User Interface Designing: Colour Therapy Sharing Application

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Abstract- **Each colour has an effect on the human in different manner, by learning how each colour affecting us, We can use colours in an effective manner to confer us an extra energy when we need it. Different colours can be used for the treatment of different diseases. In Modern society, computer device has become an integral part of our life. The increase of using digital devices has led to the emergence of variant side effects on the musculature such as neck and shoulder pain associated with the use of computer, in addition to the computer vision syndrome (CVS) which is a combination of eye and vision problems associated with the use of digital devices, that cover eye strain, irritation, headache, tired eyes, redness, blurred vision and diplopia. The process of designing a user interface with colour in software engineering can be quite complex and challenging. When challenges to colour planning are recast as opportunities for development, designing with colour can be optimized and creativity unlock. In this paper, a theory called "Computer Model Therapy (CMT)" has been proposed to minimize the side effects on users that have been clarified and to protect healthy people against such effects by developing a user's interface depending on colour therapy science.**

Keywords— User Interface design; Colour Therapy; Computer Model Therapy; Chromo-therapy;

I.INTRODUCTION

With rapid scientific and technological progress which covers all aspects of life, personal computer has become an integral part of daily life for adults and children. Using computers for long hours every day, has led to worry about the impact of exposure to the computer screen on eye health in the long term. What is the best way to minimize any effects may be caused by the use of computer on health especially on the eyes?. [10][11]

Researches [2][7][11][4] have shown scientific conduction during the past years and there are specific symptoms affect people health who use the computer for long periods. Doctors called these symptoms collectively "distress symptom related to the use of computer". These symptoms include feeling of tiredness in the eyes that could sometimes be accompanied with headache or a sense of itching and burning in the eyes with temporary periods of blurred vision or double vision with readable characters overlap with each other. Person might get one or all of these symptoms, in addition to other indirect symptoms such as feeling tired, pain in neck, shoulders, wrists or lower back.

In our subconscious, colours have a heavy impact on the person's mood. This effect varies depending on people and their culture, but there is a set of primary colours with clear influence marked on a wide range of people, for example the blue colour of the sky gives people a sense of comfort and tranquility, the green colour of gardens-on the other hand- gives a sense of happiness and pleasure. [1][8]

Colour can be used to heal the body. If the frequency of a colour aligns with the emotion needed, it activates micro particles in the brain, so healing can take place. [14] Therefore, it was not surprising that scientists in the United States requested from the prison administrations to paint the walls of prison with Rose (pink) colour, and found it has a relaxing effect on prisoners, so it can easily benefit from the effect of colours on the mood of computer's user to give an atmosphere of comfort and joy without great effort or cost. [6][5]

User interface design is science and an art as well. It shows artistic talent in creating attractive and beautiful element in design, while the core of the user interface is the logic of exchange. It's often overlooked for such things as light, colour and contrast, which negatively affect interface across distracting the user from the important things in design. [9]

Depending on these simple ideas, a theory called" Computer Model Therapy (CMT)" was suggested and applied to contribute in solving the problems that have been made obvious by merging the science of colour therapy with the design of user interfaces. Two questionnaires have been conducted. The purpose of the first one is to gather the user's requirements as being a part of the requirements of the theory, through user's requirement, the favorite colours and the number of models have been selected and built. The second questionnaire was performed after applying CMT theory on Two experiments, the first was on a computer application and the second was on a web application, then it was evaluated through applying two experiments.

II . RELATED WORKS

Many researchers have worked on computer vision syndrome and other worked on colour theory and made questionnaires about colour therapy. The following is a brief explanation about their works:

In 2007[5] Lynnay Huchendorf studied the effect of colour on memory and found that students in the sample can recall more words when warm colours (red, yellow) are used for background, than cold colours (green , blue) or even white.

In 2011[7] Mark Rosenfield found that in appropriate oculomotor response, lack of blinking and dry eye are the major causes of CVS. Therefore; he studied the reasons behind the occurrence of dry eye and noted the presence of eight factors (environmental factor, reduce blinking rate, incomplete blinking, increased corneal exposure, age and gender, systemic diseases, medications, contact leans ware and ocular conditions). He tried finding advices for some of these reasons.

In 2012[11] Sameena Kobab and Mohd Khan explained the definition of computer vision syndrome, etiology, symptoms, diagnosis, and treatment.

In 2013[8] Mi Kyoung Kim and Sung Don Kang studied the effect of colour on a sample of patient with stroke and their caregivers, they found a significant.

In 2014[4] J.H Anderson et.al, studied the effect of using the computer mouse and the keyboard on arm, neck and shoulder pain. They found that they cause severe but not prolonged or chronic pain. Using the mouse could cause greater pain on the hand –arm region.

III. BASIC RULES OF COLOUR THEORY

Colour Theory is a set of principles used to create harmonious colour combinations. Colour relationships can be visually represented with a colour wheel where the colour spectrum is wrapped onto a circle. The process of designing colour is too subjective, i.e. what evokes one reaction in one person may evoke a different reaction in another. This could be sometimes attributed to personal preference, or to the cultural background. Colour theory is a science in itself. Studying how colours affect different people, either individually or collectively. The colour wheel is a visual representation of the colour theory [3][6][14], as shown in fig 1.

Fig. 1. Colour Wheel [3]

IV.METHODS & MATERIALS

Scientists studied the effects of colour on mood, health and the way of thinking. The preference of a certain colour to another lies in the mechanism of its effects on human feelings. Scientists attributed these to the human eye which absorbs light and turn it into another form of energy that is able to see the colour. This energy affects even people who are blind and visually impaired as well as their feelings. Working light energy activates the adrenal (pituitary and pineal gland) which organize the secretion of hormones and affect the physiological organs in the body. [12][14]

A. Colour Therapy

There are different methods to administer colour therapy to a patient. One method is coloured body wraps, where the individual is wrapped in a cloth of the necessary colour to treat his illness. Eating certain colours of food, or drinking water from a coloured glass is another method of treatment.

The scientific aspect of colour therapy explains that colour therapy works through the regulation of the pineal gland as shown in Fig 2. The pineal gland contains melatonin and serotonin. Melatonin is associated with sleep, whereas serotonin is associated with wakefulness. When an individual produces too much melatonin, they can suffer from depression. Serotonin is a neurotransmitter whose action is linked with mental disturbances, such as schizophrenia and hallucinogenic states.
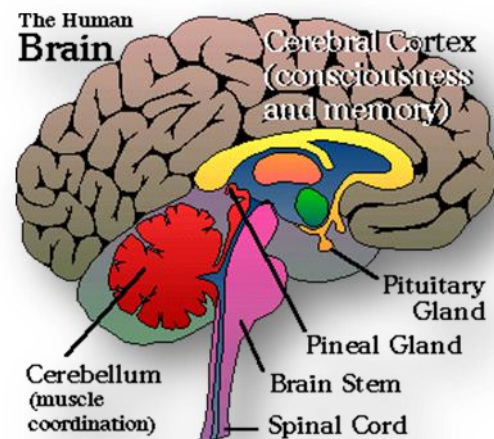

Fig 2. The human brain

The discovery of colours and their impact in terms of physical and mental health of a human was his great merit in treating many diseases. However; it was too far in thinking in the construction and design of colours, so that it serves a private computer user. Today computer users are increasing in number as well as the times of dealing with them.

B. Colour Chart

Colour is an important visual element of most user interfaces; colour is associated with meanings and elicits emotional responses. In order to prevent confusion in meaning, colour must be used consistently and to obtain the desired emotional responses, colour must be used appropriately.

Some colour preference points are expressed in the following:

- Self-expression (choosing colours that match the attributes)
- Achievement (choosing therapy colours)

Aversion against certain colours might also gives information. Possible explanations are shown in Table 1 [1][3][6][8][12][14].

TABLE 1. Colours Preferences and Meanings

1	**Red**: Brings warmth and motivation, good for energy, colds, Increases sexual desire and activity.
2	**Orange**: has worked on editing the body. Helps absorb new ideas.
3	**Yellow**: Helps strengthen the nerves and mind. It is an excellent colour for nervous conditions or nerve or related diseases. It also activates muscle.
4	**Green**: Green acts upon the sympathetic nervous system. It relieves tension in the blood vessels and lowers the blood pressure. It acts upon the nervous system as a sedative and is helpful in sleeplessness, exhaustion, and irritability.
5	**Blue**: is cool and soothing, dreamy and magical. Peace and rest.
6	**Violet / Purple**: Bring sleep. Reduce sexual activity. Reduce sensitivity to pain
7	**Pink**: Heals grief and sadness. Restores freshness. Brings you in touch with your feelings.
8	**Brown**: Brown can be warm and comfortable but also depression. Suitable for people's lives and people are stable and good friends.
9	**Black**: Black preference: symbolizes dangerous, dark, depression, death, mourning, mystery, secrecy,
10	**White**: White is the colour of perfection; white and harmony bring all aspects of one's life.

C. Colour Symbolism by Culture

Certain symbolic values in every country and culture are related to colours. There are various sources where these symbolic meanings are included. Colour symbolism may vary dramatically among different cultures[6]. The following table contains information on the cultural symbolism of various colours are shown in Table 2. [3]

TABLE 2. Information on Cultural Symbolism of Various Colours

Colour	Cultural Significance
Red	China - symbol of celebration and luck, used in many cultural ceremonies that range from funerals to weddings. India - colour of purity (used in wedding outfits). United States - Christmas colour when combined with green, Valentines Day when combined with pink, indicates stop (danger) at traffic lights. Eastern cultures - signifies joy when combined with white.
Yellow	Asia - sacred, imperial. Western cultures - joy, happiness.
Blue	China - associated with immortality. Colombia - associated with soap. Hindus - the colour of Krishna. Jews - holiness. Middle East - protective colour. * Note: Blue is often considered to be the safest global colour.
Orange	Ireland - religious significance (Protestant). United States - inexpensive goods, Halloween (with black).
Green	China - studies indicate this is not a good colour choice for packaging, green hats mean a man's wife is cheating on him. France - studies indicate this is not a good colour choice for packaging. India - the colour of Islam. Ireland - religious significance (Catholic). Some tropical countries - associated with danger United States - indicates go (safe) at traffic lights, environmental awareness, St. Patrick's Day, Christmas colour (red and green).
Purple	Western cultures - royalty.
Brown	Colombia - discourages sales.
White	Eastern cultures - mourning, death. Japan - white carnations signify death. United States - purity (used in weddings).
Black	Western cultures - mourning, death.
Saffron	Hindu - sacred colour. (orangish peach colour)
Rainbow	United States - symbol for homosexuality.

D. Age / Gender and colour

In early childhood colours are used more subjectively from age three to six. Children strongly prefer colours to shapes while at later stages of development the opposite is true. Younger children usually attract to bright, strong and warm colours, while colours become softer by time progress. Besides, every society has some specific characteristics about colour perception in gender differences. A study showed that women tend to have favorite colour more than men. [6]

E. The Effect Of Colour On Memory

It is widely accepted in scientific community that arousal and interesting events stay longer in memory as these events cause hormonal changes in human's brain which lead to enhance memory. Since colours increase

arousing and attention, they can be used to enhance memory. To conform this, a study was made by Mcconnohie in 1999, he made a slideshow of alphanumeric character and showed it to a classroom of middle scholars and asked them to recall as many characters as they could. He repeated this three times with different background colours (white, (red or yellow), (green or blue)) and the black for the character written. The study showed that when he used warm colours (red or yellow) students recall more characters than when using white or cool colours (green or blue).[5]

F.   The Effect Of Colour On Health

Chromotherapy is very old, dating back to ancient Egypt, Greece, China and India. While using sunlight as a form of healing predates the assumed debut on chromotherapy in recorded history. It is possible that it was either frowned upon or lacking practical utilization in those eras to use the individual aspects of the colour spectrum as a means of healing, rather than using their combined role in the form of sunlight [6][14].

A number of studies[12][14] have addressed the impact of colour on human health and his recovery. Psychotherapists have used colours to treat acute neurological diseases, nervous breakdown, anxiety, insomnia and mental disorders. The colour was also used by Psychotherapists in addressing some of the physical ailments resulting from depression and black thoughts and in cases where some patients are reluctant for disclosure outweighs, including who suffer of many mental illnesses. Mi Kyoung Kim and Sung Don Kang proved that colour therapy improves "Purpose In Life" (PIL) for patients with post-stroke disability and caregivers. Furthermore, colour therapy would be a useful factor for improving the quality of life of patients with stroke and their caregivers [8].

V. USER INTERFACE DESIGN

The process of creating a visual language and hierarchy that allows user to use and to be attracted to any application with the focus on the user's experience and interaction called (User Interface Design, UID),which is as important as any other part of software development life cycle. The goal of user interface design is to make the user's interaction as simple and efficient as possible. In terms of accomplishing the user's goals, it is also called user-centered design[13]. Fig 3 illustrates the Life cycle of user interface design.

Three important principles determine the design of effective user interfaces as follows:

1) place the user in control,
2) reduce the user's memory load, and
3) make the interface consistent.

An organized design process must be conducted to achieve an interface that abides by these principles.

Designing interfaces is not an easy task. When interfaces are organized in a software engineering, setting the

environment becomes even more challenging. Analyzing software engineering application is of high investment cost, which is usually conducted by the system analyst or by the analysis team. Analyzing the requirements usually involves taking into account both functional and non-functional requirements and requires both technical and business expertise. The last step of the requirements analysis process includes validating all elements of the requirements specifications document. Faults are corrected and slight changes on the requirements of the planned software solution can be absorbed. [9]
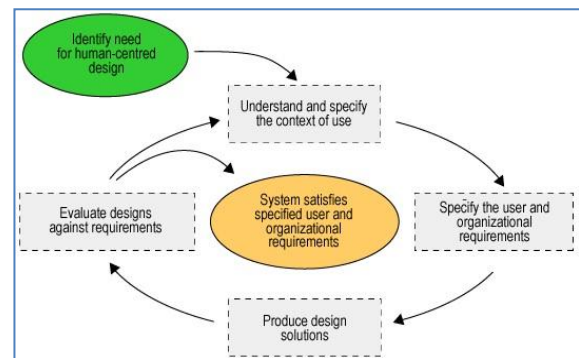

Fig. 3. Life Cycle of User Interface Design

Customers are only satisfied when their requirements are consistently met. To be competitive, these requirements must met in a timely and cost effective manner, as shown in Fig 4.

Asking the customer should be the start. However, this is only a start. Organizations, which have become adept at TQM (*Total Quality Management),* are able to go well beyond asking the customer to anticipate the future needs and desires of their customers. Second, customer satisfaction must be continually monitored. The only determina-tion of "quality" that really matters is the customer's perception. Customer's feedback and participation in the process is something essential. Formal and continuous monitoring keep the organization focused. Third, manage-ment must make sure that everybody knows their customers, both internal and external. Furthermore, it is essential that everybody can "see" the ultimate customers using their products and services. Employees at all levels of the organization should be given opportunities to observe the customer using their products and services. All employees should understand how each process is used in producing products and services add value to the customer. [13]

Understanding and applying these three principles at all levels of the organization, customer's focus will be pervasive.
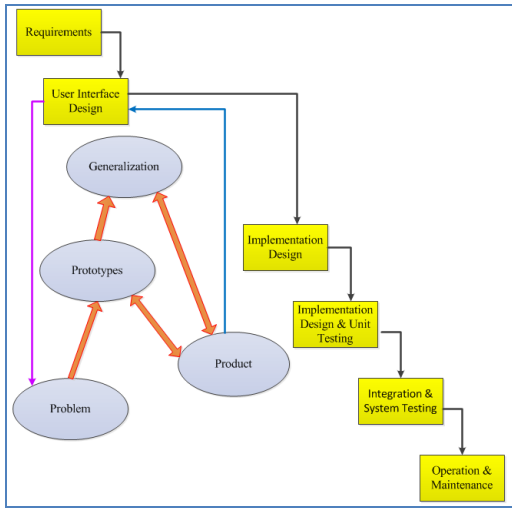
Fig. 4. Interaction Design Model

VI. COLOUR SCALE

Many colour gradations are available. Each of which consists of transformations of three colours. In our paper questionnaire on 56 males and 56 females from different ages, seven colours have been chosen for evolution coded to the text colour (Fig 5) and ten colours to the background colour. (Fig 6).
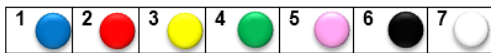

Fig 5. Text Colour Code

Fig. 6. Background Colour Code

Male: Favourite Colour

>15	>25	>35	>45	Background Colour										Text Colour							BG-Colour Scale	TC-Colour Scale
				1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7		
14	-	-	-	-	1	2	1	2	1	3			4	4	3	1	2	3	1		10	2
-	14	-	-	-	2	2	1	2	-				7	3	2	3	1	1	3	-	10	1
-	-	14	-	-	1	1	1	-	-	1			10	4	2		2		6	-	10	6
-	-	-	14	-	1	1		-					12	3	1	-	-	-	10		10	7

Female: Favourite Colour

Age				Background Colour										Text Colour							BG-Scale Colour	TC-Scale Colour
>15	>25	>35	>45	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7		
14	-	-	-	-	-	3	-	1		8			2	2	1	3	1	2	3	2	7	3,6
-	14	-	-	-	-	1	1	-	-	5		1	5	4	2	1	1	-	4	2	5	4
-	-	14	-	1	1	2	2	5		3			7	4	2		2		6	-	5	6
-	-	-	14	-	1	1	1			2			9	3	1	1	2	1	6	-	6	6

Fig. 7. Choice of Colour

A. Findings

In this section, some high level usage results from the field study are presented .

B. Basic Results

Through these random numbers and different ages, as well as sex male and female, great variation in the choice of colours of males and females has been found, according to the table shown in Fig. 7.

The question about the reason for choosing these colours, most of the answers were the sense of psychological comfort in dealing with colours. The question about the influence of colours on health was 98.5% "do not know", 2.5% of the answers was "doubt" any possible impact on health. While the question about the effect of colour on people mood was 47.5% "not know", 9.5% "not sure" and 44% "know". Whereas, the question about the effect of spontaneous changing colour in specific period in front of people reduces feeling tired, the answer was 83.5% "not know" and 17.5% "not sure". Finally, the question about mood that is faced during the day, the answer was 38% "three cases" of mood are faced during the day and 62.5% "four cases" are faced during the day in the period between (8-12 a.m.), which are inactivity, fatigue, tedium and insomnia.

Thus; all health-related studies indicate that colours have pros and cons. In this study we try to focus on the positive side of the topic, and how to be useful to the computer user.

The simple results we have attained, give us motivation to national thinking about building a computer model that helps the user make a change in the psyche of his performance to work better and efficiently.

VII. Proposed Work

As computers became part of our everyday life, modern living may give a rise to a number of visual and ophthalmic problems collectively called "the Computer Vision Syndrome" (CVS). The American Optometric Association defines computer vision synd-rome as a group of eye and vision- related problems that occur due to prolonged computer usage. The ocular discomfort appears to increase with the amount of computer usage. Up to 90% of computer users may experience visual symptoms like blurred vision, eyestrain, headaches, ocular discomfort, dry eye and diplopia. In addition, Computer use may have an adverse effect on musculoskeletal outcomes.

For years, scientists have studied the effects of colour on our moods, health, and the way of thinking. When the energy of colour enters our bodies, it stimulates the pituitary and pineal glands. This in turn affects the production of certain hormones, which in turn affect a variety of physiological processes. This explains why colour has been found to have such a direct influence on our thoughts, moods, and behaviour. An influence believed to be clearly separate by many experts from psychological and cultural factors. Colour seems to have an effect even on blind people, who are thought to sense colour as a result of energy vibrations created within the body.

Studies have shown that red light stimulates the sympathetic nervous system, while white and blue light

stimulates the parasympathetic nervous system. Some colours may increase the production of certain hormones, while other colours inhibit it. Specific colours can also have an effect on specific diseases. Symptoms of severe eruptive diseases such as measles and chickenpox were recovered when patients were put in a room with red windows. Similarly, pain and depression respond well to therapy using flashing bright lights and coloured lights. These treatments have been shown to alter neuro-chemical production in the brain, thus explaining their positive effects. Scientists now believe that the brain has specific responses to different frequencies of colours. They point out that sleep problems can often be cured within a day by this method. Mood change takes a little longer- about one to two weeks of treatments.

The process of designing can be complex and challenging. When challenges to colour planning are recast as opportunities for development, designing with colour can be optimized and creativity unlock.

To solve the problem of computer vision syndrome by making use of the effect of colours on our health, mood and behavior, a theory called Computer Model Therapy (CMT) was suggested. Where the requirements from the user's perspective is the elimination of the problems that have been noted in advance, by developing five models based on psychological states experienced by the users of computer along the day. The results obtained from the questionnaire of different age and gender samples, show that users who depend on computer in their job and used it for long time, face four psychological states, which are inactivity, fatigue, tedium and insomnia including eye, neck and shoulder pain.

Each model was developed based on colours therapy science with the design of user interfaces. Every model composed of two colours, one for the background of the user interface and the other is for writing. Interface appears to the user to let him choose the option of applying CMT theory for the software that will be used, either as default or customize to enable the user choose a model he wants to use or not to apply CMT theory.

The first model will appear to the users at the beginning of their work which include red as a background, as this colour is associated with activity, vitality and increases the body energy by activating the adrenal gland. The blue is used for writing due to its ability to renew the activity of the nervous system and remove tension. It has also a calming effect on the body. After a specific period of time this model will gradually fade away and a new model will appear.

The second model includes green as software background colour as it has the ability to absorb the negative energy like fatigue and depression, and the blue colour for writing.

The third model includes blue as software background colour and orange colour for writing as it has the ability to help in tedium, exhaustion and reduce muscle spasm (And helps in the digestive process).

The fourth model includes pink or violet colour for software background as it has a calming or smoothing effect on the body, elimination of insomnia, loosen the muscles and create a romantic ambience, and the blue is used for writing.

The fifth model was developed as a basic model that starts working after each model change. It could be described as a refreshing model for the user that appear for a short time only. It contains green as a background colour and purple for writing. The analyzing phase of CMT could be described in Fig.8.
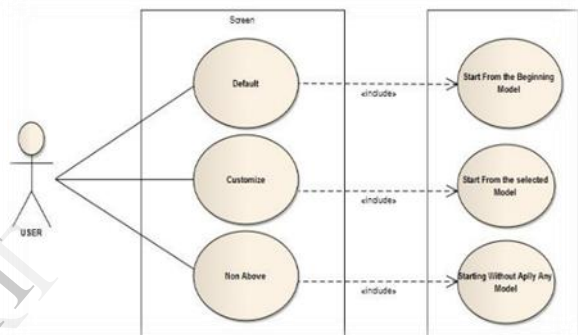

Figure 8. CMT Use Case Diagram

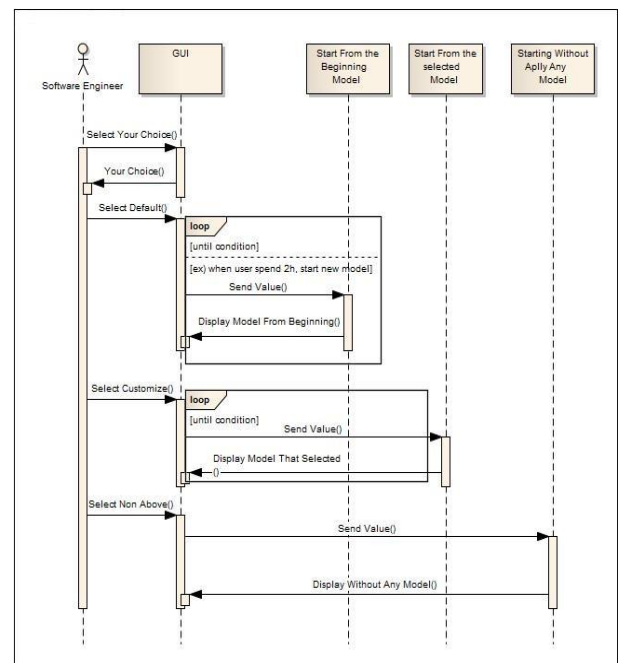Designing phase of CMT could be described as in Fig. 9.

Figure 9. CMT Sequence Diagram

VIII. CASE STUDY

This paragraph presents the testing and evaluating the performance of CMT theory and is implemented practically and discussed based on the results obtained.

CMT theory is applied by displaying an interface to users when they start to use the software or the web sites. This interface is composed of three options as follows:

1. Default
2. Customize
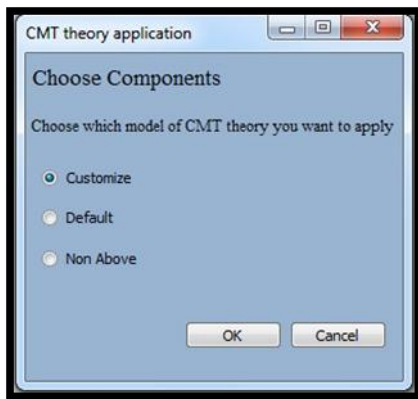3. None of the above, as in Figure 10.

Figure 10. Interface CMT Theory

The first option allows CMT theory to perform automatically by operating models in Sequenced way. The second option allows the user to select the model he likes depending on his mood. The third option is the non-application of CMT theory and keeping the software / web sites as it is.

When activating CMT theory, an option appears to the users at the bottom of the screen presenting notification massages within specific periods of time to alert the users to take a break for at least three minutes and do a specific movement to the neck, the shoulder and the back in addition to instructions on how to sit in front of a computer .

A. *The first experiment:* testing the performance of CMT theory on computer application and discussing the results that have been obtained.

CMT theory was applied on a software called (HSIS) which was used in several colleges in the university of Mosul to manage the graduates' information System. This program was applied by employees from 8:00 a.m. to 3:00 p.m. (See Fig. 11).
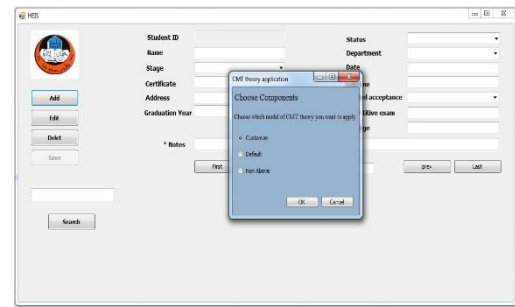

Fig. 11. Applying CMT Theory on HSIS

A questionnaire was made on 50 employees (30 males, 20 females) working on this software. The question is about the emergence of different side effects on the musculature such as neck and shoulder pain associated with the use of computer in addition to the computer vision syndrome (CVS). The answer was 100% "suffer from" these symptoms.

Refactor was applied on (HSIS) software to encounter CMT theory design, and the option "default" was chosen for twenty days, then another questionnaire was made on the same sample of employees. The result was 82% get rid of the pain in the neck and shoulders, headache and computer vision syndrome (CVS) "completely", 12% get rid of computer vision syndrome "incompletely", 6% found slight improvement which is hardly noticeable and 0% answered there was "no improvement" after applying the CMT theory.

B. *The second experiment:* testing the performance of CMT theory on websites application and discussing the results that have been obtained.

CMT Theory was applied on Social networking site called (?) which has been submitted on the internal Server to serve a group of companies in Mosul city to share information such as buying and selling prices and stock prices for twenty days.

As in the first experiment, A questionnaire was made on 50 employees working on (?) the answer to the question was 100% "suffer from" these symptoms.

Another questionnaire was prepared to identify the results of this study and to find out their effects on users. 78% of the results was get rid of the pain in the neck and the shoulders, headache and computer vision syndrome (CVS) "completely", 12% has recovered from computer vision syndrome "incompletely", 10% found little improvement which is hardly noticeable, and 0% of the answers "no improvement" after applying the CMT theory.

C. Evaluation of CMT theory.

To evaluate CMT theory, answers obtained from the questionnaire which was applied based on two experiments (computer application, web application) were collected. The answers which refer to get rid of pain completely, incomplete pain reduction and minor pain reduction in the neck, shoulders and computer vision syndrome were calculated. (See table 3).

TABLE 3. Evaluation of CMT

NO.	completely	Incompletely	slight improvement	no improvement	total
1	82%	12%	6%	0%	100%
2	78%	12%	10%	0%	100%

It's observed from the table above that applying CMT theory has succeeded by a large margin in eliminating the side effects of computer uses on muscular system and computer vision syndrome.

IX. CONCLUSION

In this paper a theory called " Computer Model Therapy" (CMT) was proposed and applied to contribute in solving the musculature problems as neck and shoulder pain associated with the use of computer in addition to the computer vision syndrome (CVS) by merging the science of colour therapy with the user interfaces design.

CMT theory was applied based on two experiments (computer application, web application). The results which have been obtained was a positive indication on the appearance of variant of side effects syndromes accompanied with the use of computer.

ACKNOWLEDGMENT

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