Marlborough Lines
Science & Technology Fair

Teachers Information Booklet

The Lions Club of Blenheim invites entries in the twenty third Marlborough Science & Technology Fair.

GOAL

- To promote in youth, a greater interest in Science and Technology.

OBJECTIVE

- To display scientific investigations and technological solutions, produced on a competitive basis, either by individuals or by a group of students.

HISTORY

Here in New Zealand the first Auckland Science Exhibition was held in 1959. Professor J.Duncan, in 1960, organised the Wellington Science Fair, in conjunction with the Royal Society of N.Z. Since then, many other Science Fairs have been organised in various centres throughout New Zealand.

Marlborough's Fair has evolved over 25 years and is now a partnership of Blenheim Lions, Local Schools, Teachers and Community Sponsors.

The Organising Committee

		School	Home
Co-ordinator	Barrie Abernethy		577 8542 - ph/fax
Secretary	Brett Cunningham		577 7761
School Liaison & Publicity	Neville Lawson	577 5688 - evn	
			577 8022 - day
			577 8021 - fax
Judging Convenor	Trevor Jane	578 0119	578 8776
Treasurer	Bill Weaver		578 1457
Sponsorship	Ray March		577 9046 - ph
			577 9083 - fax
Animal & Human Ethics	Hugh Lensen	578 4031	578 5549 - ph/fax
School Representatives	Hugh Lensen	578 4031	578 5549 - ph/fax
	Peter Sutton	578 0119	5778272
	Cathy Wilkes	578 5220	5785955

IMPORTANT SCIENCE FAIR DATES

Early September

Local School Science Fair Completed
so that
SCHOOL ENTRY NUMBERS CONFIRMED
Category and power point numbers needed
to Neville Lawson - Fax 577 8021

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Last Tuesday of term 3

Assemble exhibits at The Stadium (Kinross Street)

	Yr 7-13	7.30am to 8.30am
	Yr 3-6	7.30am to 12.30pm
Judging	Yr 9-13	8.30am to 11.00am
	Yr 3-8	11:00pm to 1:30pm

All students are to return to school after judging.
4.00pm to 7.00pm Public Viewing.

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Last Wednesday of term 3

9.00am - 7.00pm	Public Viewing
7.00pm - 7.30pm	Prize Giving Ceremony
8.00pm - 8.30pm	Exhibits Collected

GUIDANCE TO EXHIBITORS

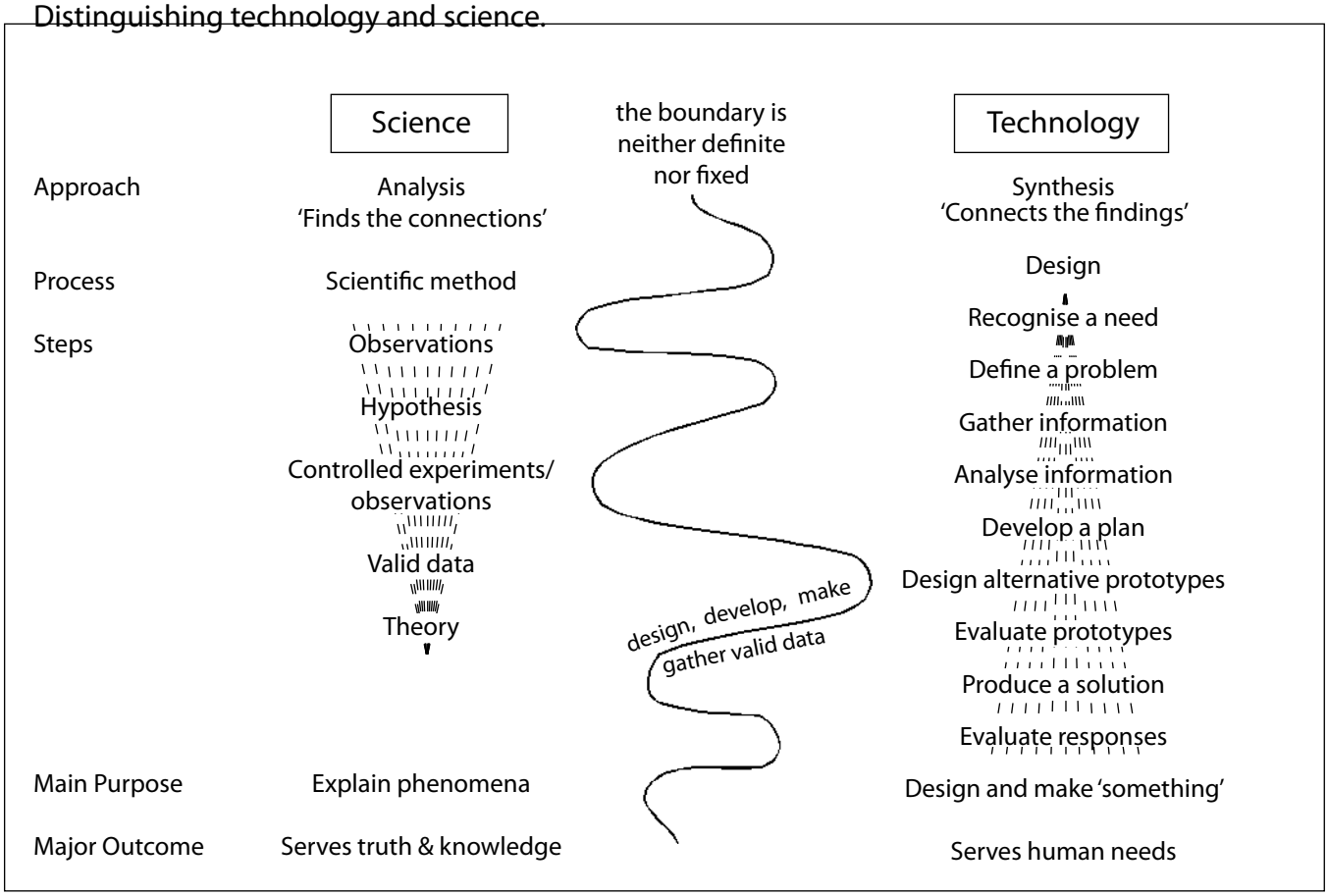
1. Choose either a Scientific Investigation or a Technological Design.

Scientific Investigations are ways of trying to find the answer to a question about the world. We begin with an hypothesis or prediction. We test our hypothesis by experimenting or observing. We collect and record results from our experiments. The results are interpreted/ analysed and a conclusion is drawn by comparing the results with our hypothesis/ prediction.
If our hypothesis does not agree with the results we make a new one.

Technological Designs are ways of trying to solve a problem or a need that is recognised.
We begin with identifying a need or problem. We collect information about the need or problem; testing, surveying. We analyse the information. We develop a plan to approach the problem. Design prototypes/systems to solve the problem.
Evaluate the effectiveness of the prototype/ system at solving the problem.
Modify or refine.

A science fair exhibit must gather data of some form, therefore an exhibit such as a working robotic arm where no tested information resulted is likely to be a technology exhibit only and not considered for an award. However, investigations into alternative methods of moving and sensing which had clear hypotheses, well designed experiments concerned with 'how' rather than 'what' and rigorous data analysis would allow the exhibit to be considered for an award.

Distinguishing technology and science.



Note that in this diagram, technology is not regarded as applied science but as a discipline distinguished by its own purpose, process, outcomes and body of practice. The view that 'science leads, technology follows' is historically inaccurate and acknowledges neither the roles of science nor technology.
This model has been deliberately kept simplistic, justified by the need to provide an easily understood and applied model.

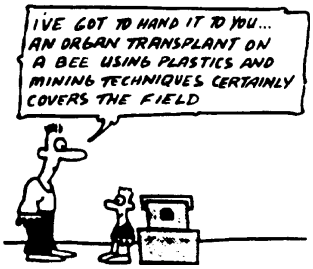
GUIDANCE TO EXHIBITORS (cont.)

2. A Science Fair Exhibit . . .

. . . is a vehicle for a child to display that child's idea about what that child has observed. All scientists use the skills and experience of others. Engineers use other people when building something . . . so should your exhibitors. Parents should always help where it is needed and teachers should not hesitate to help the child in any way either. BUT the study should be the child's and the conclusion reached be one that the child holds firmly. Judges in science fairs will quickly sort out exhibits which are those of adults rather than pupils. Remember the child has to give proof of the investigation or solution, all the fancy lettering and sophisticated machinery will be of little value if a science fair judge realises that the child doesn't know what is being studied . . . if the child didn't in fact do the work displayed.

Primary school "classroom" exhibits will be accepted but not judged against individual entries.

Students should be discouraged from testing consumer products as this seldom reflects a genuine science investigation.



SAFETY & HEALTH

Please be aware that all exhibits must follow the requirements of the Health and Safety Science curriculum manual.

PROJECTS INVOLVING PEOPLE OR ANIMALS

Human and animal ethics

Any students doing any investigations which involve humans or animals must complete an ethics form. All such investigations must gain ethics approval before they start or they can not be considered for an award at the regional fair.

Having the students consider if they need to apply for ethics approval for their investigation is a good learning process. For those students who do fill out an ethics form it will help them look more carefully at how they should carry out their investigation.

To get a form the student will need to go to the websites below

For Human and Animal ethics: http://www.scitec.co.nz/important.html

SUMMARY

A science fair investigation or solution should show clearly that you have recorded something that interests you, it will be unique if you record exactly what happened and what you believe that you observed. What you think are possible explanations for what happened.

SCHOLARSHIPS

A scholarship for further tertiary education will again be offered.

JUDGING CRITERIA - F1 to F7

These criteria are divided up into three sections: Science, Technology & Shared.

SCIENCE JUDGING CRITERIA

The focus is usually on validating experiments which lead to the gathering of data to prove or disprove the hypothesis or to further investigate an aim or seek answers to questions.

In an hypothesis identify the cause and expected effect.

Validating tests should reproducibly (through replication) show some of the following:

(a) When the cause was present, the effect resulted.

(b) If the cause was not present, the effect did not happen.

(c) The effect did not arise from causes other than that stated in the hypothesis.

(d) If the cause was transferred to other systems, the same effect resulted.

The tests should relate to the hypothesis (or aim of the study).

The tests should not go beyond the hypothesised cause to produce the effect.

Judgements about the novelty (originality, importance, significance, etc.) of the exhibit are less valid as these can not be applied as rigorously.

Scientific Thought and Understanding

A science exhibit should show evidence of appreciation for accuracy of observation, measurement, presentation of data and reporting, along with an understanding of the underlying or related scientific principles embraced within the project.

Scientific thought and understanding may be demonstrated in a project by some of the following:

- clear statements of intent;
- an effective plan and timetable;
- good experimental design with controls;
- clear description of methods and equipment used;
- variety in the way resources are used, measurements and data are gathered;
- replication as required for an appropriate level of accuracy;
- effective presentation of data e.g. graphs, tables, etc.);
- an understanding of any computer program used in data generation or processing;
- proof that data reproducibility is statistically valid and / or recognition of limitations;
- identification of variables and sources of error;
- sound conclusions related to the observations and data presented;
- discussions of significance of the findings to other situations;
- recognition of any wider implications of the study.

Originality

There is evidence of originality in the selection of a topic or statement of the problem; uniqueness of approach; resourcefulness in obtaining, handling and interpreting data; ingenious use of equipment and materials; creative displays or use of illustrative objects; inventive apparatus; insightful conclusions; inspired applications of the principle, process or product.

An original and creative project is one which:

- investigates a subject not previously studied in that area, explores a different aspect of a traditional topic or employs novel approaches to a common theme;
- documents changes or new phenomena over a period of time;
- sets up one or more experiements, surveys or trials, each with an original hypothesis or imaginative basis;
- uses novel methods, alternative approaches or new strategies in the investigation;
- displays resourceful use of materials, original choice of examples or innovative selection of situations for study;

- extends the use of any equipment, apparatus or technique far beyond its usual application;
- portrays observations, measurements, results or other data in imaginative ways;
- recognises an opportunity for a novel or unusual application of the information they have gathered;
- reaches an interesting conclusion, displays a perceptive summary or presents a fresh view of the situation being studied.

Exhibitors are expected, within the constraints of the resources they have readily available, to have investigated work previously done by others and to show evidence supporting elements they identify as original.

TECHNOLOGY JUDGING CRITERIA

Definition of Technology Exhibits

In summary, a technology exhibit is one where the development of a useful product, device, process or environment was the primary goal of the exhibitor. The development should be driven by identifiable needs, as unlike science which exists to serve truth, technology exists to serve human need. Data gathered would be for the purpose of determining the characteristics, design, configuration or operating parameters for optimum performance. However, the product, system or environment which was developed should work!

Development

'Development' is a key concept in technology, as shown by the history of most of the 'technologies' we use today, and in what we expect to be developed in the future. The process of development is related to an indentified a need or opportunity.

A project showing the development of a product, process or environmental would:

- include sufficient documentation (plans, models, notes, etc.) to verify the development process of the 'solution'
- show that each stage of development the performance (of the various prototypes) was evaluated by valid tests against criteria improtant to the intended end-users
- have a range of technological aspects which were measured or estimated; for example:
  - efficiency
  - optimisation
  - reliability
  - economy of operation (including energy efficiency)
  - safety, including fail-safe features
  - safe performance 'envelope'
  - working life / MTBF (Mean Time Between Failure)
  - cost-effectiveness
  - use of most appropriate materials (especially in relation to its working environment)
  - environmental 'soundness' — that its development, future production and/or disposal would not cause environmental damage or long-term degradation
  - working environment range
  - ease of use (by user with a range of abilities)
  - ergonomics
  - aesthetics . . . etc.
- uses specialist assistance where appropriate, with acknowledgement.

Innovative and Originality

Inventiveness, innovation and originality can apply equally to improving existing 'solutions' as to new 'solutions'. In technology, most advance is due to further development of existing 'solutions' and this must be expected in a science and technology fair situation.

A project showing technological innovation and/or originality is one where:

- the characteristics and shortcomings of existing 'solutions' are clearly identified;

- shortcomings of existing 'solutions' and/or identified needs are met in innovative or orginal ways, with clear evidence they are truly innovative or original;
- materials and/or processes are used in new or more efficient methods to achieve the 'solution'.

Identifying and Researching the Need

Technology serves human need, so any technology-based exhibit should begin with an identifiable viable need (or opportunity). As any technology exists for people, then their needs and expectations in this context need to be identified and used to determine the performance specifications of the 'solution' being developed.

A technology project identifying and researching the needs for the product, process or environment is one which:

- shows how the need or opportunity was identified and investigates the validity of the identification process;
- clearly defined the need or opportunity with reference to the end-users' expectations;
- has extensive investigation into existing 'solutions' and identified their shortcomings in relation to the identified need or opportunity;
- analysed all the information gained, in relation to the need, opportunity and existing solutions;
- defined performance specifications from an analysis of the needs and expectations of the end-users.

Evaluating the 'solution' (product/process/environment)

As there is no technology without human need, the 'solution' must be judged against the original need or opportunity.

When evaluating the product, the exhibitor would:

- measure how well the 'solution' works in relation to its defined performance specifications (functionality);
- measure how well it meets the needs of the users through appropriate tests;
- show how the end-users were taken into account at all phases of development;
- provide evidence that intended users would find it easy to use (user friendly) and that it would meet their needs efficiently;
- have investigated whether the intended users would be likely to enjoy using it, if appropriate;
- consider the ergonomic requirements of the range of people (age, gender, size, etc.) likely to use it;
- either show its potential to be aesthetically pleasing, or make it aesthetically pleasing;
- consider the potential for mass production or for disseminating it more widely, especially identifying key quality control elements.

SHARED JUDGING CRITERIA

As with the criteria above, not all elements described here may apply exactly to all exhibits, but the concepts of depth of treatment and effective presentation can be assessed for all exhibits.

Knowledge Base

This is the area of knowledge which underlies the topic of the investigation. The exhibitor should demonstrate a thorough understanding of this knowledge base.

Thoroughness

The thoroughness of work (and thus effort) which has gone into an exhibit is reflected in the scope of the topic, the scale of the investigation, the detail obtained, the extent of the results, the repetition of experiments, measurements or observations, the construction of the exhibit and its illustrative items, written material and other displays. As with all criteria, these must be related to the age of

the exhibitor, the resources and facilities available to them, and in some cases, to the topic itself.

An exhibit reflecting a thorough approach is one which:

- investigates all (reasonable) aspects, both postive and negative, of the problem;
- places the topic in the context of other work;
- specifies and acknowledges all help received in designing the project and all sources of information, in conducting experiments, fieldwork, measurement, constructions, or the exhibit itself, preparing photographs, typing, photocopying, diagrams etc., or with ideas and suggestions;
- identifies the results of previous research and/or practice, revealed by reading around the topic or by conducting interviews;
- cites literature searched and all sources of supporting data;
- identifies sources of error and eliminates or makes allowances for them;
- carries out repeated experiments, field studies, measurements or other investigations over an appropriate period of time, in many different situations, with numerous examples, or with a variety of variables;
- repeats all observations, measurements or readings until consistent accuracy is obtained;
- keeps detailed and methodical records, and offers these in a log book or diary;
- makes an exhaustive and detailed analysis (including tests of significance) and portrayal of the results and data obtained;
- exhibits close attention to detail in the construction and presentaion of the project: graphics, lettering, models, displays etc.

Technical Skills

Items required for the project have been assembled with skill and dexterity; equipment, models and structure of the exhibit have been well constructed; graphic materials have been carefully prepared and presented; living plants and animals have been well cared for; working parts are reliable; and the whole is well planned and neatly finished.

A project displaying technical skills is one which:

- shows a high level of technical skill in the making and/or assembly of the various parts of the project;
- has models, apparatus, equipment or display items well designed, soundly constructed and assembled;
- the equipment, apparatus, audiovisual aids etc., continue to function reliably and well for the duration of the Fair;
- displays skills in accurate measurement, observation, devising experiments, field investigations, computation, and design;
- the exhibitor used their own skills throughout the key aspects of the project rather than working under expert supervision;
- exhibits skilful and knowledgeable use and application of scientific and/or technological techniques or equipment;
- the health and wellbeing of the plants and animals on display show a skill in raising plants, handling animals and caring for living things;
- technical skills are reflected in the quality of photographs, drawing and/or map detail, particular graphic skills;
- tools suitable for the most efficient carrying out of tasks have been selected and used with competence, for example, spreadsheets for analysing and/or presenting numerical data, range of machine tools (as appropriate to their age) when fashioing devices, etc.

Presentation

The exhibit is well designed and developed to be attractive, visually interesting, informative on all aspects of the investigation; well illustrated with photographs, models, specimens or samples; and

with wide public appeal and effective communication.

A well presented project is one in which:

- the title is clear, and the exhibit attracts attention by its presentation;
- the purpose of the project is clearly explained in simple terms readily understood by viewers of all ages, has a logical sequence, is clear and effective, with strong public appeal;
- the methods used are set out clearly and concisely but with sufficient detail for others to follow;
- supporting material (development log, field notes, experimental record, data notebook) is well organised and neatly presented;
- illustrative items such as photographs, diagrams, models, specimens, samples and living materials are displayed appropriately to make the project both visually exciting and more informative;
- all observations and data are clearly expressed as tables, graphs, charts, etc., or summarised in other ways so that viewers are quickly able to see the results of the investigation, experiment or measurement;
- clearly sets out the overall findings and conclusions;
- care is taken with the selection, quantity and quality of written expression;
- achieves visual impact by effective and balanced use of colour, lettering, illustrative items and layout, and using the available space to advantage;
- the display headings, lettering, photographs, diagrams, drawings, charts, tables graphs and descriptive materials are carefully executed, neat, attractive and well presented;
- all pertinent details of the exhibit are displayed and communicated in a way which enables viewers to quickly grasp the essentials of the exhibit;
- video and computer equipment where used is an integral part of the project (rather than being used or included for their own sake) and may be used to present much of the above;
- an effort has been made to attract and inform with high levels of relevance and human interest;
- in a team exhibit, effective teamwork has contributed to its high quality;
- oral presentation in the interview should clarify and amplify the exhibit through explanation, discussion and description and show that the exhibitor has complete understanding and full appreciation of the purpose and detail of the project.

STUDENT BOOKLET

The student booklet is now only available on line at www.scitec.co.nz

Entry Forms

Entry froms are available on the website www.scitec.co.nz

Project Information Sheet

(for subjects and parents)

Project / investigation title _____

Student(s) carrying out the investigation

_____phone _____

_____phone _____

Teacher supervising the investigation_____phone _____

The aims of the study _____

How the subjects were chosen _____

How long the study will last_____

What will happen to the subjects during the study _____

Risks the subjects may be exposed to_____

What will happen to & who will see any information or samples taken from subjects_____

CONSENT FORM

Title of project / investigation _____

☐ I have read the attached information sheet about the project in which I am (my child is) participating and understand what it involves.

☐ I have been given the opportunity to ask questions about the study and am satisfied with the answers given.

☐ My (child's) participation is on a voluntary basis and I (they) may withdraw at any time.

☐ I understand that my (their) participation is confidential and no information that could identify me (them) will be made public.

Participant _____Signature _____

Parent / guardian _____Signature _____

(if the participant is under 16)

MY INVESTIGATION/PROBLEM:

NAME:

1. MY QUESTION:

WHAT MADE YOU THINK OF THIS QUESTION?

2. MY PRESENT ANSWER:

3. HOW I INVESTIGATED MY QUESTION:

4. MY ANSWER NOW: (or what further investigations do I think I need to undertake)

PRIMARY (YR3-4 / 5-6) JUDGING SCORESHEET

TITLE OF EXHIBIT ..... SCHOOL .....

EXHIBITOR .....

TOTAL MARKS

Focussing and Planning		Information Gathering		Processing and Interpreting		Reporting	
5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
Suitability and originality of question or investigation	Scientific method - fair testing - identifying variables	Methods chosen - suitability - originality	Observations and measurements Log book	Validity of conclusions drawn from data gathered	Exhibitor's evaluation of their investigation	Presentation - organisation of data - appearance	Ability to discuss and explain investigation to judge
Comments: Question is specific and able to be investigated Original idea for an investigation Thoughtful question	Comments: Very scientific approach Used fair testing throughout Identified all variables at start Some variables allowed for Some good scientific methods used Some fair testing noted	Comments: Very original ideas used in investigating Methods used match investigation very well Some original ideas used in investigating Methods used are quite suitable for the investigation	Comments: Log book kept carefully throughout Measurements or observations kept for a good length of time Measurements or observations have been made carefully and accurately Log book kept quite well Some good measurements or observations made	Comments: Used data collected to draw well thoughtout conclusions Results are clearly stated and used logically Some good results but better interpretation needed Good use of data but more could have been gathered	Comments: Investigation has been honestly evaluated for success against original prediction Conclusion is linked to original question Some attempt to compare results with prediction	Comments: Information is set out well and is easily followed Exhibitor has taken an obvious pride in the appearance of their entry Information is quite well arranged Some good sections where a lot of care has been taken	Comments: Is able to discuss methods and conclusions clearly and with understanding Can explain most aspects of the investigation

PRIMARY TECHNOLOGY JUDGING SHEET

TITLE OF EXHIBIT ..... SCHOOL .....

EXHIBITOR ..... TOTAL MARKS /40

	Identifying Need or Opportunity	Record Keeping	Development of Technological Opportunity	Evaluation
	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
	Clearly identify the need or opportunity.	Records are appropriate to and give clear evidence of the technological process followed.	Clear evidence of all stages of development with appropriate technological aspects considered and ongoing evaluation/reflection of process and decision making.	Ability to discuss and explain how well the solution achievs what the brief of the technological need required.
	- appropriate research showing the shortcomings of existing solutions. - identifies market or need clearly. - specifies problem well. - briefly defined the need; more detail on available solutions needed; more specifications on idea needed. - need not clearly defined, only a basic idea given.	- well kept record book showing all stages of the technology process. - good record book but some aspects of the process needed more information to be shown. - only some technological aspects considered. - brief records, but clear evidence of process followed. - few technological aspects considered.	- research, planning and possible solutions explained with reasons for choices and appropriateness given for preferred solutions. Relevant drawings, models and evalations to support preferred solution. - reliability tested or working life calculated. - safety features shown under opertaing conditions. - constructed of appropriate materials. - easy to use; ergonomically tested and aesthetically pleasing. - most development stages covered.	- shown it is a real benefit to users; defined performance goals clearly met; future potential for production. - performance evaluated in detail during development but needs to be linked to benefit of opportunity. - benefit not clearly stated but may be apparent to judge; performance goals not clearly measured. - benefit doubtful; performance goals not measured; no potential for production.