

Designing

— Tushaar Gangarapu (15IT117)

1. Design Rules

1.1. Introduction

Design rules are to be followed in order to achieve universal consistency and gracefully increasing the usability of the system. These can be subdivided into Principles, Guidelines and Standards.

1.1.1. Principles

The following principles have been followed in designing the website

- Learnability
 - Predictability
 - Synthesizability
 - Familiarity
 - Generalizability
 - Consistency
- Flexibility
 - Dialog initiative
 - Multi-threading
 - Task migratability
 - Substitutivity
 - Customizability
- Robustness
 - Observability
 - Recoverability
 - Responsiveness
 - Task conformance

1.1.2. Standards and Guidelines

Smith and Mosier standards (12 standards) and guidelines (6 categories) have been followed in the website's development.

1.1.3. Aim

The aim of this website development is to achieve usability, effectiveness, efficiency, satisfaction through an effective design.

1.2. The Eight Golden Rules of Interface Design - Ben Shneiderman

1.2.1. Strive for consistency.

Consistent sequences of actions should be required in similar situations; identical terminology should be used in prompts, menus, and help screens are developed; and consistent color, layout, capitalization, fonts, and so on, is employed throughout. Exceptions, such as required confirmation of the delete command or no echoing of passwords, are comprehensible and limited in number.

1.2.2. Seek universal usability.

Recognize the needs of diverse users and design for plasticity, facilitating transformation of content. Novice to expert differences, age ranges, disabilities, international variations, and technological diversity each enrich the spectrum of requirements that guides design. Adding features for novices- explanations, and features for expert- shortcuts and faster pacing, enriched the interface design and improved perceived quality.

1.2.3. Offer informative feedback.

For every user action, there should be an interface feedback. In the website, for frequent and minor actions, the response is modest, whereas for infrequent and major actions, the response is more substantial. Visual presentation of the objects of interest in the website provides a convenient environment for showing changes explicitly.

1.2.4. Design dialogs to yield closure.

Sequences of actions are organized into groups with a beginning, middle, and end. Informative feedback at the completion of a group of actions gives users the satisfaction of accomplishment, a sense of relief, a signal to drop contingency plans from their minds, and an indicator to prepare for the next group of actions.

1.2.5. Prevent errors.

As much as possible, design the interface so that users cannot make serious errors; for example, gray out menu items that are not appropriate and do not allow alphabetic characters in numeric entry fields. If users make an error, the interface should offer simple, constructive, and specific instructions for recovery. Users need not have to retype an entire name-address form if they enter an invalid zip code but rather are guided to repair only the faulty part.

1.2.6. Permit easy reversal of actions.

As much as possible, actions are reversible. This feature relieves anxiety, since users know that errors can be undone, and encourages exploration of unfamiliar options. The units of reversibility may be a single action, a data-entry task, or a complete group of actions, such as entry of a name-address block.

1.2.7. Keep users in control.

Experienced users strongly desire the sense that they are in charge of the interface and that the interface responds to their actions. They don't want surprises or changes in familiar behavior, and they are annoyed by tedious data-entry sequences, difficulty in obtaining necessary information, and inability to produce their desired result.

1.2.8. Reduce short-term memory load.

Humans' limited capacity for information processing in short-term memory (the rule of thumb is that people can remember "seven plus or minus two chunks" of information) requires that designers avoid interfaces in which users must remember information from one display and then use that information on another display. It means that cellphones should not require re-entry of phone numbers, website locations should remain visible, and lengthy forms should be compacted to fit a single display.

These underlying principles must be interpreted, refined, and extended for each environment. They have their limitations, but they provide a good starting point for mobile, desktop, and web designers. The principles presented in the ensuing sections focus on increasing users' productivity by providing simplified data-entry procedures, comprehensible displays, and rapid informative feedback to increase feelings of competence, mastery, and control over the system.

1.3. The Seven Principles for Transforming Difficult Tasks into Simple Ones - Don Norman

1.3.1. Use knowledge in the real world and in the head.

The first principal seems obvious, it states that people learn better when the information needed to complete a task is readily available to them. For casual users this means the information needs to be apparent from the first time they use the system. Text should be kept to a minimum and the language used should be clear and concise. Alerts and prompts will help guide users through the system. Keyboard shortcuts and manual controls improve performance for expert users but should never be used as the only way of carrying out important tasks.

1.3.2. Simplify the structure of tasks.

As a general rule we can't hold more than 5 unrelated pieces of information in short term memory at once so it's worth considering how you can ease the burden of retrieval for the user. Try minimising the amount of irrelevant information (75% of the English language is redundant) or reducing the number of choices. Use features like tooltips, undo and history to help aid memory.

1.3.3. Make things visible.

This basically boils down to two things, execution and evaluation. The user should know how the task is executed and should be able to evaluate the outcome. Feedback is critical to this principle, always give good feedback to the user about the state of the system and make the outcomes of their actions as obvious as possible.

1.3.4. Get the mappings right.

Mapping is the relationship between a control, whatever it effects and the resulting action of the control. Take the common lightswitch, it's an example of particularly bad mapping, with no natural or logical connection between the switch on the wall and the light in the room. How many times have you tried to turn on one light only for another to come on? We need to exploit natural mappings, like placing a delete button next to the item it deletes, to help the user develop an accurate mental model of the system. Another way to strengthen the mapping is to use icons and graphics as metaphors.

1.3.5. Exploit the power of constraints.

Constraints prevent errors from occurring by taking the control out of the hands of users. For example, if your application requires an email registration in order for people to use it then ask the user to fill in their email address twice and make sure both are being validated as actual email

addresses. The user should feel that there is only one possible outcome of the action they are about to take. It may seem obvious but this is one of the most important principles in this list, when used correctly it guides the user seamlessly through the system.

1.3.6. Design for error.

Assume that every error that could be made will be made, test for it and provide contingencies when it happens. Take the time to think carefully about your error messages, try to describe what's happened in as few words as possible and make sure the user can recover from the error. Offering the user the ability to 'undo' critical actions like delete, rounds off the user experience.

1.3.7. When all else fails, standardise.

This can be rephrased as 'don't reinvent the wheel'. If there isn't a quicker, easier or simpler way to carry out a task then tap into the learned knowledge and behaviours the user has already acquired.

1.4. Ten Heuristics - Jakob Nielsen

1.4.1. Visibility of system status.

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

1.4.2. Match between system and the real world.

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

1.4.3. User control and freedom.

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

1.4.4. Consistency and standards.

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

1.4.5. Error prevention.

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

1.4.6. Recognition rather than recall.

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

1.4.7. Flexibility and efficiency of use.

Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

1.4.8. Aesthetic and minimalist design.

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

1.4.9. Help users recognize, diagnose, and recover from errors.

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

1.4.10. Help and documentation.

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

2. Hypertext, multimedia and the world wide web

2.1. Multimedia.

In a media dominated world, there are strong arguments for using video or audio material as part of hypertext systems whether for education, entertainment or reference. If the video is integrated with the website then it gives the user a very pleasant and enriching experience. In my website, I have included the option for the user to link youtube videos (in blogs). Linking youtube videos directly let's the students watch the video once the content is shared by the tutor. The video can also be uploaded as a file by the tutor and this let's the student who have access to the course to watch the video. This is how multimedia is incorporated into the app.

2.2. Hypertext.

Hypertext allows a number of different pages to be accessed from the current one, and, if the hypertext is well designed, the user should find it easier to follow his own particular and not be forced down one route. A hypertext system comprises a number of pages and a set of links that are used to connect pages together. In my website by providing a navbar and a suitable menu buttons in the bar, I allow users to navigate from one page to another smoothly. Options such as sign-out, lets the users sign-out while options such as home, course etc allows the user to navigate to a particular portion of the website. Through incorporating menu-bar and detailed option it became possible to have the concept of hypertext in my website.

2.3. Hypermedia.

The system is said to include hypermedia if it includes text, diagrams, photos and so on. Both learners and teachers should be able to add information and links, giving students access to each other's opinions as well as those of their tutors. By introducing forums where teacher, students and the admin can post things on the forum and let's the others reply and comment on it helps in introducing the concept of hypermedia to the website. By allowing the tutors to post links of youtube and other external websites, it further strengthens this idea of integrating hypermedia to a website to make it more dynamic and attractive.

2.4. Icons.

Icons often appear on web pages, and while there are many available to choose from, they should be used with care. On web pages, icons are typically used in one of two ways. They are either visual cues, associating some small picture with different parts of the text (for example, some pages have icon-sized characters that appear next to instructions). They help better the User-interface of the website and makes the website look more aesthetically pleasing and intuitive to the user. By having separate icons for courses, and sign-in and sign-out options I have made the website more user-friendly.

3. Modelling Rich Interaction

3.1. Naive Psychology.

Since we know where the user is looking, we put information there (not in a status line at the top where no one ever looks). So since post users expect the sign-out button to be next to sign-in button, we have out sign-out button to replace the sign-in once the user logs in. This is because the user expects to see the sign-out button in the same exact place that he had observed the sign-in button. This takes into consideration the concept of Naive Psychology.

3.2. Status and Event.

When the user successfully uses the right username and password he is allowed to view the website depending on his role i.e Professor, Admin or Student. This is an event. However, the button that told sign-in now changes to sign-out allowing the user who is logged in to log out, this changing the name of the button is an event. When professor uploads a new chapter under a particular course, the professor is performing an event. A new card appears in the course stating the name of the lesson and the details, this is an event. The student who is registered under the professor on seeing the newly added lecture, views it. This is referred to as polling.

3.3. Triggers.

Trigger analysis looks in detail at the triggers that cause activities to happen when they happen. Different types of triggers include:

- *Immediate*: Straight after previous task. The professor has to add the name of the chapter as soon as he decides to add a new chapter to the existing course.
- *Sporadic*: If the user wants to check for a updated lesson, he can do so my going and seeing if the professor has added any new chapters whenever he wishes to do so. This event hence is sporadic in nature.
- *External event*: If the professor makes his lesson private then the student who are not enrolled to the particular course will not be able to view the course materials by the professor. This event is external to that of the student as this is controlled by the professor.
- *Environmental cue*: Something in the environment prompts action. If the user's login credentials are wrong, then the environment prompts the wrong username-password message.

Triggers are important not only for understanding the temporal behavior of the task, but also because they tell us about potential failure modes.

4. Communication and Collaborative Model

4.1. Conversation.

The forum provides a means of communication for all the users of the website. A new thread can be started in the forum by creating a topic or asking a question. Other users can reply to this message and then someone else can reply to this message and we can have a conversation under a given thread by a question-answer format. The most essential part of the conversation is turn taking where in each user takes his turn to reply to a given message. The message within each of the turn of the users is called utterance.

4.2. Context.

If we take a single message from the series of replies that are performed on a particular thread then we find it to be highly ambiguous and devoid of any sort of meaning. Arguably, even a complete conversation is heavily context dependent – without knowing the situation and the social relations between the participants, we cannot understand the words. However if we see the topic under which the thread is posted, then we can come to a conclusion as to what the topic of conversation is. So having a topic for a particular thread in the forum is highly useful.

4.3. Communication using email.

When the user registers for the course, he receives a mail acknowledging the registration. Often you cannot know when you send a message what the email culture of the recipient is. It varies between organizations and even between groups and individuals within an organization. The medium itself gives few clues. Many people do not even realize that there are such cultural differences. The pace of the conversation is the rate of such a sequence of connected messages and replies. Clearly, as the pace of a conversation reduces, there is a tendency for the granularity to increase. More interesting in a cooperative work setting are two coping strategies which increase the chunk size of messages in order to reduce the number of interactions required to complete a task. These strategies are frequently seen in both text-based conferences and in letter writing.

5. Universal Design

Application of principles for universal design in designing the website

5.1. Equitable Use.

The design is useful to people with a range of abilities and appealing to all. No user is excluded or stigmatized. Wherever possible, access should be the same for all; where identical use is not possible, equivalent use should be supported. Where appropriate, security, privacy and safety provision should be available to all. Here all the users i.e student, teachers and admins are given the same rights depending on the user-roles. No one amongst the students or the professors are given special roles and permissions and all are provided with the same security features.

5.2. Flexibility in Use.

The design allows for a range of ability and preference, through choice of methods of use and adaptivity to the user's pace, precision and custom. Here when designing the role of a professor, we try to make the design as flexible as possible by allowing flexibility to the professor's role. He can post videos, add images or write content depending on his discretion. He can also decide on whether his course has to be public and if not, who are the student who should be allowed to view his course and notes.

5.3. Simple and Intuitive to Use.

The system is designed in such a manner that it becomes simple and easy for anyone who is new and trying to operate the system. Even a novice user should not have difficulty in navigating about the website and should find the site easy to handle and operate.

5.4. Perceptible Information.

The design should provide effective communication of information regardless of the environmental conditions or the user's abilities. Redundancy of presentation is important. Essential information should be emphasized and differentiated clearly from the peripheral content. Presentation should support the range of devices and techniques used to access information by people with different sensory abilities. All the important information are highlighted and made sure that the viewer sees it.

5.5. Tolerance for error.

Minimizing the impact and damage caused by mistakes or unintended behavior. Potentially dangerous situations should be removed or made hard to reach. Potential hazards should be shielded by warnings. Systems should fail safe from the user's perspective and users should be supported in tasks that require concentration. Whenever user enter a wrong password, the system tells the user that his password is wrong. If the password is too similar to that of the username, then too the error is displayed. We also make sure that the password is strong and error messages are displayed for passwords that are weak in nature.

5.6. Low Physical Effort.

Systems should be designed to be comfortable to use, minimizing physical effort and fatigue. The physical design of the system should allow the user to maintain a natural posture with reasonable operating effort. Repetitive or sustained actions should be avoided. The website is

made minimalistic so that all the users can easily access content and are comfortable with the website and are not overwhelmed by it's complexity.

5.7. Size and space for approach and use.

The placement of the system should be such that it can be reached and used by any user regardless of body size, posture or mobility. Important elements should be on the line of sight for both seated and standing users. All physical components should be comfortably reachable by seated or standing users. Systems should allow for variation in hand size and provide enough room for assistive devices to be used. The menu bar with all the important buttons ensure that the user can reach any part of the website whenever he pleases. The important elements, through the minimalistic design of the website are made sure are in line of sight of the user of the system.

All the seven points have been considered while making this website and this goes on to prove how the website has a universal design and can be equally applicable to all the situations.