A Study on how interaction design impinge on Controls type

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Abstract:

The present study introduces a general framework of interaction design taking into account the impact on type of control in devices the paper focuses on concepts of User-Centered Design (UCD) & Activity-Centered Design (ACD). The paper discusses how an object manifestation offers cues on how it behaves and how humans may interact with it. The size, shape, and weight of cell phone devices let us know that they should be carried with us. The framework indicates processes that underlie the different types of button interaction experience through a mental model during using controls. Patterns can be used to explain the personal interaction and the layered nature of a mental model; they can also be of value for designers for assisting designers structured attempts due to user experience. The study investigates the difference between Physical affordances and digital affordances.

Problem: investigate the effect of interaction design concept on the control type. **Aim**: to reveal the influence of interaction design of control form in activities such as connecting and interacting. The study carried out a survey on the impact of interaction design concept on control type. Two groups of users with a varied experience in use and age were examined. **Methodology:** The study uses an analytical approach. **Results:** The study concluded that interaction design has an effect of changing patterns and forms of controls of devices; this confirms the relationship of interaction between the user and devices they interact with. The study found out a direct correlation between devices and their pattern of interaction design with users. Like acceleration performance, ease of use, clarity of data and a sense of satisfaction during use.

Keywords:
- ***Interaction Design***
- ***User Centered Design (UCD)***
- ***Activity Centered Design (ACD)***
- ***Affordances***
- ***Mental Model***
- ***Control design***

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Introduction

Every moment of every day, millions of people send an e-mail, talk on mobile phones, message each other, record TV shows on digital video recorders (DVRs), and listen to music on MP3 players. All of these things are made possible by good engineering but only their interaction design that makes them usable, useful, and fun.

Consumers benefits from good interaction design all the time, as they:

- Go to an automatic teller machine (ATM) to withdraw cash with a few simple touches on a screen.
- Become engrossed in a computer game.
- Buy something online.
- Tweet using Twitter from a mobile phone.
- Update their status on Face book.

In the past decades, interaction design has grown from a tiny, specialized discipline to one practiced by tens of thousands of people all over the world, many of whom don't call themselves interaction designers and may not even be aware of the discipline. Universities now offer degrees in it, and we'll find practitioners of interaction design at every major software and design firm, as well as in banks, hospitals, and appliance manufacturers. This is one of field's works of the interaction designer outside Egypt.

The rise of the commercial Internet in the mid 1990s and the widespread incorporation of microprocessors into machines such as cars, dishwashers, and phones where previously they hadn't been used led to this explosive growth in the number of interaction designers because suddenly a multitude of serious interaction problems needed to be solved. Our gadgets became digital, as did our workplaces, homes, transportation, and communication devices. It was the initial practitioners of interaction design—mostly coming from other disciplines—who helped us begin to make sense of our newly digitized world and the Internet, and these same people, now aided by new interaction designers, continue to refine and practice the craft as our devices, and our world, grow ever more complex.

Interaction Designers define the structure and behavior of interactive products and services. Interaction Designers create compelling relationships between people and the interactive systems they use, from computers to mobile devices to appliances; Interaction Designers lay the groundwork for intangible experiences.

1.Interaction design:

Interaction design as a formal discipline has been around for less than two decades. It's a young field, still defining itself and figuring out its place among disciplines such as information architecture (IA), industrial design (ID), visual (or graphic) design, user experience (UX) design, and human factors. In addition, some of these other disciplines are also new and still discovering their boundaries as well, or are radically changing to accommodate changing design landscape.(8) Figure (1) attempts to clarify the relationships between them.

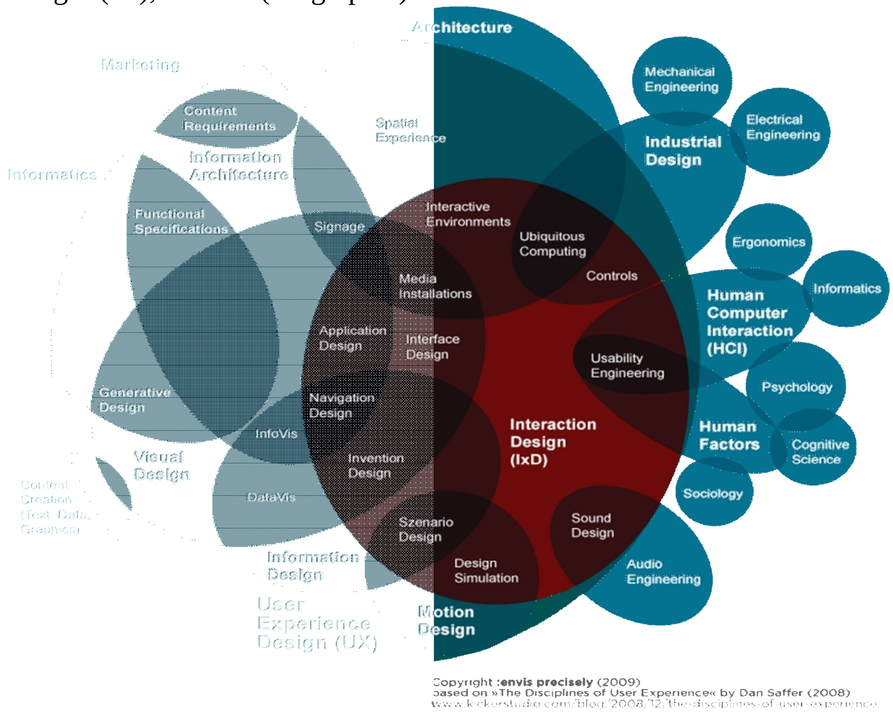


Figure (1) the disciplines surrounding interaction design.
(Controls between interaction design and industrial design)

As we can see, most of the disciplines fall at least partially under the umbrella of user-experience design, the discipline of looking at all aspects—visual design, interaction design, sound design, and so on—of the user's encounter with a product, and making sure they are in harmony .we see also there are area for controls between the interaction design and industrial design. There is no doubt where there is affected by the types of control convergence of interaction design with industrial design.

2.User-Centered Design (UCD):

The philosophy behind user-centered design is simply this: users know best. The people who will be using a product or service know what their needs, goals, and preferences are, and it is up to the designer to find out those things and design for them. One shouldn't design a service for selling coffee without first talking to coffee drinkers. Designers, however well-meaning, aren't the users. Designers are involved simply to facilitate the achievement of the users' goals. Participation from users is sought (ideally) at every stage of the design process. Indeed, some designers view users as co-creators.

The concept of user-centered design has been around for a long time; its roots are in industrial design and ergonomics and in the belief that designers should try to fit products to people instead of the other way around. Industrial designer Henry Dreyfuss, who designed the iconic 500 series telephone for Bell Telephones, first popularized the method with his 1955 book designing for People. But while industrial designers remembered this legacy, software engineers were unaware of it, and for decades they churned out software that made sense in terms of the way computers work, but not in terms of the way that people work. In the 1980s, designers and computer scientists working in the new field of human-computer interaction began questioning the practice of letting engineers design the interface for computer systems. Increased memory, processing speed, and color monitors now made, different types of interfaces possible, and a movement began to focus the design of computer software around users, not around computers. This movement became known as user-centered design

(UCD).(1)

The important Goals in UCD are designers focus on what the user ultimately wants to accomplish. The designer then determines the tasks and means necessary to achieve those goals, but always with the users' needs and preferences in mind.

In the best (or at least most thorough) UCD approach, designers involve users in every stage of the project. Designers consult users (and potential users) at the beginning of the project to see if the proposed project will even address the users' needs. Designers conduct extensive research up front to determine what the users' goals are in the current situation. Then, as designers begin ideation users are brought in to help generate concepts (which are known as **participatory design**). Designers (often alongside usability professionals) evaluate and test prototypes with users as well.

3.Activity-Centered Design (ACD):

Activity-centered design (ACD) doesn't focus on the goals and preferences of users, but instead on behavior surrounding particular tasks. Activities can be loosely defined as a cluster of actions and decisions that are done for a purpose. Activities can be brief and simple (making a sandwich) or time consuming and involved (learning a foreign language). Activities can take moments or years. You can do them alone or with others, as is the case, for example, when you sing a song. Some activities, such as withdrawing money from an ATM, have a set ending—in this case, getting the money. Others, such as listening to music, have no fixed ending. The activity simply stops when the actor (or some outside force) decides it is over.

ACD has its roots in activity theory, which is a psychological framework from the first half of the 20th century. Activity theory posits that people create tools as a result of "exteriorized" mental processes. Decision-making and interior life of individuals is de-emphasized in favor of **what people do** and the tools they collectively create in order to make (and to communicate). This philosophy translates well into activity-centered design, where the activity and the tools to support it—not the user—are at the center of the design process.(3)

Many of the products we use today were designed using activity-centered design, especially functional tools like appliances and cars. Activity-centered design allows designers to tightly focus on the work at hand and create support for the activity itself, instead of for more distant goals, thus, it's well-suited for complicated actions or for products with varied and large amounts of users.

Activities are made up of actions and decisions, otherwise known as tasks. Tasks can be as discrete as pushing a button or as complicated as performing all the steps necessary to launch a nuclear missile. The purpose of tasks is to engage in (and possibly complete) an activity. Each task is a moment in the life of the activity, and many of those moments can be aided by design. For example, a button can be provided to turn a device on, and a label or instructions may aid a user in making a decision.

The difference between a task and an activity can be fairly minor. Some tasks have enough parts to them to be considered sub activities unto themselves. For example, in making a phone call, one of the tasks is finding the right number to dial. There are quite a few ways to find a phone number: call a service for assistance, look up the number in the phone or online, recall it from memory, and so on. Each of these solutions to the task of finding a number is itself a task. So is finding a phone number a task or an activity? For designers, the difference is usually academic; it has to be designed for no matter what it's called.

Like user-centered design, activity-centered design relies on research as the basis for its insights, albeit differently. Designers observe and interview users for insights about their behavior more than about their goals and motivations. Designers catalog users' activities and tasks, perhaps add some missing tasks, and then design solutions to help users accomplish the task, not achieve a goal per se.

Ultimately, activity-centered design allows designers to focus narrowly on the tasks at hand and design products and tools that support those tasks. The task "submit form" will probably require a button. The task "turn device on" will probably require a switch or button. And so on. The activity, not necessarily the people doing the activity, guides the design.

4. Affordances:

How something manifests gives us cues as to how it behaves and how we should interact with it, The size, shape, and even weight of mobile devices let us know that they should be carried with us. The sleek black or silver look of digital video recorders tells us that they are pieces of electronic equipment and belong alongside stereos and televisions.

Appearance is the major source of what cognitive psychologist James Gibson, in 1966, called affordances. Gibson explored the concept more fully in his book The Ecological Approach to Visual Perception1979, but it wasn't until Don Norman's seminal book The Psychology of Everyday Things, in 1988, that the term spread into design. An affordance is a property, or set of properties, that provides some indication of how to interact with an object or feature. A chair has an affordance of sitting because of its shape. A button has an affordance of pushing because of its shape and the way it moves (or seemingly moves). The empty space in a cup is an affordance that tells us we could fill the cup with liquid. An affordance (or, technically, a perceived affordance) is contextual and cultural. We know can push a button because we have pushed one before.(1)

When objects or designs signal properties or functions, the affordance describes to us what they are used for or what they do. A handle on a drawer allows (or affords) us to push and pull the drawer. Similarly, a button on a digital page affords us to press it. if the affordance is used properly, a basic task should be easily utilized. When a basic affordance is too complex and needs more description, then the affordance no longer informs the user about the Design's purpose.

Interaction design can be thought of in part as providing affordances so that the features and functionality of a product can be discovered and correctly used.

4.1. Physical Affordances:

As figure (2) a vertical crossbar on a door affords the user to open the door by pushing. As figure (3) the handle signals pull, but the function does not afford the user to complete the task; it needs further explanation and fails as a basic design.

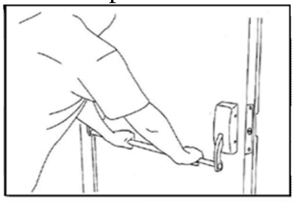


Figure (2) a vertical crossbar on a door

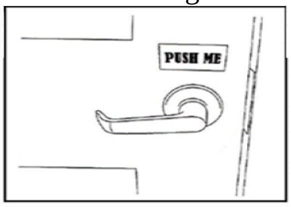


Figure (3) the handle signals pull

4.2. Digital Affordances:

As figure (4) Familiar shape and dimension of buttons afford users the ability to click that area to create an interaction. This is just one of many possible examples. As figure (5) we see Proper spacing between navigational elements and content affords the user the ability to click a button.

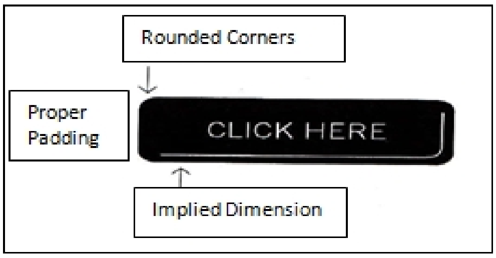


Figure (4) Familiar shape and Dimension of buttons

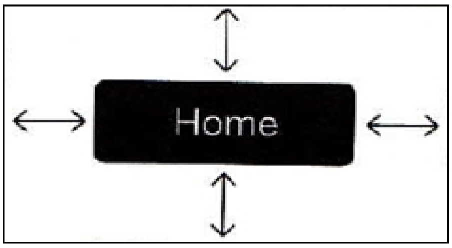


Figure (5) Proper spacing between Navigational elements

5. Mental Model:

The definition of a mental model varies greatly depending on the point of view or resource. In general it's a strategy to help UX designers understand the user's prior experiences, assumptions and skills levels using a product, digital device or interface. Mental models can also be represented in an alignment diagram figure (6) of the user's relationships to the environment, behaviors and previous actions.(2)

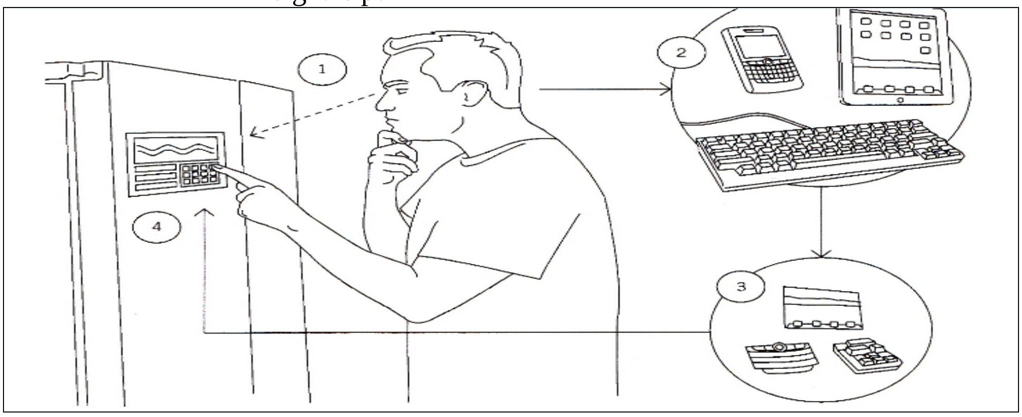


Figure (6) Mental Model

Mental model is the term for a user's internal understanding of how a system or object works, which may or may not reflect how the thing actually does work. The best mental models allow for a deep understanding of the thing, minus the complexities involved in making the thing work.

For instance, most people have a mental model of how a car behaves, even though they don't know how a combustion engine works.

Mental models are usually constructed by users from the cues provided by the designer in the form of affordances, feedback, and feed forward. Indeed, using those very things, designers can manipulate the user's mental model significantly, hiding or exposing the product's inner workings.(6)

<u>6. Controls between analog (Physical) and digital:</u>

The development of products within the framework of interaction design, we find that the design of control tools also evolved to meet the needs of the user and the design of the control tool change from analog system to digital system to increase the interaction.(5)

6.1. Button analog (Physical):

Physical controls have strong metaphors and history attached to them. Knobs and sliders typically indicate that you're looking for something vague: the right volume or temperature setting. Buttons and switches typically indicate a choice is being made. Turn the lights on. Start the microwave. Controls usually do only one thing. Accordingly, one of the biggest challenges of controls is that space, size, and cost limit you for how many features are important enough to warrant their own physical controls.

6.1.1. Switch:

A toggle switch is a very simple control. It moves from one setting ("on") to another ("off") and stays there until changed. Some common controls are found only in the physical world and not on screens (although they can certainly manipulate objects on a screen).figure (7-1)

6.1.2. Latch:

A latch opens an otherwise tightly closed area. Latches are useful for keeping some areas or items hidden or safe until needed. They are good to use when a button or drop-down menu might be too easy to click or open. For example, latches are frequently used on handheld devices to keep the battery compartment safe. Figure (7-2)

6.1.3. Dial:

Dials provide more control than buttons, allowing the user to select a setting along a continuum (such as the amount of heat on a stove's burner) or to choose between different settings or modes (such as the mode for taking pictures and the mode for viewing them on a digital camera. Dials can move freely, or simply turn from an established point to other established points on a wheel. These points are called detents. Some dials, like those often found on clothes driers, can be pushed in and pulled out, performing an action (such as turning on or off) that can vary based on the dial's rotation. Figure (7-3)

6.1.4. Jog dial:

A jog dial is a type of dial that can be manipulated with a single finger, usually a thumb. It can be dial-like, or it can be a pad of buttons, typically used on small devices for moving a cursor or moving through menus. Jog dials are somewhat difficult to control, especially for young children and the elderly. Figure (7-4)

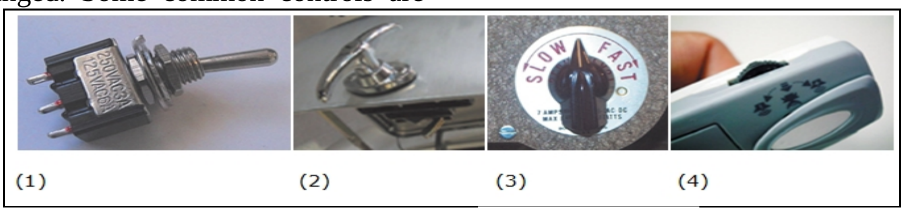


Figure (7) type of Physical Controls

6.1.5. Joystick:

A joystick is a physical device typically used in digital gaming or in other applications that require rapid movement and intensive manipulation of remote physical or digital objects. Joysticks can move in any direction or can be constrained to move only left to right or only up and down. Figure (8-1)

6.1.6. Trackball:

A trackball is a physical device for manipulating a cursor or other digital or physical objects. Trackballs are typically in a stationary base, but the ball itself moves in any direction. A computer mouse is often a trackball in a case. Figure (8-2)

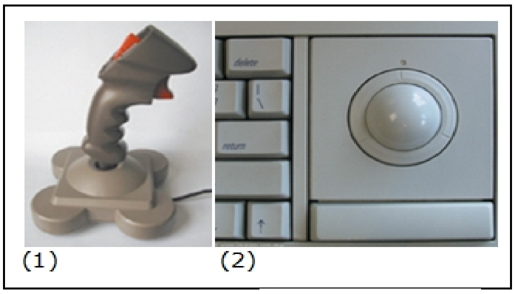
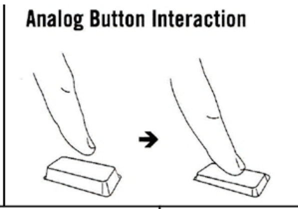


Figure (8) type of Physical Controls (Multidirectional)

Buttons are the interaction designer's best friend. Once we begin to look for them, it's apparent that buttons are everywhere, all over our interfaces. In a word processing program, there are about 30 buttons visible at any given time. A mobile phone may have about 40 buttons: the number keys for dialing and a keyboard. A button is, at base, a switch that is pressed or clicked to activate it. The button can stay pressed (a **toggle button**), requiring another press to reset it (like most on/off buttons), or it can reset itself automatically (like keys on a keyboard). Buttons can be used for a wide variety of actions: from changing modes (from writing text to drawing, say) to moving an item or a cursor via arrow keys. Buttons can take many forms, from tiny icons to physical squares on a floor that can be stepped on. Buttons, however, are good only for simple actions.

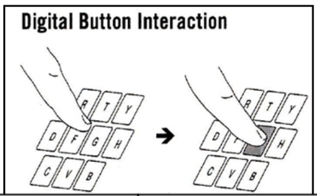
6.2. Button interaction:

The following are three examples of button interaction. The first figure (9) is an analog button, which is commonly found on keyboards, alarm clocks and various power buttons. The second figure (10) is a digital interface button, which is often seen on digital tablets and mobile phones. The last figure (11) is a standard GUI interface where the user manipulates a mouse or track pad to control an arrow on screen.



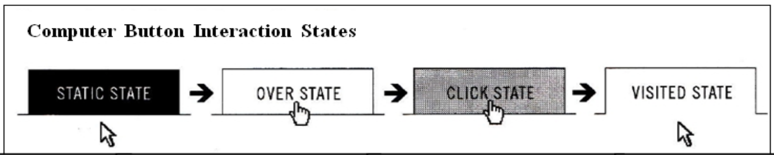
The Static state extends up off the interface to physically signal it is a button.	The Clicked/Pressed state is activated when the user presses down on the button.

Figure (9) analog button



While still physically activated by hand, the Static state is flat on most digital devices.	When clicked /pressed, the button is activated. In some cases an audible sound is also made.

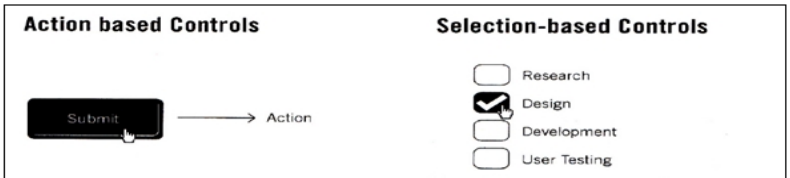
Figure (10) digital button



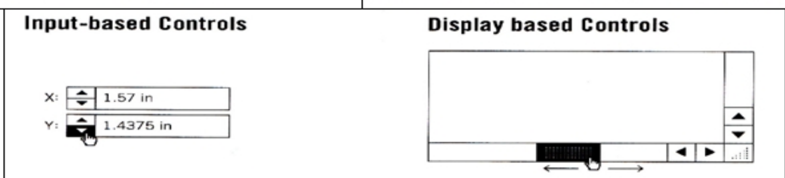
The first is the Static state when the user's mouse is not engaged with the button.	The second state is the over / hover state when the user moves / hovers the mouse over the button.	The third state is the clicked / pressed state when the user activates to visit another page	The fourth state is the visited state when the user has visited the page he selected

Figure (11) computer button

Controls are common components within screen-based interface design that allow the user to change, adjust or manipulate interface content. Controls can fit into different categories (figure (12)), working either together or separately. While users might be familiar with standard controls, the use of them does not equal good design and should only be used in the right situation. The figure shows for us just a few different types of examples of controls.



Action – based controls can be seen in controls that take a direct action. Buttons and links are examples of action- based controls.	**Selection – based controls allow the user to select one or more choices on screen. An example is a list of check boxes; the user can click on and off the box as needed.**



Input – based controls allow the user to enter information into a bound or unbound field of entry. Spin boxes are an example of both; the arrow buttons form bound increments and the field leaves it open for unbound entry.	**Display – based controls help operate the displays within an interface design. A common example are scrollbars that allow users to access information beyond the portal of view ability.**

Figure (12) different categories of Controls

6.3. Call to Action buttons:

A call to action (sometimes called call to action buttons) is simply a visual prompt (call) by the designer to the user in hope of a response (action). They can be used to encourage users to sign up for a service, download specific information or even buy a product. Urgent language that activates the user's attention is often seen in action buttons figure (13), such as "Register Now" or "Try it for Free."

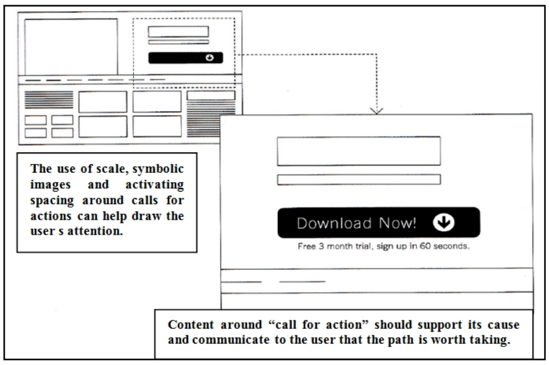


Figure (13) call to action buttons

6.4. Multi-Touch Gestures:

Multi-touch gestures are various operations and movements between a user's hand, touch pad or multi-touch device. The gestures may vary between devices and operating systems. As shown in figure (14) some common gestures and their functions.(7)

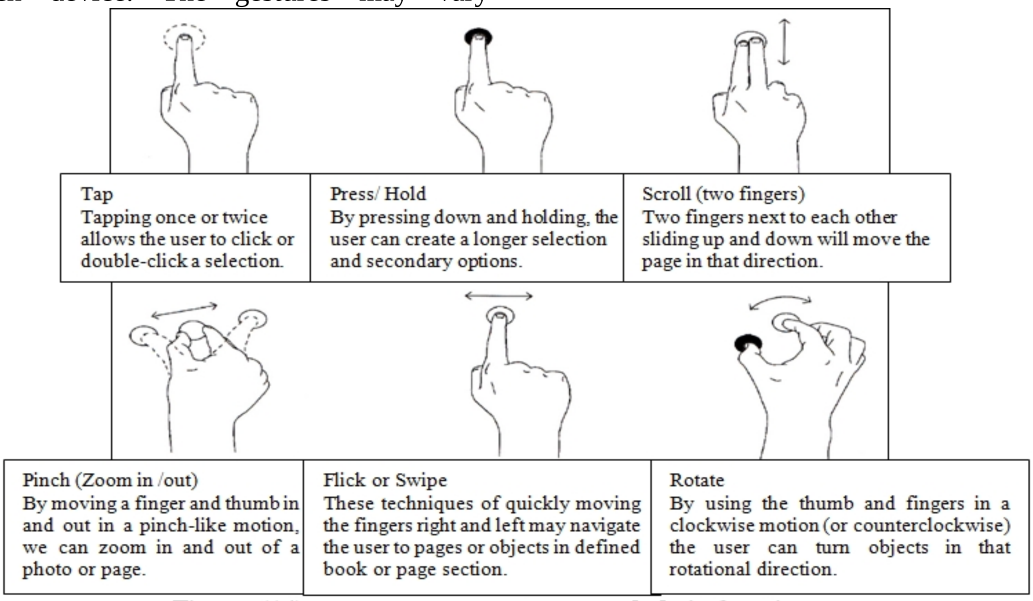


Figure (14) some common gestures and their functions.

6.5. Touch Target:

Touch target refers to the target area of a digital button or link in relation to a person's finger size figure (15). The term has most concern with mobile interface design, whereas screen size needs to be balanced with content layout. The various developers of mobile devices have varying guidelines for touch target sizes.

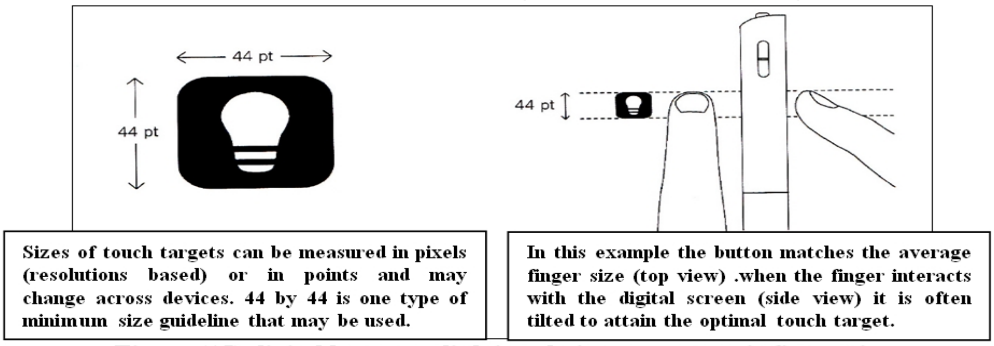


Figure (15) digital button or link in relation to a person's finger size

6.6. Controls on screens:

While many controls are found in both the physical, analog world and the digital one, some controls are only found on screens. These digital controls have grown from the original graphical user interface (GUI) vocabulary that was invented at Xerox PARC in the 1970s, reinvented in the 1980s in the Macintosh and PC operating systems, and added to and expanded by Web conventions in the 1990s:

6.6.1. Check box:

A check box enables users to select items from a short list. Figure (16-1)

6.6.2. Twist:

Twists turn up or down, either revealing or hiding content or a menu in a panel. Figure (16-2)

6.6.3. Scroll bar:

Scroll bars enable users to move content within a particular window or panel. Scroll bars can be vertical or horizontal. Scroll bars themselves can be manipulated via the cursor or buttons (for instance, by using arrow keys).Figure (16-3)

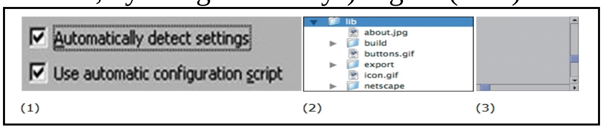


Figure (16) Check box & Twist & Scroll bar

6.6.4. Drop-down menu:

Drop-down menus allow designers to cluster navigation, functionality, or content together without having to display it all at once. Drop-down menus can be displayed by rolling over them, or they can be opened with a click. They can retract after a selection has been made or the cursor rolls off them, though not necessarily. Figure (17-1)(4)

6.6.5. Multiple-selection list (or list box):

Multiple-selection lists enable users to select multiple items in a list. Figure (17-2)

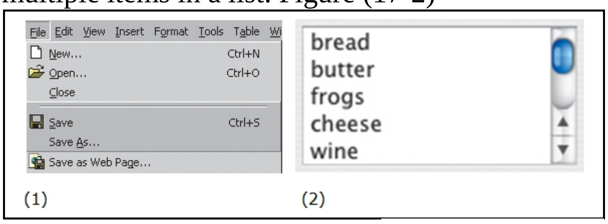


Figure (17) Drop-down menu & Multiple-selection list

6.6.6. Text box:

Text boxes enable users to enter numbers, letters, or symbols. They can be as small as (and constrained to) a single character or as large as the whole screen. Figure (18)

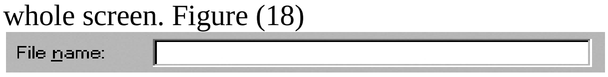


Figure (18) Text box

6.6.7. Spin box:

Spin boxes are text boxes with additional controls that enable users to manipulate what is inside the text box without having to type a value. They are good for suggesting values in what otherwise might be an ambiguous text box. Figure (19)

Figure (19) Spin box

The combination of one (and usually more) controls plus the system response is called a **widget**. Widgets are the building blocks of any application or device. An MP3 player, for instance, is made of widgets: one for controlling volume, one for controlling the playing of music files, one for organizing files, one for exporting files, and so on. In each case, the user uses controls to perform an action, and the system responds. All applications and devices are made up of widgets.

6.7. Non-traditional Inputs controls

We are arriving at a time when keyboards, mice, and styluses aren't the only—and possibly not even the primary—way we interact with the digital world. With the dawn of ubiquitous computing, interactive environments, and sensor-enabled devices, people will engage with many different sorts of objects that have microprocessors and sensors built into them, from rooms to appliances to bicycles.

The controls for these faceless interfaces are the human body: our voices, our movements, and simply our presence.(9)

6.7.1. Voice:

Widespread implementation of **voice**-controlled systems has been on the horizon for at least a decade now. For now, voice-controlled interfaces are most prevalent (naturally) on phone systems and mobile phones. For example, people call their banks and perform transactions or dial their mobile phones with just their voices. Voice commands typically control limited functionality, and the device typically has to be ready to receive voice commands, either because it only functions via voice commands (as with automated phone systems and some voice-controlled devices— see or because it has been prepared to receive voice commands, as with mobile phones that allow voice-dialing.

6.7.2. Gestures in space:

To most computers and devices, people consist of two things: hands and eyes. The rest of the human body is ignored. But as our devices gain more awareness of the movement of the human body through sensors such as cameras, the better able they will be to respond to the complete human body, including gestures. Devices like the Wii and *the I Phone with their built-in accelerometers allow for all manner of new ways of controlling our devices via movements in space. Figure (20)*

Figure (20) **Gestures** in space

Designers need to be especially aware of several issues when designing gestural interfaces:

- **Physiology and kinesiology.** Designers have to know how humans move and what the limitations are for that movement. For example, holding an arm out and making gestures can be quickly tiring—a condition known as "gorilla arm."
- **Presence and instruction.** Since there might be no visible interface—for example, consider the hands-free paper towel dispenser in many public restrooms—letting users know a gestural device is there and how to use it needs to be addressed.
- **Avoiding "false positives."** Since human beings make gestures all the time in the course of just moving around, designing and then detecting deliberate gestures can be challenging.
- **Matching gesture to task.** Without standard controls, figuring out the best motion to trigger an action is important. Simple gestures should be matched to simple tasks.(10)

6.7.3. Person's presence:

Some systems respond simply to a person's **presence**. Many interactive games and installations such as Daniel Rozin's "Wooden Mirror" respond to a body's being near their sensors.

There are many design decisions to be made with presence-activated systems. Consider a room with sensors and environmental controls, for example. Does the system respond immediately when someone enters the room, turning on lights and climate-control systems, or does it pause for a few moments, in case someone was just passing through?

In addition, sometimes users may not want to be known to be present. Users may not want their activities and location known for any number of reasons, including personal safety and simple privacy. Designers will have to determine how and when a user can become "invisible" to presence-activated systems.

7. The Experimental studies:

The communication devices have evolved in an unprecedented way in this age, and as a result the attention of the companies for the user and provide all that is suitable to him during use, this all was her motivation for the use of interactive design in the design of the devices. So the research is trying to uncover some of the impressions and reaction during user interaction with the mobile phone and the impact of the interactive nature of the user during the interactive design. These impressions like acceleration, performance ease of use, clarity of data and a sense of satisfaction during use, through a questionnaire which consists of eight questions pertaining to Age and Gender.

7.1 Demographic characteristics related to research:

Sample size is 100 persons from Egypt.
Participation rates:

1-Gender split into participation rates as follows:

- females by 62%
- Males by 38%

2-The age was divided into three categories:

- Less than the age of 28 years (from 17 to 28 years) and was a representative sample of 47%
- From 28 to 40 years and was a representative sample of 32%
- Greater than 40 years in a representative sample of 21%

7.2 Statistical methods used:

- The arithmetic mean value & standard deviation.
- Mann-Whitney test.
- Kruskal–Wallis test – one way ANOVA for non parametric tests.

7.3 questionnaire contents:

Data was collected through a questionnaire, containing the eight questions:

- What is your assessment overall in case you use a mobile phone a keyboard (buttons)?
- What is your assessment overall in case you use a mobile phone based on the touch panel (screen)?
- What is your assessment of the ease of use for the mobile phone based on the touch panel (screen)?
- What is your assessment of the speed of usage during use a mobile phone based on the touch panel (screen)?
- What is your assessment of the interaction during use a mobile phone based on the touch panel (screen)?
- What is your assessment of the use of non-conventional means of control (eye movement, movement of the hand in the air

(without touching the screen) during use mobile phone with touch screen?

- What is your assessment of the possibility of error during use (such as re-writing, re-selection, touch the icons are not required...)?
- What is your assessment of speed of search files for an order?

7.4 The result:

Q1:

What is your assessment overall in case you use a mobile phone a keyboard (buttons)?

Table (1): the extent of the differences by gender (male - female) about the evaluation of satisfaction in the case of mobile phone use panel buttons, keyboard:

Gender	Statistical Description		Mean Ranks
	mean value	standard deviation	
Female	1.97	0.886	45.27
Male	2.45	0.978	59.03
Mann-Whitney test "Z" = 2.438 Level Significance = 0.015 (Sig. at 0.05 level of Significance) P < 0.05 (P- val.)			

Results shown in the previous table on the existence of differences between the responses of both male and female, where it stressed the value Mann-Whitney test, which came significant at the 0.05 level has confirmed the statistical description, that these differences were in favor of male responses, as emphasized in the main and private averages the results of the Mann-Whitney test values.

Table (2a): The extent of difference depending on the age groups about the level of satisfaction in the case of mobile phone use a keyboard (buttons).

Age Groups	From18 to 28 years	From28 to 40 years	Larger than 40 years
From18 to 28 years	42.70(1)	1.471(2)	3.177(2)**
From28 to 40 years		50.72(1)	2.660(2)**
Larger than 40 years			67.62(1)
Kruskal–Wallis test value "x^2" = 12.022 (d.f = 2) Level Significance = 0.002 (Sig. at 0.01 level of Significance) P < 0.01 (P- val.)			

(1) Refers to the main averages (mean ranks) for the results of the values for Kruskal–Wallis test.

(2) Refers to Mann-Whitney test values.

(2) Refers to the significant Mann Whitney test at the 0.01 level of significance.**

Table (2b): A statistical description of the degree of satisfaction in the case of using a mobile phone keypad (buttons), depending on the age groups

Age Groups	Statistical Description	
	mean value	standard deviation
From18 to 28 years	1.91	1.018
From28 to 40 years	2.19	0.931
Larger than 40 years	2.62	0.590

Results confirmed the existence of statistically significant differences between the responses of the three age groups, where it confirmed that the test Kruskal Wales values and a significant, which came at 0.01 and Mann Whitney test between every two categories separately show that,

These differences between the biggest age category responses (greater than 40 years) with Minor category (from 18 years to 28 years) and the middle category (from 28 years to 40), have the results of the major averages stressed that these differences in favor of biggest age group (the biggest 40 years) - see table (2a) and (2b).

Q2: What is your assessment overall in case you use a mobile phone based on the touch panel (screen)?

Table (3) : the extent of the differences by gender (male-female) about the evaluation of satisfaction in the case of mobile phone based on the touch panel (screen).

Gender	Statistical Description		Mean Ranks
	mean value	standard deviation	
Female	4.40	0.639	55.67
Male	4.03	0.753	42.07
Mann-Whitney test "Z" = 2.497 Level Significance = 0.013 (Sig. at 0.05 level of Significance) P < 0.05 (P- val.)			

Results shown in the previous table on the existence of differences between the responses of both male and female, where it stressed the value Mann-Whitney test, which came significant at the 0.05 level has confirmed the statistical description, that these differences were in favor of female responses, as emphasized in the main and private averages the results of the Mann-Whitney test values.

Table (4a): The extent of difference depending on the age groups about the level of satisfaction in the case of mobile phone uses a touch panel (screen).

Age Groups	From18 to 28 years	From 28 to 40 years	Larger than 40 years
From18 to 28 years	57.79(1)	1.723(2)	2.698(2)**
From28 to 40 years		47.83(1)	1.453(2)**
Larger than 40 years			38.26(1)
Kruskal–Wallis test value "x^2" = 8.397 (d.f = 2) Level Significance = 0.015 (Sig. at 0.05 level of Significance) P < 0.05 (P- val.)			

(1) Refers to the main averages (mean ranks) for the results of the values for Kruskal–Wallis test.
(2) Refers to Mann-Whitney test values.
(2) Refers to the significant Mann Whitney test at the 0.05 level of significance.**

Table (4b): A statistical description of the degree of satisfaction in the case of using a mobile phone keypad (buttons), depending on the age groups.

Age Groups	Statistical Description	
	mean value	standard deviation
From18 to 28 years	4.43	0.744
From28 to 40 years	4.22	0.608
Larger than 40 years	3.95	0.669

Results confirmed the existence of statistically significant differences between the responses of the three age groups, where it confirmed that the test Kruskal Wales values and a significant, which came at 0.05 and Mann Whitney test between every two categories separately show that,
These differences between the Minor age category responses (from 18 years to 28 years) with biggest age category responses (greater than 40 years) and the middle category (from 28 years to 40), have the results of the major averages stressed that these differences in favor of Minor age category responses (from 18 years to 28 years) - see table (4a) and (4b).

Q. (3, 4, 5, 7, 8)

Table (5) the extent of the differences by gender (male-female) about some of the advantages and disadvantages of using mobile phones based on the touch panel (screen), as questions from 3 to 5 in addition to questions 7 and 8.

Q.	Statement	Gender	Descriptive stat. Mean	S. D.	Mean Ranks	Z	Sig. P- val.
3	Assessment of the ease of use for the mobile phone based on the touch panel (screen).	Female	4.27	0.682	53.79	1.590	0.112 P >0.05 N.S
		Male	4.00	0.870	45.13		
4	Assessment of the speed of usage during use a mobile phone based on the touch panel (screen).	Female	4.32	0.785	55.45	2.431	0.015 P <0.05
		Male	4.03	0.677	42.42		
5	Assessment of the interaction during use a mobile phone based on the touch panel (screen).	Female	4.24	0.670	54.39	1.870	0.061 P >0.05 N.S
		Male	3.92	0.850	44.16		
7	Assessment of the possibility of error during use (such as re-writing, re-selection, touch the icons are not required...).	Female	3.08	0.708	47.70	1.401	0.161 P >0.05 N.S
		Male	3.29	0.802	55.07		
8	Assessment of speed of search files for an order.	Female	3.98	0.757	50.72	0.105	0.916 P >0.05 N.S
		Male	3.95	0.837	50.14		

Results confirmed in a table (5) the existence of statistically significant differences between the responses of males and females on the Question No. 4 "Evaluation of speed during use mobile phone based on the touch panel." Where it emphasized the value of the Mann Whitney test, which came significant at the 0.05 level has confirmed the value of the main averages that these differences in favor of females responses. It stressed that description also statistical table. As for the rest of the questions (3, 5, 7, 8), the results confirmed that there is no statistically significant differences between the responses of both males and females.

Table (6a) the extent of the differences depending on the age group about some of the advantages and disadvantages of using mobile phones based on the touch panel (screen).

Q.	Statement	Age groups	Age Group 18 to 28	28 to 40	40 +	X^2 (d.f=2)	Sig.
3	Assessment of the ease of use for the mobile phone based on the touch panel (screen).	18 to 28	56.49(1)	1.166(2)	2.550(2)*	**7.059**	**0.029 P<0.05**
		28 to 40		49.84(1)	1.681(2)		
		40 +			38.10(1)		
4	Assessment of the speed of usage during use a mobile phone based on the touch panel (screen).	18 to 28	57.78(1)	1.396(2)	3.163(2)**	**11.168**	**0.004 P<0.01**
		28 to 40		50.00(1)	2.332(2)*		
		40 +			34.98(1)		
5	Assessment of the interaction during use a mobile phone based on the touch panel (screen).	18 to 28	57.35(1)	1.390(2)	2.800(2)**	**8.931**	**0.012 P<0.05**
		28 to 40		49.56(1)	1.956(2)		
		40 +			36.60(1)		
7	Assessment of the possibility of error during use (such as re-writing, re-selection, touch the icons are not required...).	18 to 28	49.07(1)	1.365(2)	2.736(2)**	**12.483**	**0.002 P<0.01**
		28 to 40		41.84(1)	3.228(2)**		
		40 +			66.88(1)		
8	Assessment of speed of search files for an order.	18 to 28	51.37(1)	0.942(2)	1.837(2)	**7.032**	**0.030 P<0.05**
		28 to 40		57.47(1)	2.788(2)**		
		40 +			37.93(1)		

(1) Refers to the main averages (mean ranks) for the results of the values for Kruskal–Wallis test.
(2) Refers to Mann-Whitney test values.
(2)* Refers to the significant Mann Whitney test at the 0.05 level of significance.
(2) Refers to the significant Mann Whitney test at the 0.01 level of significance.**

Table (6b): A statistical description depending on the age group about some of the advantages and disadvantages of using mobile phones based on the touch panel (screen).

Q.	18 to 28		28 to 40		40 +	
	Mean	S. D.	Mean	S. D.	Mean	S. D.
3	4.30	0.832	4.19	0.644	3.86	0.727
4	4.34	0.891	4.25	0.568	3.86	0.573
5	4.28	0.826	4.12	0.609	3.76	0.700
7	3.13	0.711	2.94	0.759	3.57	0.676
8	3.96	0.908	4.19	0.644	3.76	0.577

Previous results outlined in Tables 6a, 6b, confirmed the existence of significant differences of the responses of the three age categories on all the advantages and disadvantages where the results were as follows:

1- <u>Q3: Assessment of the ease of use for the mobile phone based on the touch panel (screen):</u>
Results Came the differences between the Minor age group (less than 28 years) with a sample of Greater age group responses (the largest of 40 years), and averages the main stressed that these differences in favor of the Minor age group responses, as in Table (6a) and stressed that too Description Statistical. As in table (6b).

2- <u>Q4: Assessment of the speed of usage during use a mobile phone based on the touch panel</u>

(screen): Where it came differences between the big age group (the largest of 40 years), with the responses of both groups has been the major averages values confirmed that these differences in favor of responses each a Category, Minor age group (less than 28 years) and the middle category (from 28 years to 40 years) - as in Table (6a) and stressed that results the Statistical Description also in Table (6b).

3- Q5: Assessment of the interaction during use a mobile phone based on the touch panel (screen).

Where it came differences between the Minor age group (less than 28 years), with responses research sample of the bigger age group (the largest of 40 years) has been the major averages values confirmed that these differences in favor of responses the Minor age group (less than 28 years) -as in Table (6a) and stressed that results the Statistical Description also in Table (6b).

4- Q7: Assessment of the possibility of error during use (such as re-writing, re-selection, touch the icons are not required...).

Where it came differences between the bigger age group (the largest of 40 years), with the responses of both groups has been the major averages values confirmed that these differences in favor of responses the bigger age group (the largest of 40 years)- as in Table (6a) and stressed that results the Statistical Description also in Table (6b).

5- Q8: Assessment of speed of search files for an order.

Where it came differences between the bigger age group (the largest of 40 years), with the responses of the middle category (from 28 years to 40 years) has been the major averages values confirmed that these differences in favor of responses the middle category (from 28 years to 40 years) - as in Table (6a) and stressed that results the Statistical Description also in Table (6b).

Table (7) the extent of the differences by gender (male-female) about assessment of the use of non-conventional means of control (eye movement, movement of the hand in the air (without touching the screen) during use mobile phone with touch screen.

Gender	Statistical Description		Mean Ranks
	mean value	standard deviation	
Female	3.18	1.079	55.75
Male	2.66	1.097	41.93
Mann-Whitney test "Z" = 2.396 Level Significance = 0.017 (Sig. at 0.05 level of Significance) P < 0.05 (P- val.)			

Results shown in the previous table on the existence of differences between the responses of both male and female, where it stressed the value Mann-Whitney test, which came significant at the 0.05 level has confirmed the statistical description, that these differences were in favor of female responses, as emphasized in the main and private averages the results of the Mann-Whitney test values.

Table (8a): The extent of difference depending on the age groups about the level of satisfaction of the use of non-conventional means of control (eye movement, movement of the hand in the air (without touching the screen) during use mobile phone with touch screen.

Age Groups	From18 to 28 years	From 28 to 40 years	Larger than 40 years
From18 to 28 years	64.80(1)	3.418(2) **	4.685(2)**
From28 to 40 years		43.56(1)	2.079(2)*
Larger than 40 years			29.07(1)
Kruskal–Wallis test value "x^2" = 26.543 (d.f = 2) Level Significance = 0.000 (Sig. at 0.01 level of Significance) P < 0.01 (P- val.)			

(1) Refers to the main averages (mean ranks) for the results of the values for Kruskal–Wallis test.
(2) Refers to Mann-Whitney test values.
(2)* Refers to the significant Mann Whitney test at the 0.05 level of significance.
(2) Refers to the significant Mann Whitney test at the 0.01 level of significance.**

Table (8b): A statistical description of the degree of satisfaction of the use of non-conventional means of control (eye movement, movement of the hand in the air (without touching the screen) during use mobile phone with touch screen. depending on the age groups.

Age Groups	Statistical Description	
	mean value	standard deviation
From18 to 28 years	3.55	1.017
From28 to 40 years	2.69	0.965
Larger than 40 years	2.14	0.793

Results confirmed the presence of statistically significant differences between the responses of the three age groups where stressed the value of the Kruskal-Wallis test, which came at a significant level of .01 and test Mann Whitney show that there are significant differences between the responses of the research sample of the three age groups has resulted in differences between the three categories, the attention of younger age group (less than 28 years) using the means of control unconventional, followed by the middle category (from 28 to 40 years) came big age group responses (over 40 years) in the latter arrangement was confirmed by the value of the major averages - Table 8 (a), as well as Description Statistical table 8 (b).

Discussion:

From previous results, we find that there are responses in the user's acceptance of the use of mobile phone based on the touch screen, where the average was 4.4 in females and 4.03 in males vs. female's average at 1.97 and 2.45 in males in the acceptance of the use of mobile phone-based button. This percentage as it came soon in a rating based on the age group, but for the benefit of least 28 years category (category Minor) and was also attributed to accept the advantages of mobile phone based on the touch screen ease of use, and speed performance, and the extent of interaction during use and how fast the transition between files on face following the order of (4.27, 4.32 , 4.24 and 3.98) in females and averages (4.0 , 4.03 , 3.92 and 3.95) in men and this refers to the degree of acceptance largely dealing with devices that rely on interactive design, which makes it easier to processes to use and gives the user a sense of positive.

The results also find that the average over the acceptance of the use of unconventional means the ratio of 3.18 in females and 2.66 in males while the group's younger an age the most accepting of it was 3.55 average vs. 2.69 average for the category an age and 2.14 biggest category an age and this indicates that interaction devices appropriate to the nature of the user younger.

Reference

1- **Dan Saffer (2010), Designing For Interaction: Creating Innovative Applications And Devices, Second Edition, New Riders**

2- **James Pannafino (2012), Interdisciplinary Interaction Design, Assiduous Publishing**

3- **Richard Caddick (2011) ,Communicating The User Experience: A Practical Guide For Creating Useful Ux Documentation ,Wiley**

4- **Brando Jones (2010), Designing Effective Entry Points In Web Design, Http://Webdesign.Tutsplus.Com/Articles/Design-Theory/Deigning-Effective-Entry-Points-In-Web-Design/**

5- **Donald A. Norman (2003), Attractive Things Work Better, Emotional Design,**

6- **Tony Manninen (2004), Rich Interaction Model For Game And Virtual Environment Design, Oulun Yliopisto, Oulu**

7- **Dan Saffer (2009), Designing Gestural Interfaces, O Reilly Media, Canada**

8- **Interaction Design Foundation, Https://Www.Interaction-Design.Org/**

9- **Alan Cooper, Robert Reimann, And David Cronin, (2007) The Essentials Of Interaction Design, Wiley Publishing Inc, Usa**

10- **Donald A. Norman (2002), The Design Of Everyday Things, Usa**