PRINCIPLES AND METHODS OF INTERFACE DESIGN

New Courseware to Design and Develop Electronic Products

MOHD FAZIDIN, J. AND AHMAD ZUHAIRI, A.M.
Faculty of Creative Multimedia, Multimedia University, 63100 Cyberjaya, Malaysia.
fazidin@mmu.edu.my, zuhairi.majid@mmu.edu.my

Abstract. Current problems in designing products or devices that carries content such as WAP phones, Digital Satellite TVs, PDAs and GPS Navigation system demands more than the traditional means of product or industrial design theories and techniques. Designers of such devices cannot rely only on physical appearance or technology alone. Interface Design, Bachelors in Multimedia course offered by the Faculty of Creative Multimedia, Multimedia University, is tailored to solve some of the above issues.

1. Interface Design: Introduction

One of the most common but not quite accurate description of Interface Design is the process of designing Graphical User Interfaces (GUI) for specific multimedia application. Here, the misconception is that interface designers only concentrate on the graphics or user interaction of an application including type of menu system and icons, docking / undocking, minimize / maximize of windows and components etc. Basically it is closer to graphic design for software engineering. This understanding is not exactly the Interface Design the Faculty of Creative Multimedia, Multimedia University is offering. For us, Interface Design is the medium between human and technology. Anything that help humans to access technology and make it part of our lives requires interface design.

2. Current Problems of Interface Design

To generate design via Interface Design process, traditional product/industrial design or software graphics design or a hybrid of both may not yield the desired
output. There are many instances where an electronic product or product that carries content is designed where heavy and comprehensive manuals and trainings are required before the product can be used. Limitations of technology or budget constraints for better parts and materials are often blamed. Worst still, many manufacturers of these devices separate the design of the physical aspects of the device from the GUI and technology. This is how our VCRs and satellite TV remotes becomes so unintuitive to use. There are many GUIs that doesn’t follow the button layout or having important functions of a computer at the back end of a never-ending cascading menu. Increasingly becoming disjointed is the relationship between what we see, what we touch, how we operate and how we function at a particular time and work. The GPS system in a car can sometimes have as many as 40 to 50 buttons on the center console and we are expected to operate this system with one hand on the steering wheel and at least 90% concentration on the road. An Internet phone for the masses shouldn’t have the complexity of a home computer to operate as it must cater for the rural folks and senior citizen who may or may not be computer literate. Buttons for a mobile phone should be aligned with the screen menu and be able to operate with minimum of keystrokes. No doubt that technology gives us so many functions and choices. This however cannot be the excuse not to design a good interface. As a bridge between human and technology, the interface design should help technology be used as if it’s a second nature for us. The technology is designed for us to be closer in the first place, so why not make the bridge short, direct and easy to use.

3. Principles of Interface Design

To cater for the new age of technology, a new approach is needed for interface design. The approach culminates in principles of interface design that should define the design scope and link aspects of design such as technology, human and environment in a whole concept. The student’s goal is to achieve a symbiosis between these aspects of design and provide credible, reliable and outstanding product. The principles of interface design are Positioning, Identity, Functionality and Technology.

3.1. POSITIONING

Positioning defines the scope of the design such as target market, complexity, type of technology used, physical and behavioural aspects etc. This principle is the best platform to compare the design with other similar products or services to clarify the goal of the design. It uses axes to define the extremes of the scope and positions the targeted area in which the design should reside. The position will be the goal of which the design should meet or surpass. An example of
positioning is the age of the target users of the design. For a kid’s type electronic dictionary, the targeted clients would be set at 5 to 7 years old. The axis would stretch to cover similar devices such as electronic toys and e-book from age 1 to 15. The images of these devices are positioned within the axis as a reminder to the designers what the scope of design is. Axis can be quadrant based or more to cater for related positioning aspects. Pugh, S. (1990) says: “The user need, customer requirement, or voice of the customer is paramount to the success or failure of the product”. Another example of the use of positioning is to gauge the type of content and technology to be used or to mark an improvement over older or similar models that may be using slightly different or obsolete technology. Say, WAP and GPRS. WAP has the speed of the slowest modem at around 9 to 12 KHz whereas GPRS can give almost twice the speed of the fastest modem at 96 to 128 KHz. This means GPRS can carry content WAP can never deliver such as low bitrate video, medium resolution graphics and more complex applications. Positioning in this area should establish the new benchmark of the technology through the same concept of axis and place the design on its deserved position as reference during the design process.

3.2 IDENTITY

Identity defines the design theme and personality as a concept to be adhered to during the design process. The identity chosen should mould the design’s ideation and development to generate a unique and integrated design. This is also a perfect platform to anchor the design specific to our culture, religion, race and/or way of life. Other than that, we can also create themes that reflect directly the reason for the design’s being and the gist in which the technology is created. Besides that, identity gives a role for the design to breech the boring and generic concept most consumer products have and hopefully can give life to the design. One of the main goal of identity is to generate a theme for a design. Imagine a design of a pen for the blind. The pen only writes dots in Braille within a specific area of a pad and the pad would translate the Braille characters into words that can be pronounced via voice activation. In theory, the pen can look like any other pen and the pad can be just a simple rectangle. With identity, we can define a theme for the design such as “confident and smart”, with a connotation that the theme reflects the user of the design. An image panel can then be created using the theme and anything and everything related to ‘confidence’ and ‘smart’ can be rasterized and put on an image panel with the strongest message as the biggest and more towards the center of the panel. Images that conjure ‘confidence’ and ‘smart’ can be a squirrel (agility), a set of gears (precision), a compass (direction), phases of moon (time) and a book (learned). The design will then use abstract concept of the panel and enhance the design to achieve the theme “confident and smart”.

Other themes for different types of design, for example, are “Nature”, “Futuristic”, “Lightness”, “Vibrant”, “Humble”, “Tough”, “Young”, “Cool” etc. We’ll then decide the best representation of identity for the theme we choose and the reason for choosing it. Abstraction of the identity can be in the form of outline, shadow, color, profile and extraction. One example from Apple computer, in 1982, Jerry Manock the designer who works with Steve Job creates a new identity for Apple’s computer product called The Snowwhite Project. Jobs loved the idea. Like the storybook characters, he wanted Apple’s products to exude a sense of charm and optimism, with a playful personality that would appeal to the child in everyone, and a sophisticated look that buyers would instantly recognize.

3.3 FUNCTIONALITY

Functionality defines the design’s features, usability and relevance. A navigation chart that lays the features and functions of the design is required. All interrelated functions must be linked and usually the most important and used functions are layered at the top of the chart and the least important and used at the bottom. Layers or segmentation should be marked or colored and text or image of each layer is of different size or thickness to reflect the importance. An example of functionality is a navigation chart of a menu structure of a satellite TV’s remote. At the very top is the power on button (most important – if the remote cannot turn the TV on, it is useless). The second level is the channel selection (should start with the last channel on or most frequent channel visited), The third level should be the adjustability of properties of the TV such as volume, color, contrast etc. The forth and subsequent level would be the connectivity to other services such as Internet, radio, pay per view etc. The bottom most level may include connection to other devices such as VCR, HiFi,
computer etc. Functionality chart should give the interface designers the ability to design based on function and should help to give more weight to the most important aspect of these functions. It should also create a link for different components of the design to work together as a whole and give intuition for the user of the design to be able to operate the finished product diligently and intelligently. The chart can also be used to integrate the physical appearance of the design and minimize unnecessary duplication of function.

![Juragan Smart Navigator](image)

3.4 TECHNOLOGY

Technology is defined in interface design as a medium to accomplish specific task and application in a faster, more meaningful, highly informational and sometimes different ways. There are generations of technology that does what today’s technology do but are limited in terms of speed and content. There are technologies that forever change the way we live and work. Sometimes we cannot run away from these technologies such as our TV and radio, our cars and our phones. It is an empowerment of content, information, transportation and communication that shape our lives. Karl T. Ulrich (1995) say: ‘In developing technology-push products, the firm begins with a new proprietary technology and looks for an appropriate market in which to apply this technology (that is, the technology “pushes” development). To create a meaningful design panel for technology, we should be able to represent it as how it changes our lives or how we work. A storyboard is required for technology panel as it shows how we use the technology in our lives. For example, a navigation system for a car should have a storyboard on how we would use the system as we would in our car. The storyboard would show the navigation system main screen as displaying
information we usually need such as amount of fuel, distance can be covered by the fuel, date, time and the car’s other vital information. The storyboard should also show how we operate the car and the navigation system together in a multitude of environment such as in traffic, while cruising, when turning and in different time of day and conditions. It should show the different displays required at each different environment and user requirement. Other than how we drive with the system, the storyboard may also show how the technology itself work such as connecting to a central server via receiving towers or satellite and downloading or uploading of information.

4. Methods of Interface Design

The design and development methods of interface design are formulated to give students exploratory ability within the Physical, Sensory and Applied interfaces. These interfaces deals with specific design issues and each can have a specific output that can be considered complete on its own. Design methodologies would start off with research using principles of interface design as guides. The output would be a design specification and a design brief. The second step is ideation. Ideation is in the form of generating design ideas in sketches, drawings, 3D modeling and mock-up models. The third step is conceptualization. Basically conceptualization ties design ideas together to form a meaningful interpretation of the ideation. The fourth step is development. Development executes the concept towards production of the design taking into consideration the user requirement, technological issues and cost to market. The fifth step is prototyping. Something concrete must come out from development be it a 3D model, Graphical User Interface or Diorama. The final sixth step is presentation. Students are required to present their prototype in a collective presentation that best reflect and represent the design to the world.

4.1 PHYSICAL INTERFACE

Design and development of physical interface requires understanding of all principles of interface design. Physical interface is used to generate design form in drawings, renderings, 3D or models. During ideation, traditional mediums may be used to develop ideas on the design form and its components such as sketches and renderings. Consideration should be given to shape, size, scale and properties of the form. During concept and development, 2D technical drawing, 3D modeling and rapid prototyping may be used. The final prototype can be interactive 3D models such as VRML or a real physical model at specific scale. Presentation of the design can be in the form of animation of the model and design boards. Physical interface uses product and industrial design techniques but the output shouldn’t be compared directly to those disciplines. It should be
understood that physical interface designers are creating the bridge between human and technology. The quest for interface designers in creating physical form to satisfy their design requirements should be seen in that context. Aesthetics, ergonomics and functionality are the major concerns of physical interface. K. T. Ulrich (1995) says: ‘Manufacturers used designers to style, or “gift wrap,” after its technical features were determined. Companies would then market the product on the merits of its technology alone, although customers certainly evaluate a product using more holistic judgements, including ergonomics and style. But today, a product’s core technology is generally not enough to ensure commercial success.”

4.2 SENSORY INTERFACE

While physical interface develops the form, sensory interface concentrates on the content. Although interface designers are not true programmers and builders of the technology, they must understand the basic principles, properties and functions of the technology. They must challenge the programmers to maximize the potential of the technology through the medium and interaction they design. As sensory interface development is centered towards audio, visual, touch and interaction, the output during ideation would be the GUI, information layout and multimedia support. Concept would generate mock-up graphics at the required scale and display type for any given scenario. Development can then concentrate on building interactive representation of this concept together with the physical interface concept. The relationship of both has to established using the principles of interface design. Prototypes can then be created. Output of sensory interface would be a small program that simulates the applications of the design. An example of sensory interface design development is creating web content for Wireless Application Protocol (WAP) phones to help daily activities of a Muslim. A sensory interface design would generate ideation in the form of screen displays at different content of the WAP with physical interface based on popular WAP phones. Sensory interface designers should maximize the graphics limitations of a WAP content, for example to display prayer times and gives audio reminders of prayers. An application for prayer beads or tasbih can be created and the phone’s up-down buttons can be used as counter. The beads with numbers would then scroll the screen and beeps when a certain number is reached. It is very important to understand the limitations of a particular technology before maximizing its sensory interface potential. Therefore, interface designers should check on their design principles to see the scope of design so that the design becomes relevant.
4.3 APPLIED INTERFACE

Applied interface shifts the weight of the design more towards the human aspect of interface design. Ergonomics of the design for targeted users is as important as the environment in which the design is being used. Ideation of applied interface can be study drawings between the design, the user and the environment. The study should encompass what happen when the design is idle and human is idle, when design is active and the user is idle, and when the design active and the user is active, in different possible environment. Concept would be creating application models for the various functions of the design. Development builds upon the relationship between applied, physical and sensory interfaces so they work together cohesively. Prototype can then output Diorama of the user with his/her environment while using the design. This diorama can be in 3D interactive model and/or physical models. Applied interface becomes relevant because the actual usage of the design in the environment is studied. The context in which the physical and sensory interfaces exist is now the applied interface.

5. Conclusion

Interface Design is not much different from other design disciplines. But, the interface design that Multimedia University is offering shows how important it is to create new generation that can cater for development of future products. Most product manufacturers do their own research to develop new technologies or try to apply some new technologies for their range of products. Interface Designer have their own role to fulfill this kind of design activity, starting from research which are product planning, product mapping and market segmentation that we believe no specific courses can cater for this kind of activity before. From there the task will go towards detail development until mass production.

References

Ulrich, K.T. and Eppinger, S.D 1995 “Product Design and Development”