Survey Outline

(1) Purpose

This aim of this survey was to ascertain approaches taken by Research/Design/Development divisions, which represent the core of companies' new product development capabilities, in response to management issues, the current status of development design and other issues by means of a questionnaire. We intend to use this to illustrate trends in the industry as a whole, look into future approaches and provide feedback to each company in the form of proposals.

The following surveys have been carried out to date, enabling us to ascertain trends in companies' approaches and in the industry as a whole and to put forward key issues.

- The 1st Fact-Finding Survey concerning development design in response to rapid growth (1968)
- The 2nd Fact-Finding Survey concerning development design in response to reduced growth (1978)
- The 3rd Fact-Finding Survey concerning development design in response to changes in technology (1988)
- The 4th Fact-Finding Survey concerning development design in response to changes in the business environment (1994)
- The 5th Fact-Finding Survey concerning development design in response to reduced growth and changes in mega-competition (1997)
- The 6th Fact-Finding Survey concerning innovations in development design management towards value creation (2001)

The 7th survey was carried out in order to study the current status of technology, development design and management innovation in the age of MOT. This survey also incorporated comparative studies including a number of countries other than Japan. We intend to compile a separate report detailing this particular area.

(2) Contents

In order to gain an understanding of the current status of development design at individual companies and conduct comparative studies against past surveys, the contents of this survey were as follows.

1) Outline of the company or department (unit)
2) Challenges for the engineering department
3) Development capabilities
4) Current status of themes in development design
5) Current status of QCD in development design
6) Current status of development design management and related issues
7) Management of other areas of development design
8) Education for engineers
9) R&D innovation towards value creation

(3) Methods

This survey was targeted at 3070 departments, primarily in the field of manufacturing, at companies listed on the first or second sections of the Tokyo Stock Exchange and unlisted companies. The survey was carried out during the period from July to August 2004 and consisted of sending out questionnaires to the heads of companies' research, development and design departments by post. The collection rate was 8.3%.

Basic Understanding and Hypotheses

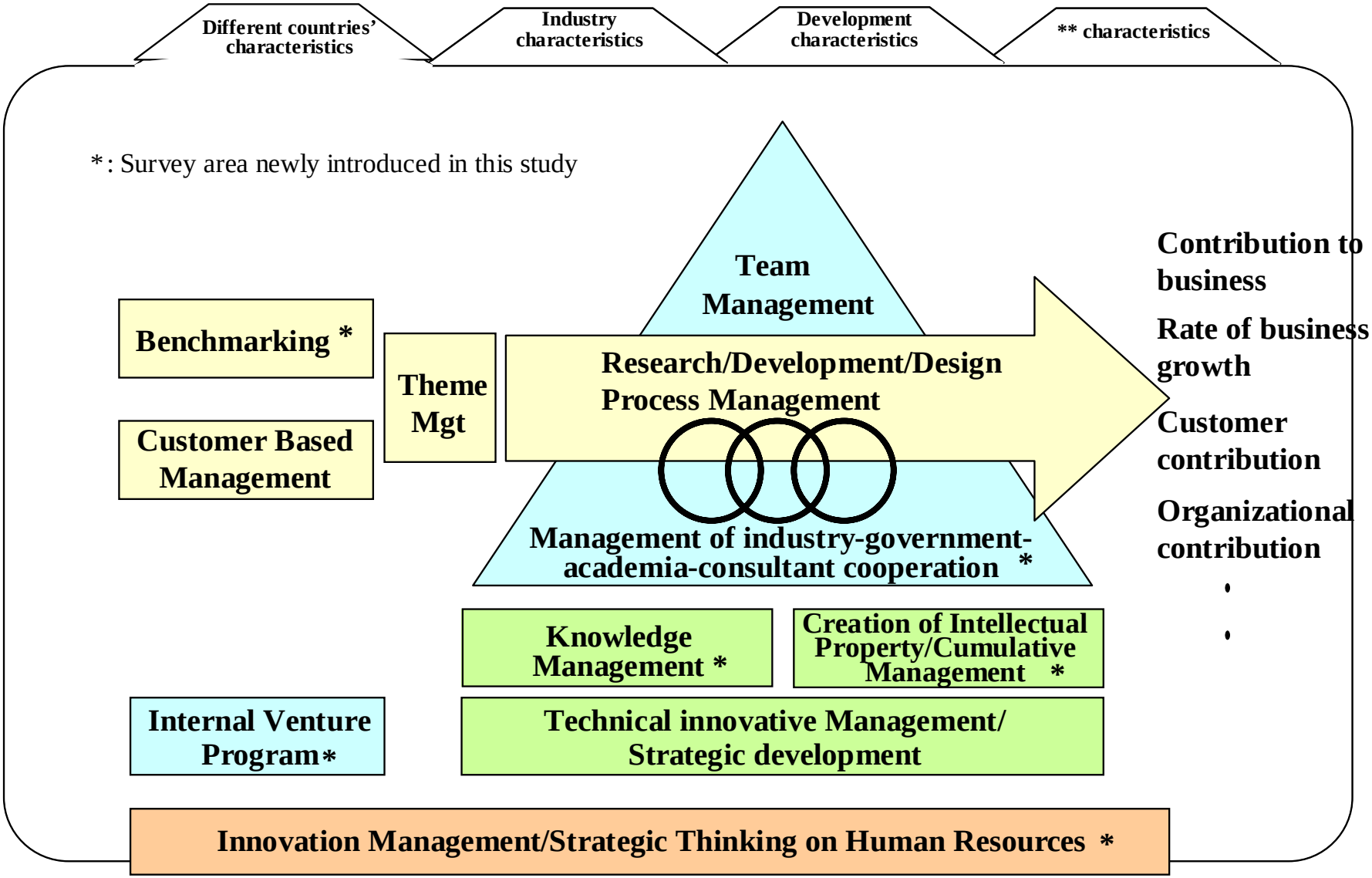
Basic understanding of the environment surrounding development design departments

- In addition to factory capabilities, the Japanese manufacturing industry is establishing development departments in other countries alongside production bases.
- Although the key mission at overseas development bases at present is to arrange and design base products and technology developed in Japan according each country's capabilities, the very existence of development departments in Japan may be called into question in the future.
- The were cutbacks in the numbers of engineers at Japanese development departments during the slump in the wake of the collapse of the bubble economy. This is holding back the acceleration of the country's economic recovery.
- MOT (Management of Technology) has been the focus of much attention recently and the role that engineers are expected to play is changing.

Hypothetical issues that development design departments will have to face in the future

- Enhanced value creation capabilities stemming from development departments
- Medium to long tem technical strategies and plans based on a comprehensive understanding of product development
- Awareness of customers and competition; engineers themselves participating in the product planning process
- Concurrent engineering and collaboration based on an awareness of not only the company itself but also its customers, outsourcing and alliance partners, etc.
- Improvements in engineers' skill levels in order to both reduce development periods and ensure design quality.
- Developing a heightened awareness of the need for innovation throughout development departments and ensuring individual's commitment to innovation

The Framework for R&D Benchmark

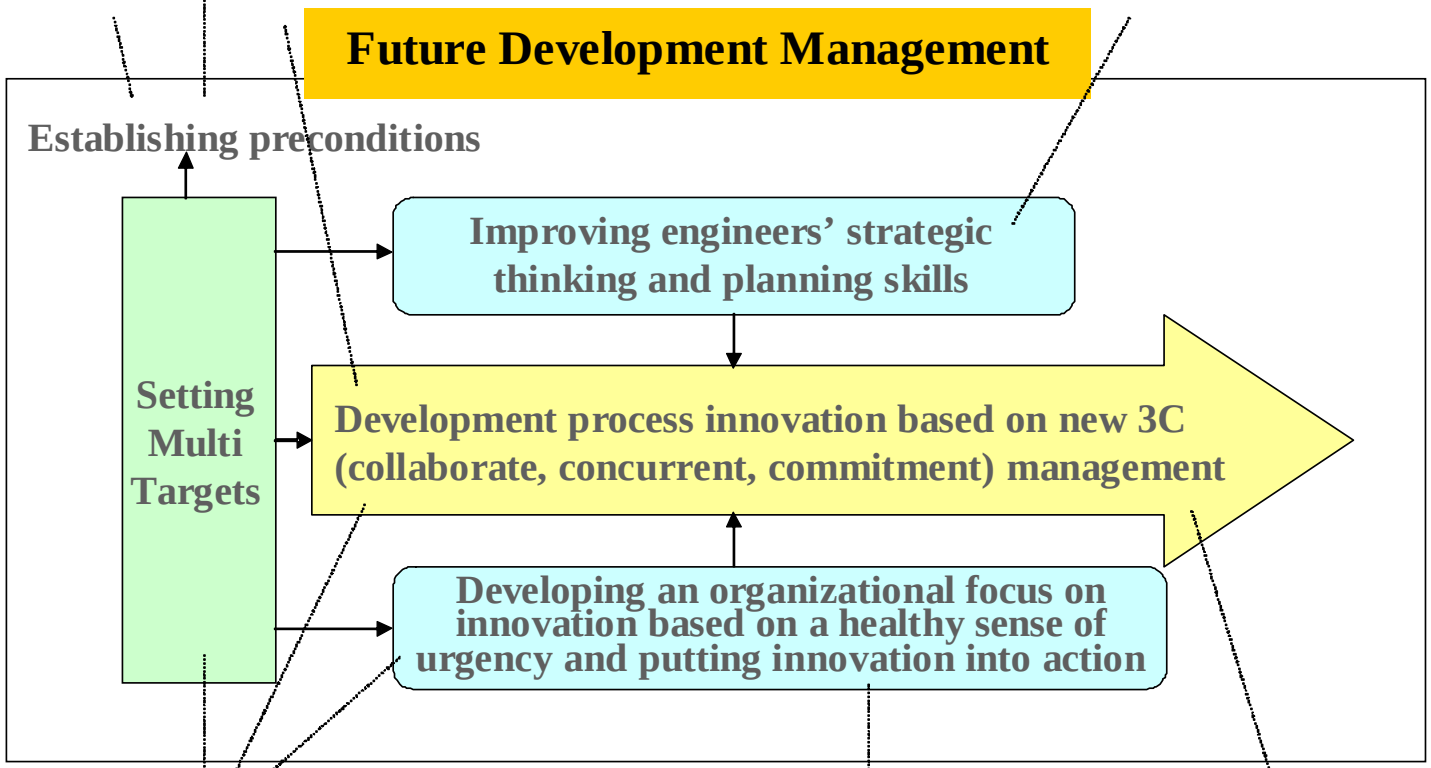


Recommendation

1. Invest heavily in R&D

2. Make full use of alliances

4.Work on improving engineers' planning skills



5.Implement steps to improve organizational design quality capabilities

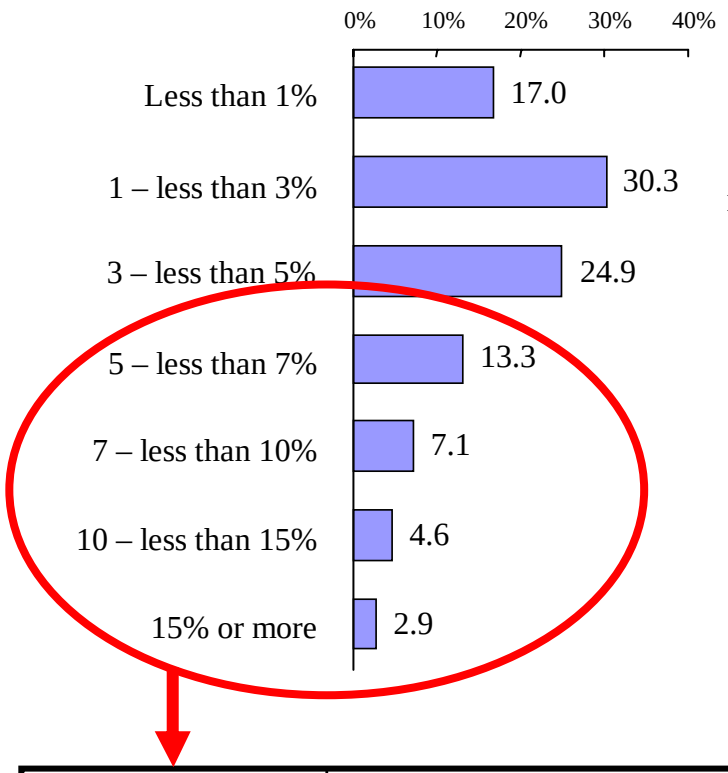
3.Improve on parallel management of advanced development and development design

6. Develop a healthy sense of urgency throughout engineering departments

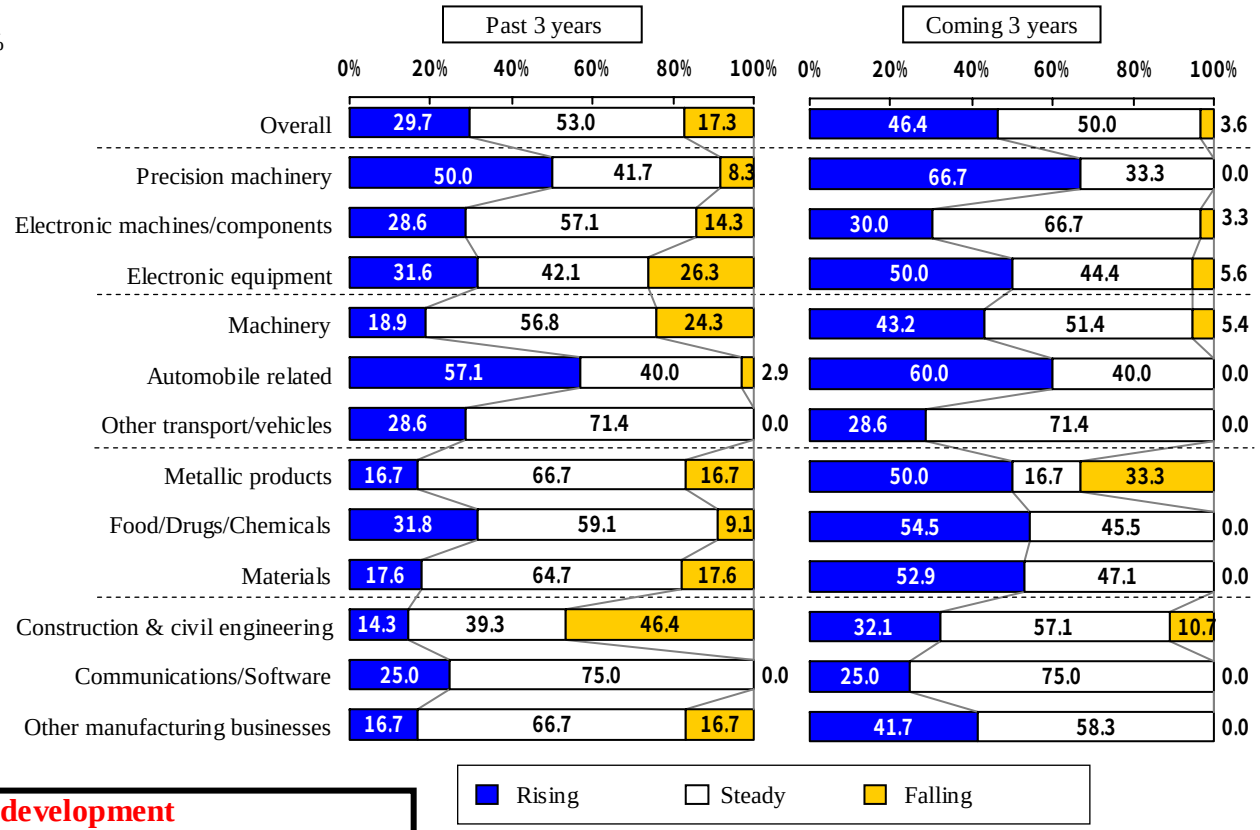
Recommendation 1: Invest heavily in R&D

Rather that merely reducing investment in R&D in line with falling sales in the immediate future, it is important to invest in R&D in a calculated, consistent manner from a medium to long term perspective

Percentage of sales spent on R&D (N=241)



Scale of investment in R&D over the last three and the next three years according to business category (N=249,250)



% of sales spent on R&D	Companies with advanced development capabilities are increasing investment in R&D				
Over 5% of sales spent on R&D	High	**27.0%**	Low	**18.3%**	**1.5x difference**

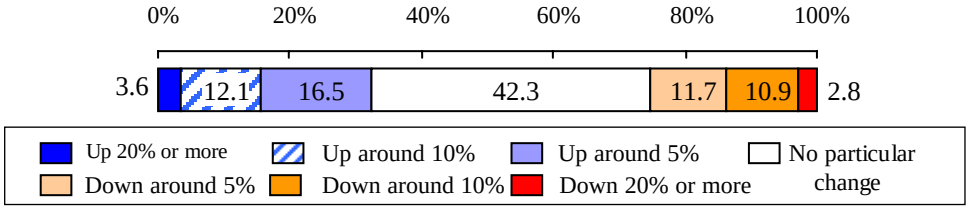
Recommendation 2: Make full use of alliances

Selection and concentration of limited resources are essential to effective, efficient development. Based on clarification of your company's core competence and concentration on high value operations, you should seek to form alliances.

Based on discussions between both top and middle management focusing on future trends in the market and technology, you should examine your core competence and try to prioritize high value operations.

To keep confusion in the workplace to a minimum after forming alliances, it is also important to merge and align quality management systems.

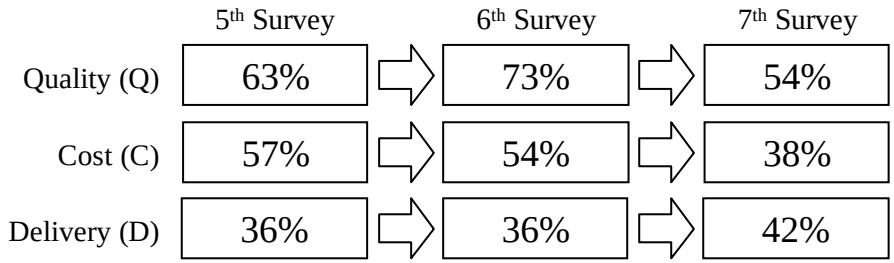
Changes in the workforce in development design/engineering divisions (N=248)



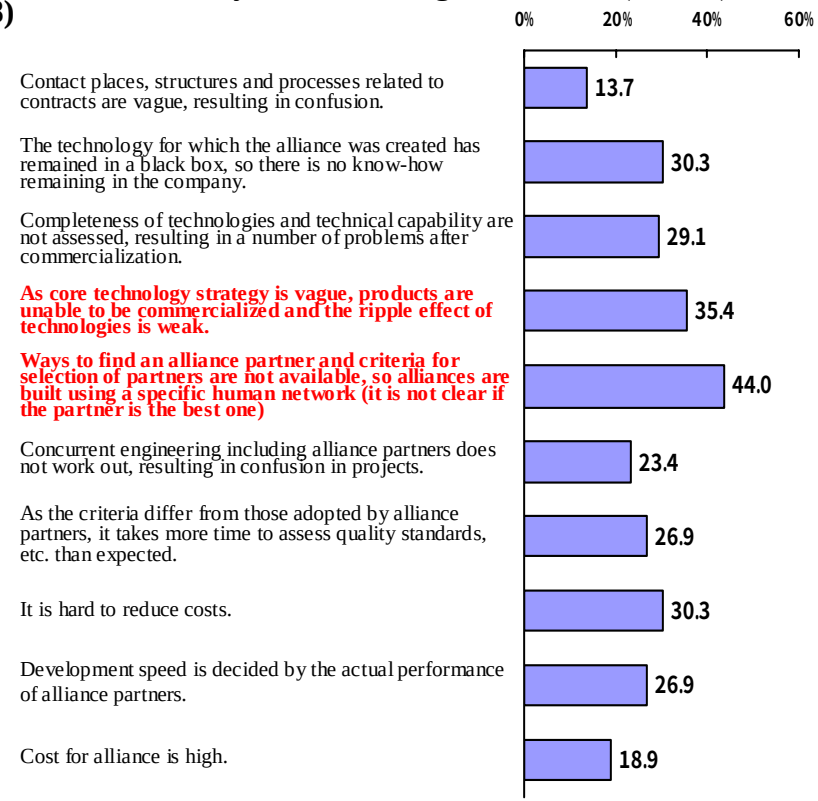
Increases in the number of development/design themes (N=234)

•3 years ago	•Now	•In 3 year's time (estimate)
•98	•100	•111

Percentage of departments claiming to be "having no problems" with development design QCD (N=238)



Future key issues relating to alliances (N=222)



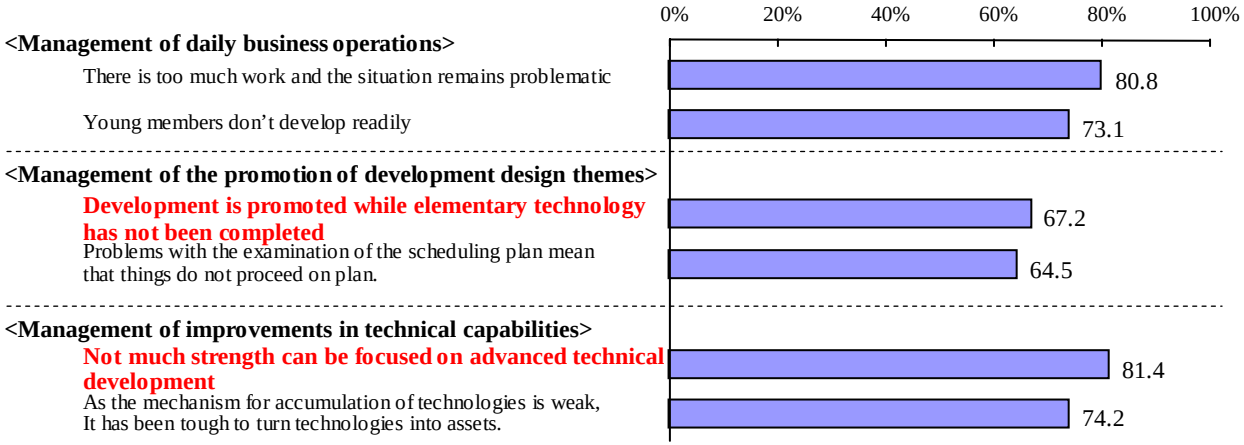
Recommendation 3: Improve upon parallel management of advanced development and development design

It is of the utmost importance to set targets as part of advanced development.

Technical platforms need to be taken into consideration from the time that advanced development is initiated.

A structure or management system promoting the new 3Cs (Concurrent, Collaborate, Commitment) management is also essential from the time that advanced development is initiated.

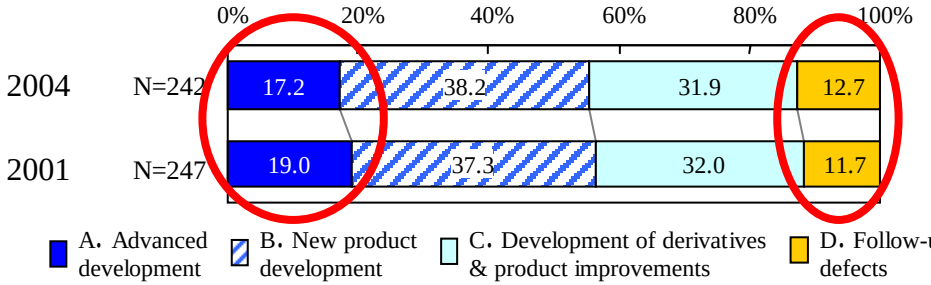
Problems with the current state of development design management (N=248)



Percentage of respondents indicating "advanced development" as a key future issue for QCD management

Q	**73.2%**
C	**65.0%**
D	**70.4%**

Allocation of man-hours to development design themes and operations (N=242)



Allocation of man-hours	**The more advanced a company's development capabilities the higher the rate of rate of man-hours to allocated to advanced development and product improvement. The less advanced a company's development capabilities the higher the rate of rate of man-hours to allocated to the development of derivatives and follow-up for defects.**				
% allocated to advanced development and follow-up for defects	High	**23.8% 8.3%**	Low	**13.3% 14.3%**	**2x difference**

Recommendation 3 (addition): New 3C Management

New concurrency

Adding to existing concepts of parallel management by reassessing of methods of cooperation in line with innovative and new roles performed by each department and working together to pinpoint knowledge and possible issues during the early stages of development

New 3C Management

New collaboration

Reassessing the scope of collaboration in order to work together to gain knowledge from a business perspective; Securing alliance and outsourcing partners and stake holders

New commitment

Clarifying three contribution targets – customer value and collaboration, company and other project value and current project value – and creating an organizational climate in which medium to long term targets will be set automatically

Recommendation 4: Work on improving engineers' planning skills

Improved hypothetical methods of meeting customer requirements from an engineers' perspective need to be tested and assessed for feasibility at the planning stages.

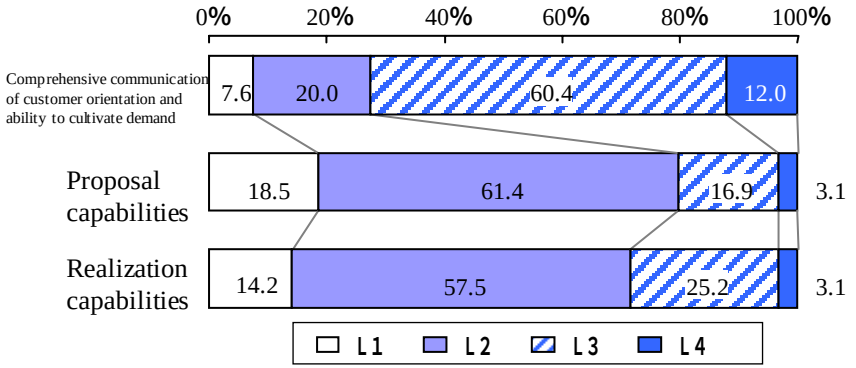
Companies need to cut back on follow-up activities and engineer a power-shift in operations and man-hours towards advanced stages, ensuring that power is concentrated on core operations. Companies also need to have their own commercialization visions and concepts and hypothetical ways of achieving them.

In the future, engineers will have to think from a medium to long term management perspective when coming up with hypotheses.

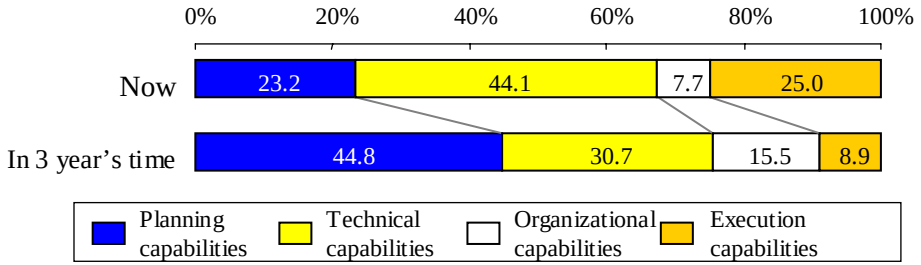
Ways of providing education and OJT for engineers in areas such as marketing, product planning and customer analysis are also important

Future key fields to be addressed/innovation issues (N=255)

Current level of customer orientation management (N=250)



Areas of development capabilities being strengthened (N=244)



Recommendation 5: Implement steps to improve organizational design quality capabilities

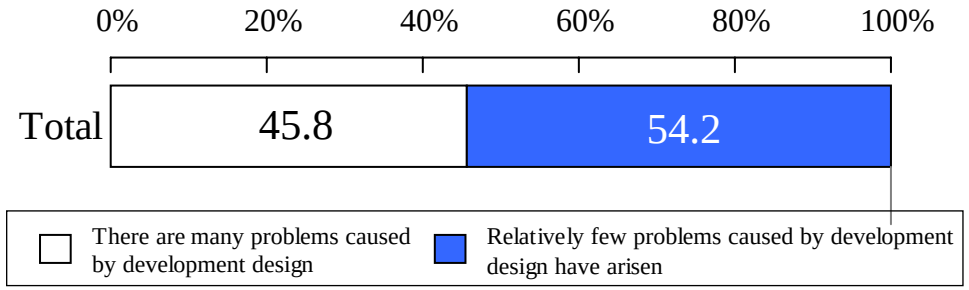
We have reached the limits of how far we can go in terms of efforts to improve design quality on an individual level.

As it is essential to also take the company's response to new technology into consideration to improve design quality, it is vital that the entire organization works to a medium to long term vision.

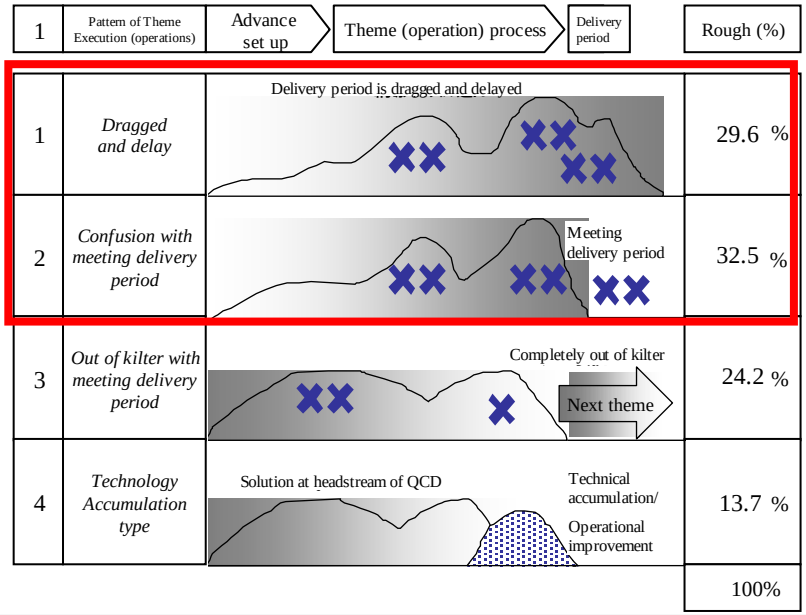
In order to promote efforts to improve organizational design quality, themes such as those listed below need to be addressed.

① Clarifying and spreading awareness of reform visions and scenarios
② Changing in-built design quality processes
③ Creating a climate of maintaining and improving design quality
④ Improving design quality based on quality systems such as ISO9001 and CMMI

The quality of development design/current status of completeness (N=238)



Process pattern of development design (N=240)



Recommendation 6: Develop a healthy sense of urgency throughout engineering departments

In the current management environment, where paradigm shifts in products and technology occur constantly, companies are sometimes satisfied with their current status and cling to past and present experiences of success rather than coming up with innovative activities borne out of a healthy sense of urgency.

In the future, engineering departments, which will be required to be a company's driving force, will have to set high targets outlining the ideal goal to aspire towards and work together to bridge the gap between that and their current status rather than clinging to past business successes or failures. What is needed is an organizational structure with a healthy sense of urgency that is capable of innovation on an ongoing basis.

Levels of organizational innovation activity a comparison of development capabilities (N=250)