



7-8 October, 2009, Pune, India.

Graphic interfaces for sales interaction : a case of a consumer choosing colour for a product

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Abstract This paper reports usability issues that arose during an attempt to conceptualize a series of screens for allowing a consumer to choose the colour of a bicycle on the screen before placing an order for it. A palate of square grids was suggested. This was modeled on commonly adopted color specifying software programs used by designers. A survey of respondents' reactions to this square grid GUI indicated that there are two extreme ends of a solution spectrum. On one end, if the choice of available colours is basic and few in hues, the interaction is quick and easy but the probability of the consumer being not fully satisfied at the end is observed. On the other end of the solution spectrum - if a complex colour grid is incorporated the consumer may get confused and feel challenged to exercise his / her colour choice. The answer probably lies in between the two ends of the solution spectrum. It is suggested to use Fuzzy logic based intelligent or smart GUIs that adopt to the individual user at every click and address effectively the 'affective' component of the needs of users making choices on a GUI.

1 Introduction

Interacting through computer screens has become all pervasive. Web commerce affords making personalized choices while ordering products by a consumer. The 'one to one' GUI interaction at the sale point, be it online or in show rooms, converts a nameless 'consumer' into a live emotional interacting 'user'. What seems to be a case of simply choosing from a given set of alternatives is not as satisfactory as it is assumed especially when elements such as colour, are involved. Choosing colour is a very personal as well as a cultural issue involving emotions, feelings, tastes and fashion trends. All these involve 'affective' components both for the designer as well as for the user.

Manufacturers of products are now offering self customizable products under the label of 'participatory design'. Design elements such as colour, graphics, texture etc are allowed to be decided by users themselves. Automobile companies are attempting to recreate the entire experience of driving the car as well as 'feel' the interior trims on virtually platforms before a consumer can make a final choice. How does one approach the GUI for such an interaction? What degree of freedom can be afforded to exercise the choice? Should the consumer be allowed to self operate the GUI. How many variations are too many or too less for a user to exercise their choices especially when there is an established relationship between the design element and users' emotions. While on the one hand the available colour range for a given product can be limited due to manufacturing and cost constraints the user's emotional needs are to be satisfied at the decision making stage. An element of fun and freedom of choice needs to be built in such point of sale GUI interaction.

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2 Graphic interfaces for sales interaction : a case of a consumer choosing colour for a product.

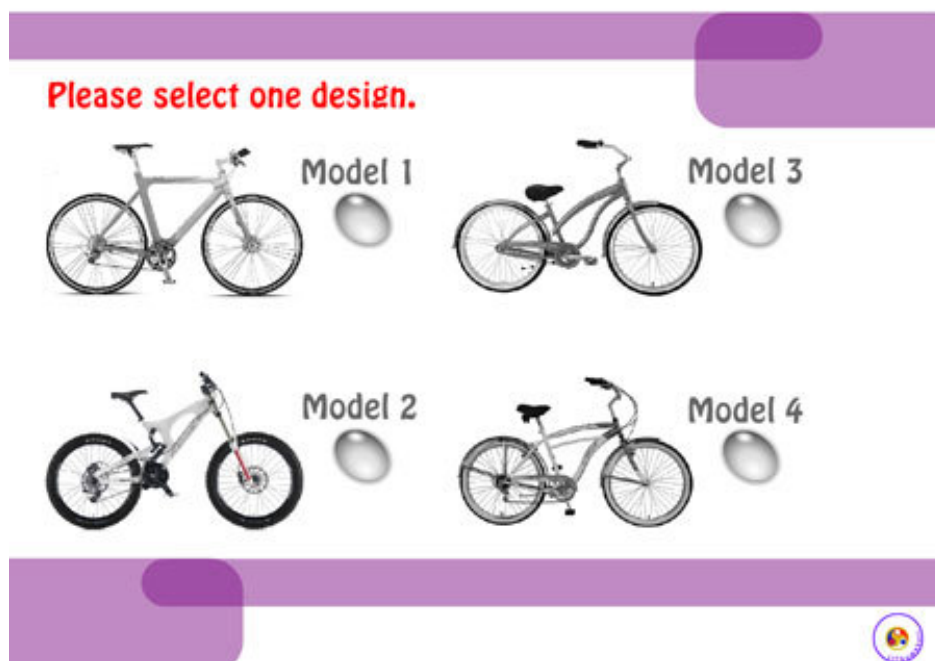
In this paper usability and interactivity issues that arose during an attempt to conceptualize a series of screens for allowing a consumer to choose the colour of a bicycle being ordered by the consumer are reported. The task was to encourage a consumer to explore and determining the colour choice for a bicycle on the screen before placing the order for it. In an initial GUI concept a palate of square grids was incorporated based on what is commonly used in color specifying software programs frequently used by designers. A survey was conducted involving 17 respondents in order to find out the usability issues of the square grid type of colour palate.

2. Colour as a design element in marketing of products

Colours are universal but their choices are not. Colours have different meanings in different cultures. For example yellow coloured flower means death in Mexico. In France yellow is profanity and in Iran it connotes hate! [1]. Any manufacture intending to cater to an universal market cannot standardize product features that involve affect and cultural background of its consumer. It is widely reported in Design literature that consumers perceive color and form through different emotional filters that have roots in cultures.

In a case of a bicycle manufacturer [2] in Iran there are 38 different models of bicycles on offer. They include mountain bikes, city bikes, racing bikes, folding bikes, ladies bikes, tandem bikes and tricycle carriers. Apart from Iran the company has offices and sales outlets in three different countries with differing cultural practices. This manufacturer has market sales data that indicates a wide difference between geographical regions as far as colour preferences are concerned. For instance consumers in northern part of Iran who live by the Caspian Sea and close to the forest prefer green, blue, red and yellow, but people from the south of Iran living by the side of mountains and deserts prefer colours like black and shades of grey. Consumer preferences, attitudes and beliefs can be used to predict their buying behavior. [3]. However tastes and fashion trends being adopted by consumers are rapidly changing due to media exposer [4]. Therefore available buying behavior data may or may not be valid at the point of purchase or decision making. Consumer choice is affected by communications, ambiance and imagery that is constantly being bombarded by media. [5]. Hence a consumer, if allowed to exercise the choice of a colour for a product, may indicate a very personal choice which may or may not match with the one based on predictions which in-turn is based on collected behavioral and cultural marketing data. This also has an effect on the range of choices that a consumer may need, so as to make a satisfying decision about a colour. A consumer may also want comparative visual stimuli and imagery to make a decision especially in the case of colour.

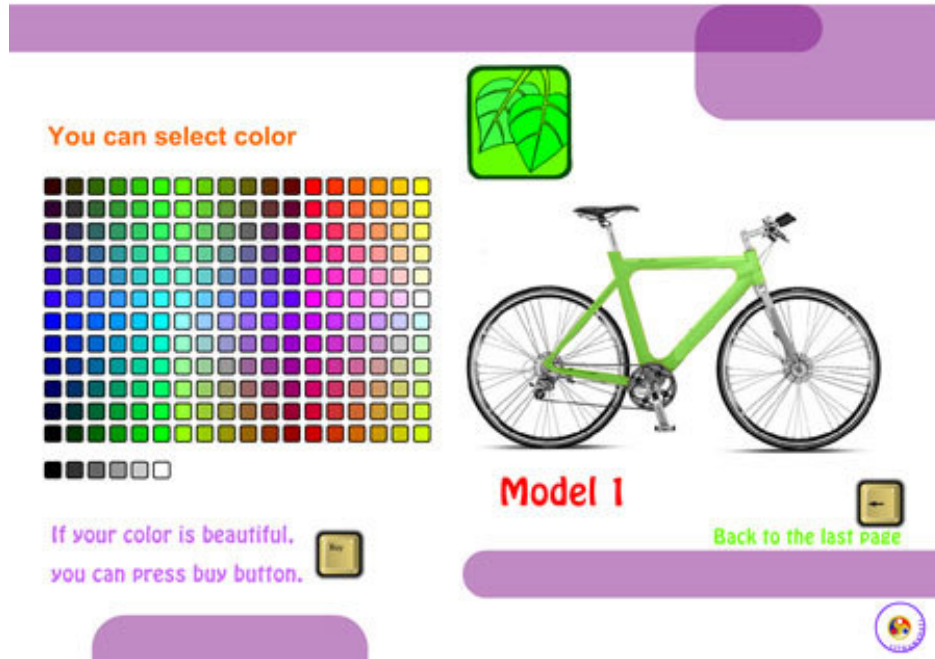
Fig 1. First prototype screen for choosing the cycle model.



3. Evaluation of a GUI concept for choosing colour for the bicycle.

In order to understand various usability issues that may be involved in conceptualizing a useable, emotionally sensitive (to the consumer) interactive GUI screen – a flash based prototype was executed (Fig 1, Fig 2). This prototype was intended to be used for heuristic evaluation. (Please note the English terms shown in fig 1 & 2 are a direct- exact translation of the local Iranian language instructions as they appear on the site).

Fig 2 Second prototype screen for choosing the colour.



3.1 The evaluation procedure

Seventeen (17) subjects were involved in evaluating and testing the prototype. The age ranged between 20 and 28 years. Seven of the seventeen subjects were females out of which one was married. The subjects were asked to first chose one of the four cycle models (on the computer screen) which they wanted to buy and then were asked to decide on the colour they wanted from the second screen that came up after they selected their cycle model.



Fig 3 Users being tested at the IITG Useability laboratory.

The number of trails each subject tried out before being satisfied with their colour choice was noted down. They were also asked to write down on paper their general comments as to how easy it was, confusions if any, if there were any operational aspect they did not like or did not understand; what other method would have been better. The results have been summarized in the table 1 bellow.

Table 1. Results compiled

Number	Gender	Age	Field	Job	Originally From	User's Opinion
1	M	21	B.Des Design	Student	Indore, MP	The idea is good to chose or assemble a bicycle. You can sort out colors according to their feel like yellow for sporty. That would have helped. You can add graphics on bicycles apart from colors .I could not find my last selection
2	F	21	B.des Design	Student	Bhopal, MP	While choosing the colors, I may like to eliminate few colors that I don't like (for e.g. green or yellow) at the initial level itself.
3	F	20	B.Des Design	Student	Rajasthan	You can categorize the colors according to different activities like sporty colors, activity colors, girlish colors, old people colors.
4	M	30	PhD CS	Research	Andhra Pradesh	Buffer to keep track of all the previous colors selected. Is required.
5	M	28	PhD CS	Research	Tamil Nadu	Too many colors were confusing. May be you can let people choose the major 3 colors and then go for variations or shades of them.
6	F	25	M.Tec.CSE	Student	West Beng	Can't find the color I want.
7	M	24	B.Tech CSE	Software developer	Bangalore	Range of Choice of colors is good. The interface was usable. It helped me test all the colors with the bicycle look & feel. However I could not remember which one was more appealing in the process of trying outall
8	M	23	M.Tech CSE	Student	UP	I think it easy to choose colors. Because in case of bicycles colors like brown, white and some light colors are not good in my sense. I think all the work is good and model was also good.
9	F	32	M.Tech CSE	Teaching	Assam	There is no difficulty for color selection. All colors are of good choice and out of trial and error method any one can choose a suitable color of choice.
10	M	18	B.Tech CSE	Student	Chennai	There is no difficulty in navigating through the page, I would like to have the whole spectrum of colors made available to me so that I can chose the particular shade of color I am fond of...
11	M	20	B.Tech Chemical Eng.	Student	New Delhi	There is no problem in selecting the color of the bicycle and also gives a vibrant choice of colors. The 4 cycle designs presented are quite good also.
12	F	20	B.Tech (CSE)	Student	Guwahati	The webpages are made in an interesting form. There is no problem in going through the pages. The color choice indicator is good too
13	F	26	P.hD Bio technology	Researcher	Kolkata	The page is made interestingly. It is easy to choose product from this page. The colors number may be decreased so that customer won't be puzzled for choosing colors.
14	F	23	-	Housewife	Assam	I am confused through out the selection procedure. May be I was not sure of what I like.....
15	M	22	B Des	Student	Guwahati	It will be great if from pure color , I can select a shade and then the color which I choose can show various shades of that particular colors.
16	M	21	M Des	Student	-	First I need to see color in different Setup such as sporty , rich look , simple .. only then I can be sure.

3.2 Generating Useability Heuristics

The comments of the respondents in table 1 along with the number of clicks were further rated by the authors using useability factors such as (a) Learnability ; (b) Efficiency; (c) Memoriability ; (d) Intuitive interactivity ; (e) satisfaction.

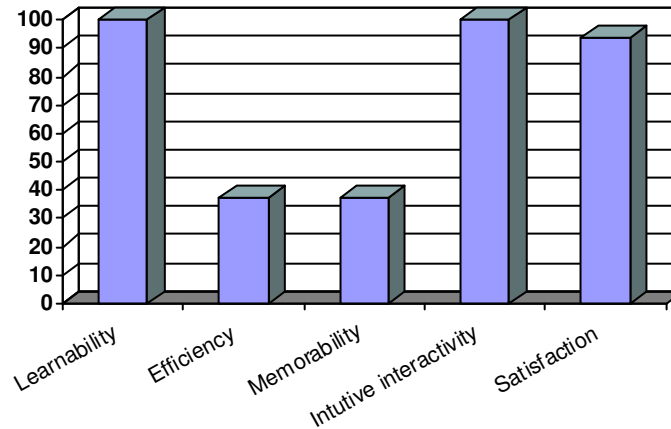
Each respondent's expressed opinion was carefully examined for prevalence of each of the above factors and they were either included or excluded under each of the five factors as shown in table 2. For example

for respondent number 5's opinion - "Too many colors were confusing...." It was inferred that there was no difficulty in learning the operations of the GUI as he could operate it intuitively and understood what he was doing -therefore under learnability factor in table 2 a tick mark was put. The respondent was confused and did not find the GUI efficient to operate. Therefore a cross mark was put under efficiency in table 2.

Table 2. Evaluating Useability Factors

Number	User's Opinion	Number of trials before finalizing colour	Learnability	Efficiency	Memorability	Intuitive Interactivity	Satisfaction
1	The idea is good to chose or assemble a bicycle. You can sort out colors according to their feel like yellow for sporty. That would have helped. You can add graphics on bicycles apart from colors .I could not find my last selection	7	√	X	X	√	√
2	While choosing the colors, I may like to eliminate few colors that I don't like (for e.g. green or yellow) at the initial level itself.	14	√	X	X	√	√
3	You can categorize the colors according to different activities like sporty colors, activity colors, girlish colors, old people colors.	10	√	X	X	√	√
4	Buffer to keep track of all the previous colors selected. Is required.	17	√	X	X	√	√
5	Too many colors were confusing. May be you can let people choose the major 3 colors and then go for variations or shades of them.	15	√	X	X	√	√
6	Can't find the color I want.	23	√	X	X	√	X
7	Range of Choice of colors is good. The interface was usable. It helped me test all the colors with the bicycle look & feel. However I could not remember which one was more appealing in the process of trying outall	22	√	√	X	√	√
8	I think it easy to choose colors. Because in case of bicycles colors like brown, white and some light colors are not good in my sense. I think all the work is good and model was also good.	8	√	√	√	√	√
9	There is no difficulty for color selection. All colors are of good choice and out of trial and error method any one can choose a suitable color of choice.	8	√	√	√	√	√
10	There is no difficulty in navigating through the page, I would like to have the whole spectrum of colors made available to me so that I can chose the particular shade of color I am fond of...	8	√	√	√	√	√
11	There is no problem in selecting the color of the bicycle and also gives a vibrant choice of colors. The 4 cycle designs presented are quite good also.	8	√	√	√	√	√
12	The web pages are made in an interesting form. There is no problem in going through the pages. The color choice indicator is good too	1	√	√	√	√	√
13	The page is made interestingly. It is easy to choose product from this page. The colors number may be decreased so that customer won't be puzzled for choosing colors.	9	√	X	X	√	√
14	I am confused through out the selection procedure. May be I was not sure of what I like.....	9	√	X	X	√	X
15	It will be great if from pure color , I can select a shade and then the color which I choose can show various shades of that particular colors.	10	√	X	√	√	√
16	First I need to see color in different Setup such as sporty , rich look , simple .. only then I can be sure.	12	√	X	X	√	√
TOTAL			16	6	6	16	15
Percentage			100	37.5	37.5	100	93.7

Fig 4. Graph of evaluated useability factors



3.3 Observations

The overall result of the heuristic evaluation is depicted in the graph in Figure 4. From the graph one can infer that the majority of users did not find it difficult to learn to operate the GUI. The GUI was highly inefficient as it contributed to confusion in 65 % of users as far as colour decision making was concerned. The GUI was also overloading on the memory of the users as only 37.5 % were able to remember their previous selections. The GUI was clearly not aiding the respondents in retaining their previous selections/colour choices made.

The GUI was found easy to interact with intuitively. This is so due to the high familiarity of the respondents with computers. The same cannot be said of a consumer unfamiliar with computer screens. While the GUI was found as satisfactory by the respondents, it cannot be ascertained as to which particular set of feature in the GUI contributed to this. The satisfaction rating could also mean satisfaction at completing a task successfully rather than satisfaction of the processes it self. It need not necessarily reflect on the overall satisfaction. The number of subjects is too small to make a conclusive inference but is sufficient enough to indicate presence of major useability issues.

The following can be inferred from the heuristics analysis findings:

- Number of colours need to be restricted to avoid confusion or memory loading.
- Need for incorporating a 'bin' to pick up and store colours and eliminate the unwanted ones from the screen to avoid confusion so as to be able to narrow down the choice.
- Improve the context for choosing by incorporating visual ambiance that encourages trying out colours on the product without fear of having to loading memory for comparisons.
- Provide a culturally congruent platform that allows playful exploration in a qualitative way along with a quantitative categorisation of colour.

4. Use of Fuzzy logic for aiding colour selection.

Colour theory in literature indicates two main approaches to studying colour namely the physics based Newtonian approach and the traditional perception & feelings based Aristotelian approach. [6]. The Newtonian approach is more evident in the GUIs of software programs dealing with designing applications such as photos, illustrations, 3D modeling etc. The colour wheel, the RGB palette, etc are examples of the colour element applications in such software packages. The mixing of colours is effected by moving sliders the result of which is seen in a new box or by making a choice from a geometrically arranged grid of colours.

The Aristotelian approach to GUI – involving art, feelings, emotions etc are rarely incorporated into GUIs. From the user point of view who has limited understanding of graphic colour theories the Newtonian type of GUIs are operable in terms of 'clicks'. However seldom does a user think of colour in isolation of the Form on which it is applied. A consumer who is a user has no scope of associating emotions and feelings in the grid like Newtonian GUI interfaces for colour. Colours are seen not existing as different independent hues in isolation but as mixed integral manifestation of qualities of material objects and nature. Colours have association with moods and personalities. They also have physiological implications [6]. In the

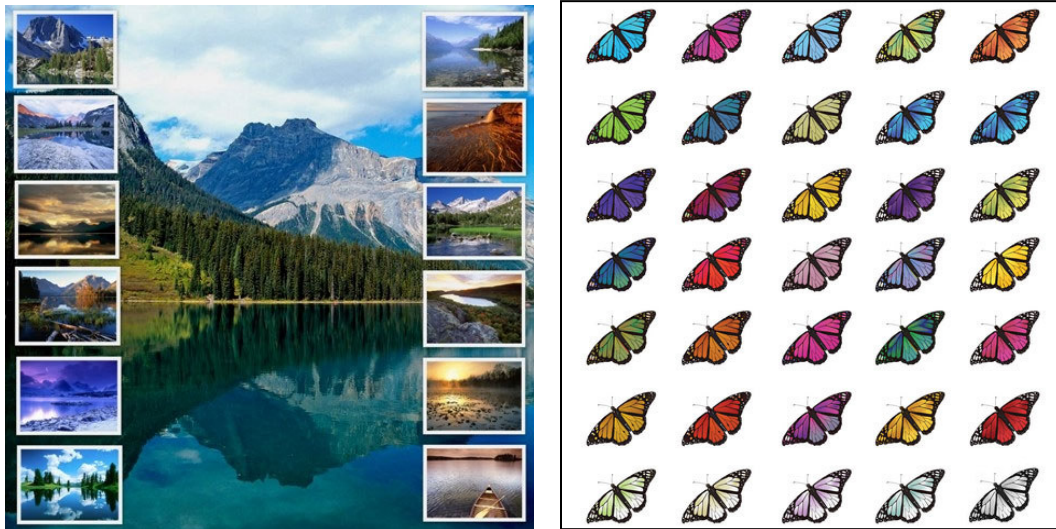
Aristotelian approach one can hope for ‘application’ of colour rather than ‘clicking’ of colour as in Newtonian GUIs. Dimensions of the colour element such as Hue, Tint, Chroma, tone and value are to be understood not only in terms of their underlying Newtonian physics but also in terms of moods, feelings, and psychological effect – all put together as ‘affect’. Fine arts literature for instance disuses colours in terms of ‘romanticism, impressionism, modernism’ but GUIs affording interactions on the ‘romantic’ plane or the Autumn, Summer, Rainy season context are not usually found in computer applications programs. It is precisely this Aristotelian approach that is likely to be more useful and useable for a common user who wants to emotionally decide on a colour preference as a consumer.

Fuzzy logic systems [7] afford an advantageous possibility to blend in both qualitative as well as quantitative aspects of colours given the computing environment. Much of this is already in use in computing environments but it happens behind the interactive screen. Choosing colour involves uncertainty, approximate reasoning and comparative decision making. Fuzzy logic provides a remarkably simple way to draw definite conclusion from vague, ambiguous or imprecise information being input into a fuzzy system. Fuzzy logic resembles human decision making with its ability to work from approximate data and find precise solutions. Newtonian way of doing things match the Classical or Boolean logic which has two values or states often expressed as 'yes or no', 'true or false', 'on or off', '0 or 1'. which are easily ‘clickable’. Yet in the real world situations are not black or white but involve shades of gray. These shades of grey can be described and interacted with, using Fuzzy logic. The concept of fuzzy logic controls is based on "chunking" human thinking in terms of feelings rather than precise mathematical computation. It is very appropriate for dealing with colour which is a physical quantifiable element as well as a qualitative feeling and emotion involving element. The challenge for Useability HCI designer dealing with the element colour is how to visualize a GUI that is a blend of Aristotelians as well as Newtonian approach.

4.1 Proposals for new GUI

The Taxonomy of HCI interactions involve all the three domains namely Cognitive, Affective and Psychomotor domains. The Affective domain of a user’s interaction involves receiving information (appreciation) Responding (interest) Valuing (formation of attitude) Organising (feelings, emotions of the self) and finally acting to satiate the cycle.

This means that the first GUI screen needs to provide a qualitative experience of evoking emotions. It is proposed to use nature landscape scenery as one of possible evokers. In addition a butterfly iconic panel is being proposed. These two qualitative interactions wherein the user needs to chose preferred scenes as well as the butterfly to start with. It is proposed to use Fuzzy logic to come up with customized colour palate in the second screen. It is proposed to have a backend fuzzy logic program that will be smart enough to show hues, related shades & tints surrounding the users colour preferences as captured by the first two screens. Wire frames of the proposed GUI are under development and are as shown bellow.



5. Conclusions

On one end, if the choice of available colours is basic and few in hues, the interaction is quick and easy but the probability of the consumer being not fully satisfied at the end of the decision processes is observed. On the other end of the solution spectrum - if a complex colour grid is incorporated the consumer may get confused and feel challenged to exercise his / her colour choice. The answer probably lies in between the two ends of the solution spectrum. A fuzzy logic based qualitative cum quantitative GUI is proposed.

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