

Design management systems —

Part 1: Guide to managing innovation

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- Association of MBAs
- Association of Project Managers
- British Standards Society
- Chartered Society of Designers
- Defence Manufacturers' Association
- Department of Trade and Industry
- Design Council
- Electricity Association
- Federation of Small Businesses
- GAMBICA (BEAMA Ltd.)
- Institute of Quality Assurance
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- Institution of Electrical Engineers
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Foreword

This part of BS 7000 has been prepared by Technical Committee MS/4. In October 1993, BS 7000:1989, *Guide to managing product design* was renumbered BS 7000-1:1989 to accommodate the addition of further parts.

BS 7000-1:1989 was replaced by BS 7000-2:1997, BS 7000-3:1994 and BS 7000-4:1996, and was withdrawn in 1997 while a new part 1 (this part) was prepared.

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 10: Glossary of terms used in design management*.

Other parts might be added.

Because of the novel nature of the subject matter, 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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 36, an inside back cover and a back cover.

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0 Introduction

0.1 General

This standard describes how senior executives or principals within organizations can plan their products and services a significant time into the future: the product/service generation after the generation after the next (3-Gen products and services). It has been prepared in part to help disparate enterprises (especially those that are new or very small, with little experience of innovation) to enhance their performance and form effective innovative alliances fast.

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.

NOTE 1 Research undertaken as groundwork for this standard took the form of in-depth interviews with senior executives from selected organizations in the United Kingdom that offer a wide spectrum of products and services. All were considered to be innovative and many had won awards for design, technology or innovation during the 1990s. The largest employed 58 000 people around the world; the smallest consisted of just three individuals. Annual turnovers ranged from £12 000 to £8.4 billion.

NOTE 2 The term “product” also encompasses services and processes (including business processes).

NOTE 3 For the sake of brevity, the term “principals” is used in most instances to denote owner-managers, partners, board directors and other top executives.

0.2 Survival of the fittest

The first priority of an organization is to ensure that it survives and prospers.

Survival usually depends on growth from the expansion of existing markets, withdrawal from stagnant markets and taking advantage of new opportunities, while keeping a firm control of finances. The accumulation of market intelligence and a researched knowledge base of customer requirements are also key to formulating realistic business strategies and delivering products that generate growth. An organization that fails to develop its product range continuously is unlikely to grow in real terms, especially with the increase in open competition across the globe. Eventually it might be forced to cease trading.

0.3 Innovation goes beyond technology

It is also important to emphasize that innovation can occur in all parts of an organization and at all stages of the value chain: research, design, manufacture, distribution and marketing, servicing, maintenance and the eventual disposal of products. Worthwhile contributions should be sought through innovation at all stages of a product's life.

NOTE Worthwhile contributions will not necessarily relate to financial outcomes, particularly where public 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 enterprise, or for every product of innovative organizations. Typically, innovation takes longer, costs more, and is riskier than product improvement. Therefore, incremental product improvement might be a preferable option.

0.5 Structure of this standard

This standard puts forward a comprehensive framework and outlines how key issues might be tackled.

Clause 4 explains the important role of innovation, describes the various kinds of innovation and gives guidance on innovation management processes.

Clause 5 outlines issues that need to be dealt with when managing innovation at the organizational level.

Clause 6 gives guidance on aspects of management from idea generation through to integration within an organization's culture.

Clause 7 describes tools and techniques for managing innovation.

1 Scope

This part of BS 7000 gives guidance on managing innovation: specifically the development of innovative and competitive products that will satisfy customers' perceived and latent needs in the long-term future (the generation after the generation beyond those currently under development). It does not encompass continuous improvement in the short term.

This standard stretches the horizon of design management and should be used by those with overall responsibility for an organization's well-being to plan future product strategies and so help ensure long-term survival. It should be used in conjunction with the other design management guides in the BS 7000 series. The proposals in this standard dovetail into those of BS 7000-2, BS 7000-3 and BS 7000-4.

This standard is relevant to all types of products and services, and to the business processes involved in their creation, fabrication, delivery and sustenance in the market, right through to final disposal, including the management of obsolescence.

It also applies to all levels of staff and management in all types of organizations operating in the manufacturing, process, service and construction industries as well as in the public and “not-for-profit” sectors. The principles and procedures outlined should be of particular interest to small and medium-size enterprises (SMEs).



Guidance is given on the application of general principles and techniques to the management of innovation. Discussion of the techniques themselves, such as the management of people and time, and their application to areas other than innovation and design is excluded.

The guidance provided in this standard provides insights into what should eventually be attained at all levels of an enterprise.

NOTE 1 Appropriate reference is made to other documents for guidance on general management techniques. A Bibliography is given at the end.

NOTE 2 Guidance on procedures needed to meet statutory requirements (such as health and safety, or product certification and liability) are not intended to be comprehensive. Reference should be made to other documents where appropriate.

NOTE 3 This standard is intended to complement BS EN ISO 9001:1994 to which reference should be made.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 3811:1993, *Glossary of terms used in terotechnology*.

BS 4778-3.1:1991, *Quality vocabulary — Availability, reliability and maintainability terms — Guide to concepts and related definitions*.

BS 4778-3.2:1991, *Quality vocabulary — Availability, reliability and maintainability terms — Glossary of international terms*.

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 7000-10:1995, *Design management systems — Glossary of terms used in design management*.

BS 6079:1996, *Guide to project management*.

BS EN ISO 8402:1995, *Quality management and quality assurance — Vocabulary*.

BS ISO 10007:1996, *Quality management — Guidelines for configuration management*.

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in BS 7000-10:1995, BS 3811:1993, BS 4778-3:1991, BS 6079:1996, BS EN ISO 8402:1995 and BS ISO 10007:1996 and the following apply.

NOTE The terms in this clause will help to clarify the different types of innovation as well as differentiate long-term product and service creation from short-term product and service development.

3.1

innovation

⟨product⟩ transformation of an idea into a novel product, operational process or new service in industry or commerce

[BS 7000-10:1995, definition 23011a)]

NOTE 1 It 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, or the introduction of a new service.

NOTE 2 This definition also applies to public sector and not-for-profit organizations where the products might not be saleable as such but are created for the good of society.

3.2

innovation

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

[BS 7000-10:1995, definition 23011b)]

NOTE This applies mainly to the construction industry.

3.3

innovation

⟨ideas⟩ successful exploitation of new ideas

NOTE This definition is widely promoted by the Department of Trade and Industry.

3.4

3-Gen product

long-term product or service that will become available, typically in the generation after the generation beyond those currently under development

3.5

innovative alliance

formal collaboration between two or more individuals and/or enterprises in order to develop innovative ideas

3.6

innovation brief

statement that describes the purpose and required performance of a product, service or process

3.7

innovation champion

person dedicated to the promotion of, and strategic thinking behind, 3-Gen products

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

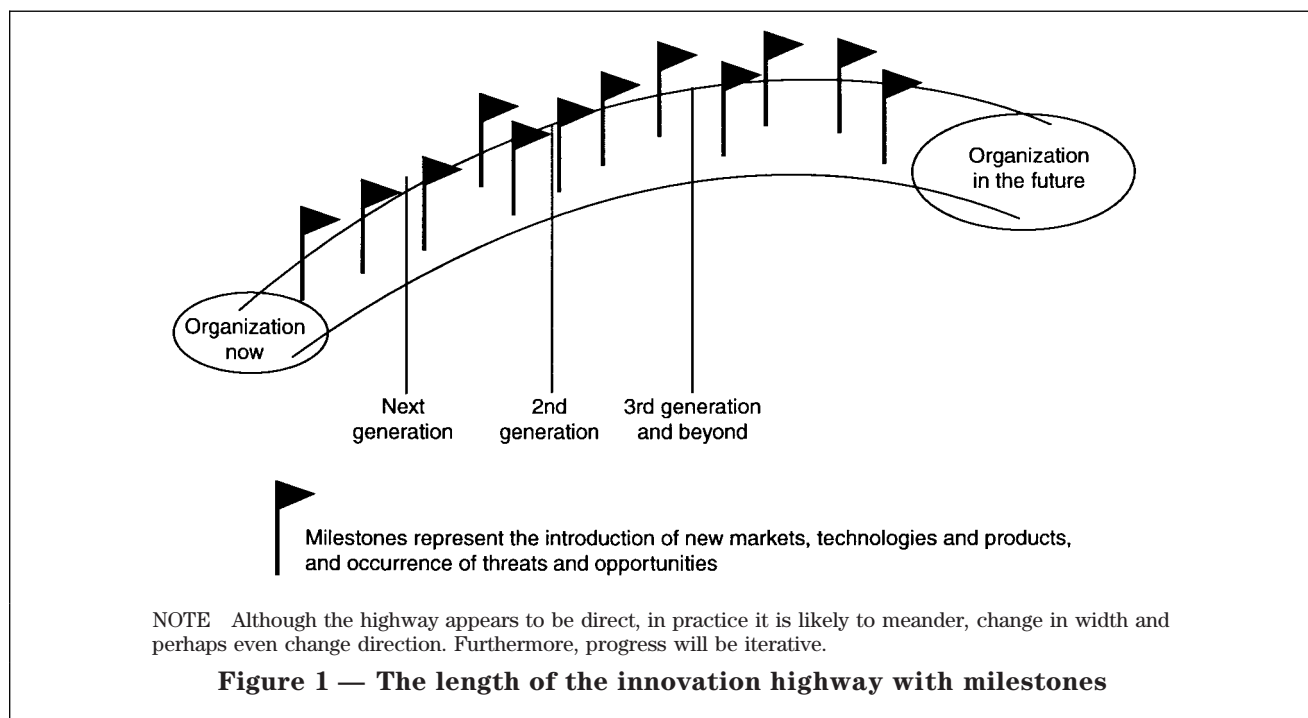
3.8

innovation highway

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

NOTE See also 3.26, 3.45 and Figure 1.





3.9

innovation leader

⟨activities⟩ person who takes the lead in innovative activities

3.10

innovation leader

⟨authority⟩ person accepted as being the key authority where matters relating to innovation are concerned

3.11

innovation leader

⟨initiation⟩ person who is first to introduce a particular innovation

NOTE This definition could also refer to enterprises.

3.12

innovation leader

⟨driving⟩ person who consistently drives innovation and has an acknowledged record of achievement through innovation

3.13

innovation leader

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

NOTE This definition could also refer to enterprises.

3.14

innovation plan

subsection of the overall business or corporate plan that brings together all elements relating to innovation whether dealing with output, processes or parts of an organization

3.15

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

NOTE 2 Innovation reviews might take place several times during the progress of an innovative project. The 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 Innovation reviews can be conducted at any stage of the innovation process, and should definitely be conducted at the completion of this process.

3.16

innovation spiral

process of building innovations effectively on their predecessors

NOTE This process should ensure 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.

3.17

innovation strategy

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

3.18**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 This process could apply to markets, products, services, processes and organizations.

3.19**blue-sky thinking**

unbounded thinking, and research, during which ideas are explored without concern as to their practicality, applicability or marketability

3.20**innovation management system**

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

3.21**innovation philosophy**

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

NOTE This is the “innovation” equivalent of a business mission which articulates the basic reason for innovating within the organization and formalizes its role.

3.22**master innovation programme**

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

3.23**corporate software**

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

3.24**envisioning**

capacity to conceive of a future state

3.25**“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 These differ from “what if” analyses in that the starting point is a specified desired future state, not the present. See 3.44.

NOTE 2 “If onlys” are critical enablers of, or pathways to, the achievement of a new vision.

3.26**length of the innovation highway**

period of time over which new long-term products and services will be planned

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

NOTE 2 See also 3.7, 3.45 and Figure 1.

3.27 product generation

⟨enterprise⟩ step advance for an organization or industry

3.28**product generation**

⟨standard⟩ advance that establishes a new standard that others adopt

3.29**product generation**

⟨advantage⟩ advance that results in a significant competitive advantage

3.30**product generation**

⟨platform⟩ advance that establishes a new “platform” from which to build future output

3.31**product generation**

⟨obsolescence⟩ advance that makes old products obsolete

3.32**product generation**

⟨attitude⟩ advance that forces a significant change in perception and the way things are done

3.33**product generation**

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

3.34**product generation**

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

3.35**product generation**

⟨simultaneous change⟩ change or cluster of changes incorporated into a product at the same time

3.36**parametric product brief**

limitations as specified in the length and width of the innovation highway

NOTE This will include products that will be allowed to be developed by the organization over a specified time period. It will also provide the primary determinants against which long-term new product and service ideas are eliminated.

3.37**sensitivity analysis**

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

3.38**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.

3.39**serial innovation**

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

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

3.40**technological route map**

description of an anticipated series of developments and milestones in identified technologies that provides guidance on the way forward in the foreseeable future

NOTE With judicious planning, new products could be conceived to use anticipated technological developments as they come on stream.

3.41**value chain**

all the activities undertaken by an organization that contribute to the value of its products as perceived by customers and users, from first conception through to final disposal

3.42**visual imagery**

visual rendition of ideas and concepts

3.43**visualization**

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

3.44**“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 Such analyses differ from “if only” analyses in that the starting point is the known present rather than a desired future state. See 3.24.

3.45**width of the innovation highway**

parameters (including financial) that must be met by long-term products and services

NOTE See also 3.7, 3.26 and Figure 1.

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

4.1 Flow chart of the complete innovation management framework

The framework for innovation management is outlined in its entirety in Figure 2 and indicates the general direction to be followed. In practice, there might be iteration back to earlier stages for clarification or as new and better information becomes available. Opportunities for concurrent processing should be considered by all technical and non-technical personnel. This will help to reduce the time-to-market for new products.

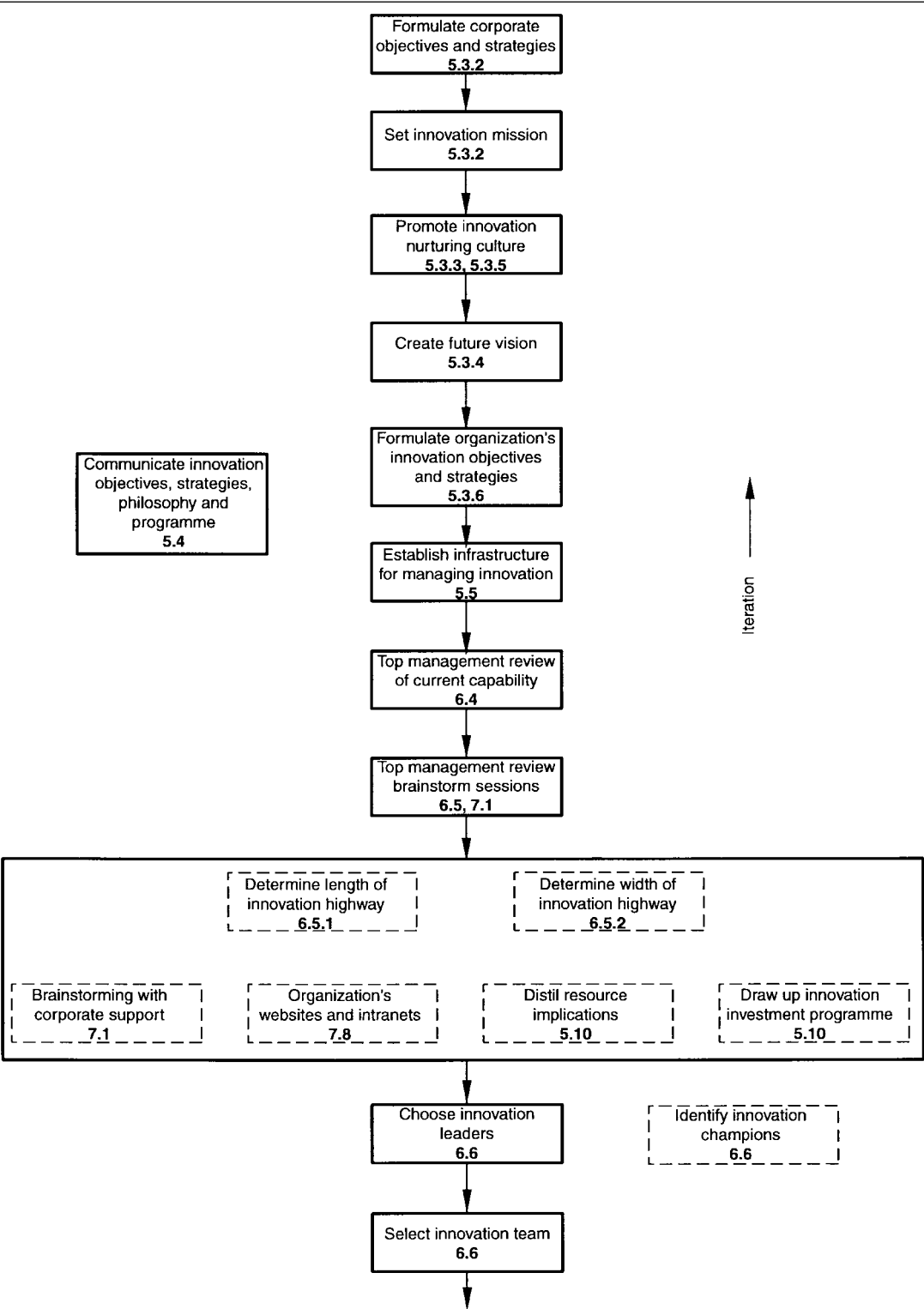
It is possible to implement all the stages of this framework immediately and this can then be used to direct innovation management. The stages apply equally well to small enterprises and large organizations. The procedures adopted are similar; the differences should be principally in the degree and scale involved.

Explanations of the terms used in this framework are given in clause 4. Relevant portions of this figure will be highlighted near the start of clauses 5 and 6.

4.2 Planning beyond current horizons

The research undertaken revealed that there is very little that cannot be planned up to three product generations into the future. This span will vary depending on the type of products with which the organization is involved, 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.

This time span is not especially long. Most people would like to ensure the survival of their organization and security of their employment for at least ten years into the future. This can only be achieved with a constant supply of well-designed products and services. Their introduction needs to be planned, as does the withdrawal of products and services in decline. Furthermore, new products and services need to be developed along an identified “highway” into the future: this sets the direction an organization will follow over a specified planning period and the milestones to be achieved in order to develop the requisite products and services at specified times.



Numbers in bold face refer to the relevant clauses in this standard

NOTE In small firms, the owners will probably be involved in the specific search for innovative products. In these cases, the following activities might occur during top management brainstorming sessions (6.5): analyses of customer-product experience cycles (7.4), visualization (7.5), scenario planning (7.2), backcasting (7.3), evaluation of intellectual property (7.6), and the establishment of strategic alliances (5.9).

Figure 2 — Flow chart giving an overview of the complete innovation management framework

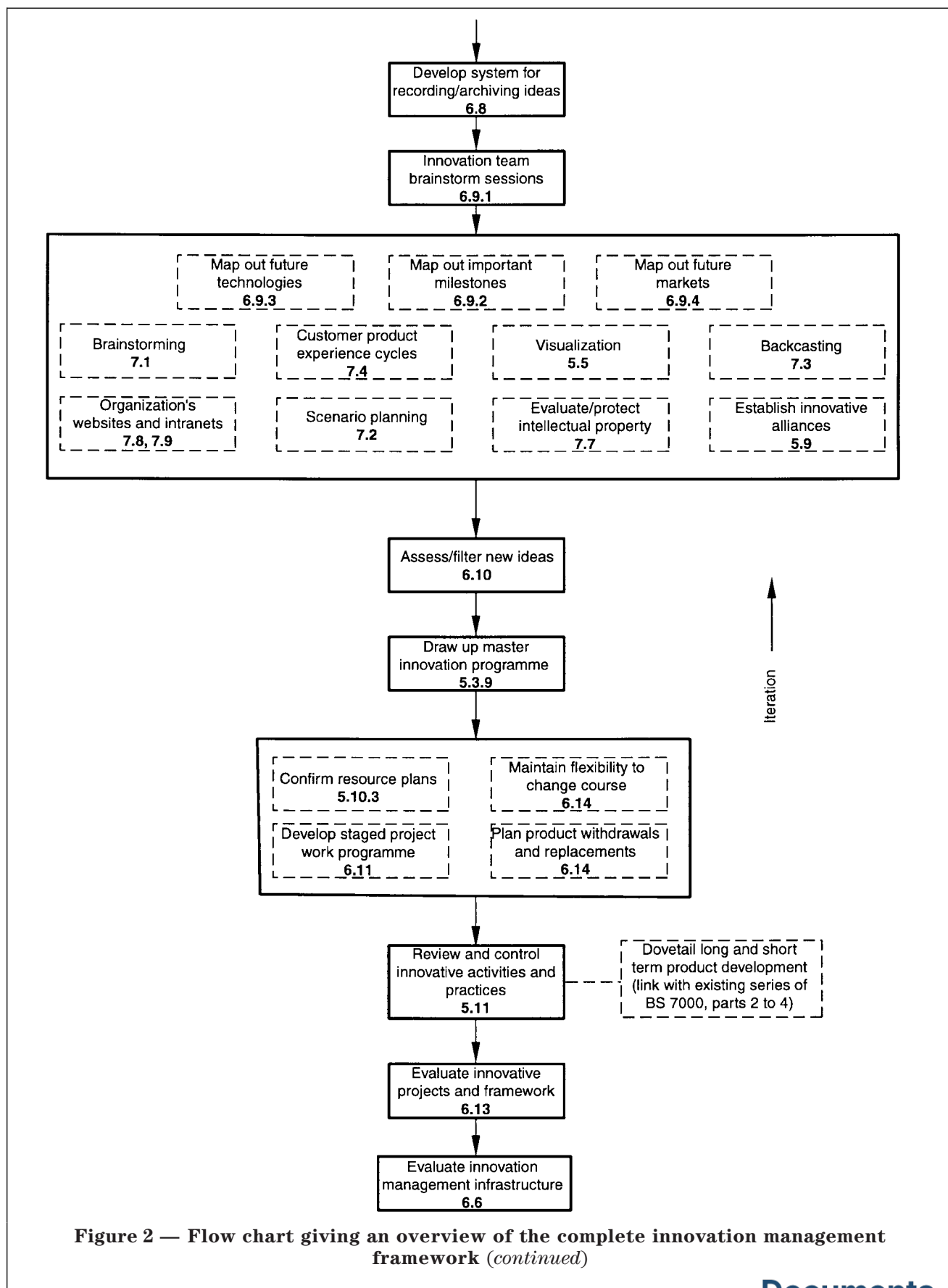


Figure 2 — Flow chart giving an overview of the complete innovation management framework *(continued)*

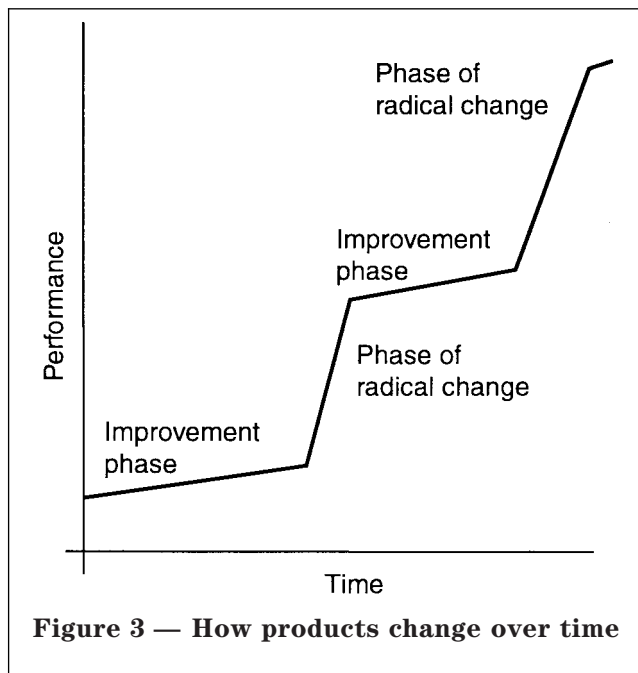
4.3 Assignment of tasks and responsibilities

In large organizations, tasks and responsibilities relating to innovation will probably be discharged by different individuals. In small organizations, they might be undertaken by a single person. All those involved should be aware of what is required of them: therefore, it is recommended that they achieve an understanding of the full content of this standard while paying special attention to the section that is most directly relevant to them.

4.4 How products change over time

Normally, products are upgraded over time. Within an existing product concept, there are periods of incremental improvement (such as improvements in the ergonomics of a product or its aesthetics). Occasionally, radical improvements in performance might be achieved through advances in existing technologies, ergonomics and business practices, or the introduction of new technologies and procedures. Innovative phases tend to be followed by “stable” phases where incremental enhancements are introduced until a further radical change occurs (see Figure 3).

Radical phases might herald new generations of products, however most innovations are in reality “sub-innovations” that do not transform the overall product even if one or more components might have been substantially altered.



4.5 Nature of innovation

Innovation is the creation of change which introduces a significant element of “newness” in thought (for example, through blue-sky thinking) and action. Typically, the change itself is radical, though it might be smaller in scale, perhaps the last piece of a jigsaw that leads directly to a more radical advance or transformation.

The 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 and unexpected advances. Consequently they might not be obvious when first encountered, though those affected, the stakeholders, might quickly accept them.

A close link between idea and action is essential: ideas need to be followed by action and the outcome should be seen to be beneficial to stakeholders, though the benefits need not be evaluated in financial terms.

An innovation might be a “single step” change or comprise an imaginative combination of changes, some of which might involve making better use of existing knowledge and practices as well as introducing smaller evolutionary advances.

Innovations might provide new insights which might lead to new perspectives and a crucial restructuring of problems and recommended solutions.

Innovation might be the achievement of a critical cost, hence price, reduction 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 radical “step” nature of change brought on by innovations might result in uncomfortable discontinuities. However, even dramatic change can be brought about in a seamless manner if planned properly. More often than not, success is determined by factors other than the technical content of an innovation, not least the manner in which it is launched and sustained once implemented. In some instances, serial innovation might occur with complementary changes through the value chain: for example, in relationships with customers and suppliers. The “spirals” of innovation that might result should help reinforce technical and market leadership.

4.6 Reasons to innovate

Many reasons make innovation an imperative for a substantial proportion of business enterprises, particularly those of small and medium sizes.

The following list summarizes the principal reasons why innovation should be among an organization's core competencies:

- a) to survive adverse changes in operating circumstances;
- b) to make life easier for their customers and help them improve their businesses;
- c) to raise margins and profitability;
- d) to gain competitive advantage;
- e) to protect market share;
- f) to comply with legislation (actual or anticipated);
- g) to reposition an enterprise and raise its market profile;
- h) to lead the market and reinforce a reputation as market leader;
- i) to open new horizons so as to get out of a rut or avenues with limited potential;
- j) to stimulate staff with interesting and challenging work;
- k) to attract and retain higher calibre staff;
- l) to provide stability for the workforce;
- m) to attract extra funding;
- n) to attract alliance partners;
- o) to encourage those with good ideas to approach the company;
- p) to reduce competition and/or the influence of competitors.

4.7 "High productivity" innovation

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

The curiosity of staff members, the challenge to do better within a company, customer requests or dissatisfaction, and competitive pressures all act as spurs to innovation. However, particular special efforts should be made to generate, "high productivity" innovations that:

- a) spawn further innovations;
- b) solve more problems than originally envisaged;
- c) interest and inspire more people;
- d) are easy to "sell", internally and externally;
- e) are easy for colleagues to comprehend, adopt and make their own;
- f) arise out of trouble-free development;
- g) are easy to implement and fit more readily into host organizations;

- h) have shortcomings that are easy to rectify;
- i) have a high "fun content" in addition to presenting real challenges to those who develop them;
- j) are difficult for others to copy or surpass;
- k) set new "standards" in markets which competitors struggle to reach.

4.8 Degrees of "newness"

The spectrum of change that might be introduced through innovation extends from "new to the world" at one extreme through to "new to an individual" at the other.

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 the potential impact and returns of the latter are strictly 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 developed. The spectrum of newness' is shown in Figure 4.

4.9 Sources of "newness"

The sources of "newness" might be personal to individuals or relate collectively to groups within an enterprise or whole enterprises. They should be sought in the following:

- a) aspirations and ambitions;
- b) attitude towards the future;
- c) attitude towards problems, constraints, threats;
- d) vision and perceptions of the future;
- e) where boundaries are placed;
- f) the distance ahead it is sought to work and influence;
- g) how things are put together;
- h) how the future is linked to the present;
- i) what is done;
- j) how these things are done.

"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 colour of a product to one that is unique in the market might transform it in the eyes of customers.

