are to:

a) establish a focal contact point for staff and third parties, especially when there is an open invitation to make or validate inputs (such as ideas for improvement, lessons learnt, interesting information gleaned from elsewhere, issues that ought to be investigated and opportunities for collaboration);

b) help communicate the innovation mission statement, the future vision of the organization and the parameters of the innovation highway;

c) set out the protocol for sharing, divulging and using information (extent, safeguards, guidelines);

d) provide direct access to, and speed applications of, useful information by presenting it in a ready-to-use format;

e) indicate current and emerging technologies and business areas of particular interest;

f) identify leading players and best practices in all technologies, techniques and business processes of interest;

g) list on-going projects, staff and third parties involved;

h) incorporate a register of knowledge, skills and experience within the organization (including individuals to be consulted with queries and requests for support);

i) provide guidance on refining ideas, formulation and submission of project proposals;

j) document case studies of good practice and achievements;

k) publicize innovation success stories from across the organization and acknowledge individuals involved;

l) provide a forum for a competitive internal market such as a "Best five long-term ideas of the month" competition;

m) advise on best ways to use the web (e.g. guidance on key sources of information and how to carry out searches);

n) outline the innovation management system adopted and provide guidance on how it might be used to best effect (e.g. organization of stages, undertaking work, handling the people issues, etc.).

Extranets, extensions of an organization's intranet, connect the intranets of its customers, suppliers, or other organizations that share common goals. This makes it possible to create e-commerce applications that link all aspects of a business relationship, from ordering, through payment to after-sales support and development.

It is now increasingly common for organizations to create a website (known as a "wiki") for each product; indeed, many consider this an important component of the product. Wikis allow easy sharing of information, as well as adding, editing and deleting pages as necessary. Referring to this information is both efficient and effective for those who are allowed access because it is easy to upload and amend, is fully searchable, and appropriate links are provided.

Similar wikis are set up for groups of staff and external contacts (such as communities of interest) to share information relating to areas of interest and common practice. For example, project management, development in certain technologies, and exploration of how needs might be addressed are all possible bases for establishing such communities.

Websites, intranets, extranets and wikis need to be updated regularly to feature new information, expand links to other sites of further interest, help bring together and stretch people with common specialist interests. These facilitate more fruitful searches, and help build valuable networks. Such factors, together with prompt responses to queries and suggestions posted on sites, should encourage constant use by staff and other target audiences.

It is essential for intranets, extranets and wikis to be secure against those without authorized access (who could, perhaps, use them illegally or maliciously edit content), while maintaining easy access to targeted users.

The content/pages of all such websites should be preserved in the central archives of organizations, not least as legal implications could require reference to this material several years after a website is withdrawn.

7.13 User-centred design

A growing number of organizations admit openly that customers know more about the use of their products than they do. Harnessing that vast reservoir of experience is often a critical source of competitive advantage for innovation leaders, especially when the parties push and stretch each other to reach new insights. The way lead users customize products to suit their particular circumstances, and their wish lists for future upgrades, can be equally instructive.

With user-centred design, the design/innovation process revolves around understanding fully users' needs, priorities, preferences and wants. They are encouraged to express their views, values and aspirations because hearing these articulated directly, often in fresh unusual terms, opens up new perspectives. Dialogue and trust are built up so there is a sense of co-ownership of the challenges tackled.

NOTE Also known as "empathetic design".

This feedback is complemented with acute observation of users interacting with the product in a variety of real situations (not just clinically in the studio) to provide a better sense of how the product fits into users' lives, their other activities and possessions. Wherever possible, questions are asked to clarify behaviour, practices and occurrences. Gauging responses to different product features is critical to understand how different aspects of the offering are valued and their relative importance.

Another feature is to invite users to spend time in the studio with the design/innovation team discussing problems, experiencing how problems are worked through and validating approaches and/or outputs. Sometimes those arrangements are formalized and users become co-opted team members with well-defined roles. These are instances when co-creation occurs.

7.14 Visualization

Though ideas are communicated predominantly with words and numbers, there is overwhelming evidence that many people think visually. Indeed, observation is a major factor in learning and understanding; acute observation is probably a more valuable source of innovative ideas than good listening.

As ideas take shape, come to life, are tested and personalized, they play like moving pictures in the mind accompanied by a soundtrack as individuals talk through their ideas and imagine discussions with other interested parties. As such, there are considerable benefits to be gained from underpinning communication with imagery, not least when it is critical to gain shared understanding quickly and build a binding spirit between diverse people who need to work together effectively.

Envisioning and visualization are about seeing in the mind's eye, then externalizing and sharing those images. The design activity translates these images into reality more powerfully than any other discipline in business.

This added dimension is generally taken to be non-threatening, largely because most people consider themselves to be visually literate through widespread familiarity with cinema, television, computer games, and so on. This view holds even though relatively few have developed skills in drawing or other techniques of visual representation.

When speed and radical change are sought, harnessing the visual dimension of communication is critical to success, not least because its inclusiveness encourages collaboration and facilitates rapid acquisition and application of new knowledge and skills.

Special care should be taken to ensure that content and presentation is mutually reinforcing. The credibility of communication should not be compromised by poor visual aids that negate its content and impact. The effective use of design can help present innovative messages in fresh ways that provide immediate demonstrations of how things might be done differently, to higher standards.

The benefits of using visualization are that it:

a) facilitates rapid comprehension and faster adoption of new knowledge and skills;

b) introduces fresh perspectives and encourages multiple viewpoints;

c) illustrates and helps devise enlightened ways to apply these new ideas and technical advances;

d) helps evaluate user appeal through value analyses and ranking preferences;

e) enables testing of users' comprehension as well as their sophistication in the use of products;

f) provides checks on technical feasibility and isolates potential conflicts between marketing and performance specifications;

g) provides guidance and exemplars for sales and other service/support personnel;

h) establishes common experiences and understanding among development team members, either created together or subsequently shared;

i) isolates inconsistencies of approach and gaps/disjoints in experiences during projected lifecycles;

j) provides messages that are more vivid and real to target audiences, yet allow flexibility and personalization, hence greater potential for development.

Bibliography

Standards publications

BS 7000-2, *Design management systems – Guide to managing the design of manufactured products*

BS 7000-3, *Design management systems – Guide to managing service design*

BS 7000-4, *Design management systems – Guide to managing design in construction*

BS 7000-6, *Design management systems – Guide to managing inclusive design*

BS EN ISO 9001:2000, *Quality management systems – Requirements*

BS EN ISO 14001:1997, *Environmental management systems – Specification with guidance for use*

BS 31100,[2)] *Code of practice for risk management*

BS 25999-2,[2)] *Specification for business continuity management*

BS EN 61160:2005, *Design review*

BS IEC 62198,[2)] *Project risk management – Application guidelines*

PAS 11000, *Collaborative business relationships – A framework specification*

Further reading

BS 7373-2:2001, *Product specifications – Guide to identifying criteria for a product specification and to declaring product conformity*

BS 7373-3:2005, *Product specifications – Guide to identifying criteria for specifying a service offering*

BS EN ISO 14004:1997, *Environmental management systems – General guidelines on principles, systems and supporting techniques*

BS EN ISO 14040:1997, *Environmental management – Life cycle assessment – Principles and framework*

EUROPEAN COMMUNITIES. Council regulation No. 1836/93. Eco-management and audit scheme.

Luxembourg: Office for Official Publications of the European Communities.

ISO/IEC DIS 12207-1, *Information technology/software – Part 1: Software life-cycle process.*

2) In preparation.

Other publications

Strategic management and planning

CHATTERJI, D. Accessing external sources of technology. *Research-Technology Management*, 1996, March–April.

HIRSHHORN, L., and T. GILMORE. The new boundaries of the "boundary-less" company. *Harvard Business Review*, 1992, May–June.

HOUSTON, W. *Riding the business cycle.* Boston: Little, Brown, 1996.

MacMILLAN, I.C., and R.G. McGRATH. Discover your products' hidden potential. *Harvard Business Review*, 1995, May–June.

MINTZBERG, H. *The rise and fall of strategic planning*. Upper Saddle River: Prentice Hall, 1994.

NONAKA, I. The knowledge-creating company. *Harvard Business Review*, 1991, November–December.

PETER, E. *Web weaving, intranet and extranet and strategic alliances*. Woburn: Butterworth-Heineman, 1998.

PORTER, M.E. *Competitive Advantage*. New York: The Free Press, 1985.

SENGE, P.M. *The fifth discipline: The art and practice of the learning organization*. New York: Currency/Doubleday, 1990.

STACEY, R. *Strategic management and organizational dynamics*. London: Pitman, 1996.

TOPALIAN, A. Developing a corporate approach to design management. In: M. OAKLEY, ed. *Design management: A handbook of issues and methods*. Oxford: Blackwell, 1990.

TOPALIAN, A. Design leadership in business: The role of non-executive directors and corporate design consultants. *Journal of General Management*, 1990, 16(2).

TOPALIAN, A. Design in strategic planning. In: P. McGRORY, ed. *The challenge of complexity.* Helsinki: University of Art and Design, 1997.

WHEELWRIGHT, S., and K. CLARK. *Revolutionizing product development*. New York: The Free Press, 1992.

Long-range planning, envisioning and visualizing the future

AINSWORTH-LAND, V. Imaging and creativity: An integrating perspective. In: J. HENRY, ed. *Creative management*. London: Sage, 1991.

BURNSIDE, R.M. Visioning: Building pictures of the future. In: J. HENRY and D. WALKER, eds. *Managing innovation*. London: Sage, 1991.

EDGE, G. Thinking about the technology future. *R&D Management*, 1995, 25(2).

GIBSON, R., ed. *Rethinking the future*. London: Nicholas Brearley, 1997.

GRADEL, T.E. *Streamlined life-cycle auditing*. Upper Saddle River: Prentice Hall, 1998.

HAMEL, G., and P.K. PRAHALAD. *Competing for the future*. Boston: HBS Press, 1994.

HOLLINS, B., and G. HOLLINS. *Over the horizon*. Chichester: Wiley, 1999.

MERCER, D. *Future revolutions: A comprehensive guide to life and work in the next millennium*. Buckingham: Open University Press, 1998.

NORDIC COUNCIL. *Product life cycle auditing principles and methodology*. Copenhagen: The Nordic Council, 1992.

RINGLAND, G. *Scenario planning: Managing for the future*. New York: Wiley, 1998.

SCHWARTZ, P. *The art of the long view.* New York: Doubleday, 1998.

SLAUGHTER, R. *The foresight principle: Cultural recovery in the 21st century.* London: Adamantine, 1995.

TOPALIAN, A., and J. STODDARD. *'New' R&D Management: How clusternets, experience cycles and visualization make more desirable futures come to life*. Proceedings of the *Managing R&D in the 21st century: Theory and practice, the tools of the trade* Conference; Manchester Business School, July 1997.

Creativity and innovation

AMABILE, T.M. *Creativity in context: Update to the social psychology of creativity*, Boulder, Co: Westview Press, 1996.

BUZAN, T., and B. BUZAN. *The mind map book*. London: BBC, 1993.

CHESBOROUGH, H.W., and D.J. TEECE. When is virtual virtuous? Organizing for innovation. *Harvard Business Review*, 1996, January–February.

EARL, P.E. The entrepreneur as a constructor of connections, in R. KOPPL, ed. *Advances in Austrian Economics*, 6, 117–134, Amsterdam: JAI/Elsevier, 2003.

EKVALL, G. *Creative climate* (in Runco and Pritzker, *see below.* (1: 403–412), 1999.

GABEL, H.L. *Competitive strategies for product standards: The strategic use of compatibility standards for competitive advantage*, London: McGraw-Hill, 1991.

GEROSKI, P.A. *The evolution of new markets*, Oxford: Oxford University Press, 2003.

GRINDLEY, P.C. *Standards strategy and policy: Cases and stories*, Oxford: Oxford University Press, 1995.

HOLLINS, B. Why the resistance to long-term innovation management? *International Journal of Innovation Management;* Vol. 4, No. 2; June 2000.

MARTIN, R. (2007) *The opposable mind: How successful leaders win through integrative thinking*, Boston: Harvard Business School Press.

MUNDEN, S., and S. BOLIN. *Best practice ... Next practice: How to survive, innovate and grow in an ever changing world*. British Standards Institution, 2005.

McCASKEY, M.B. Mapping: Creating, maintaining and relinquishing conceptual frameworks. In: J. HENRY, ed. *Creative management*. London: Sage, 1991.

OSBORNE, A. Applied imagination. New York: Scribner, 1993.

RICKARDS, T. *Creativity and the management of change*. Oxford: Basil Blackwell Publishers, 1999.

RUNCO, M.A. and S.R. PRITZKER, eds. *Encyclopedia of creativity*. Volumes 1–2, San Diego: Academic Press, 1999.

SUTTON, R.I., and A. HARGADON. Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, 1996, 41, December.

SWANN, G.M.P. *The economics of standardization*. Report for Standards and Technical Regulations Directorate, Department of Trade and Industry, London, 2000.

TEMPLE, P., K. BLIND, A. JUNGMITTAG, C. SPENCER, G.M.P. SWANN and R. WITT. *The empirical economics of standards*, DTI Economics Paper No. 12, London: Department of Trade and Industry, 2005.

TOPALIAN, A. The role of innovation leaders in developing long-term products. *International Journal of Innovation Management (IJIM);* Vol. 4, No. 2; June 2000.

Useful websites

http://gb.espacenet.com
User interface developed by the European Patent Office to search European patents.

http://www.aimresearch.org/maindirectory
Advanced Institute of Management Research.

http://www.communities.gov.uk/localgovernment/performanceframeworkpartnerships/freedomsflexibilities/theinnovationforum/

http://www.cordis.europa.eu
Information service on European Community activities and initiatives in research & development and Innovation.

http://www.designcouncil.org.uk
The Design Council, UK. Design Council Knowledge Cells on various issues such as user-centred design, inclusive design, trends, market research, and visualization.

http://www.design.ncsu.edu/cud/pubs/center/pubslist.htm#eval
Center for Universal Design, USA.

http://www.domino.research.ibm.com
IBM's Global Innovation Outlook.

http://www.dius.gov.uk/policy/innovation

http://www.exploringinnovation.org.uk/

http://www.ergonomics.org.uk
The Ergonomics Society – professional society for ergonomists and human factors specialists.

http://www.gemconsortium.org
Global Entrepreneurship Monitor – an annual assessment of entrepreneurial activity at national level.

http://www.hhrc.rca.ac.uk
Helen Hamlyn Research Centre, Royal College of Art, London.

http://www.icass.co.uk
Innovators Counselling and Advisory Service for Scotland, funded by the Scottish Executive, facilitates the commercialization of innovative ideas originating in Scotland.

http://www.innovateuk.org
Technology Strategy Board, UK.

http://www.innovating-regions.org
Innovating Regions in Europe – platform for sharing experience on implementing regional innovation strategies/schemes.

http://www.innovationtools.com
Innovation Tools – resources on business innovation, creativity and brainstorming.

http://www.innovation-unit.co.uk
Department for Education and Science – catalyst for innovation and improvement in education.

http://www.ipo.gov.uk
UK Intellectual Property Office, the government body responsible for granting intellectual property rights in the United Kingdom (patents, designs, trade marks, and copyright) and promoting the role of these rights in supporting innovation.

http://www.mbs.ac.uk/research/engineering-policy
PREST provides independent analysis and information for those developing and implementing policy for science and technology.

http://www.nao.org.uk/publications/nao_reports/05-06/05061447i.pdf
National Audit Office, UK.

http://www.nao.org.uk/publications/nao_reports/9900864.pdf
National Audit Office, UK.

http://www.nesta.org.uk
National Endowment for Science Technology and the Arts.

http://www.open-futures.net
European Union programme of future centres.

http://www.prod-dev.com
Product Development Institute Inc/Robert G Cooper/Specialists of the Stage-Gate Innovation System.

http://www.raeng.org.uk
Royal Academy of Engineering brings together the UK's most eminent engineers from all disciplines to promote excellence in the science, art and practice of engineering.

http://www.ricability.org.uk
Consumer research and product evaluation, in particular with regard to older and disabled people.

http://www.sussex.ac.uk/spru
Science Policy Research Unit.

http://www.tiresias.org
Information resource for professionals who work in the field of visual disabilities.

http://www.web.mit.edu/evhippel
Eric Von Hippel website at Massachusetts Institute of Technology, USA.

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