Sheffield Hallam University

A Sheffield Hallam University thesis

Applicant: Martin Stirling Woolley MDesRCA

Supervisors: Timothy Coward NDD MDesRCA MSIAD

                        Roger Breakwell MdesRCA

External Advisor: Kenneth Agnew MDesRCA MSIAD FRSA

DESIGN, PRODUCT IDENTITY AND TECHNOLOGICAL INNOVATION

March 1983

6   APPENDICES

6.1 DESIGNER AND USER RESPONSES TO THE NON-SUPPORT SECTION OF THE QUESTIONNAIRE

Each response is prefaced by the appropriate Manufacturing (M), Operational (O), Stylistic (S) or Technological (T) classification.

Note: D indicates a Design response, U a User response.
The M, O, S, T classification precedes the response number.

Question 1   What is the red light for?

Response:

O	D1	It shows that the power is on.
Nil	D2	This was a market requirement, I do not know the full reason.
O	D3	It was thought that the consumer required it as a "comfort" in addition to the cavity light indicating that the oven is on.

CONSENSUS O

Question 1   What is the red light for?

Response:

O	U1	to show that the oven is on
O	U2	so that I can tell that it is on - apart from the noise
O	U3	shows that the power is on and is linked with the inside light
O	U4	to show that the oven is on
O	U5	to tell if the oven is on or off
Nil	U6	do not know
O	U7	to show that the power is on
O	U8	so that I can tell that the oven is on
O	U9	to show that the oven is on
O	U10	it shows that the power is on

<u>Question 2   Why is it red rather than any other colour?</u>

Response:

T   D1   Because neons (which this is) are normally red
or orange, although it is possible to obtain
other colours, but not usual.

OT   D2   It is a good visible colour – it provides high
lumens for low power from the back.

S   D3   In theory any colour was possible, although
the colour red is traditionally chosen for ovens –
not so in the case of refrigerators and freezers
where they are often yellow, blue or green – it
was therefore chosen to relate to the identity
of other forms of cooking.

CONSENSUS TOS

<u>Question 2   Why is it red rather than any other colour?</u>

Response:

O   U1   red is associated with go

SO   U2   it is eye-catching, red is associated with
warning – it is pretty

S   U3   it looks better in red

O   U4   traditional colour for warning lights, eg
washing machines

SO   U5   because red is a warning colour and the colour
relates to the colours around the timer and
power switches

O   U6   to indicate danger

O   U7   it stands for danger

O   U8   indicates danger

O   U9   because red is associated with danger

O   U10 because this colour is associated with danger

<u>Question 3   Why is it rectangular and not round, for example?</u>

Response:

S	D1	Largely to do with visual styling, it matches the majority of other shapes on the product with the exception of the two power and time controls.
S	D2	So that it matches the rectangular door frame.
S	D3	It tends to have a very definite visual image which emphasises the horizontal and also the quality of being an "eye" – very keen on making the cooker look horizontally lengthy rather than tall.

CONSENSUS S

<u>Question 3   Why is it rectangular and not round, for example?</u>

Response:

O	U1	so that it will not be confused with the power and timer scales
S	U2	so that it will blend in with the rest of the design – apart from the switches
T	U3	for technical reasons
S	U4	looks neater and simpler than a round one
O	U5	for optical reasons, so that it can be seen clearly
S	U6	to improve the looks of the oven
O	U7	it attracts the attention more easily
O	U8	so that it can be easily differentiated from the other two controls
O	U9	so that it can be noticed more easily as contrasted with the circular scales
O	U10	because it is a warning light, it must stand out, so it is rectangular and not round as the switches are

<u>Question 4</u>   <u>Why is the power control knob smaller than</u>
             <u>the time knob?</u>

Response:

M   D1   I do not know exactly, but I do know that the
             spindle sizes are different so it could well be
             related to getting the right knob on the right
             spindle during assembly.
Nil   D2   A USA constraint.
O   D3   I do not really know. However, it is probably
             related to the fact that more turning torque is
             required on the timer rather than the power
             switch. It is a quality that was present on the
             original Litton oven.

CONSENSUS MO

<u>Question 4</u>   <u>Why is the power control knob smaller than</u>
             <u>the time knob?</u>

Response:

O   U1   so that blind people will be able to differentiate
             them
O   U2   for blind people to use
T   U3   technical reasons
Nil   U4   unable to answer
O   U5   so that it is easier to clean
O   U6   so that on the power switch there is more room
             to see the scale; also the top switch is more
             difficult to turn, so needs to be larger
O   U7   the timer is bigger because it is more important
O   U8   as an aid to the blind
O   U9   to distinguish between the two controls – hadn't
             noticed it before you showed me
O   U10   if you are short-sighted it is easier to distinguish
             between the two

<u>Question 5   Why does it have a metallic finish?</u>

Response:

M	D1	It is a standard knob which is readily available – it would have been a lot more difficult to get exactly what we wanted.
Nil	D2	A USA constraint – typically flashy.
MO	D3	The knobs were off the shelf, normally used in products in the USA. The metallic finish emphasises the fact that the knobs are functional and relate this function to the oven door switch. (Later Litton models have a darker oven switch.)

CONSENSUS MO

<u>Question 5   Why does it have a metallic finish?</u>

Response:

S	U1	to improve the way the product looks
S	U2	to match the metallic surround of the door and control panel
S	U3	to improve the way the product looks
S	U4	to improve the looks
O	U5	so that it is easier to clean
M	U6	it is cheaper to manufacture
S	U7	because it looks smarter – like the metallic finish on cars
S	U8	just for the looks
T	U9	a metal finish is longer-lasting than a plastic one
T	U10	it will last longer

<u>Question 6   Why does the power scale only extend around</u>
<u>   part of the circle?</u>

Response:

T   D1   It registers 0 to 100% power and cannot go
           directly from low to high power because there
           is no step-down system, as there is on some
           cookers where the power switch can be rotated
           all the way round.
T   D2   I do not know the full reason, it is something
           to do with the control unit.
T   D3   Because of the mechanical design of the power
           control device.

CONSENSUS T

<u>Question 6   Why does the power scale only extend around</u>
<u>   part of the circle?</u>

Response:

O   U1   prevents you from going from low power to high
           power accidentally
T   U2   so that there is a slow build-up to maximum
           power - not too sure about this because one can
           switch it on at maximum power - technical reasons
O   U3   it can be operated easier
T   U4   not easier to use - would have been easier for
           left-handers if it did go right round; it is the
           same as my washer - to do with the mechanism
O   U5   as a safety factor, so that one sees a definite
           gap
T   U6   to stop it being operated directly from off to
           high for technical reasons
T   U7   for technical reasons, it stops you from getting
           right round to the start
T   U8   for technical reasons - to do with the things
           inside
T   U9   every scale has to have a beginning and an end -
           for technical reasons (Mr T, does it have a
           programme to switch itself off?)
T   U10   I do not know, but it is like the timer on my
           cooker - it is a set thing (technological)

Question 7   Why does it have a part-yellow, part-orange
              circle around it?

Response:

O   D1   To give an indication of the energy input.
O   D2   To draw the attention of the public to the cold
            zone and the hot zone.
O   D3   It indicates the different areas where different
            levels of cooking occur, shows the power being
            used, where to reheat, etc. 30% power used for
            reheating and defrosting.

CONSENSUS O

Question 7   Why does it have a part-yellow, part-orange
              circle around it?

Response:

O   U1   the colours are associated with high and low
            powers and temperatures
O   U2   because the orange stands for cook and the yellow
            for defrost
O   U3   it indicates the power - red associated with heat
O   U4   to show which is cooler and which is hotter
            cooking
O   U5   it indicates the heating effect
O   U6   indicates lowest and highest heat settings
O   U7   these indicate high and low power
O   U8   to show that the control is to do with radio
            waves
O   U9   to show that there are two different heat settings -
            a higher and a lower
O   U10   to indicate the different levels of cooking power

<u>Question 8   Why is the time switch above and not below</u>
<u>the power switch?</u>

Response:

Nil	D1	I do not know - a USA constraint.
Nil	D2	I do not know the reason - I do not think it is critical.
O	D3	Because the time switch is always used when cooking, unlike the power switch. Also the use of the oven runs sequentially from the top of the control panel to the bottom: time, power, door switch, and the position appropriate to this sequence.

CONSENSUS O

<u>Question 8   Why is the time switch above and not below</u>
<u>the power switch?</u>

Response:

O	U1	easy to operate that way round
TM	U2	for technical reasons - it is easier for the manufacturer to produce like this
O	U3	it is easier to operate this way round
M	U4	easier to manufacture this way
O	U5	because you have to work out how long first, and then the power setting
T	U6	for technical reasons
O	U7	because the timer is more frequently used than the power control
O	U8	to help to operate the oven - yet this conflicts with the instructions, which say to operate the power control first
M	U9	probably because it is easier to manufacture this way
T	U10	it has to do with the works - technological

Question 9   Why does the minute scale get larger, the
              nearer it gets to zero?

Response:

O   D1   So that it will be more accurate at the lower
            time settings.
Nil   D2   I do not know the reason, this originated in
            the USA.
TO   D3   There are two reasons: firstly the mechanism
            is logarithmic, secondly the bulk of the cooking
            takes place at short time intervals and the
            scale gives better definition and accuracy for
            the user at this point. Accuracy is less
            significant at greater time levels.

CONSENSUS OT

Question 9   Why does the minute scale get larger, the
              nearer it gets to zero?

Response:

O   U1   because smaller times are used most frequently,
             I have never been above 15 minutes
O   U2   because 30 seconds does not matter much over a
             30 minute period but is critical over short
             periods - and the shorter times are used more
             frequently anyway
T   U3   for technical reasons
O   U4   easier to operate for those foods which take
             only a few seconds
O   U5   because more use is made of the smaller times
TO   U6   for technical reasons, and more use is made of
             the smaller time sequences
O   U7   because the shorter times are used more often
O   U8   I have not cooked anything for 30 minutes - it
             makes operation easier
O   U9   to get a finer degree of setting for smaller
             times
T   U10   I never noticed because I never use the longer
             times, I double the shorter times for longer
             periods because you must keep turning the food
             (technological)

<u>Question 10   Why does it have an orange circle around it?</u>

Response:

S   D1   To fit in with the general style of the product.
S   D2   Probably to balance it with the power scale –
         purely decorative, there is no visual coding to
         do with the power scale.
S   D3   This was a Creda styling decision – probably to
         accentuate the control.

CONSENSUS S

<u>Question 10   Why does it have an orange circle around it?</u>

Response:

O   U1   so that you will be able to see that it is on
S   U2   to match the power scale
S   U3   to improve the looks
S   U4   to match the power switch
O   U5   as a background to help you to see the scale
         more easily
T   U6   for technical reasons
O   U7   so that it is easier to see
O   U8   so that is is easier to read
S   U9   purely decorative
T   U10 for technical reasons

<u>Question 11</u>   <u>Why was 30 minutes chosen as the limit of</u>
                    <u>the timer?</u>

Response:

M   D1   The timing mechanism was what was available.
            We really wanted one which went up to 45 minutes
            because there are some foods which take this
            time to cook and ours would require resetting.
Nil   D2   I do not know.
O   D3   For this (domestic) operation, 30 minutes covers
            90% of all applications. With an increased time
            of 45 minutes, definition is lost at the shorter
            time levels.

CONSENSUS MO

<u>Question 11</u>   <u>Why does it go up to 30 minutes and not a</u>
                    <u>greater or lesser time?</u>

Response:

O   U1   this is the maximum that one needs to cook items
            for
O   U2   because you rarely go beyond 30 minutes - when
            it would become more worthwhile to use the con-
            ventional oven anyway
O   U3   because this time is suitable for most foods
O   U4   because 30 minutes is adequate
O   U5   this is the average necessary time
O   U6   30 minutes is a long time and adequate for most
            foods
O   U7   because this is adequate for most cooking
O   U8   because most things can be cooked within a limit
            of 30 minutes
O   U9   because most cooking is done at a lesser time
            than 30 minutes
O   U10   most things can be cooked within this period;
            you do not therefore need a longer time

Response:

T   D1   It is mechanically easier to arrange in relation to the door interlocks.

O   D2   It is logical, all the controls are in one area. (We did consider another approach, with the release mounted on top of the unit.)

SM D3   The linkage from the door release to the controls is simpler to make if it is taken from the panel itself. Also it gives a "clean" door without any protrusions. This was an engineering staff decision and could well have been on the door.

CONSENSUS MOST

Question 12   Why is the oven door release mounted on the control panel and not on the door?

Response:

OT U1   easier to use and wouldn't get damaged so easily when the door is open

T   U2   prevents the straining of the door hinges and damage to the door catches

T   U3   because if it was mounted on the door it would wear the hinges out in time

SM U4   looks neater and probably easier to service

T   U5   for technical reasons and so that it relates to the controls mechanically more strongly

M   U6   so that all the controls are grouped together for cheaper manufacture

O   U7   it is handier - and would not get in the way as easily as it would if mounted on the door

OT U8   if it was on the door it would get in the way - also would tend to cause seal damage if leaned on

T   U9   so that it does not weaken the door after constant operation

O   U10 it is easier to use and would be an obstruction if mounted on the door

<u>Question 13   Why is the door release this particular shape?</u>

Response:

Nil	D1	I do not know – this is a USA constraint.
0	D2	I presume that it was the ergonomic way to do it. (I would not have designed it this way myself.)
S	D3	I do not really know, but suspect that it balances visually and again emphasises the horizontal.

CONSENSUS OS

<u>Question 13   Why is the door release this particular shape?</u>

Response:

0	U1	because it is easy to use
0	U2	easier to use
0	U3	easier to operate
0	U4	easier to operate
0	U5	because it is convenient to press
OM	U6	easy to operate and manufacture
0	U7	so that it is easy to press
0	U8	so that it can be easily differentiated from the other two
0	U9	so that it can be operated positively
0	U10	no idea – easier to operate

<u>Question 14   Why does it have a textured finish?</u>

Response:

O	D1	I do not know but suspect that it is easier to touch.
Nil	D2	A USA constraint – again, typically flashy.
S	D3	So that it does not show finger prints.

CONSENSUS OS

<u>Question 14   Why does it have a textured finish?</u>

Response:

O	U1	so that wet hands will not slip on it
O	U2	to prevent the hand from slipping
O	U3	so that fingers do not slip on it
S	U4	matches the strip around the door
O	U5	for better pressure
O	U6	so that the fingers do not slip
O	U7	this makes it non-slip
O	U8	so that you know that you are not touching other parts – and so that wet hands will not slip
O	U9	so that it will be non-slip
S	U10	no idea – it looks better

Question 15   Why does the door have a fine mesh across it?

Response:

O   D1   To screen out microwaves.
O   D2   To screen out microwaves.
O   D3   Prohibits microwave energy from exiting from the
           cavity. The holes in the mesh are smaller than
           the wavelength of the energy.

CONSENSUS O

Question 15   Why does the door have a fine mesh across it?

Response:

TO   U1   for technical reasons and prevents the door from
           shattering if broken
O   U2   did know but I have forgotten - I think it is to
           prevent the glass from shattering
O   U3   protection from the heat
O   U4   stops the glass from exploding - like toughened
           glass with wire in it
O   U5   to stop radiation coming through - the size of
           the holes is significant for this
T   U6   prevents heat distortion in the window glass
O   U7   it prevents the rays coming out
O   U8   it keeps the microwaves in
O   U9   to stop the rays from coming out
T   U10   no idea - provides protection for the glass

Question 16   Why does the door have a thick dark band
               around it?

Response:

S   D1   Purely for stylistic reasons.
S   D2   To disguise the frame of the interior cabinet
           (I think it makes the space look smaller).
S   D3   It is a mask for the structural components of
           the oven cavity.

CONSENSUS S

Question 16   Why does the door have a thick dark band
               around it?

Response:

T   U1   it protects the seal
S   U2   for style - it concentrates the eye on the cooking
           space and not the wall thickness
O   U3   not sure - for protection
S   U4   for looks
O   U5   to prevent microwave leakage around the side
T   U6   reflects the rays - (I use it as a mirror, Mrs C)
T   U7   this cuts down the flashing (electrical)
OT   U8   for technical reasons - so that less microwaves
           will escape
O   U9   to prevent the rays from coming out
T   U10   no idea - for technical reasons

<u>Question 17   Why is the control panel this particular colour?</u>

Response:

S	D1	For stylistic reasons.
MS	D2	To match the above dark band on the door frame; the other brown matches the brown used on the current range of Creda products. It is a standard colour.
Nil	D3	I do not know, this was a Creda decision.

CONSENSUS MS

<u>Question 17   Why is the control panel this colour?</u>

Response:

S	U1	to make it look more attractive
O	U2	so that the controls are easier to read
S	U3	this is a neutral colour to blend in with the rest of the front
S	U4	for appearance – to match the rest of the front of the oven
S	U5	for stylistic reasons – it gives a two-tone effect
O	U6	so that it can be seen better
O	U7	so that it will stand out well
S	U8	so that it will match the rest of the oven
SO	U9	so that it matches the door – and the dials will show up more clearly
SM	U10	it is to match the standard colour of many electrical goods and wiring

<u>Question 18   What is the thin line around the panel for?</u>

Response:

S	D1	To match the metal trim around the door.
S	D2	Balances the bright edge of the metal extrusion around the door. We tried designing the oven without it and it did not work.
S	D3	It visually encloses the controls – similar to the Litton original.

CONSENSUS S

<u>Question 18   What is the thin line around the panel for?</u>

Response:

O	U1	to make the controls stand out
O	U2	it makes the controls stand out
S	U3	it is decorative
S	U4	to match the door
SO	U5	for style – it brings together all the controls in one block
S	U6	for decoration
O	U7	to attract your attention to the controls
O	U8	so that it isolates the controls
S	U9	for decoration
S	U10	to finish it off visually

Question 19   Why is the control panel at the side of the
               door and not above or below it?

Response:

TM   D1   Because it is not just a control panel but houses
           the transformer in the most convenient place,
           along with other components. If this was moved
           it would alter the shape of the product and would
           change the characteristics of wave distribution.
T   D2   For engineering reasons.
TS   D3   From a technological and mechanical standpoint,
           given the arrangement of the interior components,
           this is the simplest external form. Also, it
           again emphasises the horizontal aspect of the
           oven. It is more logical to connect it this way
           round.

CONSENSUS MTS

Question 19   Why is the control panel at the side of the
               door and not above or below it?

Response:

O   U1   easier to use – would be better on the top so
           that they would be away from children
OM   U2   it is easier to use this way and easier to
           manufacture
O   U3   it is easier to use – short people would not be
           able to use if mounted on top
OS   U4   easier to operate at the side and looks better
O   U5   it is the best position to enable you to operate
           the controls with the door open or closed
M   U6   easier to get at for servicing – for manufacturing
           reasons
O   U7   it is easier to control in this position
T   U8   for technical reasons – ie the magnetron has to
           be over the top, not the controls
O   U9   it is easier to see
SO   U10   it would look funny anywhere else – also better
           for right-hand users

- 21 -

<u>Question 20   Why is there a gap between the door and the
                 control panel?</u>

Response:

MS	D1	This is a manufacturing tolerance, it is less likely to show any taper that may exist.
S	D2	It is not physically necessary - it exists for stylistic reasons.
T	D3	The large tolerance decreases the risk of the door catching the frame.

CONSENSUS MST

<u>Question 20   Why is there a gap between the door and the
                 control panel?</u>

Response:

T	U1	stops the door from catching
T	U2	so that the door can be opened without catching
OT	U3	easier to clean and for technical reasons
T	U4	for some technical reason
T	U5	not for heat expansion; perhaps prevents deformation due to heat; most likely to prevent wear if the surfaces should come into contact
O	U6	so that fingers do not get trapped in it
T	U7	stops the door from catching
OT	U8	for ease of opening the door and so that if anything gets jammed in, it does less damage
T	U9	for technical reasons - and to stop the door from catching
T	U10	no idea - for technical reasons

Question 22   Why was off-white chosen as the colour for the outer case?

Response:

S	D1	A styling consideration; we tried white but it was thought to be too harsh, this colour tones in better with the rest of the product.
S	D2	For marketing reasons – we all thought that it looked best; we had inherited wood grain from the USA but preferred this.
Nil	D3	It was a Creda decision.

CONSENSUS S

Question 22   Why was off-white chosen as the colour for the outer case?

Response:

S	U1	because it is a neutral colour which will blend in with most kitchens
S	U2	it is a clean colour without being clinical
OS	U3	white shows the dirt too easily – also this colour matches most kitchen colours
S	U4	for looks, a safe colour, will go with anything
S	U5	most modern kitchens are pale so that this colour will match
S	U6	for sales purposes – most popular colour (we would have preferred a choice)
S	U7	it goes better with the dark frontage than pure white
S	U8	for appearance – most other appliances tend to be this sort of colour
S	U9	so that it would go with most kitchens
S	U10	to blend in better visually

<u>Question 23   Why does it have a textured finish?</u>

Response:

M	D1	Because it had to be produced in plastic-coated steel. The USA original was, and this was what was available in the colour we wanted.
S	D2	To hide blemishes in the cabinet.
TOS	D3	A Litton recommendation; the vinyl finish tends to take more cleaning abuse than the paint finish. Also it gives a greater "dimension" to it, (meaning a more three-dimensional effect).

CONSENSUS SOMT

<u>Question 23   Why does it have a textured finish?</u>

Response:

T	U1	to prevent scratching
T	U2	less likely to be scratched or damaged
S	U3	decorative
T	U4	doesn't scratch easily (I like it)
S	U5	gives a feeling of richness
TOM	U6	cheaper to manufacture than a smooth finish – also it makes it impossible to paint it, which should not be attempted for technical reasons
O	U7	this is easier to clean
T	U8	because it is a protective coating (I like it)
T	U9	to stop chipping
T	U10	this is part of the protective coating; it has to be textured as a material

<u>Question 24   Why are the corners slightly rounded?</u>

Response:

M   D1   Because they could not be sharper, given the
            type of fabrication process.
M   D2   They have to be, as part of the manufacturing
            process.
MT   D3   Minimum radius for the metal bending fabrication
            technique - also, if it was any sharper it would
            tend to cut through the vinyl covering.

CONSENSUS MT

<u>Question 24   Why are the corners slightly rounded?</u>

Response:

O   U1   so that they will not be sharp and dangerous
O   U2   so that they will not scratch users
O   U3   safety, so that you don't scratch yourself
O   U4   so that they won't catch or scratch the user
O   U5   so that it will fit into spaces easier, eg
            built-in units
TM   U6   for manufacturing reasons to do with the type
            of finish
O   U7   safer - you cannot catch yourself and it is
            easier to grip when moving
M   U8   because the box is a folded metal sheet and the
            process automatically gives a slight rounded
            corner
O   U9   because they would be dangerous if not
O   U10   for safety if you bang into it

<u>Question 26</u>   <u>Why are the door hinges in full view and</u>
                    <u>not hidden away?</u>

Response:

M	D1	It was a well proven door and hinge - but I think it would be better if they were not (in full view).
M	D2	To reduce costs. (If we had full control we would not design them like this.)
M	D3	For expediency (cheaper to produce); lack of pressure from the design staff to push it the other way.

CONSENSUS M

<u>Question 26</u>   <u>Why are the door hinges in full view and</u>
                    <u>not hidden away?</u>

Response:

M	U1	easier to get at from the servicing point of view
OST	U2	better appearance - and for technical reasons - also food can be cleaned off easier
M	U3	easy to service and for manufacturing reasons
M	U4	so that they are easier to get at if they go wrong
O	U5	so that you will be able to tell if anything is wrong with them simply by looking at them - for safety
MT	U6	mainly for cheaper manufacture; also metal cannot be used inside the oven
M	U7	so that they are easier to fix if they go wrong or get damaged
O	U8	for protection
T	U9	so that the door fits better
O	U10	there is less chance of being caught on them

<u>Question 27</u>   <u>What is the purpose of the metal trim around</u>
                     <u>the door?</u>

Response:

T   D1   It is structural, it keeps the door right-angled
             and flat so that the three interlocks will engage
             properly and it will operate.
T   D2   The extrusion is part of the door structure.
T   D3   It holds the door parts together.

CONSENSUS T

Response:

S   U1   to improve the way that the product looks   ⟩
T   U2   to give the door strength
SO   U3   for looks and protection
O   U4   helps to seal the door
ST   U5   to strengthen the door and to look good
T   U6   it holds the glass in - stabilises the door
TSO   U7   it improves the looks of the oven, seals it and
             provides a strong support for the door
O   U8   to improve the efficiency of the seal
ST   U9   to improve the looks and to strengthen the door
O   U10   for safety - for microwave protection

<u>What is the purpose of the translucent strip</u>
                    <u>along the inside face of the oven?</u>

Response:

S   D1   Purely decorative, it was a visual device to
           match the wood grain on the original oven.
T   D2   It is a vapour seal, not a microwave seal.
           It is made out of silicone rubber.
O   D3   This is a microwave energy absorber. The door
           does not seal tightly. The strip is 'T' section
           and traps the emergent radiation and contains it
           in the base of the 'T', where it is dissipated
           as a slight heating effect. This energy is in
           the form of the main frequency. Government
           legislation determines that this is carried out.

CONSENSUS OST

<u>Question 28</u>   <u>What is the purpose of the grey edging strip</u>
                    <u>along the inside of the door?</u>

Response:

O   U1   to seal the oven
O   U2   to seal the door
S   U3   decoration
O   U4   to seal the door
M   U5   plastic – perhaps comes out to clean – for some
           manufacturing purpose, no idea what its real
           purpose is
O   U6   safety seal
O   U7   to provide a good seal
O   U8   to seal the door
O   U9   to seal the door
O   U10   this is the main microwave seal

<u>Question 29   Why does it not match the colour of the rest</u>
<u>   of the interior?</u>

Response:

S	D1	To match the wood grain.
T	D2	Because it is a different material.
TM	D3	The seal is probably polypropylene and would be difficult to match to the cavity colour. Also 20% of the plastic is recycled and this would again make it difficult to match.

CONSENSUS TMS

<u>Question 29   Why is it a grey colour and not white to</u>
<u>   match the rest of the interior?</u>

Response:

O	U1	so that I know what the seal is
T	U2	because this is the stuff that has to be used and it happens to come in this particular colour
S	U3	it wouldn't be as decorative if it was not this colour
OM	U4	easier inspection and maintenance
Nil	U5	no response
MT	U6	for manufacturing reasons because it is a different type of plastic
T	U7	it is a special, different material which provides a seal
T	U8	it is a different material which has to be this colour
T	U9	because it has to be a different material than the surround, which has to be that colour
O	U10	so that you can see it better, you know that it is there

Question 30   What is the purpose of the flexible black
                strip along the inside of the door?

Response:

T   D1   It is there to protect the microwave shield (mesh)
                from damage.   (INCORRECT)
Nil   D2   I did not know there was one - I have no idea.
0   D3   This is a secondary seal to absorb the second
                and third harmonic of the radiation which is not
                trapped by the other seal. These are multiples
                of 2450 MHz and hence would transgress government
                legislation, which restricts the frequency of
                microwave oven radiation to a limited frequency
                range - all ovens are tested in the USA on this
                point.

        CONSENSUS 0

Question 30   What is the purpose of the black edging
                along the inside of the door?

Response:

0   U1   another seal to enable the door to fit more
                tightly
0   U2   this is to seal the door
0   U3   safety
T   U4   to keep the 'glass' in
OT   U5   seals the door and also cushions the door when
                it closes to prevent vibration
0   U6   a safety seal
0   U7   another seal
0   U8   to seal the door
0   U9   to seal the door
0   U10   this is the second microwave seal

Question 31   What is the reason for having three and not
               just one door catch?

Response:

0   D1   For safety; if there was only one the door might
           be warped and would still operate. Also, with
           three interlocks, if a child pushed a pencil
           into one the oven would still not operate.
0   D2   For safety reasons - decided in the USA.
0   D3   It is a safety requirement, demanded in both the
           UK and the USA, three separate circuits must be
           closed for power to be on.

CONSENSUS 0

Question 31   What is the reason for having three and not
               just one door catch?

Response:

0   U1   for safety, so that if one should break there
           would be no leakage
0   U2   prevents the door from warping and hence preserves
           the seal
0   U3   prevents the door from warping - also keeps the
           door shut properly
0   U4   safety
0   U5   if the door should twist, they will bring it
           back into shape and hence provide a good seal
           again
0   U6   for safety
0   U7   for safety
0   U8   for safety - to ensure that when it operates it
           is completely closed
0   U9   for safety
0   U10   for safety

<u>Question 32   Why is the interior coloured white?</u>

Response:

MO	D1	It is white stove enamelling, which is cheaper than stainless steel and is a highly reflective colour.
SO	D2	It looks clean, efficient and reflects light.
S	D3	White is a "clean" colour and also gives a visual impression of space.

CONSENSUS SOM

<u>Question 32   Why is the interior coloured white?</u>

Response:

T	U1	because white reflects the waves better
O	U2	easier to see into, because it reflects the interior lighting
SO	U3	looks better; also a clearer when the interior is lit
S	U4	to enhance its looks
O	U5	so that light will be reflected and one will be able to see the contents more clearly
O	U6	to see the interior better
OT	U7	so that you can see inside more easily – also could be something to do with the way it works
O	U8	helps you to see what you are cooking more clearly because of the reflected light
TMO	U9	something to do with the rays – also cheaper to manufacture in this colour, also easier to see any spillage
S	U10	it is cleaner looking

<u>Question 33   Why was this particular interior size chosen?</u>

Response:

TO   D1   This is related to microwave distribution. You
            choose the rough volume you want and then feed
            it into what is thought to be a highly reliable
            computer programme, which will give the optimum
            dimensions required, although it still has to
            be tested.
Nil   D2   I do not know.
OT   D3   This is a complicated decision to make; the
            varying of the three dimensions affects the
            evenness of the cooking. It was originally
            developed according to the size of certain
            American cooking dishes. Also, in sales terms,
            it was thought that an internal dimension greater
            than one cubic foot was desirable.

CONSENSUS OT

<u>Question 33   Why is the interior space this particular</u>
<u>   size, and not either larger or smaller?</u>

Response:

T   U1   for technical reasons
O   U2   because it will take a fair-sized turkey
T   U3   the magnetron can only cope with small quantities
            of food, so there is no point in a larger size
O   U4   convenient to use – can get a turkey in
MT   U5   for manufacturing reasons; also there is a limit
            to an acceptable weight
O   U6   useful size for most foods (we would now prefer
            it to be smaller)
O   U7   this size is adequate for most people's needs
O   U8   it suits most families – and costs the same as
            other, smaller sizes
M   U9   cheaper to manufacture this small size (related
            to a conventional oven size)
O   U10   it is a conventional size that is more useful to
            the family

<u>Question 34</u> <u>What is the purpose of the series of holes</u>
<u>in the inside, right hand panel?</u>

Response:

T   D1   For venting steam and cooking smells.
Nil D2   I do not know.
T   D3   This is an air intake.

CONSENSUS T

<u>Question 34</u> <u>What is the purpose of the series of holes</u>
<u>in the right hand panel?</u>

Response:

T   U1   for ventilation
T   U2   for ventilation and to prevent overheating of
           the oven
T   U3   for ventilation
T   U4   the microwaves enter through them
T   U5   for ventilation
T   U6   allows the microwaves to enter the oven
T   U7   for ventilation
T   U8   for ventilation
T   U9   to extract the steam through
T   U10   air vents to allow steam to escape

<u>Question 35   Why are the inside corners not rounded,</u>
<u>as in most conventional ovens?</u>

Response:

MT	D1	It is easier to manufacture - the ceramic base tray would pose problems because it is a different material to the sides and could not therefore be bent in one piece. The cleaning problems are less than in conventional ovens.
M	D2	They should be ideally, but it is cheaper to construct this way.
TSO	D3	It would only be possible to round some of the corners, since the back is not attached to the sides. The stylists favoured the crisp corners and it was felt that, because of the lack of heating effect, this would make it easy enough to clean. In conventional ovens, vitreous enamel is used, which is sprayed on, and this would not be possible in the microwave oven. The home economist had not defined a need for rounded corners.

CONSENSUS MOST

<u>Question 35   Why are the inside corners not rounded,</u>
<u>as in most conventional ovens?</u>

Response:

T	U1	for technical reasons
T	U2	to improve the door fit - and what the walls are made out of will not bend
T	U3	for technical reasons - rounded would be easier to clean
Nil	U4	easier to clean (probed on this, and said that rounded ones would be easier to clean)
M	U5	first stated easier to clean, then corrected to cheaper to manufacture this way
M	U6	for manufacturing reasons
SO	U7	it looks better - and it is easier to get stuff in and out
T	U8	because of the construction - for technical reasons
M	U9	cheaper to manufacture
T	U10	I don't know - for technical reasons

<u>Question 36   Why is there no shelf in the interior, as
          in most conventional ovens?</u>

Response:

T   D1   In general, food does not cook as efficiently
          at higher levels. The floor of the cooker is
          in fact a shelf, the metal bottom extends about
          an inch below. This is to put the food at the
          optimum position for cooking.
T   D2 · It is related to the characteristics of micro-
          wave cooking.
T   D3   Because of the energy distribution which is
          engineered to focus on only one level. (Today
          the engineers are able to create three-dimensional
          cooking, so some of their new (Litton) ovens
          do have a single shelf.)

CONSENSUS T

<u>Question 36   Why are there no shelves in the interior,
          as in conventional ovens?</u>

Response:

T   U1   because, unlike conventional ovens, the top of
          the oven is no hotter than the bottom, and so
          there is no point in stacking food at different
          heights
T   U2   because with shelves you would get uneven cooking -
          the food on the top shelf would prevent the micro-
          waves from reaching the bottom shelf
T   U3   because it is only possible to cook one quantity
          at a time
T   U4   because the microwave operates at one temperature
          and conventional ovens have different temperatures
          at different heights - plastic rings can be used
          to stack plates
T   U5   because if objects are placed on top, the micro-
          waves will not reach those underneath
M   U6   to make the product more cheaply (we think it
          would be a good idea)
O   U7   there is no need for shelves   .
T   U8   can't, unless it was made out of plastic
O   U9   because of the speed of cooking, it is not
          necessary to stack food up
T   U10   because the microwaves could not distribute to
          the height of another shelf

<u>Question 38   What material is the power knob made out of,</u>
         <u>and why was this material chosen?</u>

Response:

TM	D1	ABS, because it is reasonably durable, cheap and will plate easily.
T	D2	Chrome-plated ABS – chosen because it is a plastic that is easy to plate.
Nil	D3	It is a plastic, but I am not sure which one, not a low or a high temperature plastic. It obeys the normal constraints of manufacture.

CONSENSUS TM

<u>Question 38   What material is the power knob made out of,</u>
         <u>and why is it made out of this?</u>

Response:

TO	U1	coated plastic – easier to clean, doesn't go rusty and for technical reasons, one should not have metal objects near to or in the oven
M	U2	plated plastic – because it is cheaper
T	U3	steel, for harder wear
M	U4	plastic, for cheaper manufacture
M	U5	plastic (but feels like metal), less strong than metal, used because it is cheaper
Nil	U6	a metal alloy
T	U7	stainless steel – for increased strength
T	U8	a man-made plastic – because metal and microwave do not go together
Nil	U9	first thought it was stainless steel – then chromium-plated – having examined them closely they concluded that they were plastic
O	U10	metal, for safety

<u>Question 39</u>   <u>What material is the transparent door made</u>
                     <u>out of, and why was it chosen?</u>

Response:

T   D1   Glass - for durability.

T   D2   Glass (the control panel is plastic) - it is more
             durable and provides more stiffness for the door.

T   D3   The outer panel is glass because it does not
             scratch easily. The inner one is milar film
             because this forms a flexible part of the sand-
             wich to enclose the front mesh screen.

CONSENSUS T

<u>Question 39</u>   <u>What material is the door panel made out</u>
                     <u>of, and why is it made out of this?</u>

Response:

T   U1   perspex, because it is stronger than glass and
             will not shatter

T   U2   perspex - because it is tougher than glass and
             weighs less

SOT   U3   glass outside, plastic inside - glass looks
             better and is easier to clean, plastic for
             technical reasons

O   U4   perspex, for safety

T   U5   glass - because it is more durable than plastics

T   U6   glass - more heat resistant than plastic

T   U7   I do not know - not plastic, not glass - some
             durable material

T   U8   glass - because glass does not distort through
             heat

M   U9   plastic - cheaper to manufacture

O   U10   a special glass for safety - plastic would not
             be suitable

<u>Question 40</u> <u>What material is the white, outer case made out of, and why was this chosen?</u>

Response:

M D1 Plastic-coated steel - largely a cost factor. The manufacturing plant does not have wide production facilities so the materials have to be bought in and ready-coated steel saves on painting.
M D2 Plastic-coated steel - chosen mainly because of its relatively low cost.
M D3 PVC-covered soft steel - this is the normal construction for cheap manufacture of cabinets and covers.

CONSENSUS M

<u>Question 40</u> <u>What material is the off-white case made out of, and why?</u>

Response:

T   U1   plastic-coated metal - stronger and with a longer life
T   U2   metal - to keep the waves in
T   U3   plastic-covered steel for hard wear
T   U4   metal - hard wearing
S   U5   vinyl-covered metal - for appearance
Nil U6   a metal alloy
0   U7   vinyl - because this is easier to clean
T   U8   vinyl over a metal case - to reflect the microwave
T   U9   plastic-coated metal - lasts longer and does not chip
0   U10 metal with a plastic coating, for safety

<u>Question 41</u>   <u>What material is the base of the interior</u>
                 <u>made of, and why?</u>

Response:

TO	D1	Glass ceramic – because it is tough, transparent to microwaves, and is easily cleaned.
Nil	D2	I do not know.
T	D3	This is glass/ceramic and forms a shelf with microwave energy coming up from beneath it. It must therefore be transparent to microwave energy, unlike the walls and roof of the cavity. It must also have a low coefficient of expansion, so that it may heat through conduction without expanding and breaking.

CONSENSUS OT

<u>Question 41</u>   <u>What material is the base of the interior</u>
                 <u>made of, and why?</u>

Response:

O	U1	feels like enamel-coated metal, for ease of cleaning
T	U2	a thick plastic – to take the extra weight of the food
T	U3	plastic – polystyrene – so that it does not heat up
M	U4	plastic – cheaper to manufacture
TO	U5	special material – plastic-coated steel for durability and easy to clean
T	U6	a plastic for better heat conductivity
T	U7	a mixture of polystyrene and ceramic material, to stand the heat
T	U8	metal, to reflect the waves
O	U9	plastic, so that it is easy to clean
OT	U10	some kind of perspex; it seems thick, chosen for safety and so that it will stand up to heat

<u>Question 42   What materials are the walls of the interior</u>
<u>made of, and why</u>?

Response:

M	D1	Stove-enamelled steel – because this is cheaper than stainless steel.
Nil	D2	I do not really know, but think they are some sort of plastic.
T	D3	Mild steel with a multiple coating – I do not know what of, but it is a two to three stage process. They reflect microwave energy.

CONSENSUS MT

<u>Question 42   What materials are the walls of the interior</u>
<u>made of, and why</u>?

Response:

T	U1	nylon, because metal cannot be used for technical reasons
T	U2	plastic-coated metal – to keep the rays in
T	U3	a more rigid plastic than the above – again, will not heat up
T	U4	metal – for durability
T	U5	painted steel, for durability
T	U6	metal, to reflect the microwaves
T	U7	metal – for structural strength
T	U8	metal, to reflect the waves
T	U9	like tin – a metal – to reflect the rays
T	U10	metal, to reflect microwaves

Question 43   What material is the interior roof made of,
                and why?

Response:

Nil D1   A plastic, I think it is PVC.
Nil D2   I do not know.
T   D3   As 42.

CONSENSUS T

Question 43   What material(s) is the roof of the interior
                made of, and why?

Response:

O   U1   again, enamel-coated metal for ease of cleaning
T   U2   the same as above - plastic-coated metal - to
            keep the rays in
T   U3   same as the walls - a more rigid plastic than
            the base - will not heat up
T   U4   metal - will resist wear and tear
T   U5   plastic to allow the radiation through
T   U6   metal for reflecting the microwave
TO   U7   plastic, to reduce the weight and to house the
            motor
Nil U8   plastic and metal - do not know
T   U9   metal like the sides - to reflect the rays
T   U10   two different materials, plastic/perspex and
            metal, for technical reasons

<u>Question 45</u>   <u>Why is the oven so heavy for its size?</u>

Response:

T	D1	The control gear, transformer and magnetron are all inherently heavy.
T	D2	Because of the inherent weight of the magnetron.
T	D3	A combination of the weight of the transformer and the magnetron.

CONSENSUS T

<u>Question 45</u>   <u>Do you think the oven is light or heavy to lift - why is it so light/heavy?</u>

Response:

T	U1	heavy, because there is so much metal inside it
T	U2	heavy - particularly on the side where the magnetron is, so I would assume the magnetron is heavy
T	U3	for technical reasons
T	U4	because of the weight of the 'mechanism'
T	U5	heavy, for technical reasons to do with the magnetron
Nil	U6	average weight for its size
T	U7	very heavy because of the weight of the magnetron
O	U8	it is heavy so that it will be stable on uneven surfaces - I put it on an uneven surface once and it started flashing
T	U9	heavy - because of the weight of the magnetron
O	U10	heavy, for stability

Question 46   Why does it make a noise whilst operating?

Response:

T   D1   Two noises, the stirrer and fan noise and the
             magnetron itself. The transformer and magnetron
             are probably the noisiest.
T   D2   The magnetron is responsible for the noise.
T   D3   This is the blower noise.

CONSENSUS T

Question 46   Why does the oven make a noise when cooking?

Response:

T   U1   the extractor fan
T   U2   it is the noise of the microwave being generated
OT   U3   for technical reasons – also tells you that the
             oven is on – the timer also makes some noise
T   U4   the movement of the air through the fan – you
             can't have a silent fan
T   U5   I do not know, but it sounds like a fan
T   U6   because of the fan
T   U7   it is the noise made in generating the rays
T   U8   it is the noise of the concentrated radio waves
             being generated
Nil   U9   no idea
T   U10   the microwave generator causes this

Question 47   Why is the oven wall as thick as it is?

Response:

T   D1   At the bottom is the well, the stirrer is at
         the top, the hinge mountings at one side and
         the controls at the other. It is nothing to do
         with insulation or microwave screening.
T   D2   Because it determines the angle of reflection.
T   D3   As response D1.

CONSENSUS T

Question 47   Why is the oven wall so thick?

Response:

O   U1   to prevent microwave leakage
TO   U2   insulation – of heat and microwaves, for safety
O   U3   for safety and to prevent leakage of microwaves
O   U4   there are materials necessary for safety inside
TO   U5   the top roof because it carries the magnetron,
          and the walls for protection against leakage
O   U6   for safety and microwave insulation
O   U7   for protection
O   U8   for protection from the microwave inside
O   U9   to keep the rays in
O   U10 for safety – so that microwaves will not get out

6.2 DESIGNER AND USER RESPONSES TO THE SUPPORT SECTION OF THE QUESTIONNAIRE

Question 3   What would you say are the main attractions
              of microwave cooking for consumers?   (Would
              you rank these in order please)

Response:

D1   Speed and convenience - a false optimism about the
      range of possible uses.
D2   The speed of cooking and defrosting.
D3   (a) Convenience and speed, which go together; the
           particular circumstances of the user accentuate
           the value of certain attributes, eg a family or
           working user may accentuate the need for increased
           cooking speed.
      (b) For children, better, more nutritious meals
           available outside normal cooking hours. Also
           it is safe to allow children to use it by them-
           selves.
      (c) More nutritious and tastier foods, eg fish and
           vegetables.
      (d) 25 - 75% energy saved over electric cookers.

Pre-purchase and Purchase

3   Why were you originally attracted to the idea of microwave ovens?

U1   the speed - I kept forgetting to take food out of
      the freezer
U2   had a freezer - for both speedy defrosting and quicker
      cooking
U3   I was working at the time and thought it would be
      useful for defrosting the things that I kept forgetting
      to defrost
U4   the speed - I was working at the time of purchase, so
      needed the convenience
U5   I had a freezer and wanted to speed up defrosting - saw
      a demonstration
U6   some American relatives visited us and praised its
      convenience
U7   we saw it at demonstrations - we both work, I work
      shift work, so we wanted it for convenience
U8   became aware of them when they first came out 10 years
      ago; I work all day and thought that it would be
      convenient
U9   saw a demonstration of the Creda at Coles and had seen
      ovens on the television, where it was portrayed as
      'a thing of the future' - thought it looked useful
U10   we own an allotment and got fed up with the amount of
      blanching of vegetables for the freezer - we thought
      there must be a quicker way and we looked at books on
      microwave cooking

<u>Question 4</u>   <u>What are the main attractions of the Creda,</u>
                    <u>as opposed to other models available?</u>
                    <u>(Would you rank these in order please)</u>

Response:

D1   Good performance - at the time it was the only one
        in the UK with the variable control - and one of the
        largest interior capacities.
D2   It appears to be, and is, bigger than most - also
        the variable power control.
D3   Offers a variable power control which relates to the
        traditional use of gas and electric ovens. Some foods
        need to cook slower at low energy.

<u>4</u>   <u>What attracted you to the Creda, as opposed to other</u>
       <u>makes or models?</u>

U1   liked the large size of the interior
U2   the price related to the large size
U3   I liked the variable power control
U4   I liked the large size and the discount
U5   knew that I could get it cheap from a warehouse called
        S & E, associated the Creda brand name with quality -
        liked the large internal size, simplicity and solidity
U6   the variable power control - the size did not matter
        much
U7   more room inside, the roasting tray and the variable
        power
U8   went to Coles, asked them what model they would recom-
        mend for a family of five and they said the Creda would
        take five dishes stacked - also liked the variable
        power control
U9   the price - there was a £10 special reduction - also
        the variable control; met a man at the demonstration
        who was re-buying an oven in order to have a variable
        power control
U10   the large size, attractive looks and the browning tray

<u>Question 6</u>   <u>As the idea of microwave cooking is fairly</u>
              <u>new to most people, in what ways would you</u>
              <u>expect prospective purchasers to find out</u>
              <u>about and obtain information on the oven?</u>

Response:

D1   Magazines, particularly "Which", and microwave books.
D2   They would most likely become aware through looking in
      magazines at the advertisements (although recently
      Philips TV advertisements have become important).
D3   The August 1978 "World in Action" broadcast, which
      had its equivalents in other parts of the world,
      converted a 20 to 30% knowledge into 90%, even though
      this was adverse. This in turn stimulated manufacturers
      to advertise to counter this (formation of the micro-
      wave oven manufacturers' association). Knowledgeable
      consumers first buy the oven assuming that the manu-
      facturers' assertions are correct and then, by word
      of mouth, convey awareness to others. Sales demonstra-
      tions are important also.

<u>6</u>   <u>Before you bought the oven, in what ways did you try to</u>
      <u>find out information, eg books, sales, leaflets,</u>
      <u>demonstrations, friends, etc?</u>

U1   only visited one shop but looked at lots of leaflets -
      did not know any other people who owned one at the time
U2   Mrs P had used another model as a barmaid previously -
      they had no friends who have one - attended demonstra-
      tions - visited one or two stores
U3   visited a number of shops - no demonstrations - had a
      friend who had one
U4   asked a lot of people in shops - read many sales leaflets -
      did not know any other users
U5   visited one shop - liked another more 'futuristic' one
      (with push buttons) and would have bought that but the
      sales people were slow to order - no known other users
U6   Toshiba demonstrator at the local showrooms visited
      several times, very helpful - visited a number of shops -
      read the Toshiba recipe book
U7   a Creda demonstration at Coles - saw it in the shops
U8   spent a long time looking around many shops - saw a
      couple of demonstrations, did not have any friends who
      owned one
U9   visited three or four stores - we went into it thoroughly
      and attended a demonstration of several makes of cooker
U10   looked at books, attended a YEB demonstration - did not
      know anyone who owned one

Question 7   I would like you to tell me which of the
              following you would expect to be the most
              important factor in influencing prospective
              users: (i)   LISTENING to what friends or
              salesmen said about the oven;   (ii)   READING
              about the oven in books, magazines, etc;
              (iii)   LOOKING at the oven in the shops or
              pictured in magazines.   Which would be the
              second most important?

Response:

D1   (i) then (ii).
D2   (ii) then (i).
D3   (i) - unable to provide second because not that
      familiar with the UK market.

7   Which of the following do you consider to be the most
     important in deciding to buy the oven: (i)   listening
     to what friends or salesmen said about the oven;
     (ii)   reading about the oven in books, magazines,
     instructions;   (iii)   looking at the oven in shops or
     pictured in magazines?

	Most important	Next important	Least important
U1	(ii)	(i)	(iii)
U2	(iii)	(ii)	(i)
U3	(ii)	(iii)	(i)
U4	(iii)	(ii)	(i)
U5	(iii)	(ii)	(i)
U6	(i)	(ii)	(iii)
U7	(i)	(ii)	(iii)
U8	(i)	(iii)	(ii)
U9	(i)	(ii)	(iii)
U10	(ii)	(i)	(iii)

<u>Question 8</u>   <u>Compared with other consumer durables, would</u>
              <u>you say that choosing a microwave oven is</u>
              <u>generally (i) more difficult, (ii) about the</u>
              <u>same, (iii) easier?</u>

Response:

D1   (i).
D2   (i).
D3   (i) - because there is no awareness and understanding
     of the product features.

<u>8</u>   <u>Compared with other products that you may have bought,</u>
     <u>like furniture, electrical goods, cars, etc, would you</u>
     <u>say that choosing a microwave oven was easier or more</u>
     <u>difficult?   Why do you say that?</u>

U1   about the same as most others
U2   about the same
U3   about the same as buying any other product
U4   about average
U5   more difficult because I was not sure what the oven
     would do for me personally, unlike the other products
     that I have bought
U6   did not find it difficult, but might have if we had
     not received advice from our American relatives
U7   it was an easy decision to make
U8   it was, if anything, easier because there was not a
     great deal to choose from
U9   about the same as other purchases - we always go into
     things thoroughly
U10 more difficult, because we did not know anything
     about it - when we first bought it I thought that it
     was a big mistake because I did not know how to use
     it and felt it was frightening, although it has now
     proved worthwhile particularly in the blanching pro-
     cess (we bought a pea podder and can do very large
     quantities very quickly)

Learning to Use the Product

<u>Question 10</u>   <u>Would you say that the average user:</u>
<u>(i) read all the instructions before use;</u>
<u>(ii) read a few of the instructions before</u>
<u>use; (iii) read none of the instructions</u>
<u>before use?</u>

Response:

D1   (i).
D2   (ii).
D3   (i) - this is for the UK user; they are more thorough
in reading instructions than Americans - main problem
in the US was consumer understanding and we provide
a freephone service for advice to counter this.

Learning to Use the Product

<u>10</u>   <u>When you first bought the product, would you say that:</u>
<u>(i) you read all the instructions before using it;</u>
<u>(ii) you read a few of the instructions before using</u>
<u>it; (iii) you read none of the instructions before</u>
<u>using it?</u>

U1   the instruction booklet is fine but I have not used
any of the recipes - (i)
U2   (ii)
U3   (i)
U4   (i)
U5   (i)
U6   (i)
U7   (i)
U8   (i)
U9   (i)
U10   (ii) - my husband read them all

<u>What would you expect to be the most common</u>
<u>difficulties and mistakes made by users</u>
<u>when they first operate the oven?</u>

Response:

D1   The pre-planning and organising of menus.
D2   People would expect too much from them - and would
     not study the instructions properly.
D3   Underestimating how fast the cooker cooks, and there-
     fore a tendency to overcook food. Also the association
     of textures and colours after cooking with the tradi-
     tional appearance of food tends to mislead the user
     as to the correct cooking times.

<u>11   Everybody makes mistakes when they first use a micro-</u>
<u>wave oven. What kind of difficulties did you have</u>
<u>when you first learned to use it?</u>

U1   accidentally cooked a piece of frozen meat that I
     only wanted thawing; also, a couple of times, I have
     put food in and set the controls and nothing has
     happened to the food - suspect that the machine is
     faulty
U2   found, and still find, sponge cakes extremely difficult;
     found the instructions supplied perfectly adequate, but
     have bought several other books which, in some ways,
     are difficult to relate to the Creda power settings
U3   overcooked a tinned steamed pudding - melted some
     Tupperware containers - still can't do fried eggs -
     don't like choice of recipes - not enough information
U4   cooked a cake in too small a dish - overflowed, not
     successful, too soggy
U5   I normally went by the book; dried out some hamburgers
U6   nothing particular - cooked a potato too slowly to
     begin with
U7   we tried to make fresh bread in it, which was a
     disaster
U8   I was always a bit afraid of using it because of the
     safety thing, which is always at the back of my mind
     (Mrs S enquired about portable leakage detectors);
     cooked eggs on the roasting tray, which were a disaster -
     not keen on using the tray, I do not like the channel
     around it, would prefer channels going right across
U9   made a mess of a Yorkshire pudding - cooked a cauli-
     flower with no liquid; do not feel that the recipe book
     is explicit enough - we have looked for, but not dis-
     covered, a good general book on microwave cooking
     (it can never replace a conventional oven) - we do not
     use the oven a great deal, in fact it is really a bit
     of a white elephant (Mr T)
U10 overcooked and spilt custard all over the oven; I
     cooked a sponge cake in too small a container so that
     it overflowed; burnt hands on roasting tray (see later
     question)

Question 12   Is there anything that you now feel could have been modified in the oven that would have made it easier to learn to use, eg more instructions on the product itself or different control arrangements?

Response:

D1   A meat probe included; a more accurate digital timer. Improved literature with the product - it takes too long to understand the instructions, could be better detailed.

D2   Possibly touch controls, for digital rather than analog control of time and power.

D3   A visible cooking guide for a small range of common foods. Improved browning effect, matching cooking time to traditional appearance. A list of deficiencies (what the product will not do), eg cooking at different levels is not efficient.

12   Is there anything that can be done to the product that would make it easier to learn to use, like perhaps more instructions on the product itself or different types of controls?

U1   no response - 'it is bound to be trial and error'

U2   no - not particularly keen on instructions written on the product

U3   useful to have instructions for cook times of foods actually on the oven - do not like the choice of recipes in the instruction book

U4   more books on microwave cooking required (although thought the instruction book was adequate); more instructions on the actual packets of frozen foods - suspicious of printing more instructions on the oven itself because the oven would look less attractive and they always wear off

U5   no - as long as you follow the instructions and get the weights right there is no problem

U6   not in favour of putting more instructions on the product because the dials would have to be bigger; very critical of the instruction booklet - had bought 3 other books but not much use, as the models were always different than the books; Creda recipes are too complicated, much preferred the Toshiba instructions; also liked cookery cards - there ought to be better books

U7   no, it is already simple to use - I am not in favour of more instructions on the product

U8   would like a proper recipe index in the instructions, which are adequate in general; I have tried a number of recipes - I like the Toshiba because it had some instructions written on it - particularly useful for the children who use it - they know the controls but not necessarily the cooking times

U9   it is already very simple to use; Mrs T was a little
      bit afraid to use it
U10   I do not like more instructions on the oven because
      they always wear off; I found it frightening to begin
      to learn; you get used to taking containers out of
      the oven with bare hands, as they are relatively cool,
      and forget that the roasting tray is different -
      there is no warning about handling it - I burnt myself
      quite badly; at the demonstration you also see the
      containers handled by hand

Product Identity/Style

Question 13   The style of a motor car can be described
               using a variety of words, eg sporty, sleek,
               compact, luxurious, etc. What words would
               you use to describe the style of the oven?

Response:

D1   De luxe, modern.
D2   Reasonably smart within the USA constraints.
D3   "Comfortable" - products in the kitchen should look
      "functional" but the UK is not yet ready for the
      extreme form of functionality, as exhibited by some
      of the German products. The oven also has the appear-
      ance of having value. The UK is also slow at adopting
      built-in appliances.

Product Identity/Style

13   The style of a motor car can be described using a
      variety of words, eg sporty, sleek, compact, luxurious,
      etc. What words would you use to describe the style
      of the oven?

U1   no response, even after probing 'I like it'
U2   quite elegant, solid looking
U3   all right, nice to look at - good - bigger
U4   compact, neat, attractive
U5   modern - straightforward, simple, compact, simple
      control layout
U6   not sleek - don't know - we never really look at it -
      'useable', a bit big, wish it was smaller but like the
      appearance, looks like a television set
U7   nice - I like the black front - the dials are simple,
      easy to read
U8   this is very difficult at a moment's notice - it is
      plain and fits in well
U9   no opinion - all right - a bit like a television,
      looks 'cold'
U10   great, I like it, it fits in well

<u>Question 14</u>   <u>I would like you to look at these photographs
               of other microwave ovens. Do you prefer the
               look of either of them to the Creda? Why do
               you prefer it?</u>

Response:

D1   I like A because I have seen it in the flesh; I do
      not like this photograph of it. C looks out of date.
D2   I prefer A, it is a designer's design, better inte-
      grated, more sophisticated, rather like hi-fi equip-
      ment.
D3   I prefer the Philips "continental" styling, but not
      sure that this is suitable for the UK market. B is
      busy, C is clean and not cluttered.

<u>14</u>   <u>I would like you to look at these photographs of
      other microwave ovens. Is there one that you prefer
      the look of, rather than the Creda? Why do you prefer
      it?</u>

      (If the answer is no, ask about a particular feature)

U1   do not like the food cooking instructions of the
      top of oven A; I prefer the simplicity of the Creda to
      either; like the wood-grain finish on B, would like
      to have it on the Creda
U2   A doesn't look as good as the Creda - B is as good
      looking, B also looks as if it would tell me more
      about what is going on; like the turn-table on B, I
      wish that I had now chosen an oven with a turn-table
U3   likes B because the controls are more attractive -
      door handle looks nicer
U4   don't like B - the door handle is too big; like A
      just as much as the Creda
U5   like B if it has, as it looks to have, a turn-table;
      the others look too complicated to use
U6   prefer the Creda to either of them - like the simpler
      look of the controls;the Creda looks neater
U7   no - still prefer the Creda - do not like the turn-table
      on the Toshiba
U8   I prefer the general simplicity of the Creda to either
      of these, I think that simplicity is particularly
      important for older people; I particularly do not like
      the flush control panel of illustration A
U9   B looks more complicated - do not like that; Mr T
      liked the look of the Philips
U10   I still prefer the Creda - the Philips looks as if it
      has too many gadgets and gimmicks; I have seen B in
      the shops, it looks too "squashed up", too complicated
      I mean

Response:

D1   The control panel needs a great deal of improvement,
     I do not like its colours - the door section is okay.
D2   I would improve the depth of the front - at the
     moment it is merely an applied surface or facade.
     I would make it look more three-dimensional, which
     would give it a greater feeling of solidity.
D3   Move away from blacks into browns, or perhaps even
     beige - warmer colours used.

15   How would you improve the way the Creda looks?

U1   only have a wood-grain finish
U2   no response
U3   no response - apart from different cooking time for
     meats displayed on the oven
U4   no response
U5   I like its simplicity already, you could not make it
     simpler
U6   make a variety of colours and finishes available -
     like the coloured appliances available in the US -
     about time they were available over here - Mr C
U7   I am satisfied with the way it looks - I am more
     concerned that it gives good service
U8   I would like to have a separate on/off switch
U9   I like its simplicity - would prefer a more cylindrical
     switch, as on their conventional cooker - would look
     less cold
U10 I would alter the power control - bigger writing
     spread out from the control knob; I would add a
     pointer to the switch - when my glasses steam up,
     frequently I cannot see the switch position clearly

<u>Question 16</u>   <u>What would you say is the least attractive</u>
              <u>feature of the oven?</u>

Response:

D1   The controls.
D2   The door handle.
D3   The control panel could be "fresher", as in the new
      Litton (see Illustration 1010) with wood grain.

<u>16</u>   <u>What is the most ugly feature of the oven?</u>

U1   the front to back distance is too long - ideally I
      would set it into the kitchen wall but my neighbour
      would probably object
U2   the rather flimsy knobs
U3   the metal rim that surrounds the control panel
U4   nothing particularly ugly (in spite of several probes)
U5   the piece of wood on the door edge
U6   nothing - perhaps the colour
U7   the switches
U8   the knobs look weak - I would prefer a more cylindrical
      shape
U9   the switch knobs
U10   I have never really thought that it could be an ugly
      oven; I do not like the way that the hinges stick out

Question 17   Would you say that generally the oven is
               (i) ugly, (ii) good looking, (iii) of
               average looks?

Response:

D1   Average (although the door is good).
D2   Average looks.
D3   Good looking.

17   Would you say that the oven is generally (i) ugly,
      (ii) good looking, (iii) of average looks?

U1   (iii)
U2   (ii)
U3   (iii)
U4   (iii)
U5   (ii)
U6   (iii)
U7   (ii)
U8   (ii)
U9   (iii) - we didn't consider the looks a great deal
      but were impressed by the large internal space
U10 (ii)

<u>Question 18</u> <u>Are there any aspects of the way the oven</u>
<u>looks that you feel would not fit in with</u>
<u>the decor and appliances found in the average</u>
<u>user's kitchen?</u>

Response:

D1   The controls.
D2   No – I think it would blend in well, particularly
     the dark browns that we settled on.
D3   I do not know.

<u>18</u>   <u>Is there any aspect of the way the product looks</u>
     <u>that you feel does not fit in with your kitchen decor</u>
     <u>or other appliances?</u>

U1   it was the last thing in the kitchen that we have
     bought and matches well, especially the smoked glass
     door
U2   no – it is sufficiently neutral to go with anything –
     especially like the plain dark glass
U3   no
U4   the cream colour does not match my other appliances
U5   no, it would fit into any kitchen
U6   the large size
U7   my wife says she would prefer a true white finish
     to match the other appliances in our kitchen
U8   no, the colour blends in very well
U9   no
U10 no – but I would like a bigger inside space and
     smaller outside – thinner walls

<u>Question 19</u> <u>In general would you say that, in visual</u>
<u>terms, the oven would fit in (i) very well,</u>
<u>(ii) moderately well, (iii) not well, with</u>
<u>the average user's decor and other appliances?</u>

Response:

D1   Moderately well.
D2   Moderately well.
D3   I do not know.

<u>19</u>   <u>In general does its style fit in (i) very well,</u>
<u>(ii) moderately well, (iii) not well?</u>

U1   (i)
U2   (i)
U3   (ii)
U4   (i)
U5   (i)
U6   (ii)
U7   (i)
U8   (i)
U9   (i)
U10   (i)

Question 20   Do you feel that any of the features have a low quality finish or standard of workmanship?

Response:

D1   The plated knobs.
D2   There are quite a number of examples of bad detailing: gaps between the outer case and the front, the way the hinges are screwed on and the feel of the door handle.
D3   Of course not.

20   Do any of the features have a low quality finish or standard of workmanship?

U1   no
U2   the timer is not particularly reliable - the gap between the door and the control panel tapers; the timer over a range of say 15 minutes may be up to three or four minutes out
U3   the steel outside panel has developed a gap, with a certain amount of give
U4   no
U5   no
U6   the texture of the outer case
U7   no
U8   the bell doesn't always work and the timer does not always return to zero but stops at around the 30 second mark - this makes it difficult to actually cook things like frozen breadcakes, which only need 30 seconds
U9   there is play in the door (when we first purchased the oven it failed to operate and we were supplied with a replacement)
U10 I do not think so

Question 21   Would you say that the quality of finish
               or standard of workmanship of the oven is
               (i) high quality, (ii) of average quality,
               (iii) low quality?

Response:

D1   (i) high quality.
D2   (ii) average quality.
D3   (i) high quality.

21   Would you say that the quality of finish or standard
      of workmanship of the oven is (i) high quality, (ii)
      average quality, (iii) poor quality?

U1   (ii)
U2   (ii)
U3   (i)
U4   (i)
U5   (i)
U6   (ii)
U7   (i)
U8   (i)
U9   (ii)
U10   (i)

Question 22   Which parts of the oven would you say are the most difficult to clean?

Response:

D1   The plastic cover on the interior roof; also the interior corners are a bit difficult.

D2   The crevice around the door.

D3   The control panel — newer models now feature touch controls which make this easier.

22   Which parts of the oven are the most difficult to clean?

U1   the gaps between the seal ring and the rest of the oven interior; also always tend to get a streaky effect on the glass door

U2   the inside face of the door, around the black plastic lip, and outside the door, around the door trim

U3   the inside corners and the door seals

U4   the inside roof, because of the light and vent holes

U5   splashes on the sides, top and back, although I cover everything so this does not happen

U6   the ceiling surface inside and the textured outside finish

U7   the grill on the roof inside

U8   the control panel — food can lodge behind the switches and metal trim; also the door glass bubbles up when in use — is this harmful?

U9   it is all very easy to clean — have not found anywhere where food lodges

U10   the inside roof, because of the plastic grill

<u>Question 23</u>   <u>Would you say that in general the oven is
(i) quick and easy to clean, (ii) difficult
to clean, (iii) average?</u>

Response:

D1   (i) quick and easy to clean.
D2   (i) quick and easy to clean.
D3   (i) quick and easy to clean.

<u>23</u>   <u>Would you say that in general the oven is (i) quick
and easy to clean, (ii) difficult and time-consuming
to clean, (iii) average?</u>

U1 (i)
U2 (i)
U3 (i)
U4 (i)
U5 (i)
U6 (i)
U7 (i)
U8 (i)
U9 (i)
U10 (i)

<u>Question 24   Which visible parts of the oven would you</u>
           <u>expect to show signs of wear and tear first?</u>

Response:

D1   The plastic inner door liner – the interior stove
     enamelling.
D2   The perspex control panel, which would begin to show
     scratches when cleaned with abrasive cleaners. It
     would cause static, which would attract dust and
     hence cause more cleaning.
D3   The controls, switches and the door release bar.

<u>24   Which visible parts of the oven would you expect to</u>
     <u>show wear and tear first?</u>

U1   the door handle
U2   the three door catches and hinges – if someone
     leans on the door
U3   the door handle
U4   the door handle release
U5   the switches
U6   the door – because it is always being wiped down
U7   the door – at the hinges if someone was rough with
     them
U8   the control knobs – they look as if they will easily
     break off
U9   the door – hinges, locks and seals
U10 the controls

Question 25   Would you say that the oven is generally
               (i) robust and durable, (ii) of average
               durability, (iii) not particularly durable?

Response:

D1   (i) robust and durable.
D2   Between (i) and (ii).
D3   (i) robust and durable.

25   Is the product generally (i) robust and durable,
      (ii) of average durability, (iii) not particularly
      durable?

U1   (i)
U2   (i)
U3   (i)
U4   (i)
U5   (i)
U6   (i)
U7   (i)
U8   (i)
U9   (ii)
U10   (i)

<u>Question 26   What aspect of the oven would you consider</u>
             <u>to be least safe?</u>

Response:

D1   None - the door seal - the use is outside our control
     (the plastic liner does not have to be airtight).
D2   It is generally safe, unable to comment further.
D3   The projecting open door - heads caught on it or
     running children colliding with it.

<u>26   What aspect of the oven would you consider least</u>
     <u>safe?</u>

U1   the possibility of leakage - also children (has two)
     accidentally operating the oven; I would prefer the
     controls to be on the top for this reason
U2   the possibility of leakage, although in general it
     is a safe product because there is less risk of burn-
     ing, especially with children (ours use it)
U3   children standing near the front - danger from leakage -
     also leaving it plugged in
U4   thought it was totally safe - 'the manufacturer should
     not shoulder all the responsibility for safety - it
     is my responsibility to make sure that it is operated
     correctly'
U5   the way that the door fits - it could be strained,
     especially by children
U6   the bell sounds before the timer is exactly at zero -
     Mrs C worries that the oven is still operating because
     the indicator is never dead on zero
U7   the danger of leakage through the seals - I am going
     to have it regularly checked
U8   I can see the light coming through a gap between the
     top, outer case and the metal trim and I worry about
     this being a source of leakage; also the oven did not
     appear to be Electricity Board approved, and again
     this worried me
U9   the door seal - I always move away from it when it is
     operating because of the risk from radiation
U10 small children being able to open it too easily

Question 27   In general, would you say that the oven is (i) very safe, (ii) moderately safe, (iii) unsafe?

Response:

D1   (i) very safe.
D2   (i) very safe.
D3   (i) very safe.

27   In general would you say that the oven is (i) very safe, (ii) moderately safe, (iii) unsafe?

U1   (ii)
U2   (i)
U3   (i)
U4   (i)
U5   (i) - aware of the safety problem but thought the fact that it would rarely cause burns was in its favour
U6   (i) - 'fitting the plug is the most safety risking operation'
U7   (i)
U8   I cannot judge this
U9   (ii) - the dangers are always at the back of their mind, especially as the handbook indicated possible leakage from broken seals
U10   (i) - I hope it is

<u>Question 28</u>   <u>Which of the following features would you</u>
                     <u>expect the average user would like to see</u>
                     <u>incorporated in the product if the extra</u>
                     <u>cost was small?</u>

(i)   The oven automatically detects any spillage of liquid
      or food and switches itself off - eg so that boiling
      over is prevented.

Response:

D1   No.
D2   No.
D3   Yes.

<u>28</u>   <u>Which of the following features would you wish to</u>
      <u>have incorporated in the oven if the extra cost was</u>
      <u>small? (I shall read out the list, then repeat</u>
      <u>it slowly so that you can indicate 'yes' or 'no' to</u>
      <u>each feature</u>)

(i)   The oven automatically detects any spillage of liquid
      or food and switches itself off - eg so that boiling
      over is prevented.

U1   no
U2   no
U3   no
U4   yes
U5   no
U6   no
U7   yes
U8   no
U9   no
U10   no

<u>Classified Results</u>

Design responses:

no   D1, D2
yes   D4

User responses:

no   U1, U2, U3, U5, U6, U8, U9, U10
yes   U4, U7

(ii)   The oven cannot be switched on when empty.

Response:

D1   Yes.
D2   No.
D3   No.

(ii)   The oven cannot be switched on when empty.

U1   yes
U2   no
U3   yes
U4   no
U5   yes
U6   yes
U7   yes
U8   yes
U9   yes
U10   yes

Classified Results

Design responses:

no   D2, D3
yes   D1

User responses:

no   U2, U4
yes   U1, U3, U5, U6, U7, U8, U9, U10

(iii)   The oven cannot be switched on with metal objects
        inside.

Response:

D1   Yes.
D2   Yes.
D3   No.

(iii)   The oven cannot be switched on with metal objects
        inside it.

U1   yes
U2   yes
U3   yes
U4   no
U5   yes
U6   no
U7   no
U8   yes
U9   yes
U10   yes

Classified Results

Design responses:

no   D3
yes   D1, D2

User responses:

no   U4, U6, U7
yes   U1, U2, U3, U5, U8, U9, U10

(iv)   The oven is self-cleaning.

Response:

D1   No.
D2   No.
D3   Yes.

(iv)   The oven is self-cleaning.

U1   no
U2   no
U3   no
U4   no
U5   no
U6   yes
U7   no
U8   no
U9   no
U10   yes

Classified Results

Design responses:

no   D1, D2
yes   D3

User responses:

no   U1, U2, U3, U4, U5, U7, U8, U9
yes   U6, U10

(v) The oven has a built-in thermometer that can be inserted into foods.

Response:

D1   Yes.
D2   Yes.
D3   Yes.

(v) The oven has a built-in thermometer that can be inserted into food.

U1   yes
U2   no
U3   no
U4   no
U5   no
U6   yes
U7   yes
U8   yes
U9   yes
U10 yes

Classified Results

Design responses:

no
yes D1, D2, D3

User responses:

no   U2, U3, U4, U5
yes U1, U6, U7, U8, U9, U10

(vi)   The oven can be programmed so that the power cycle
       can be changed automatically, eg when defrosting
       the power can go from defrost to cooking without
       resetting.

Response:

D1   Yes.
D2   No.
D3   Yes.

(vi)   The oven can be programmed so that the power cycle
       can change automatically, eg when defrosting the
       setting can go from low power to high without
       resetting.

U1   no
U2   yes
U3   yes
U4   no
U5   yes
U6   yes
U7   no
U8   yes (note: as long as it has a manual over-ride)
U9   no
U10   no

Classified Results

Design responses:

no   D2
yes   D1, D3

User responses:

no   U1, U4, U7, U9, U10
yes   U2, U3, U5, U6, U8

(vii) A turntable is included to rotate the food
      automatically.

Response:

D1   No.
D2   No.
D3   Depends on experience in use.

(vii) A turntable is included to rotate the food
      automatically.

U1   no
U2   yes
U3   no
U4   no
U5   yes
U6   no
U7   no
U8   yes
U9   yes
U10   no

Classified Results

Design responses:

no   D1, D2
(no response - D3)

User responses:

no   U1, U3, U4, U6, U7, U10
yes   U2, U5, U8, U9

(viii)   The oven gives a warning if any microwave leakage
         occurs.

Response:

D1   Yes.
D2   Yes.
D3   Yes.

(viii)   The oven gives a warning if any microwave leakage
         occurs.

U1   yes
U2   yes
U3   yes
U4   yes
U5   yes
U6   yes
U7   yes
U8   yes
U9   yes
U10   yes

Classified Results

Design responses:

no
yes   D1, D2, D3

User responses:

no
yes   U1, U2, U3, U4, U5, U6, U7, U8, U9, U10

(ix) The oven can be set to stir liquids whilst cooking.

Response:

D1   Yes.
D2   Yes.
D3   Yes.

(ix) The oven can be set to stir liquids whilst cooking.

U1   no
U2   yes
U3   yes
U4   no
U5   yes
U6   yes
U7   no
U8   yes
U9   no
U10   no

Classified Results

Design responses:

no
yes   D1, D2, D3

User responses:

no   U1, U4, U7, U9, U10
yes   U2, U3, U5, U6, U8

6.3.1 MATCHED FACTORS

Q 3   "Speed and Convenience" were perceived as important pre-purchase attractions for microwave cooking.

Q 4   Variable power control and large cavity size were perceived as important pre-purchase factors of the Creda oven, compared with other models.

Q 6   The main sources of pre-purchase information: sales demonstration, word of mouth and books on the subject.

Q 7   Listening, reading, looking - their relative influence on the pre-purchase decision: too inconclusive and scattered to provide evidence.

Q 8   Ease of choice compared with other durable purchases: designer and user responses do not match.

Q 10   Reference to the written instructions before use: reasonable match between designers and users, who both believe that all the instructions are read prior to use.

Q 11   Most common difficulties and mistakes during the initial period of use: over-estimation of product capabilities, overcooking of food.

Q 12   Modifications that would make the product easier to learn to use: improved instructions.

Q 13   Word description of product identity/style: "modern, reasonably smart" matches "neat and attractive".

Q 14   Visual preferences related to two competing models: almost total mis-match.

Q 15   Methods of improving the visual quality of the product: colour changes, changes in controls.

Q 16   Least attractive feature of the oven (visual): the controls.

Q 17   General attitude to product appearance: close match between average/attractive, with neither users nor designers expressing the option "ugly".

Q 18   Compatibility with environment/other appliances: matching high number of nil responses by both users and designers.

Q 19   General attitude to visual compatibility: no matching responses.

Q 20   Features with a low quality finish or standard
       of craftsmanship: no response match of one
       designer and 5 users; gap between outer case and
       door.

Q 21   General attitude to quality of finish/standard of
       workmanship: close matching between average and
       high quality, with neither users nor designers
       expressing a "low quality" response.

Q 22   Parts of the oven most difficult to clean: interior
       roof, interior corners, door seals.

Q 23   General attitude to cleaning the product: total
       match for response (i), quick and easy to clean.

Q 24   Anticipation of characteristics which will exhibit
       signs of wear and tear first: the controls, power
       and timer; door release bar; door panel.

Q 25   General attitude to product durability: close
       matching between "robust and durable" and "average
       durability", with neither designers nor users
       expressing the response "not particularly durable".

Q 26   Least safe aspect of the oven: one design nil
       response and one user nil response; the door seal.

Q 27   General attitude to product safety: "very safe" total
       design consensus matched the majority of user
       responses.

Q 28   Design prediction of future user product require-
       ments: close matching of leakage indicator, thermo-
       meter as desirable; close matching of spillage
       detector, self-cleaning,turntable as undesirable.

6.3.2   UNMATCHED FACTORS – DESIGN RESPONSES

Q 3   Principal attactions of microwave cooking: nutritional value of cooked food; user safety, especially for children, improved taste, energy saving.

Q 4   Pre-purchase attraction of the Creda oven compared with other models: none.

Q 6   Sources of pre-purchase information: magazines.

Q 7   Listening, reading, looking – their relative influence on the pre-purchase decision: too inconclusive and scattered to provide evidence.

Q 8   Ease of choice compared with other durable purchases: designer and user responses do not match – the design group unanimously assumed that the user group would find the pre-purchase choice more difficult than for most other consumer durables, whilst the majority of users stated that it was a very similar process.

Q 10   Reference to written instructions prior to use: reasonable match.

Q 11   The most common difficulties and mistakes during the initial period of use: pre-planning and organising menus.

Q 12   Modifications that would make the product easier to learn to use: a meat probe, a more accurate digital timer, touch controls, visible cooking guide, improved browning.

Q 13   Word description of product identity/style: de luxe, comfortable, not as functional looking as many German products, appearance of having value.

Q 14   Visual preferences related to two competing models: unlike the user group, a preference for the Creda over the other models was not directly expressed by the designers. Strong dislike of B because "it looks out of date", "it is busy"; identification of A as a designer's design, better integrated, more sophisticated, rather like hi-fi equipment, continental styling.

Q 15   Methods of improving the visual quality of the product: a more three-dimensional frontal design.

Q 16   Least attractive visual feature of the oven: the door handle.

Q 17   General attitude to product appearance: close
        match.

Q 18   Compatibility with environment/other appliances:
        incompatible controls.

Q 19   General attitude to visual compatibility: no
        matching responses.

Q 20   Features with a low quality finish or standard of
        craftsmanship: the plated knobs, the way that the
        hinges are screwed on, the feel of the door handle.

Q 21   General attitude to quality of finish/standard of
        workmanship: close match.

Q 22   Parts of the oven most difficult to clean: control
        panel.

Q 23   General attitude to cleaning the product: close
        match.

Q 24   Anticipation of characteristics which will exhibit
        signs of wear and tear first: the cavity wall
        finish, perspex control panel.

Q 25   General attitude to product durability: close
        match.

Q 26   Least safe aspect of the oven: the projecting door
        when open, because of the possibility of collision
        by passing user, causing possible injury and/or
        microwave leakage from damaged door.

Q 27   General attitude to product safety: close match.

Q 28   Design prediction of future product requirements:
        see page 81.

Q 3   Principal attractions of microwave cooking: the
       blanching of home-grown vegetables.

Q 4   Pre-purchase attraction of the Creda oven compared
       with other models: the Creda brand name, the price
       factor, simplicity, visual attractiveness, the
       browning tray, "solidity".

Q 6   Sources of pre-purchase information: sales litera-
       ture, enquiries at sales outlets.

Q 7   Listening, reading, looking - their relative
       influence on the pre-purchase decision: too incon-
       clusive and scattered to provide evidence.

Q 8   Ease of choice compared with other durable purchases:
       see response 6.3.2 8.

Q 10   Reference to written instructions prior to use:
       reasonable match.

Q 11   The most common difficulties and mistakes during
       the initial period of use: suspected product mal-
       functions, difficulty in estimating thawing times,
       relating general literature on the subject to the
       use of the Creda, melted food containers, the use
       of containers that are too small, difficulty in
       using the browning tray, fear of safety factors.

Q 12   Modifications that would make the product easier
       to learn to use: visible warning for the use of
       the roasting tray.

Q 13   Word description of product identity/style: "like
       a television", big, bigger, compact, fits in well,
       simple, simple control layout, simple dials, plain,
       solid looking, not sleek, usable, cold.

Q 14   Visual preferences related to two competing models:
       see responses under 6.3.2 14.

Q 15   Methods of improving the visual quality of the
       product: nil.

Q 16   Least attractive visual feature of the oven: the
       front to back distance is too great, the metal
       rim surrounding the door panel, the piece of wood
       on the door edge, the colour, the projecting door
       hinges, the control knobs.

Q 17   General attitude to product appearance: close
       match.

Q 18   Compatibility with environment/other appliances:
        off-white case colour, the size, requires a bigger
        inside cavity space and smaller outside walls.

Q 19   General attitude to visual compatibility: no
        matching responses.

Q 20   Features with a low quality of finish/standard of
        workmanship: taper on the gap between the door
        and the control panel, unreliable timer, play in
        the door, the texture of the outer case.

Q 21   General attitude to the quality of finish/standard
        of workmanship: close match.

Q 22   Parts of the oven that are the most difficult to
        clean: the glass door, the textured case finish,
        general splashes on the cavity walls.

Q 23   General attitude to cleaning the product: close
        match.

Q 24   Anticipation of those characteristics which will
        exhibit signs of wear and tear first: the door
        seals, the door locks, the door hinges.

Q 25   General attitude to product durability: close
        match.

Q 26   The least safe aspect of the oven: leaving the
        unit plugged into the mains supply, the oven still
        on when the timer indicates zero, operation by
        children, microwave leakage.

Q 27   General attitude to product safety: close match.

Q 28   Design prediction of future product requirements:
        see page 81.

PERCEIVABLE CHARACTERISTIC AND SUPPORT QUESTIONNAIRES

CONTROL INTERFACE

1   What is the red light for?

2   Why is it red rather than any other colour?

3   Why is it rectangular and not round, for example?

4   Why is the power knob smaller than the time knob?

5   Why does it have a metallic finish?

6   Why does the power SCALE only extend around part of the circle?

7   Why does it have a part-orange, part-yellow circle around it?

8   Why is the time switch above and not below the power switch?

9   Why does the minute scale get larger the nearer it gets to zero?

10   Why does it have an orange circle around it?

11   Why does it go up to 30 minutes and not a greater or lesser time?

12   Why is the oven door release mounted on the control panel and not on the door?

13   Why is the door release this particular shape?

14   Why does it have a textured finish?

15   Why does the door have a fine mesh across it?

16   Why does the door have a thick dark band around it?

17   Why is the control panel this colour?

18   What is the thin line around the panel for?

19   Why is the control panel at the side of the door and not above or below it?

20   Why is there a gap between the door and the control panel?

21   (Space for extra control interface question.)

PRODUCT ENCLOSURE

22   Why was off-white chosen as the colour for the outer case?

23   Why does it have a textured finish?

24   Why are the corners slightly rounded? .

25   (Space for optional product enclosure question.)

INPUT INTERFACE

26   Why are the door hinges in full view and not hidden away?

27   What is the purpose of the metal trim around the door?

28   What is the purpose of the grey edging strip along the inside of the door?

29   Why is it a grey colour and not white to match the rest of the interior?

30   What is the purpose of the black edging along the inside of the door?

31   What is the reason for having three and not just one door catch?

32   Why is the interior coloured white?

33   Why is the interior space this particular size, and not either larger or smaller?

34   What is the purpose of the series of holes in the right hand panel?

35   Why are the inside corners not rounded, as in most conventional ovens?

36   Why are there no shelves in the interior, as in conventional ovens?

37   (Spare question for input interface.)

OUTPUT INTERFACE

As input interface.

PRODUCT MATERIALS

38   What material is the power knob made out of, and why is it made out of this?

39   What material is the door panel made out of, and why is it made out of this?

40   What material is the off-white case made out of, and why?

41   What material is the base of the interior made of, and why?

42   What materials are the walls of the interior made of, and why?

43   What material is the roof of the interior made of, and why?

44   (Spare question space for product materials.)

GENERAL PRODUCT

45   Do you think that the oven is light or heavy to lift - why is it so light/heavy?

46   Why does the oven make a noise whilst cooking?

47   Why is the oven wall so thick?

SUPPORT QUESTIONS

1   Length of period of use.

2   Do you have any special connection with the micro-wave industry?

PRE-PURCHASE AND PURCHASE

3   Why were you originally attracted to the idea of microwave ovens?

4   What attracted you to the Creda, as opposed to other makes or models?

5   What was the most important of the Creda features?

6   Before you bought the oven, in what ways did you try to find out information, eg books, sales leaflets, demonstrations, friends, etc?

7   I would like you to tell me which of the following you consider to be most important in deciding to buy the oven:
     (i)   LISTENING to what friends or salesmen said about the oven.
     (ii)   READING about the oven in books, magazines, instructions.

(iii)   LOOKING at the oven in shops or pictured in
          magazines.
     Which was the least important?

8   Compared with other products that you may have
     bought, like furniture, electrical goods, cars,
     etc, would you say that choosing a microwave oven
     was easier or more difficult? Why do you say that?

9   (Question space for purchase question.)

LEARNING TO USE THE PRODUCT

10   When you first bought the product, would you say
     that:
     (i)   you read all of the instructions before
              using it;
     (ii)   you read a few of the instructions before
              using it;
     (iii)   you read none of the instructions before
              using it?

11   Everybody makes mistakes when they first use a micro-
     wave oven. What kind of difficulties did you have
     when you first learned to use it?

12   Is there anything that can be done to the product
     that would make it easier to learn to use - like
     more instructions on the product itself or different
     types of controls?

PRODUCT IDENTITY/STYLE

13   The style of a motor car can be described using a
     variety of words, eg sporty, sleek, compact, luxurious,
     etc. What words would you use to describe the style
     of the oven?

14   I would like you to look at these photographs of
     other microwave ovens. Is there one that you prefer
     the look of, rather than the Creda? Why do you
     prefer it? (If the answer is no, ask about a
     particular feature.)

15   How would you improve the way the Creda looks?

16   What is the most ugly feature of the oven?

17   Would you say that the oven is generally:
     (i)   ugly,
     (ii)   good looking,
     (iii)   of average looks?

18   Is there any aspect of the way the product looks
     that you feel does not fit in with your kitchen
     decor or other appliances?

19   In general, does its style fit in:
      (i)   very well,
      (ii)   moderately well,
      (iii)   not well?

20   Do any of the features have a low quality finish or standard of workmanship?

21   Would you say that the quality of finish or standard of workmanship of the oven is:
      (i)   high quality,
      (ii)   of average quality,
      (iii)   poor quality?

22   Which parts of the oven are the most difficult to clean?

23   Would you say that in general the oven is:
      (i)   quick and easy to clean,
      (ii)   difficult and time-consuming to clean,
      (iii)   average?

24   Which visible parts of the oven would you expect to show wear and tear first?

25   Is the product generally:
      (i)   robust and durable,
      (ii)   of average durability,
      (iii)   not particularly durable?

26   What aspect of the oven would you consider to be least safe?

27   In general would you say that the oven is:
      (i)   very safe,
      (ii)   moderately safe,
      (iii)   unsafe?

28   Which of the following features would you wish to have incorporated in the oven if the extra cost was small? (I shall read out the list, then repeat it slowly so that you can indicate yes or no to each feature.)

      (i)   The oven automatically detects any spillage of liquid or food and switches itself off, eg boiling over is prevented.

      (ii)   The oven cannot be switched on when empty.

      (iii)   The oven cannot be switched on with metal objects inside it.

      (iv)   The oven is self-cleaning.

(v)   The oven has a built-in thermometer that can
        be inserted into food.

(vi)   The oven can be programmed so that the power
        cycle can change automatically, eg when de-
        frosting the setting can go from low power
        to high without resetting.

(vii)   A turntable is included to rotate the food
        automatically.

(viii) The oven gives a warning if any microwave
        leakage occurs.

(ix)   The oven can be set to stir liquids whilst
        cooking.

Name: Address:

Age group: 15-20   20-25   25-30   30-35   35-40   40-45
           45-50   Over 50

Occupation or self-description:

Socio-economic group:

Product serial no:

NOTES: self-image question

An analysis of each question, 1 - 47.

CONTROL INTERFACE

Q 1   What is the red light for?

This question is thought to be one of the easiest to
answer and so was deliberately introduced at the start
of this section to familiarise the interviewee with the
form that the subsequent questions would take, without
being over-demanding in other directions. In point of
fact it is likely to provoke a very similar response in
many users - ie to tell them that the oven is on.

Q 2   Why is it red rather than any other colour?

As the colour can vary depending on whether it is operating
(orange), or according to whether the ambient lighting is
strong or weak, the question was put in the form "Why is
it this colour, rather than any other colour?" The general
intention was to find out how closely the designer's
symbolic use of the colour matched the user's interpreta-
tion of it.

Q3   Why is it rectangular and not round, for example?

The question is put in the form "Why is it rectangular . . .
(pause) then, and not like these?", indicating the circular
switches and scales. Again it is a fairly straightforward
comparison question between the design intention and the
user's perception. Some indication of whether users place
any meaning, other than the purely decorative, on this flat,
graphic shape may well be significant, given the broad
probable safety role of the light.

Q 4   Why is the power knob smaller than the time knob?

The question is posed in this form, but is prefaced by
the comment "You have probably not noticed, but . . .",
the purpose of which is to prevent the user from automatically
assuming that his or her perception is inadequate and thus
preventing a balanced approach to the problem. In earlier
pilot questioning the word "switch" was used instead of
"knob", but it was observed that a number of interviewees
thought that this referred to the switch and surrounding
scale combined.

This question is perhaps one of the more difficult to
answer, so a consequent reliance on the prompt card answer
is probable. At the time of the user interviews, like many
other questions, the meaning of this characteristic was
unknown to the interviewer - a situation which is possibly
helpful, as it minimises the possibility of unconsciously
leading the interviewee.

Q5   Why does it have a metallic finish?

It is recognised that two of the words in the question –
metallic and finish – are, in a sense, leading statements
about the nature of the product materials. However, less
meaningful alternatives are difficult to imagine. It is
believed that the word "finish" in common usage does not
imply a surface coating or a surface treatment of a solid
material – but could be either. Also the word "metallic",
as it is commonly used, does not necessarily imply an
actual metal finish but can be equally interpreted to mean
a 'metal-like' appearance. (O E D: METALLIC – of metal(s)
. . . characteristic of metals, as metal lustre.)

It is thought that the substitution of a less specific
question, ie "Why do the control knobs have the finish
that they do?", would be rather too ambiguous, in that it
could be concerned with the high gloss, the reflected
colour, the scratch marks, degree of precision or composi-
tion of the switch.

**Q 6   Why does the power scale only extend around part
         of the circle?**

This question is posed as it is written, the gap segment
of the circle being indicated by pointing. Again it is a
rather difficult question to answer and reference to the
prompt cards is likely. In terms of results, the divisions
are likely to be between operational advantages and technical
reasons. Some reference in the pilot questionnaire results
was made to other appliances which possess this characteristic.

**Q 7   Why does it have a part-orange, part-yellow circle
         around it?**

Again this is posed as written. It has a design relation-
ship to Questions 1 and 10, in that these also refer to
what is likely to be an inconsistent design colour code,
the power light being orange/red, the power scale being
orange and yellow and the timer having an orange circle
around it. If, as seems likely, the orange and yellow
segments on the power scale symbolise high and low cooking
temperatures respectively, then the use of the colour
orange on the time scale has no obvious relationship and
could, if purely decorative, be misleading. To a lesser
degree, the on/off warning light colour may only add to
this confusion. An extra question for the design team is
therefore justified. It is concerned with the relation-
ship of these colours and whether there was an attempt to
design a colour co-ordinated symbol system or not.

**Q 8   Why is the time switch above and not below the power
         switch?**

The question is posed as written. Occasionally, after a
pause, the probe "and not the other way round" is added.
It is probable that the design intentions for this

characteristic are likely to be in the manufacturing and
technological spheres. During the pilot questioning it
was noted that there was a general reluctance to define
manufacturing advantage as a motive, probably because it
would imply criticism of the product. (The concept of an
elegant and economic production process is probably only
seen as praiseworthy by those connected with product design
and manufacture. To the consumer, cost-cutting on the
part of the manufacturer is, understandably, likely to be
associated with a feeling of being taken advantage of. With
an expensive product, the acceptance of such an attitude
gets dangerously near to self-criticism for having purchased
the 'dubious' article.) Where the design intention was
within this manufacture/technology definition, then this
and other similar question results were examined for evidence
of this type of user attitude.

Q 9   Why does the minute scale get larger, the nearer it
      gets to zero?

The question is posed as written and always followed by
indicating the way in which 5 minutes takes up a larger
segment of the circle at the 30 minute end of the scale
than it does towards the zero end. This is because many
of the interviewees in the pilot examination were not con-
sciously aware of this characteristic and it consequently
required added explanation.

The question of conscious and subconscious awareness of a
design characteristic, particularly when, as in this case,
it is connected with an ergonomic advantage, is an important
one. It could well be argued that it is irrelevant that
the user recognises that the time scale increases, when it
is perhaps inevitable that he or she will be able to operate
the timer more easily and more accurately, whatever the
level of comprehension.

Q 10 Why does it have an orange circle around it?

(See Question 7.)

This question checks for any confusion connected with the
decoration/colour coding of the two switches and warning
light - an even scatter of different user responses from
the designer response will provide such an indication.

Q 11 Why does it go up to 30 minutes and not a greater
      or lesser time?

In a sense this question is almost certain to produce an
answer which lies within the category devoted to ease of
operation of the product, ie "most of my cooking falls
within this time limit". What may be more relevant to this
research is the information which may accompany such a
reply. Statements about the user's ready acceptance of
this time limit, even though it may differ from the personal

limit of time when in actual use, are of particular note, since they provide warning of a lack of critical awareness.

Q 12 Why is the oven door release mounted on the control panel and not on the door?

The question is stated as above, but it is important that the actual device is pointed out to the user, since "oven door release" may not be understood. (Substitute words like "door handle" may be even more confusing, because of the device doubling as both door opener and power control switch.) The question has a variety of possible answers, many of equal plausibility. It may thus provide a useful indication of the user's ability to interpret concepts of ergonomic, engineering mechanics, material stress and strain, and construction detail. The central point of interest is the way that the user discriminates between explanations which are self-beneficial and those which benefit the manufacturer. This, in turn, provides more general data about the user's overall critical or non-critical attitude to the oven.

Q 13 Why is the door release this particular shape?

Very occasionally, if the user response is hesitant, the words "rectangular, a long strip . . . not a lever" are added.

The undistinguished form that the release switch takes is again useful, in that its anonymity allows a wide range of potential reasons to be put forward. If it had been shaped like a conventional door handle, ie a U shape, then, in all probability, the user's reply would fall automatically into the category of operational benefit. If, in spite of its ambiguous form, the user response remains centred around ergonomic benefits, ignoring possible manufacturing advantage, then again a consistent bias of attitude in favour of the product may be indicated.

Q 14 Why does it (the door release) have a textured finish?

The textured surface must be pointed out and, during the pilot interviews, many users touched the release, presumably to check that it was, in fact, slightly textured.

The question can be answered on a simple level, in terms of ergonomic benefit, ie "wet or greasy fingers will not slip", or in terms of applied decoration. On a more difficult level, the possibility of manufacturing advantage would seem to indicate a user with a high degree of technical knowledge or intuition (even if the response proved to be incorrect in design terms).

Q 15   Why does the door have a fine mesh across it?

The question is asked in the form "I don't know if you
have noticed when the internal light is on (the light is
switched on) that there is a fine metal mesh across the
door viewing panel - do you know what its purpose is?"

The question is the first which refers directly to a
characteristic which has a purely technological role to
fulfil. Indeed, it is fairly obvious that its presence
is an operational drawback, since it makes it more difficult
to view the interior. It is expected therefore that the
majority of users will define some kind of technological
justification for its existence. The form that this explana-
tion takes is of great interest, because a possible safety
hazard may be indicated. For example, the function of the
mesh is to prevent the emergence of microwaves and yet allow
the passage of visible light. During the pilot interviews
some users believed it to be a device for preventing the
heating up and eventual cracking of the transparent door
panel. Under such circumstances, it is possible that any
damage to the mesh might be tolerated by the user, with
dangerous consequences.

On another level, the function of the mesh is mentioned in
the instruction booklet, but only obliquely, on the
diagrammatic representation where the viewing panel in
the door is arrowed and referred to as "oven door -
including glass panel and screen". What the "screen" does
is not mentioned. The user response to the question may
well be conditioned by this reference, although its incon-
spicuous nature does not provide any indication of how well
the instructions were read or understood.

Q 16   Why does the door have a thick dark band around it?

It is important that the band is pointed out clearly as,
verbally, it might be confused with the seals or door
rim. The door has to be open and the interior light switched
on for best results.

There is a danger in following the previous question with
this one that some pre-conditioning might occur in relation
to the function of the mesh. However, the proximity of
the band and its obvious close relationship (visually, at
least) with the mesh would appear to pre-empt such condition-
ing. This question is a potential indicator of the ability
of the user to comprehend the differences between techno-
logical detail and pure decoration, in that it appears to
be strongly linked to the screen and might be thought to
reduce the area of visibility through the door. Hence the
information presented more than hints at a technological
function, when the likely purpose is to render the front
inside edge (including seal) of the oven invisible when the
door is closed.

Q 17 Why is the control panel this colour?

The question is asked in the form "Why is the control panel this particular colour - dark brown in two tones, unlike, for example, the outer case?"

The general intention of the question is to find out what "purpose" the user may ascribe to a colour, given the range of options on the prompt card. It is not a test of what associations the colour may hold - although this may well be revealed by some interviewees. It is possible that users may interpret this "purpose" in the same way that the dark band around the door is, ie it has a non-decorative "purpose".

Q 18 What is the thin line around the panel for?

The question is asked as stated but it is important that the line is indicated, to distinguish it from the trim.

The line is clearly a printed, two-dimensional image and as such may not be thought to have any particular function, in the way that a three-dimensional trim might. It is likely therefore that the user will either see it as a purely decorative feature or one which makes the controls visually more easy to use (or both).

Q 19 Why is the control panel at the side of the door and not above or below it?

The question is asked in the above form. Its purpose is to find out how the user feels about the general control positioning - is there an assumption that the controls are thus placed for his or her benefit? Or is there an accompanying recognition that manufacturing or technological parameters play an influential role?

Also, although microwave ovens are fairly new to the mass market in Britain, it is possible that the "traditional" form that the product might take is already well established. In the "Which Magazine" guide to microwave ovens (November 1979) for example, 14 ovens are tested and only one model, the Philips 610D, deviates from the arrangement of control panel down the right hand side, opening door pivoting from the left. Even this model has now been deleted in favour of the Cooktronic 7915, which conforms to the standard arrangement. Thus an already established view of the Creda control panel position, that it is a traditional and hence tried and tested arrangement, may be present in the user response.

Q 20 Why is there a gap between the door and the control panel?

This question is asked in the form: "I don't know if you have noticed, but there is a gap between the door and the

control panel (indicated) which is about a quarter of an inch wide - have you any idea why this prominent gap should be necessary?"

The question potentially possesses several different solutions, from manufacturing tolerances, ergonomic constraints to aesthetic detailing. Thus the general view of the interview group may indicate a bias towards one set of these solutions, which may, in turn, reflect a particular sensibility towards the reasons why product characteristics exist as they do.

Q 21 (Space for extra control interface question)

These spaces are included at the end of each section in case a particular characteristic of the product which was previously thought to be unimportant assumes some significance during the early interviews, in which case an additional question may be inserted.

Page 2

PRODUCT ENCLOSURE

Q 22 Why was (off-white) chosen for the product enclosure?

The question is asked in the form "Why was this colour (indicated) chosen for the outer case?" This is because a variety of verbal descriptions of the colour was recorded during the pilot interviews and it is felt that a stated colour would therefore tend to prejudice the interviewee's response.

The question is an important one, in the sense that it deals with one of the fundamental aspects of kitchen appliance design, ie the product identity of so-called "white goods" and its relationship to the colour white, with the resulting associations of hygiene and cleanliness. Responses in the form of "clean-looking" or even "looks like other kitchen appliances" would tend to confirm the acceptance of this traditional identity, in spite of the fairly revolutionary nature of the product's technology.

Q 23 Why does it have a textured finish?

The question is asked in this form.

In contrast to the previous question, the textured finish departs from the smooth, glossy finish of many other appliances: washing machines, cookers, dryers, mixers, etc, whilst the colour remains in context. This might be viewed as an attempt to improve the aesthetic appeal of the product or simply a means of finishing the product more cheaply. The former view would seem to imply an agreement that the texture does improve the visual quality, whilst the latter probably indicates a degree of criticism on the part of the user.

Q 24 Why are the corners slightly rounded?

The question is asked as stated. It refers to the external
corners on the steel case only.

It is a common view within the design field that the radii
of corners can represent a somewhat unwarranted obsession
with detail, to the exclusion of more important product
characteristics. There may be recognition that adjustments
in proportion are done for purely "unwarranted" aesthetic
reasons, or the user may define a more "practical" justifica-
tion.

Q 25 (Space for optional product enclosure question)

INPUT INTERFACE

Q 26 Why are the door hinges in full view and not hidden
      away?

The question is asked thus: "I would like you to look at
the hinges. On some models they are built into the oven and
cannot be seen from the outside. Why do you think that they
are exposed on this model?"

It is therefore a question which distinguishes between an
exposed, mechanical detail, the type of detail that has
been internalised, or, in the case of the purely electrical
or electronic product, deleted. The importance of this
type of detail was emphasised by Ziziros[1] in an article
in Design Magazine, when discussing the relevance of user
research to the design of gramophone turntables:

> "First we confirmed what we suspected, that cosmetics
> are more important than features and possibly even
> performance. Since we are, I suppose, in an exten-
> sion of the toy business - we make toys for adults -
> this is not surprising; but it is important to
> design thinking. Second, our cosmetic emphasis
> on wood was wrong, so we reduced it. And an item
> that we thought was trivial - the hinging of the
> lid - was most vital to people's perceptions of
> the product. With hindsight we realised that a
> hinge is what people first come across in the
> product as a working unit; it will have a bad
> effect if it is badly done."

In many respects the door of the microwave oven is similar
in status to the above-mentioned lid of the record deck.
It is one of the features that users actually try out, even
if the product is not functioning electrically in appliance
sales outlets. It may also involve the perception of safety
factors related to the microwave door seal.

The question is designed to provide information about the
associations connected with the hinge, whether decorative,

structural, safe or cheap to manufacture, and hence adds
to the evidence about the overall product identity.

Q 27   What is the purpose of the metal trim around the
        door?

The question is asked in this form, although it is important
to indicate that the metal trim is not just the exposed
metallic edge but includes the dark grey covered part, in
fact the entire area around the viewing panel.

Structurally this component acts as a rigid frame for the
door and also enables it to be hinged to the body of the
oven, providing a base for the door interlocks. Neverthe-
less it may possess connotations of the rather more super-
ficially applied decorative trim associated with, for
example, car windows and appliance design of the 1940's
and 50's.

Q 28   What is the purpose of the grey edging strip along
        the inside of the door?

The question refers to a semi-translucent strip, approximately
half an inch wide, which surrounds the oven interior on
the body of the oven. Since devising the original question
it has become evident that the word 'grey' should be deleted,
since it is not the pigment colour of the material and may
be misleading.

As in the case of Question 15, the user's identification
of the safety feature is perhaps critical in certain extreme
situations, ie in order to "ensure that the oven door seal
and front rim of the oven are kept clean and free from soil",[2]
the user must be able to identify the seal. To aid this,
the diagram of the oven[3] indicates the seal clearly, and
thus any misconceptions expressed by the user may result
from a combination of unread or unremembered instructions
and a lack of symbolic or realistic design indication that
the strip is, in fact, a seal. Failure to recognise it as
such may lead to soiling being left deposited on it and may
result in microwave leakage. The possibility is further
compounded by the existence of an additional plastic seal
on the inside edge of the door, which is not indicated on
the diagram.

Q 29   Why is it a (grey) colour and not white to match
        the rest of the interior?

Again the word 'grey' is deleted and, in this case, the
word 'neutral' is substituted. The contrast with the
interior colour is included to create the idea in the user's
mind that a positive deviation away from the norm has been
carried out, for which there must be a justifiable and,
by implication, answerable reason.

If the seal is identified by the user, a simple answer

might be that it has to be made of this material, which
must be this colour, for technical reasons. Conversely
it is a different colour from its surroundings so that
it can be identified easily. Any response which differs
indicates a lack of recognition of its role as a microwave
seal.

Q 30   What is the purpose of the black edging strip along
       the inside of the door?

The question is asked in the above form and the strip
clearly indicated to the interviewee.

The question is similar to the previous one, in that it
concerns the user's understanding of the microwave seal.
However, as was stated previously, the apparent existence
of two sets of door seals may be confusing, particularly
as they are visually dissimilar. Also the user is faced
with an apparent paradox, in the sense that the instruc-
tion booklet[4] explains that microwaves are not reflected
by plastics, in which case the fact that the seals are
made of plastic may appear confusing.

Q 31   What is the reason for having three, and not just
       one, door catch?

The question is asked in this form.

Again the question is concerned with aspects of safety
directly related to the innovatory product technology and
its interface with product operation.

Q 32   Why is the interior coloured white?

The question is asked in the form "Your conventional oven
probably has an interior which is a dark colour, perhaps
black or dark grey. Why do you think that the microwave
oven interior is a light colour?" As in Question 29, the
purpose of contrasting the two colours is to encourage the
idea that a justifiable deviation from the norm must be
explained. The reference to a definite colour (white) has
been removed, for reasons previously stated.

The question is a fundamental concern of the industrial
designer and possibly the ergonomist - like many of the
other questions, the user with little or no training in
design is being asked a question which requires a design
analysis, albeit a simple one, for its solution. The per-
ception of colour may relate to decorative qualities or
beneficial operational qualities in the way of increased
visibility into the interior.

Q 33   Why is the interior space this particular size, and
       not either larger or smaller?

The question is asked in this form.

Although the question is on a specific point of detail, the range of possible answers makes it a fairly open-ended question, related to the volume of food cooked by the user and perhaps some possible speculation on the size dictated by the product technology itself.

Q 34   What is the purpose of the series of holes in the right hand panel?

The series of holes is normally not within the line of vision of the standing user, so it is necessary to point them out clearly, particularly as there are other holes elsewhere in the interior.

The holes are an external clue to a totally internalised technical process. Hence the user's response indicates a part of his or her understanding of the product's internal functioning.

Q 35   Why are the inside corners not rounded, as in most conventional ovens?

The question is put in the above form - occasionally, if the user hesitates, the inside corners are indicated and the words "as you can see, these corners are very square" may be added.

During the pilot interviews a small number of interviewees responded to the effect that the square corners were easier to clean than rounded ones. This can be assumed to be a demonstration of the lack of ability or desire to criticise the product and is a useful guide to the other responses of such users, which should be treated with caution. (The alternative responses fall into ease of manufacture and technical constraints related to the properties of micro-waves.)

Q 36   Why are there no shelves in the interior, as in conventional ovens?

Since piloting the question, the singular form of 'shelves' has been substituted, in order to reduce the possibility of answers which relate to the smaller interior space of the microwave oven.

The character of the question is unlike the previous questions, in that it concerns the lack of a particular characteristic rather than its existence. It is included because it provides an open-ended formula for the user to consider the nature and properties of microwaves - independent of physical features. It is likely that the product designers will have contemplated it as a possibility and thus a correlation between the two sets of interviews is still possible.

OUTPUT INTERFACE

In the case of the microwave oven, the common input/
output interfaces are the same, ie the oven door and
interior; the energy input is obviously not, but this is
considered to be of relatively little importance compared
with the other product characteristics.

PRODUCT MATERIALS

The purpose of the questions in this section is to examine
the way that users perceive materials and, in a similar
way to the previous questions, examine the user's under-
standing of why these materials were employed in the
product. A statement of this purpose is given to the user
to prepare him for what is one of the more difficult sec-
tions of the questionnaire to answer.

Q 38   What material is the power knob made out of, and
        why is it made out of this?

The question is asked in the above form.

It deals with a material which is overlaid with an entirely
different material, possibly for decorative reasons. This
question is intended to probe the user's perception - is
the covering layer taken at face value or is the true
nature of the material understood? What does the user
make of the "deception" itself?

Q 39   What material is the door panel made out of, and
        why is it made out of this?

The question is asked as stated.

Clearly the range of options for the material composition
is limited to either glass or plastic, or a combination of
the two. Two clues as to the identity of the material are
contained in the instruction manual;[4] on page 8 under
Cleaning and Maintenance, point 2 states "Use only a mild
detergent, water and a soft cloth to clean the door surface
and interior surfaces". In other words, the door can be
damaged by abrasive cleaners and is thus more likely to
be the softer of the two materials, a plastic. Secondly,
on page 9[4] under Questions and Answers the question
"The inside door of my microwave oven seems to ripple when
I cook; is it safe to use?" is asked, to which the reply
reads "Yes, it is safe to use. It is only expanding because
of heated air or steam and will return to normal when cool."
This effect is not normally noted on other appliances, such
as conventional cookers with glass doors, and so the user
may have deduced that the door cannot be glass.

The problems associated with the confusion of materials
with differing properties has been discussed previously
(ref 1.1), with reference to the dangers of using an

abrasive cleaner accidentally. Like the example of the acrylic bath, the transparent door has several associations which may confuse the user. It is an oven door viewing panel in a tinted, transparent material and thus may be compared with the glass doors fitted to conventional cookers.

Q 40   What material is the off-white case made out of, and why?

The question is asked in the above form, but with the words "off-white" removed (see Question 22).

As in Question 38, this question is concerned with a material which has a surface layer of a different material covering it. The perception of this "illusion" by the user is investigated, together with his opinion as to why it has been done. There may be an association of manufacturing cost reduction, or the finish may be viewed as an acceptable form of decoration.

Q 41   What material is the base of the interior of the oven made out of, and why?

The question is asked in this form.

The question is an extremely difficult one, as this material is probably quite a complex one, not frequently encountered by the user. There is no reference to what it is in the instruction manual, but the sales literature does state that "The base of the oven itself is sealed pyro-ceramic, so food can be cooked directly on it", and some of the users may have read this. The fact that the material is a pure white colour, as opposed to the walls of the oven cavity which are a pale cream colour, may emphasise the difference in materials, as may the fact that the material appears thicker than reality because of its disguised front edge.

Q 42   What materials are the walls of the oven made of, and why?

The question requires some clarification so that the interviewee does not include the roof of the oven cavity. It is asked in the form "What materials are these three internal walls (indicated) made of . . . and why?"

The instruction manual[4] clearly states on page 1 that "Metal reflects microwaves. The walls and top of the oven are made of metal so that the microwaves will bounce off them into food placed in the oven."

The user response is clearly, therefore, conditioned by having either read or remembered this statement. The response is seen as an important indicator of the degree of accuracy of user perception of materials technology.

Q 43   What material is the roof of the interior made of, and why?

The question is asked in this form and is essentially similar to the previous one.

Q 44   (Spare question for product materials)

Page 3

GENERAL PRODUCT

This short section is designed to include certain characteristics which are centred on important, non-visual, perceivable characteristics - weight, smell, touch, noise, etc - together with any questions which may not slot easily into a single product interface category.

Q 45   Do you think that the oven is light or heavy to lift? Why is it light/heavy?

The question is asked in this form.

During the pilot questionnaire a number of users said that they found the oven rather heavy to install and move. As the weight of the oven is due to its internal technological components, rather than for reasons of stability, ergonomic improvements, etc, the question is seen as a means of gathering more information about the user attitude to the internal technology.

Q 46   Why does the oven make a noise whilst cooking?

The question has been slightly modified, so that it now reads "Why does the oven make a noise whilst operating", to avoid implying that the noise is related to the physical 'cooking' of the food.

As in the previous question, the user's perception of the technological process is examined. The noise can be related to the air and condensation extraction process or to the generation of microwaves.

The characteristic represents an important difference between the microwave oven and more traditional forms of cooking, and one which is possibly overlooked during the purchase demonstration, which may take place in noisier surroundings than the domestic kitchen.

Q 47   Why is the oven wall so thick?

The question is asked as stated.

The purpose is to add to the information about the user's background knowledge of the properties of microwave radiation.

SUPPORT QUESTION FUNCTIONS

Q 1   Length of period of use

As the printout of user addresses contains a numerical
code which gives the date of purchase, the information
as obtained from the user is not really necessary. How-
ever the question is included at the insistence of Creda.
The information is required to validate the one to two year
period of use required as part of the t i p selection
criteria.

Q 2   Do you have any special connection with the micro-
       wave oven industry?

As with the previous question, this is a test for validity.
The difference between an acceptable and an unacceptable
reply is a question of degree. At one extreme, a user who
was involved with the design of microwave ovens would
obviously give unrepresentative replies; on the other hand,
a person carrying out routine clerical work within the
industry could usually be considered to be fairly acceptable.

The selection of the South Yorkshire area for this research
is likely to minimise this possibility, in that there are
no known manufacturers of domestic appliances in the region
and certainly no organisation that is concerned with the
design and production of microwave ovens.

Pre-purchase and Purchase

Q 3   Why were you originally attracted to the idea of
       microwave ovens?

This question is put in the form of "Why were you originally
attracted to the idea of microwave cooking?" The reason
is that the interviewee is less likely to be diverted into
commenting on the actual oven purchased, which is the con-
cern of Question 4, and more likely to concentrate on
general qualities of the cooking method.

The purpose of the question is to provide information about
general expectations before purchase, which can then be
compared with other data which deal with the fulfilment of
expectations.

It also provides more information about perceived identity,
as it can provide responses which deal with fundamental
needs and requirements (for speed, for defrosting, for
convenience, etc) rather than provoking more superficial
responses describing the product's physical function, ie
cooking food.

Q 4   What attracted you to the Creda, as opposed to
        other makes or models?

The question is asked as above.

Again it is concerned with identifying fundamental aspects
of perceived identity. On another level, it may indicate
the relative importance of product identity compared with
other influential factors, such as price, availability,
servicing guarantees, special sales offers, credit facili-
ties, etc.

Q 5   What was the most important of the Creda features?

The question is asked as above.

It is inserted in the questionnaire on behalf of Creda
and would not otherwise be included. The pilot question-
naires show that the long-term users interviewed were
seldom able to recall more than a couple of reasons for
preferring the Creda before they purchased it and frequently
only one.

Q 6   Before you bought the oven, in what ways did you
        try to find out information, eg books, sales leaf-
        lets, demonstrations, consulting other users that
        you may have known, etc?

The question is asked in the above form, but rather than
being a strictly controlled check-list of possible informa-
tion sources, examples are given and the user left to open-
endedly discuss information sources. The exception is
the influence of other known users, which is understood
to be influential when the product is innovative.[5] This
was then questioned separately: "Did any of your friends
possess a microwave oven . . . and did they discuss it
with you?"

Allowing an open-ended approach, this question means that
the user will probably indicate the most important influences
rather than producing a catalogue of all possible influences,
which would be the case if a check-list method had been
employed.

Q 7   I would like you to tell me which of the following
        you consider to be most important in influencing
        you to buy the oven: (i) LISTENING to what friends
        or salesmen said about the oven; (ii) READING
        about the oven in books and magazines; (iii)
        LOOKING at the oven in shops or pictured in magazines.
        Which was the least important?

The question is asked in the above form, with the exception
of the final line. It was found in earlier tests that
"What was the second most important?" was more easily
answered than "Which was least important?" - though

obviously the information obtained is essentially the same.

The purpose of this line of questioning is not to determine the primary sources of purchase influence, but to determine the type of sensory experience which has greatest effect. This is of prime importance because it will help to determine the relative status of visible perception (iii), as opposed to information gathering (ii), or susceptibility to outside influences (i). Whilst it is accepted that these categories are perhaps highly simplified, the results, when contrasted with the related design expectations, allow the research conclusions to include a view of the user's priority compared with a view of the designer's view of his own professional influence on the product and its user.

Q 8   Compared with other products that you may have bought, like furniture, electrical goods, cars, etc, would you say that choosing a microwave oven was easier or more difficult? Why do you say that?

The question is put in the above form, but some attempt is made to link the consumer durables that are quoted as examples of the kind of products that are observed in the interviewee's home. Occasionally, if the user has difficulty responding to this question, a probe question is used: "Did you find it more difficult to select the product from the others available . . . was it more easy or more difficult to make up your mind?"

The results of the question are used to confirm or refute the theory that microwave ovens, because of their innovatory nature, are difficult for users to evaluate in terms of their potential usefulness. The evidence is unlikely to be conclusive as one particular factor – the number of products that the user makes his selection from – will affect attitude. This may have little or no connection with the number of ovens actually on the market at the time of purchase, but may be more closely linked with the proportion of those products actually encountered by the user.

Also, the nature of the marketing policy of the microwave industry must play a part in influencing the results – as was shown in the limited pilot questionnaires, the role of product demonstrations is highly influential and may well be viewed by the user as a means of easing the decision-making process.

In discussing any results from this question, it is important that such factors are taken into account.

Q 9   (Question space for purchase question)

Learning to Use the Product

Q 10   When you first bought the product, would you say
that (i) you read all the instructions before using
it; (ii) you read a few of the instructions before
using it; (iii) you read none of the instructions
before using it?

In the pilot interviews this question (like others which
were subsequently altered) produced a fairly predictable
response, in which nearly all the interviewees replied
that they had read all the instructions prior to operating
the product. It was, however, considered that even this
rather suspect response pattern did indicate a specific
and genuine attitude to the importance of instruction read-
ing. If it remains consistent in the questionnaire applica-
tion, it must be contrasted with previous questions, which
include information about facts stated in the instruction
manual, eg Questions 42 and 43 in the first part of the
questionnaire.

Q 11   Everybody makes mistakes when they first use a
microwave oven. What kind of difficulties did you
have when you first learned to use it?

The question is put in the form as above, but the words
"including me" are inserted after 'mistakes'. This is to
encourage the interviewee to feel that admitting to mis-
takes is not a critical self-judgement.

The main difficulty with this question is directing it at
the product learning process and not at the more general
mistakes that might have been made in carrying out the
food preparation. If the results are found to be biased
towards the latter, the only conclusion that can be drawn
is that the learning process for the product use and con-
trol was fairly simple, compared with the learning process
applied to the production of a reasonably high standard
of food preparation.

Q 12   Is there anything that can be done to the product
that would make it easier to learn to use? . . .
(Probe) like more instructions on the product it-
self or different types of controls?

The question is asked in the above form.

This question type has generally been avoided throughout
the rest of the questionnaire, since it is asking the
user to perform the role of designer. However, the real
purpose of the question is not to gather new learning
methods, even if this were possible. It is designed to
provoke the user to respond in a way which is critical of
the methods of learning that he/she has been involved in.

Product Identity/Style

Q 13   The style of a motor car can be described using a variety of words, eg sporty, sleek, compact, luxurious, etc. What words could you use to describe the style of the oven?

The question is asked in this form. The word "compact" has, however, been dropped from the list of examples, since it might readily describe the microwave oven and hence tend to lead the interviewee in that direction.

The purpose of the question is to allow the user to describe the overall identity of the product in a fairly open-ended form. During the pilot interviewing this particular question proved to be one of the most difficult for users to respond to and the assumption was that the question form itself was at fault. However, in later comparison tests between the appearance of the Creda and two other models, the results showed that the Creda user preferred the "simplicity" of the product. It may be therefore that the question itself is not inherently difficult to answer, but the perceived "neutrality" of the product itself is difficult to put into words. The results are therefore examined for a particular bias towards words which describe a neutral, simple, plain or ordinary image.

Q 14   I would like you to look at these photographs of other microwave ovens . . . (20 second pause approximately) . . . Is there one that you prefer the look of, rather than the Creda? . . . Why do you prefer it? (If the reply is no . . . Why do you dislike the other two products?)

The question is asked in the above form. The selection of other products has been deliberately kept to a minimum, ie two samples: a colour photograph of the Philips "Cooktronic 7915" labelled 'A' and the Toshiba ER-778 labelled 'B'.[6] The two images were selected on the basis that they represent a number of design extremes. The Toshiba is an early model, at least three years old, with a digital time read-out, temperature setting, 'heat and hold' control, complicated control panel, prominent door handle and imitation wood-grain finish. In general it has a slightly old-fashioned air. The Philips model has a visually simple, yet functionally complex, control panel, an information panel for various food cooking times, an unobtrusive door handle and a slightly futuristic style which departs quite radically from the traditional white goods identity, and would appear to have more in common with the Philips house style as applied to some of their hi-fi and video equipment. Both products have a more complex appearance than the Creda.

Like the previous question, the intention is to enable the user to indirectly describe his/her attitude to the

visual identity of the Creda - this time by contrasting
it with other possibilities. If, therefore, any comment
is made which refers to either of the examples it is always
contrasted with the Creda.

Q 15   How would you improve the way the Creda looks?

The question is asked as above.

As in the case of Question 12, the user is being asked to
make design decisions which he may find difficult, par-
ticularly given the fairly anonymous appearance of the
product. Certainly the tendency during the pilot inter-
views was to reply that the Creda was already attractive
enough as it was. However, this tendency is felt to be a
positive finding, since it would tend to show where the
limitations of product research lie, particularly when
contrasted with the following question - which is a
further probe to this one.

Q 16   What is the most ugly feature of the Creda oven?

The question is asked in this form.

The intention is to put the user into a position where
any response must be critical. The immediate reaction
during the pilot interviews was to state that there were
no ugly features - in which case it was found necessary
to run through different areas of the product appearance
until the user responded. The question serves the dual
purpose of creating a critical attitude before making
the overall assessment of the quality of appearance in
Question 17. This will tend to correct the tendency to
over-praise the product found during the pilot. The
technique is employed in Questions 16 to 27.

Q 17   Would you say that generally the oven is (i) ugly,
        (ii) good looking, (iii) of average looks?

The question is asked in the above form.

It is not really anticipated that the user will describe
the product as being ugly, since he did decide to purchase
it. However, compromises may have been made to justify
the purchase of a product of average appearance. Alterna-
tively the actual selection of products did not include
one which the user felt was attractive.

Q 18   Is there any aspect of the way the product looks
        that you feel does not fit in with your kitchen
        decor or other appliances?

The question is asked in the above form.

Again the question is intended to increase the critical
approach of the user prior to making a general judgement

- 113 -

in the question that follows. The relationship of the product's identity with other products and with the working environment is under scrutiny. The apparent anonymity of the object is likely to provoke few critical responses.

Q 19   In general, does the style fit in (i) very well, (ii) moderately well, (iii) not well?

The question is asked in the above form.

Q 20   Do any of the features have a low quality finish or standard of workmanship?

The question is asked in the above form. If there is no response the statement "Is there something that you feel is not particularly well made?" is added.

In the pilot interviews reactions to this were fairly variable. Some users expressed the opinion that most mass-produced articles had a low standard of finish and therefore tended to judge the Creda relative to this low standard. Others tended to judge it according to a more general quality standard.

Q 21   Would you say that the quality of finish or standard of workmanship of the oven is (i) high quality, (ii) of average quality, (iii) poor quality?

The question is put as stated.

As in the case of Question 19, a simple method of obtaining a value judgement is employed, to simplify comparisons with the design interview results.

Q 22   Which parts of the oven are the most difficult to clean?

The question is asked in the above form.

Few would argue that, compared to conventional cookers, the microwave oven is easier to clean because of its small size, lack of 'baked-on' food soil, smooth materials and, in the case of the Creda at least, a fairly uncluttered interior. The danger therefore is that any question concerned with ease of cleaning will produce a predictably favourable response pattern. To avoid this, the user is forced into a critical stance by having to pick individual features that are difficult to clean.

Q 23   Would you say that, in general, the oven is (i) quick and easy to clean, (ii) difficult and time-consuming to clean, (iii) average?

The question is asked in the above form.

Q 24   Which visible parts of the oven would you expect
       to show wear and tear first?

The question is asked in the above form.

Unless there is a major failure in the exterior quality
of the oven, it is likely that the average user will have
encountered little in the way of visible wear during the
one to two years of use. The question is really intended
to examine which features appear to be likely candidates
for wear and tear or which,for functional reasons (eg a
part of the product that is subject to frequent use) the
user decides will wear badly. In either case, it provides
an indication of product areas which require particular
design skills to overcome "apparent" weakness.

Q 25   Is the product generally (i) robust and durable,
       (ii) of average durability, (iii) not particularly
       durable?

The question is asked in the above form. The word 'robust'
is inserted in the first option only, to make clear the
meaning, or intended meaning, of the word 'durable'.

Q 26   What aspect of the oven would you consider to be
       least safe?

The question is asked in the above form.

The question results from early interviewing   with
manufacturers of microwave ovens, where problems of the
safety of microwave ovens had been publicised by the mass
media several years previously. This had resulted in a
major slump in sales from which the industry had only
recently started to recover. In early user interviews
it became apparent that nearly all the users had a knowledge
of the criticisms made but, at the same time, expressed
the fact that they considered their oven perfectly safe.
In other words, the users frequently expressed faith in
the product's safety record, whilst at the same time
describing evidence to the contrary, which they were in
no real position to prove or disprove. It is therefore
felt that there must be doubts within the consumer's mind
about the safety problem, which could only be probed in-
directly.

This question is intended to force the user to make a
critical judgement about a variety of potential safety
hazards, to see how frequently microwave leakage is referred
to relative to other hazards. Question 27 is intended to
document the superficial response, and option (viii) in
Question 27 to provide firm evidence that the user is con-
cerned enough about potential leakage to desire the inclu-
sion of a leakage safety monitor.

Q 27   In general, would you say that the oven is (i)
        very safe, (ii) moderately safe, (iii) unsafe?

The question is asked in the above form.

Q 28   Which of the following features would you wish to
        have incorporated in the oven if the extra cost
        was small? I shall read out the complete list
        then repeat it slowly so that you can indicate
        yes or no to each feature.

The question is asked in the above form, the motives be-
hind each optional feature being described individually.
One purpose of this question is to probe the attitude of
the user to automation. A number of the proposed features
may not be technically feasible, which does not affect the
validity of the responses. What is desired is an indica-
tion of the type of automation that users require and an
indication of those areas that the user is content, or
perhaps even keen, to continue operating manually.

(i)   The oven automatically detects any spillage of
        liquid or food and switches itself off, eg boiling
        over is prevented.

This feature is designed to represent a method of increas-
ing the 'foolproof' potential of the product. As has been
stated previously, the Creda, when contrasted with many
other ovens, has a level of apparent simplicity, which may
be one of the criteria for selection by the user. If this
is the case, a critical bias against many of the features
may have to be taken into account. The user may well see
this feature as a threat to his level of involvement with
the product and a diminution of the degree of skill normally
associated with the preparation of food.

(ii)   The oven cannot be switched on when empty.

With a minority of users it is necessary to point out that
the operation of the oven whilst empty may damage the
magnetron.

Again this feature would add to the foolproof operation
of the product but, in this particular case, the automation
is linked directly to what might be viewed as a techno-
logical inadequacy of the product. If this is the case,
the user is likely to desire the feature. Any view to the
contrary must be seen as a reaction against the added costs
and inconvenience of increased technological complexity.

(iii)   The oven cannot be switched on with metal objects
        inside it.

The question is very similar to the previous one and, to a
great extent, the results should be similar for each user.
Again it is intended to use this type of result to clarify

the user attitude to automation and to find out how this varies when the automation is de-skilling, as opposed to this case, where it is linked to a purely technological phenomenon.

(iv)   The oven is self-cleaning.

The question is usually extended to include a description: "A chemical causes the food deposited on the sides of the oven to flake off, under the action of microwaves".

The intention is to test the user attitude to the existing cleaning process, to determine whether there is any feeling that this could be improved.

(v)   The oven has a built-in thermometer that can be inserted into food.

The intention is to investigate the user's attitude to a device which is designed to give increased information about the progress of the cooking process. In this sense it is a very different feature compared with points (i) and (ii). It is the type of feature which is related to a skilled involvement with the product, and thus the general comparison can be made directly with (i) and (ii) results.

(vi)   The oven can be programmed so that the power cycle can change automatically, eg when defrosting the setting can go from low power to high without resetting.

The question is intended to provide the user with an easily understood example of a typical micro-processor control application, and to determine his attitude to it.

(vii)   A turntable is included, to rotate the food automatically.

This example is concerned with a characteristic which some users will have been aware of at the purchase stage, but presumably came to the conclusion that it was not particularly desirable. An affirmative answer would thus indicate that the user had acknowledged an incorrect buying decision or one which had demanded an important compromise.

(viii) The oven gives a warning if any microwave leakage occurs.

The reasons for the inclusion of this feature were described in Question 27.

(ix)   The oven can be set to stir liquids whilst cooking.

The question is usually followed by the following example:

"For example, if you want to make scrambled egg it will stir the liquid within the oven, so that you do not have to keep taking it out and stirring it."

The general intention of the question is to provide a feature which represents increased automation, whilst reducing a traditional chore rather than a skill.

Under the section for "NOTES", three other questions are asked, depending on the attitude of the user to the length of the interview by this stage.

Self-image Question

This takes the form "Amongst your acquaintances, do you tend to be the person who buys new products before the others? . . . or not?"

The purpose is to determine which users see themselves as innovation-adopters. Where indications of new product lines in the user environment are noted (eg the presence of a video tape recorder), these are recorded.

Percentage Use

The user is asked to allocate a percentage to how much cooked food is prepared on the microwave oven, as compared with the traditional cooker.

This is thought to be a good indication of the degree of use that the product is put to - it illustrates the relative success of the product and also the degree of flexibility of the user in adapting to the new technique.

Fulfilment of Expectations

The user is asked whether the product has been more useful or less useful than anticipated prior to its purchase.

Again this is intended to be an indication of the long-term success of the product.

The remaining portion of the questionnaire is devoted to descriptive records of the user.

Apart from the name and address, the age group within a 5 year block is noted. This is to be cross-checked with the designer's conception of his expected target market.

Similarly notes are made on the socio-economic group, in social class terms and also in terms of whether the user is an owner-occupier or an occupier of rented accommodation.

This is also to be compared with the designer's definition of his intended market.

The user is finally asked to give a self-description or occupation.

NOTES

1   Ziziros, M: Design Magazine, Jan 1979, No 361, p 42.

2   Microwave Cooking with Creda - Instruction Manual,
    40B-0005G, Issue 2, July 1978, p 8.

3   Ibid, p 7.

4   Ibid.

5   Baumgarten, S A: The Innovative Communicator in the
    Diffusion Process, Journal of Marketing Research,
    Vol XII (Feb 1975), pp 12-18.

In this section, as in the user question description, the
purpose and presentation of the questions is discussed.
However, because of the assumed degree of knowledge of
the design interviewees, the majority of questions require
fewer probes and hence there is little variation in the
form and pattern of the questioning. It is not therefore
intended to cover each question, but only those about which
extra information is involved.

The questionnaire was put to the interviewee in the exact
order of the printed document.

Questions 1 to 47

This section was introduced in a similar way to the tech-
nique employed with the user group. The interviewee was
told that this part of the research was intended to find
out how users perceived and understood the visual charac-
teristics of the product. In order to do this, accurate
information about the reasons for the existence of the
characteristics was required from the designer. The inter-
viewee was instructed to give the main reasons why the
design features were decided on. If he did not know, he
was asked not to guess but to provide the name of someone
in the company who did. The choice cards used in the user
questionnaire were not required, since it was assumed that
the interviewee's involvement with the production process
would familiarise him with the general motives underlying
design decisions.

It is recognised that, in asking for the main reasons, the
interviewee is in effect being asked to judge the level
of importance of particular motives. The danger is that
occasionally the individual may miscalculate and either
dismiss an important aspect or include an unimportant one.
However, the fact that more than one designer is inter-
viewed is bound to reduce this potential error. Also, it
is thought to be preferable to employ such a ranking tech-
nique, rather than allowing possible insignificant details
to dominate the answers.

Support Questions

As the forms of the questions differ from those in the
user questionnaire, each is described on an individual
basis in this section. The numerical listing is related
to the listing of the user questionnaire. Where there is
no parallel question (length of period of use, for example),
the numbers have been deleted.

Q 3   What would you say are the main attractions of
       microwave cooking for consumers? Would you
       rank these in order please.

The general aim of this question is to determine how
accurately the designer is able to predict the expecta-
tions of the market - any significant deviation must be
seen as a potential source of design error, although the
nature of the deviation defines the degree to which this
is significant. The rank order is similarly used as a
means of determining the significance of any mis-match,
although it may not always be possible for the inter-
viewee to provide a ranked order.

Q 4   What are the main attractions of the Creda, as
       opposed to other models? Would you rank these
       in order.

It is important that the interviewee is told to make the
comparison between the Creda and the competing products
that were on sale at the time the user group was making
its purchase, and not models which are new to the current
market. Again the rank order may or may not be possible.

Q 5   (What was the most important of the Creda features?)
       A question inserted by Creda in the original user
       questionnaire and no longer required.

Q 6   As the idea of microwave cooking is fairly new to
       most people, in what ways would you expect pros-
       pective purchasers to find out about and obtain
       information on the oven?

The question is designed to determine the designer's views
about t i p purchase related to consumer information. A
comparison of the two sets of information could, in theory,
yield information about the relative importance of an
explicit sales identity within the product itself. For
example, if the designer is convinced that most users
become aware of the product through secondary information
sources such as advertising, yet the user group relies
predominantly on access to the product itself or verbal
explanation by a trained demonstrator, then there might
well be a case for reconsidering the nature of the design
relative to initial market impact.

Q 7   I would like you to tell me which of the following
       you would expect to be the most important factor
       in influencing prospective users: (i) LISTENING
       to what friends or salesmen said about the oven;
       (ii) READING about the oven in books, magazines,
       etc; (iii) LOOKING at the oven in the shops or
       pictured in magazines. Which would be the second
       most important?

In this question comparison, it is intended that some

knowledge about the relative importance of sensory
influences on the purchase decision is revealed. The
answers will indicate the level of importance that the
designer attaches to his own work, compared with the
influences of perceivable characteristics on the user
at the purchase stage. Part (iii) of the question is
particularly significant for this.

Q 8   Compared with other consumer durables, would you
        say that choosing a microwave oven is generally
        (i) more difficult; (ii) about the same; (iii)
        easier?

It is likely that the design interviewees will assume
that the purchase of an unusual, technologically innovatory
product with a number of competitors, will prove difficult
for the consumer. Such an assumption, whether correct
or incorrect, may affect the design process by calling
into question the degree of visual explicitness of the
product.

Q 9   (Question space for additional purchase question)

Learning to Use the Product

Q 10   Would you say that the average user (i) read all
        the instructions before use; (ii) read a few of
        the instructions before use; (iii) read none of
        the instructions before use?

The predictable nature of the pilot user responses is
potentially reflected in this design question. Just as
the user is inclined to state that he has read all the
instructions, it is likely that the designer will tend
to make the assumption that the user would read only some
or none of the instructions before use. The findings will
be limited in any case by the fact that the question may
require a self-critical response from the user, which may
or may not be forthcoming. Ideally, an accurate result
would require an elaborate test in which the user was
tested on his supposed understanding of the instructions.
However, this technique is not within the scope of the
already lengthy questionnaire.

Q 11   What would you expect to be the most common diffi-
        culties and mistakes made by users when they first
        operate the oven?

With the designer group the nature of the response is
likely to be less specific than the user group response,
since if a difficulty is encountered by the user it will
have a well-defined, individual quality, whilst the designer
is forced by the question to speculate about general possi-
bilities. In comparing the results, therefore, it is neces-
sary to group the user responses into general categories
to match the design responses.

Q 12   Is there anything that you now feel could have
        been modified in the oven that would have made
        it easier to learn to use - eg more instructions
        on the product itself or different control arrange-
        ments?

In the case of the Creda microwave oven, a unique situation
exists related to this question, in that the model to
which the questionnaire was applied has subsequently been
redesigned. Many of the design changes that have been
made result from a re-evaluation by the designers and,
as such, provide some of the answers to the above question.
However, it would be a mistake to assume that all of the
design group's intentions have been incorporated in the
new model - thus there is still a need for the above
question to be put verbally.

Product Identity/Style

Q 13   The style of a motor car can be described using a
        variety of words, eg sporty, sleek, compact, luxurious,
        etc. What words would you use to describe the
        style of the oven?

It would be incorrect to assume that the members of the
design group would find it easier than the user group to
answer this question. Certainly if the designer is used
to describing essentially visual characteristics in verbal
terms, (if he lectures or writes about design, for example),
then one would expect an informative response. The realities
of the practice of industrial design, however, may not
demand such specialised forms of communication, and it is
therefore necessary to apply the other more probing ques-
tions contained in this section.

Q 14   I would like you to look at these photographs of
        other microwave ovens. Do you prefer the look of
        either of them to the Creda? Why do you prefer it?

In this question the designer is shown the identical photo-
graphic samples used in the consumer interviews.

Q 15   How, if at all, would you improve the way that the
        Creda looks?

Similar points arise to those in Question 12 with respect
to the redesigned model, although again both the verbal
answer and the new oven design must be used for the com-
parison.

Q 16   What would you say is the least attractive feature
        of the oven?

When put to the designer, this question would appear to
call for a certain amount of self-criticism, in which the
interviewee might be reluctant to indulge. It is believed

however that the fact that industrial design is usually carried out within a group of other disciplines may reduce the sense of self-criticism in favour of delegated criticism of the group performance. This would undoubtedly make it easier for the designer to give a direct answer.

Q 17   Would you say that the oven is (i) ugly, (ii) good looking, (iii) of average locks?

Q 18   Are there any aspects of the way the oven looks that you feel would not fit in with the decor and appliances found in the average user's kitchen?

There may be no mechanism by which the designer would be brought into contact with the intended environment for his product; any design decisions that are made about such an environment may be derived from rather remote sources. In the white-goods area, for example, great reliance is often placed on the information, preferences and opinions of the retailer. Knowledge about the consumer is sometimes seen, in the absence of formal market research, to be quite suitably acquired from such indirect sources.

Q 19   In general, would you say that, in visual terms, the oven would fit in (i) very well, (ii) moderately well, (iii) not well, with the average user's decor and other appliances.

Q 20   Do you feel that any of the features have a low quality of finish or standard of workmanship?

As with some of the previous questions, the possibly self-critical bias is, to a great extent, negated by another factor. It is possible that the design group view the quality of finish and standard of workmanship as being something outside their immediate field of responsibility.

Q 21   Would you say that the quality of finish or standard of workmanship of the oven is (i) high quality, (ii) of average quality, (iii) low quality?

Q 22   Which parts of the oven would you say are the most difficult to clean?

It is unlikely, but not inconceivable, that the t i p designer would not actually try out the product when it has been manufactured. This question must be considered therefore in terms of both possibilities: either that the designer's response is predicted from the inherent characteristics of the product, or he has used the product for a trial.

Q 23   Would you say that, in general, the oven is (i) quick and easy to clean, (ii) difficult to clean, (iii) average?

Q 24   Which visible parts of the oven would you expect
       to show signs of wear and tear first?

It is possible that the designer's response to this ques-
tion will represent an informed prediction of how the
product will age. However, the fact that the product is
relatively new to the market means that there will have
been little opportunity to obtain feedback on wear and
tear (unless something has gone drastically and immediately
wrong). The designer must therefore rely on his own
experience of the way materials and finishes perform and
apply this to the product and into the predicted mode of
use/user environment. It is this rather complex ability
that the question comparison examines.

Q 25   Would you say that the oven is generally (i) robust
       and durable, (ii) of average durability, (iii) not
       particularly durable?

Q 26   What aspect of the oven would you consider to be
       least safe?

This is perhaps an unlikely question to be answered
accurately, since it implies a self and company criticism
with potentially much graver consequences than those con-
cerned with pure aesthetics. It is possible that the
form of the answer, rather than its content, will indicate
areas of doubt about the safety factors. As with Question
24, the designer may not yet know a great deal about post-
market safety performance.

Q 27   In general, would you say that the oven is (i)
       very safe, (ii) moderately safe, (iii) unsafe?

It is unlikely, for the reasons mentioned in the previous
question, that the reply will indicate that the product is
unsafe. However, this is included in the list of possi-
bilities so that the "moderately safe" response will not
imply total criticism. A response in this form would
indicate some clear doubt about the safety aspect.

Q 28   Which of the following features would you expect
       the average user would like to see incorporated
       in the product if the extra cost was small?

As in previous questions, the latest model exhibits some
of the listed possibilities - the temperature probe, for
example - although it must be borne in mind that not all
the design proposals can be put into practice in a new
model which is an "improved version" and is not redesigned
from basics.

The most difficult area of this section is the questioning
devoted to purely hypothetical, technological features,
like the ability of the oven to detect spillage and switch
itself off. It is probably technically possible to produce

a product with this facility but not, at the present, within the production and R & D cost constraints. Hypothetical features when studied by most users would appear neither more nor less feasible than more feasible features, such as the temperature probe. The situation changes when the question is put to the more technologically informed design group. It is therefore important that the design interviewee appreciates the abstracted nature of the technology and considers how beneficial it might be to the user, rather than how difficult it might be to design and produce.

Q 29   Would you say that the majority of users are the kind of people who tend to buy new or innovative products before everyone else?

A speculative question, if put to designers who have had no access to market research. Beneath the surface of the response may lie an indication of a general attitude to the product: whether it is an expensive, clever, status-related toy or a genuine, explicit, labour-saving machine.

Q 30   What age group or groups would you expect to be the most common users of the oven?

This is again a difficult question to answer if the designer has had no access to formal market research findings. However, the importance of informal market feedback should not be underestimated. For example, at the Creda plant there was evidence of an informal information link between the resident home economist, who was in daily contact with consumers, and marketing/design personnel. Naturally this information is entirely divorced from the original design information, as it could only exist at the post-market stage. Other evidence of information which may have contributed to the design process was found in indirect communication between the retail trade and the designers. At Creda, for example, it was common for designers to spend some time at sales exhibitions where they would come into contact with retailers, who in turn had some knowledge of the general nature of the microwave oven consumer, prior to the marketing and design of a specifically Creda product.

Q 31   What percentage of cooked food would the average user prepare in the microwave oven, as opposed to the conventional oven? Would you expect there to be a wide variation in this?

Q 32   In general, would you expect that users would get more, less or the same use out of the oven than they anticipated before purchase?

The question is intended to probe the designer's understanding of the relationship between user expectation and the realities of product use. Obviously, advertising may

play a key role in arousing, sometimes, over-expectation, but the design input itself may contribute to the product appearing more useful than it actually is.

Q 33   Could you describe the kind of background, occupation, social grouping, etc, of the typical user group or groups.

The results from this question may be detailed or very generalised and, in terms of comparison with the user results, the stated limitations of sample quality must be taken into account.

DETAILS OF DESIGN INTERVIEWEE

This information is necessary, partly to judge the appropriate weighting if some of the design responses are conflicting, by relating the degree of influence and participation of the interviewee in the design decision, and partly to define the professional role and background of the interviewee and test its relevance to the design activity.

Name

Present Position in the Company

Depending on the response, it may be necessary to enlarge on the interviewee's self-description, so that he indicates firstly the activity he is engaged in and, secondly, his general professional level within the company.

Professional Background

The principal objective is to determine whether the design decision-maker has an engineering, industrial design, marketing or any other professional background.

Role in Developing and Designing the Microwave Oven

The designer is asked to summarise this in a paragraph and, if possible, to relate his role to the other participants in the new product development programme.

Predicted Changes to the Model

Question unnecessary because a direct comparison with the subsequent model is possible.

6.6 ANALYSIS OF THE SIGNIFICANCE OF MULTIPLE FUNCTIONS IN SINGLE PERCEIVABLE CHARACTERISTICS

As has been stated previously, design tends to produce
perceivable characteristics with multiple roles, for a
number of economic, technical and aesthetic reasons.
It is perhaps this act of rationalisation which, though
justifiable, must increase the ambiguity of meaning of
the characteristic and perhaps lead to a greater degree
of misinterpretation. It cannot be assumed that all such
misinterpretation is unjustifiable in design terms, and
similarly it would be equally misleading to assume the
reverse. Since materials became increasingly varied and
more flexible in form, design philosophy has expanded
from the single "truth to materials" dogma, so that it
is no longer assumed that visual identity should spring
from inherent qualities. This has provided increased
technical scope for the creation of illusory product
qualities, which may increase the perceived general value
of the product.

It is necessary therefore to discriminate between desir-
able and undesirable interpretations of perceivable
characteristics in a systematic way, in order to assess
the research findings. The implications of interpreta-
tion will vary considerably from one product and user to
another and will be related to the degree of innovation.
However, conclusions can be drawn by contrasting the
relationships between the four general functional roles
of perceivable characteristics (ie manufacturing, techno-
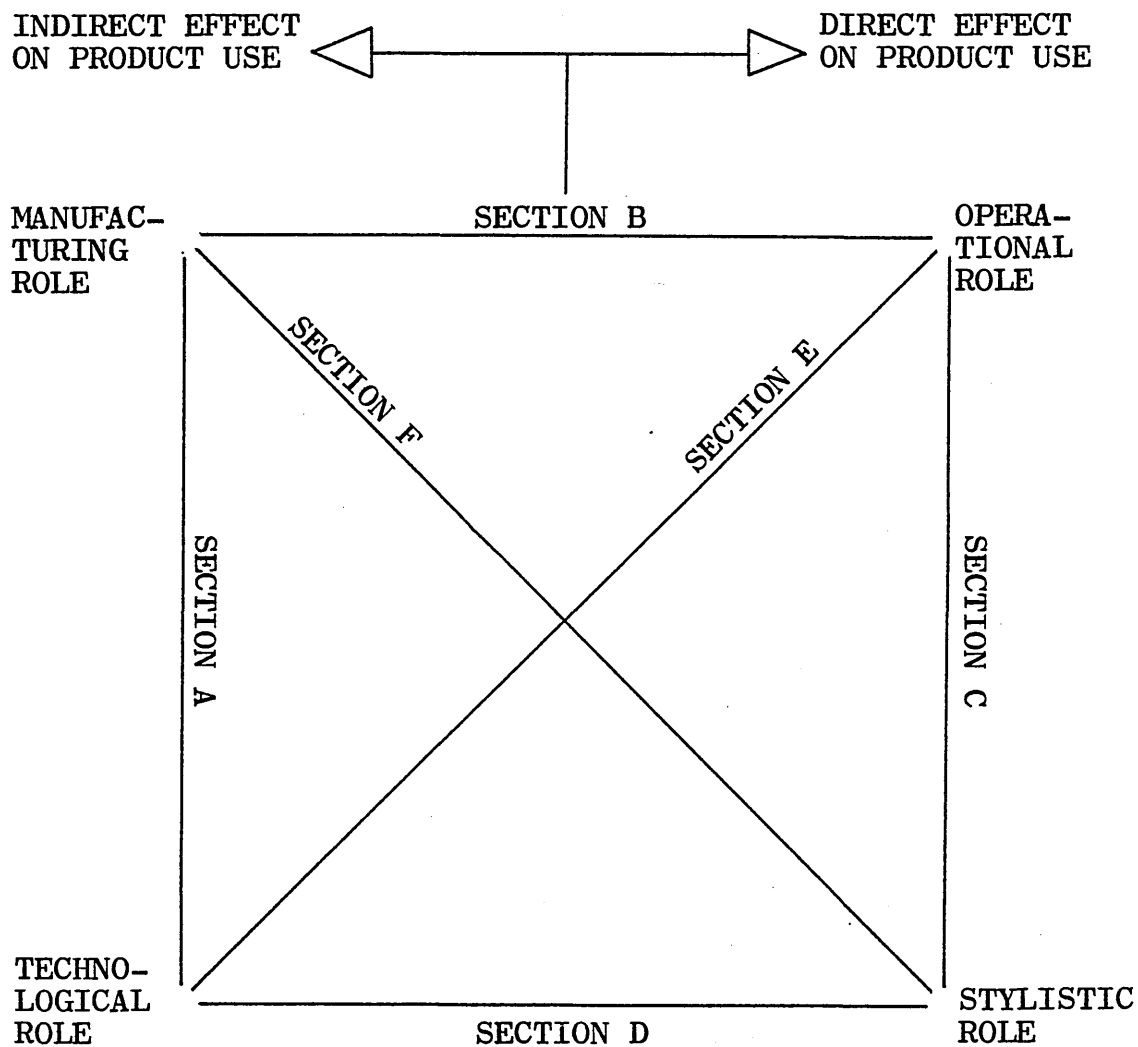logical, stylistic and operational) which will be exhibited
by t i p's.

To accomplish this it is initially necessary to produce
a simplified model of the interaction between the functional
roles of characteristics (T10).   This illustration
shows the six possible permutations, A to F, and their
relative level of importance at the user/product interface.
The manufacturing and technological roles are essentially
indirect and secondary, because lack of user perception
will not necessarily affect the ability to use the product
(although it may condition attitudes to it).

The operational and stylistic roles are, on the other hand,
directly related to the user's activity. The following
section describes the effects of mismatches in user per-
ception across these role definitions.

A. Manufacturing/Technological Roles

It can be noted that each mismatch works in either direc-
tion: a manufacturing role misinterpreted for a techno-
logical role and vice versa. Thus for simplicity the
above heading is taken to mean a manufacturing role as
defined by the designer, mistaken for a technological
role by the user.

This misinterpretation between two aspects which only

INDIRECT EFFECT
ON PRODUCT USE ◁————————┬————————▷ DIRECT EFFECT
ON PRODUCT USE

MANUFAC-
TURING   SECTION B   OPERA-
ROLE   TIONAL
                                                            ROLE

SECTION F   SECTION E

SECTION A   SECTION C

TECHNO-
LOGICAL   STYLISTIC
ROLE   SECTION D   ROLE

T10   DIAGRAM OF THE POSSIBLE ROLE PERMUTATIONS FOR
INDIVIDUAL PERCEIVABLE CHARACTERISTICS

The diagram shows the relationship of Sections A to F
beginning on page 129 of the Appendix, so that, for
example, Section A relates to the confusion of manufac-
turing roles with technological roles.

indirectly affect the user is one which has little direct
impact. It means in practice that the user's background
knowledge of the product's manufacture and how it works
is limited.

Technological/Manufacturing Role

Here the technological role as defined by the designer is
mistaken for a manufacturing role by the user. Again
this has little direct consequence for the user unless
he is involved with self-maintenance, eg the cylinder
head bolts on a car engine might be thought to be devices
to facilitate the fitting of the engine to the car, in
which case the user's ability to maintain the engine
would be restricted.

The mismatch may have other indirect effects, in limiting
overall technical know-how, so that the optimum operational
parameters are affected. It is, however, unlikely that
a single mismatch could cause this, but rather the sum
total of several mismatches.

B. Manufacturing/Operational Role

Here the user has mistaken something which is intended
purely to facilitate production for an aid to operation.
The user, rather than the designer, is the final arbiter
of what constitutes a useful functional characteristic.
In this case, for example, it is beneficial if the manu-
facturing characteristic possesses some unintentional
yet ultimately useful side-effect. However, it may con-
versely illustrate the lack of understanding of product
use by the designer. Also it may possibly encourage the
misuse of the product if it detracts from the necessary
operational pattern.

Operational/Manufacturing Role

Here the user has assumed that a potentially useful or
necessary control or ergonomic aid is merely present to
aid production. Obviously this represents a direct limita-
tion on successful product use, assuming that the charac-
teristic is not a superfluous addition.

C. Operational/Stylistic Role

The implications are similar to those of the previous
example, in that a potentially useful operational charac-
teristic is judged to be purely decorative and, as such,
rendered useless from a functional point of view. An
example of this phenomenon is an applied graphic symbol
which does not appear to the user to have any particular
functional meaning - which is not the same as a user
recognising a functional symbol but being unsure of its

meaning. In this latter case, a purely stylistic role
is not assumed. It represents a mismatch or misinterpreta-
tion within the role and not across the boundaries between
other roles.

Stylistic/Operational Role

Again the user may be the final arbiter in deciding what
constitutes an operational characteristic. For example,
in ascribing a colour to a particular product, the designer
may be motivated by the single desire to maximise the
visual attractiveness of the object. It is possible,
however, that the user may, incorrectly, ascribe operational
meanings to the colour - "It will not show the dirt",
"It can be seen easily", etc.

D. Stylistic/Technological Role

In this case a purely stylistic characteristic has been
mistaken for a technological attribute by the user. This
phenomenon may be increased by the prevalence of "technical
styling", where purely stylistic scientific symbols are
built into products to encourage a spurious belief in
their technological abilities and sophistication. It is
possible that in so doing it encourages high expectations
at the purchase stage which are unfulfilled in use. Con-
versely, it cannot always be assumed that such high expecta-
tions will always be tested. For example, a bogus set
of cooling fins fitted to a machine may imply that it is
more powerful than other models which have none. Its
operational limits, however, may be above those required
by the user and hence the inadequacy remains hidden. A
fundamental long-term belief in the operational superiority
of the product may therefore persist. However, it must be
borne in mind that the various consumer testing organisa-
tions test products to their operational limits and such
information may well be fed back into the user group.

Technological/Stylistic Role

In this case, although the user may not directly inter-
act with the product's internalised technology, there are
circumstances when he may unwittingly alter the externalised
characteristics of the technology. For example, a device is
finished in a certain colour to radiate maximum heat. If
this colour is understood to be purely a stylistic device,
then there is little to discourage its user from changing
it for a less functionally efficient alternative.

Such circumstances may be rare, but user behaviour outside
the ordinary operational running of products may be affected
by this general type of misinterpretation.

Conversely, there may be cases in which the designer decides
that it is preferable not to communicate that little bit of

(technical) knowledge which might be a dangerous thing. Thus, often for safety reasons, there are cases where a technological detail might be suitably disguised as a stylistic component - the screw heads which secure the covers of a high voltage device, used by untrained operators, for example.

E.   Operational/Technological Role

In this case an operational function is interpreted as being something which is related to the way the product works and not a function which enables the user to operate the product. General examples of this are likely to be found where a designer has attempted to match a control (by colour, form or texture) too closely to its surroundings and where the user has not received information about this from instructions, demonstration, etc.

Technological/Operational Role

Examples of this reverse case, where a technological function is thought to fulfil an operational role, are likely to be less common than the above. This is because of the previously discussed remote nature of technological detail and thus relatively few technical characteristics would be directly observable by the user. Again it must be emphasised that the judgement of what constitutes an operational function is often the user's, and thus a technological feature which exists in an external form - a machine motor component, for example - would rarely be externalised unless there was a good physical reason (eg the cooling function of a heat exchanger exposed at the rear of a refrigerator). Where a piece of technology is externally revealed, it is sufficiently rare in the contemporary product field for the user to automatically assume that it has a non-technological function.

F.   Manufacturing/Stylistic Roles

In this case a manufacturing detail, eg the markings left by mould flashing on many plastic and metal products, is interpreted by the user to be a visual decoration. As was stated earlier, this type of illusion is often seen as a highly desirable one, since a reduction in production costs has directly resulted in a more attractive, and hence more marketable, object. However, its occurrence in the questionnaire results must indicate a clear limitation of user knowledge, but knowledge which is not, in general, a barrier to successful product use.

Stylistic/Manufacturing Roles

In the reverse of the above, taking the same example, a purely decorative detail on a plastic or metal moulding

may be considered to be a by-product of the moulding process by the user. It is not, however, considered to be a particularly significant misconception, since it would not directly affect the operation of the product.

The above comparisons represent extreme cases, where the characteristics have single functions - in practice, it is likely that many would fulfil multiple roles and hence comparison will be difficult and complex. It is now necessary for the main limitations of the technique so far described to be discussed.

Perceivable Characteristics that are Mismatched within Identical Functional Groups

Four general functional groups have been defined within which the purpose of all perceivable characteristics can be placed. These are: manufacturing, technological, stylistic and operational functional roles. The significance of mismatched perception of one functional role for another has been assessed for all the possible permutations. However, it is inevitable that mismatches will occur between design intentions and user perceptions within the same functional groups, which may be as significant as those which occur between different functional groups.

To give a simple example, a product may have a number of controls, some of which are not understood or are mistakenly identified by the user. This could obviously have a highly significant effect on how the product is used, even though the general functional role (operational) has been correctly designated. Similar effects are possible in the three other functional roles, so their relative significance will be analysed separately.

Technological Role Mismatch

Mismatches which occur within this first category are indicators of lack of knowledge on the part of the user about how the product works. It is debatable how important this is, in terms of the total product technology (internal and external). At one extreme there are certain professional and skilled amateur users who require a deep understanding of internal technology, either to develop and maximise the performance of the product, or to be prepared for unusual or unpredictable operational contingencies. Within this group, it is also often the case that the operational characteristics are so complex that an understanding of the synthesised user/technology interface can only be learned by first comprehending how the internal technology functions.

At the other extreme are the untrained, relatively uninvolved product users, who depend on outside professional service

if unusual contingencies (eg an equipment malfunction) arise. This group is the group that this research has focused on and it is tempting to assume that any knowledge about the internal technology would be surplus to requirement. Certainly this is true for a large number of products, particularly those which are reliable, durable, safe, relatively foolproof and which possess fairly straightforward control interfaces - a simple pocket calculator, for example. It is less true for those products which tend to have the reverse properties, in which case the range of potential "unusual contingencies" is increased. For example, the less sophisticated dye-line copying machines, which have complicated control interfaces which rely on observation/use feedback, contain potential safety hazards - mechanical, electrical and chemical - and are not noted for their durability.

It might well be argued that this latter example would be used by predominantly trained personnel, who would be sufficiently informed to be capable of rationally resolving most contingencies. However, there are many products aimed at the untrained user which exhibit similar characteristics - pressure cookers, electric steam irons, motor cars, lawn mowers, etc - where a knowledge of underlying technical principles might be beneficial in resolving uncharacteristic product performance. (In the case of t i p's, the added difficulty arises that the user may not be able to differentiate between normal and abnormal product performance in the first place, unless directed by separate instructions.)

As has been stated in a previous chapter (Ref 1.3.4), technology has tended to become more and more internalised and remote from the user, with consequently a smaller proportion of perceivable technological detail existing externally. This development may mean that any technological detail that does remain will have no logical visual continuity, nothing which can connect it with an explanation of how the product works. A bicycle, for example, can be seen to be a coherent system of mechanical parts, whilst a television receiver appears to be a simplified enclosure with a small number of fragmented, externalised technological characteristics: the glow from a valve, a heating vent, the prominent bulge of the rear of the CRT, a speaker grill, an external aerial, etc. In the case of the t i p, by definition, less is likely to be known about the product technology by its user and hence the lack of coherence and fragmentation of the externalised technology is exaggerated.

This leads to the conclusion that there is likely to be a relatively high proportion of technological characteristics which are mismatched, compared with more established product types. It is assumed that any externalised technological characteristic is significant in use and that a misinterpreted characteristic may represent a possible

source of user difficulty. This could be obviated through design revisions; product instructions could label the characteristic correctly; the characteristic could possibly be internalised; the characteristic could have a more accurate design identity.

Stylistic Role Mismatch

A simple illustration of this type of mismatch would occur if a stylistic device employed by the designer to achieve a particular effect was perceived by the user to have an entirely different effect (eg the horizontal line was added to make the product look wider - the horizontal line makes the product look taller). In practice it has been found that not all users are able to provide verbal explanations of visual characteristics, so that any mismatches detected in the results will be unquantifiable. This is believed to be an acceptable limitation, inasmuch as the mismatching of purely stylistic details has no particular relevance to t i p design alone, but is a subject which has significance for most design fields.

The significance of stylistic roles only becomes apparent in t i p design when confused with other functional roles.

Manufacturing Role Mismatch

A general example of this would be an externalised production detail, such as a taper to allow a plastic product to be removed from a tool, being identified as a material economy.

This section extends the work of Rogers[1] on the diffu-
sion of innovation to discussion of the five-stage purchase
process for the t i p.

(a) Awareness

Rogers[1] defines awareness as the point when "the individual is exposed to the innovation but lacks complete information - often becoming aware by accident".

A fundamental problem which arises from t i p selection at this stage is that, although the consumer may well be exposed in the physical sense to the innovation, he or she may be unaware of any truly innovative characteristic. The causes of this may be various: a growing confusion of product identities (as documented by Wouldhuysen in a survey of the Hanover Technology Fair);[2] the 'remote' nature of much technology, rendering functional capabilities less explisit (ref Mono);[3] the complexity of much technology and technological language obscuring the capabilities of the innovation. For many reasons, therefore, the consumer may be less frequently exposed, in a sense that creates understanding and awareness, to technological innovation than to other forms of innovation. This poses special problems in both the design and marketing of products.

(b) Interest

This is the phase, identified by Rogers, when "The individual becomes interested in the idea and seeks additional information on it".

This information search will possibly be more difficult for an innovatory product than a known quantity, simply because more information will be required. A glance at back issues of the Consumers' Association Magazine "Which" tends to confirm this view, as the descriptive information devoted to innovatory products far exceeds that devoted to non-innovatory products. For example, in the November 1979 issue there were 190 cm of columns of text devoted to microwave ovens, with a mere 53 cm devoted to ordinary electric cookers.

The matter is perhaps further complicated when the innovation is technological - for certain products it may be necessary to explain the underlying technological principles in order to demonstrate the functional characteristics. The microwave oven is a good example, where a significant proportion of sales literature is devoted to rudimentary descriptions of microwave technology. Even descriptions of the physical capacities, such as the power output, for example, may require reference to units of measurement which may be unfamiliar to many consumers. The prospective t i p purchaser is thus frequently expected to proceed through a definite learning process, even at this early stage.

Also, the fact that the product is innovatory means that certain sources of information will be reduced. Contact

with other users, for example, is bound to be restricted since, by definition, there are fewer innovatory product users around.

In a survey of pre-purchase information-seeking for new cars and major household appliances,[4] Newman and Staelin regarded the purchase decision procedure as being essentially a learning process. Their findings supported the hypothesis that the "information search varies directly with (consumer) education because the latter represents ability and interest in seeking and evaluating information". Although this study in no way seeks to apply this hypothesis to t i p's, it is envisaged that an appropriate t i p purchase may well depend upon the consumer's inherent ability just as much as on the characteristics of the products. T i p's may well demand greater learning abilities than established products and may possibly, therefore, require improved methods of conveying information about the product.

(c) Evaluation

As Rogers states, "This is the stage when the individual mentally applies the innovation to his present and anticipated future situation and then decides whether to try it. A sort of 'mental trial' occurs at the evaluation stage."[1]

It is this phase which probably poses the greatest difficulty for both the producers and users of t i p's, particularly if the innovation is discontinuous, as in the case of the pocket calculator, where the consumer may have the greatest difficulty in relating the product to his or her present and future needs without a direct trial with the product itself. A perfect example of this is contained in the Hewlett-Packard Report (ref No RM13) where market research techniques failed to predict a demand for the then unmarketed pocket calculator. User tests of a simulated calculator, however, produced data which identified a considerable demand, implying that consumers are unable to predict patterns of use of new products at an abstracted level. This is a problem for both the producer, in terms of predicting market demand for future innovatory products, and also the user.

The evaluation period is also a time when there are marked differences between 'technology push' orientated products and the 'demand pull' equivalent. If the product is induced by a demonstrable demand, Rogers' "mental trial" is bound to be dominated by a comparison of just how well the product matches up to the preconceived requirements. If, on the other hand, it is a predominantly 'technology push' product it will comprise information gathering and interpretation, and prediction of future use possibilities - a much more complex procedure.

The research method, although it does not define t i p's

in terms of these two factors, does record the differing methods of evaluation by consumers.

(d) Trial

"At the trial stage the individual uses the innovation on a small scale in order to determine its utility in his own situation. The main function of the trial stage is to demonstrate the new idea in the individual's own situation and determine its usefulness for possible complete adoption."[1]

The trial stage may or may not be part of the consumer's adoption process, either because he or she does not feel the need for one, or because a trial may not be possible. This latter cause may vary considerably from one type of product to another. Non-durable items of food, for example, may be easily sampled on a small scale prior to adoption. Similarly, articles of clothing can be tried in situ. With more durable items, trial becomes, in many cases, less convenient.

The character of the sales point also affects the opportunity to try out and test the suitability of a product. For example, hi-fi equipment – at one extreme there are retail outlets which preclude a trial, such as mail order or discount warehouses; at the other extreme certain retailers will offer home trial, demonstrations in the home, or 'approval' schemes. The research method records the type of sales outlet, together with evidence of pre-purchase trial, as it is suspected that t i p's may be retailed in ways which prevent trial (for example, mail order or "warehouse" direct selling methods).

The rapid pace of t i p manufacture is frequently reflected in aggressive retail methods once the product has reached the competition stage, which depend on high sales turnover and non-specialist sales forces. This results in many cases in a reduction in demonstration capability, together with a greater reliance upon passive information sources, sales literature, etc.

Donnelly and Etzel assume that:[5]

> "Decisions to try new products actually
> involve two kinds of risk. Specifically,
> the type of consumer who tries new products
> appears to be willing to risk purchasing
> some products with which he may not be satis-
> fied. On the other hand, the individual
> who restricts his purchases to products with
> which he is familiar is rarely dissatisfied
> with these familiar products. However, this
> individual takes the risk of avoiding many
> products that could provide him with more
> satisfaction than the ones he currently

purchases."

As the research method is concerned exclusively with
t i p's, there is a distinct possibility that the con-
sumers interviewed are more willing to risk purchasing
an unproven product than the average buyer. For this
reason the reduction of demonstration facilities at the
retail outlet may not be considered a problem by this
group.

It should also be noted that many product characteristics
cannot be assessed effectively by a short term trial -
such areas as reliability, safety, and overall running
costs. Users whose selection of a product is based on
these factors may well feel that a trial is unnecessary.

(e) Adoption

"At the adoption, the individual decides to continue the
full use of the innovation. The main functions of the
adoption stage are: consideration of the trial results
and the decision to ratify sustained use of the innova-
tion."(1)

Again the t i p user will have a modified behaviour pattern
differing from that specified by Rogers, in that he or
she may use the product for the first time only after
purchase. Consideration of the trial results may thus
be a case of assessing results obtained by others - either
formally, as assessed by consumer publications (such as
"Which", "What Buy"), or informally through contact with
other users.

NOTES

1   Rogers, E M: Diffusion of Innovations, The Free Press,
     New York, 1962, pp 81-86.

2   Woudhuysen, J: Design, 367, p 41.

3   Mono, R: Design, 352, p 48.

4   Newman, J W and Staelin, R: Pre-purchase Information
     Seeking for New Cars and Major Household Appliances,
     Journal of Marketing Research, Vol IX (August 1972),
     pp 249-257.

5   Donnelly, H J and Etzel, M J: Degrees of Product
     Newness and Early Trial, Journal of Marketing Research,
     Vol X (August 1973), pp 295-300.

Adjacent Technology

Ref Woudhuysen, J: How Micros Can Rub Away the Bumps on
Top and Leave New Lumps Below, Design, 366, June 1979, p 18.

When a fundamental technological advance occurs in a
product it often accelerates the advance of other (adjacent)
technologies within the product. For example, the micro-
processor in the pocket calculator speeds up the develop-
ment of the adjacent LCD display system.

Advanced Technology

Technology which is more sophisticated than that which is
currently diffusing into products.

Apparent Value

The anticipated financial price of a product, judged
solely on visual qualities by the potential customer.

Applied Graphics

Any two-dimensional design work on the product - includes
symbols, instructions and decoration.

"Black Box" Product Style

A visual style which minimises the meaning of the product
within an anonymous aesthetic and hence increases its
similarities with other, equally anonymous products,
serving different functions.

Closed-ended Question

An interview question designed to elicit specific informa-
tion within a highly structured framework.

Consumer Needs, Consumer Requirements, Consumer Demands

Needs - Non-luxury items or features that the consumer
group considers to be necessary for tolerable living con-
ditions.

Requirements - Products or characteristics of products
for which their consumers have expressed a genuine pref-
erence and which are likely to prove beneficial in use.

Demands - Products or characteristics of products for
which there is consumer preference, unrelated to post-
purchase requirements.

Definition of the Stages Leading up to the Adoption of an Innovation

Defined by Rogers, E M: Diffusion of Innovations, pp 81-86.

(a) Awareness

The stage when the individual is exposed to the innovation but lacks complete information - often becoming aware unintentionally.

(b) Interest

The stage when the individual becomes interested in the idea and seeks additional information on it.

(c) Evaluation

This is the stage when the individual mentally applies the innovation to his present and anticipated future situation and then decides whether to try it.

(d) Trial

At the trial stage the individual uses the innovation on a small scale in order to determine its utility in his own situation.

(e) Adoption

At the adoption stage the individual decides to continue the full use of the innovation.

Demand-Pull

The opposite of technology-push (QV) - a product which is manufactured as a direct result of a proven consumer requirement.

Design Intentions

The purpose of individual and collective design characteristics, as expressed by the designer(s) of the product.

Firmware

Any device which acts as a store of software (information, programmes, etc) and enables it to be inserted into an interpretative machine (hardware), eg tape, card, disc, film.

Functional Information

Functional information explains or helps to explain what the product does, how it does it and how to use it. It can be either product-based, ie found on the product itself, or instruction-based, ie remote from the product in verbal or diagrammatic form.

Robertson[1] has identified three different types of
innovation. These are modified for use in the research
with reference to _technical_ innovations. Robertson's[1]
definitions read as follows:

1. A Continuous Innovation - Has the least disrupting
    influence on established patterns. Alteration of a
    product is involved, rather than the establishment
    of a new product.

2. A Dynamically Continuous Innovation - Has more dis-
    rupting effects than a continuous innovation, although
    it still does not generally alter established patterns.
    It may involve the creation of a new product or the
    alteration of an existing product.

3. A Discontinuous Innovation - Involves the establish-
    ment of a new product and the establishment of new
    behaviour patterns.

Given this document's broad working definition of the
technologically innovatory product (ref 1.2), it is clear
that the two sets of definitions are mutually compatible
and Robertson's can thus be modified to apply specifically
to t i p's:

1. A Continuous Technologically Innovatory Product

An industrially produced object which results from the
alteration of an existing product, rather than being a
newly established product. It incorporates new technology,
which results in new functional characteristics, which
have limited disrupting influence on established patterns
of behaviour.

2. A Dynamically Continuous Technologically Innovatory
    Product

An industrially produced object which may result from the
alteration of an existing product or be a newly established
product itself. It incorporates new technology, which
results in new functional characteristics, which do not
generally alter established patterns of behaviour.

3. A Discontinuous Technologically Innovatory Product

An industrially produced object which is newly established.
It incorporates new technology, which results in new func-
tional characteristics, which, in turn, establish new
patterns of behaviour.

Interfaces

Control Interface

The parts or zones of a product which facilitate its
operation by the user, including those parts or zones
which provide operational information.

Input Interface

The parts or zones of a product which facilitate the
intake of energy, materials or data for processing.

Internal technology

The functional mechanism of a product which is imper-
ceptible from the exterior.

Output Interface

The parts or zones of a product which facilitate the
removal of processed energy, materials or data. (In
many products the input and output interfaces are com-
bined, eg the loading door of a washing machine.)

Product Enclosure

Any exposed part or zone of the product's structure or
superstructure that does not constitute any of the other
defined interfaces.

Service Interface

The parts or zones of a product by means of which the
user or trained individual is able to carry out maintenance.

Line Structure

Ref Sears - Roebuck Research Interview (Ref No RM14).

A line structure is a range of products with the same
manufacturer and basic function but offering different
secondary functions at varying price levels.

New Technology

The technology that is currently diffusing into innovatory
products, as opposed to innovatory technology, which
refers to the historical period when any given technology
was or is new to the product.

Open-ended Question

An interview question which is intended to elicit a free,
wide-ranging and unstructured reply, the purpose of which
is to reveal unsuspected information and to encourage less

guarded responses in the interviewee.

Perceivable Characteristics

Those qualities of products - visual, tactile, audible and odorous - which are directly experienced by both users and non-users and which may indicate both real and mythical product attributes.

Pilot Questionnaire

Refers to the first trial of the questionnaire method with the user group of a single t i p. The purpose was to test the consistency of response patterns and to correct inadequate question forms.

Point of Sale

The environment or situation in which the product purchase is made - includes conventional retail outlets, mail order methods, trial periods, unseen purchase, etc.

Post-Market Research

The gathering of information from product users.

Predictive/Prescriptive Design Methods

A predictive design method is one in which a serious attempt is made to research the requirements or preferences of potential users and to use this information during the design process for decision making.

A prescriptive design method is one in which no user research is fed back into the design process, but rather an attempt is made to create new requirements and preferences as a result of the new product's design.

Pre-Pilot Questionnaire

Refers to the first application of the questionnaire method amongst a variety of products, their users and their designers. The purpose was to examine both specific and non-specific problem areas, to determine effective interview techniques and to experiment with a means of contrasting designer and user responses.

Pre-Purchase Expectations

The anticipated performance of the product in use, as pre-dicted by the non-user.

Probe

A supplementary question used during interviews if a particular response is felt to be incomplete or inaccurate.

Producer

The individual or group responsible for the decision to design, develop, manufacture and market a product.

Product Attributes

The functional capabilities of a product - what the user may accomplish with the aid of the product - the factors which indicate the relative level of the product's performance.

Product Identity

The composite meaning of a product derived from its attributes, perceivable characteristics and associations.

Product Planning

The development of long-term strategies for the design, development and marketing of products, based on the researched prediction of technological developments, user requirements, economic considerations, company performance, market competition, social and demographic changes and manufacturing constraints. The purpose of product planning is to encourage the smooth overlap of product life-cycles, the establishment of compatible product ranges and the maximisation of the market lead time of products.

Questionnaire

Refers to the final form of the developed questionnaire, as applied to user and design groups of the single product.

Self-Service Products

Those products which represent the equivalent of industrial or commercial sector production equipment, transformed for domestic use, eg do-it-yourself equipment, washing machines, Prestel and other information systems. (See Gershuny, J: After Industrial Society?, Macmillan, 1978, p 80.)

Styling

The manipulation of visual elements by the designer for purely aesthetic purposes.

Stylised

Describes a product or characteristic in which purely aesthetic design criteria predominate.

Support Questions

The questions in the second half of the questionnaire, which are concerned with the general characteristics of

t i p use, as opposed to the non-support questions devoted
to the user's comprehension of the meaning of perceivable
attributes in the first part.

Technical Styling

The deployment of functional design characteristics in
products for primarily non-functional motives. The intro-
duction of superficially functional technology into
products to create consumer demand primarily through its
visual associations, and not because it fulfils a func-
tional role.

Technological Assessment

"The systematic study of the effects on society that may
occur when a technology is introduced, extended or modified,
with special emphasis on the impacts that are unintended,
indirect and delayed." - Coates, J F: Methodological Guide-
lines for the Social Assessment of Technology, OECD, 1975.

Technologically Innovatory Product (t i p)

A mass-produced, useful object that requires new control
techniques and which exhibits new functional capabilities
as a direct result of developments in its integral tech-
nology.

Technological Spin-off

The technological developments in one field creating
technological opportunity in another as a by-product.
In this research special reference is made to techno-
logical spin-off effects from large-scale programmes in
the aero-space, military, transport and medical fields,
etc, into high-volume product design.

Technology-Push

The momentum generated by existing technological research
and development, which may encourage the unsuitable applica-
tion of technology to products without due consideration
for the needs of the consumer. The opposite of demand-pull.

Untrained User

A product user who has received no formal instruction in
operating the product, such as serving a professional
apprenticeship, attending a training course for commercial
purposes, etc, but rather has depended on the self-teaching
information supplied with the product or attended a simple
sales demonstration.

NOTES

1   Robertson, A: Innovation Management, Theory and
     Comparative Practice, MCB Publications, 1974.

REFERENCES

AARON, R: "Progress and Disillusion: the Dialectics
of Modern Society" UK, Penguin, 1972, Ch 5.

ANON: "The Home of Today" UK, Daily Express Publications,
1934, p 173.

ARCHER, L B: "Computers, Design Theory and the Handling
of the Qualitative" Department of Design
Research Paper, London, The Royal College of
Art, 1976.

AW Design Study Group of the Establishment for Product
Design and Product Planning and IPI: "Function
Analysis in Product Planning" Germany, Institute
for Product Research and Information, 1978.

BARRON, I and CURNOW, R: "The Future With Microelectronics"
Forecasting the Effects of Information Technology,
UK, F Pinter, 1979, p 134.

BARTHES, R: "Système de la Mode" UK, Open University,
1975, p 47.

BELL, D: "Notes on the Post-Industrial Society" The
Public Interest, Part 6, Winter 1967.

BELL, D: "The Coming of the Post-Industrial Society:
Venture in Social Forecasting" UK, Heinemann
Education, February 1974.

"Belling 79" Sales Brochure, 1 July 1979.

BERGER, J: "Ways of Seeing" UK, Penguin, 1972.

BLAUNER, R: "Alienation and Freedom" University of
Chicago Press, 1964, pp 20, 23, 26, 29, 32.

BOVA, B: Computer Weekly, 5 October 1978, pp 10-11.

BROOKS, H: "Science, Growth and Society; A New Perspective"
Paris, OECD, 1971, Ch 4.

BRUTTON, M: "After Modernism - Towards a New Industrial
Aesthetic" Design, Vol 368, August 1979, p 84.

CHARPIE, R A: "The Management of Technological Innovation"
USA, Harvard Business Review, May-June 1969,
p 162.

CLARKE, R: "The Pressing Need for Alternative Technology"
Impact of Science on Society, 1973.

COATES, J F: "Methodological Guidelines for Social
            Assessment of Technology" Paris, OECD, 1975.

Creda Instruction Manual, pp 7-8.

CROSS, N, ELLIOT, D and ROY, R: "Man-Made Futures" UK,
            Hutchinson, 1974, p 13.

DAVIDSON, P: "Home Management" UK, Batsford, 1960,
            p 192.

DE BONO, E: "Eureka" UK, Thames and Hudson, 1979,
            p 150.

DEBORD, G: "Society of the Spectacle" Detroit, Black
            and Red, 1970.

DICKSON, K and MARSH, J: "The Microelectronics Revolution:
            A Brief Assessment of the Industrial Impact"
            UK, Technology Policy Unit, December 1978.

DONNELLY, H J and ETZEL, M J: "Degree of Product Newness
            and Early Trial" Journal of Marketing Research,
            Vol X, August 1973, pp 295-300.

DORFLES, G: "Design History; Past, Process, Product"
            London, Design Council, 1979.

EDWARDS, A: "Design for Living" UK, Ward Lock Ltd,
            1970, p 11.

Engineering Today, UK, Vol 3, No 12, 26 March 1976.

EVANS, C: "The Mighty Micro" UK, Gollancz, 1979.

Fagor, Sales Literature, 1980.

FORTY, A: "Wireless Style" UK, Architectural Association
            Quarterly, Spring 1972.

FORTY, A: "The Electric Home" UK, Open University, 1975,
            p 47.

GERSHUNY, J: "After Industrial Society" UK, Macmillan,
            1978, pp 80-81, 138-139.

GREGORY: Cabinet Maker Magazine, UK, 21 October 1933,
            p 86.

HOLLINGTON, G: "Last Word on the Product Identity Debate"
            UK, Design, 347, February 1980, p 34.

Industrial Design: "Doblin's Pyramid" USA, January/
            February 1981, p 37.

JEWKES, J, SAWERS, D and STILLERMAN, R: "The Sources
        of Invention" UK, Macmillan, p 136.

Journal of Marketing: "Coffee - Projective Techniques in
        Marketing" April 1950, pp 649-656.

LANGRISH, J: "Wealth from Knowledge" UK, Macmillan,
        1972, p 75.

LARGE, P: "Are we prepared for the New Society that
        must follow when computers run industry?"
        Guardian, 18 July 1977.

LARGE, P: "The Day After Tomorrow" Guardian, 17 February
        1979, p 9.

LLOYD JONES, P: "A Taste of Class" UK, Architectural
        Review, February 1979, p 75.

LUKACS, G: "History and Class Consciousness" UK, Merlin
        Press, 1971, p 86.   (Translated from German.)

MANNHEIM, K: "Man and Society in an Age of Reconstruction"
        New York, Harcourt Brace and Company, 1940,
        p 59.

MARX, K: "Economic and Philosophical Manuscripts of 1844"
        Moscow, Foreign Languages Publishing House,
        1961.

MARX, K: "Capital" III, 1889, p 809.

Modern Plastics International: "A Solid Feel for Bath
        Fixtures" April 1977, p 12.

Modern Plastics International: "Meeting Design Demands:
        Polysufone Suits Needs of Microwave Cookware"
        September 1977, p 37.

MONO, R: "It's Simple, It Works Well, But What Is It?"
        UK, Design, 352, April 1978, pp 48-49.

NADER, R: "Nader's Challenge to the Designer" USA,
        Industrial Design, March/April 1979, p 35.

NELSON, G: Extract from "George Nelson on Design"
        Architectural Press, published in Design, 372,
        December 1979, p 54.

NEWMAN, J W and STAELIN, R: "Pre-purchase Information-
        seeking for New Cars and Major Household
        Appliances" Journal of Marketing Research,
        Vol IX, August 1972, pp 249-257.

New Scientist: "East Meets West on Discs for the Home"
          UK, 19 April 1979, p 188.

OAKLEY, A: "Sociology of Housework" Martin Robertson,
          1974.

OLLMAN, B: "Alienation" Cambridge University Press,
          2nd edition, 1976, pp 141, 144, 146.

OOMENS, W J: "The Demand for Consumer Durables" Netherlands,
          Tilburg University Press, 1976.

Open University Course Team, in consultation with
          LOWE, J, ROBERTSON, A and TAYLOR, R: "Micro-
          processors and Product Development" UK, Open
          University, Unit 3, Designing Products Incorporating
          a Microprocessor, 1979, pp 26, 40.

Oxford English Dictionary: Definition of 'Style' - entry
          21, UK, Oxford University Press, Compact
          Edition, Vol 2, 1971.

PACKARD, V: "The Hidden Persuaders" UK, Longmans,
          1957, p 3.

PAPANEK, V: (Untitled) Italy, Domus, 602, p 41.

PARSONS, S A J: "The Framework of Technical Innovation"
          UK, Macmillan, 1968, pp 1, 166.

PEDLAR, K: "The Quest for Gaia" UK, Souvenir Press,
          1979, p 109.

Philips, Sales Literature, CAT 006/September 1978.

ROBERTSON, A: "Innovation Management: Theory and
          Comparative Practice" MCB Publications, 1974.

ROBERTSON, A: "Designing a Cyberman, Superman or a Robot?"
          Computing, Vol 7, No 49, pp 16-17.

ROGERS, E M: "Diffusion of Innovation" New York, The
          Free Press, 1962, pp 81-86.

SCHON, D A: "Technology and Change" Pergamon, 1967,
          pp 21, 25.

Science Policy Research Unit: "Success and Failure in
          Industrial Innovation" Sussex University SPRU,
          1972, p 4.

Science Policy Research Unit: "The Current International
          Economic Climate and Policies for Technical
          Innovation" Sussex University SPRU, November
          1977.

SEEMAN, M: "On the Meaning of Alienation" USA, American
Sociological Review, XXIV, 1959, pp 783-791.

SINGLETON, W T: "Man-Machine Systems" UK, Penguin, 1974,
p 95.

STANLEY, M: "The Technological Conscience" UK, Macmillan,
1978, p 5.

Sunday Times: "Cleaning Up with the Heavy Mob" 8 March
1981, p 91.

Technology Policy Unit: "The Microelectronics Revolution -
A Brief Assessment of the Industrial Impact"
Technology Policy Unit, Aston University,
December 1978, p 4.

TOFFLER, A: "Future Shock" UK, Bodley Head, 1970, p 379.

Toshiba, Sales Literature, TUK/SH/501079.

TRIST, E L and EMERY, F E: "Towards a Social Ecology:
Contextual Appreciation of the Future in the
Present" Plenum Press, 1972, Ch 12.

Video and Film International, UK, April/May 1978, p 21.

WALKER, G M: "Electronics in the Home" UK, Electronics
Magazine, 10 May 1973, p 81.

Which Magazine: "Microwave Oven" UK, November 1979,
p 599.

WOUDHUYSEN, J: "Information Bridges the Invention/
Demand Gap" UK, Design, 343, July 1977, p 32.

WOUDHUYSEN, J: "How Micros Can Rub Away the Bumps on
Top and Leave New Lumps Below" UK, Design,
366, June 1979, p 18.

WOUDHUYSEN, J: "Things to Come" UK, Design, 367, July
1979, p 41.

ZIZIROS, M: Design Magazine, 361, January 1979, p 42.

RESEARCH INTERVIEWS CONDUCTED BY MARTIN WOOLLEY QUOTED
IN THE TEXT

ALBERT, S: Designer, Gruye-Vogt Organisation Inc,
        Paob Alto, California, 6 December 1978.
        (Ref RM6)

BRICKWOOD, D: P A Design, question 3c. (Ref RM5)

CLOUGH: Chief Industrial Designer, Sears Roebuck, Chicago,
        1978. (Ref RM14)

The Consumers Association. (Ref RM20)

DAVIES, J B and FLUDE, G W: Directors, Marketing and
        Retail Analysis Ltd, London, 3 April 1979.
        (Ref RM10)

DOSSETT, R: Director, Marplan, London, 5 June 1979.
        (Ref RM8)

GOLDSMITH: Industrial Design Consultant, Chicago,
        28 November 1978. (Ref RM7)

MILLER, P: Head of Design Services, GAF Corporation,
        New York, 14 November 1978. (Ref RM2)

MOGAVERO, L N: Director of the Technological Utilization
        Office, NASA, November 1978.

PEMBERTON, J: Industrial Designer, Sinclair Radionics,
        September 1978. (Ref RM21)

SPEEDMAN, B: Chief Designer, Creda Cookers, 25 January 1980.

(For a complete list of Research Interviews refer to the
R M File in the Project Records.)