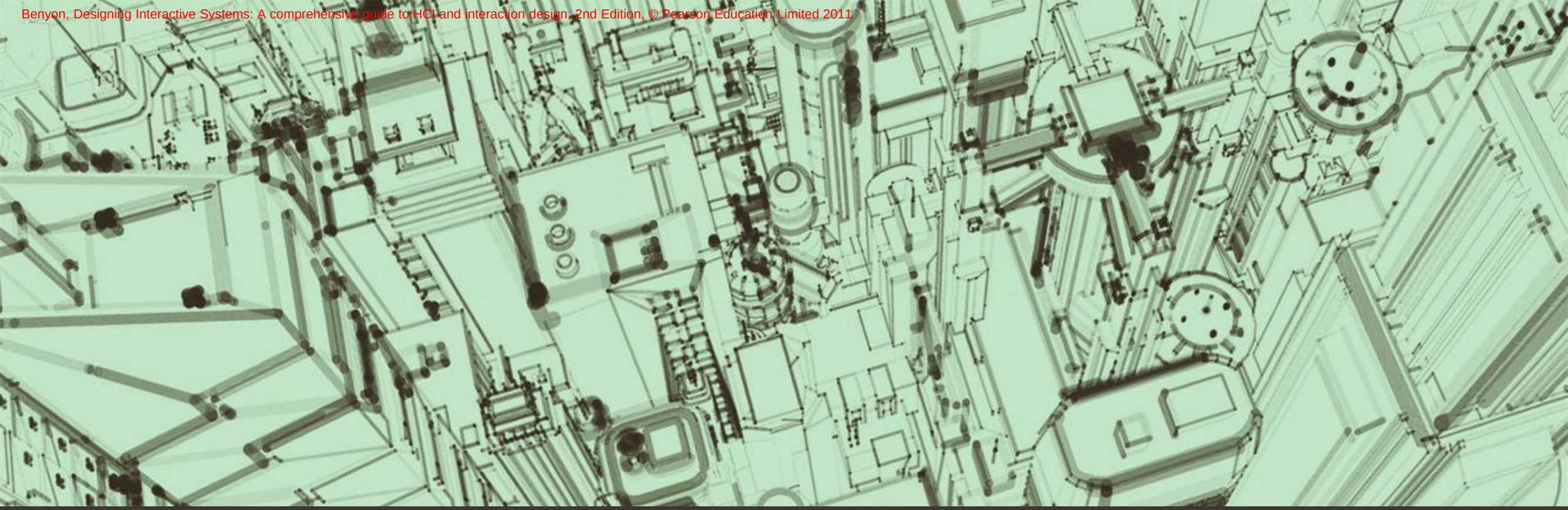

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Chapter 5

Usability and Design Principle

Aims

- Usability has always been the central pursuit of human–computer interaction (HCI).
- The original definition of usability is that systems should be easy to use, easy to learn, flexible and which engender a good attitude in people (Shackel, 1990).
- As the variety of people, activities, contexts and technologies of interactive system design has increased so this definition, whilst still being valid, hides many important issues.
- For example, accessibility is now a key design aim, as is sustainability.
- The goals of usability are now primarily seen as concerned with efficiency and effectiveness of systems.

Usability Definition

- A system with a high degree of usability will have the following characteristics.
- It will be efficient in that people will be able to do things using an appropriate amount of effort.
- It will be effective in that it contains the appropriate functions and information content, organized in an appropriate manner.
- It will be easy to learn how to do things and remember how to do them after a while.
- It will be safe to operate in the variety of contexts in which it will be used.
- It will have high utility in that it does the things that people want to get done.

Good Design

- Good design cannot be summed up in a simple way and nor can the activities of the interactive systems designer, particularly one who takes a human-centred approach to design.
- One view might say ‘The interactive systems designer aims to produce systems and products that are accessible, usable, socially and economically acceptable ’.
- Another view might say ‘The interactive systems designer aims to produce systems that are learnable, effective and accommodating’.
- A third view could be ‘The aim of the interactive systems designer is to balance the PACT (People, Activities, Context, Technology) elements with respect to a domain’.

Good Design (cont.)

- Usability refers to the quality of the interaction in terms of parameters such as time taken to perform tasks, number of errors made and the time to become a competent user. A system may be assessed as highly usable according to some usability evaluation criteria, but may still fail to be adopted or to satisfy people.
- Accessibility concerns removing the barriers that would otherwise exclude some people from using the system at all. Clearly a system must be accessible before it is usable.
- Acceptability refers to fitness for purpose in the context of use. It also covers personal preferences that contribute to users ‘taking to’ an artifact, or not.

Accessibility

- Access to physical spaces for people with disabilities has long been an important legal and ethical requirement and this is now becoming increasingly so for information spaces.
- Legislation such as the UK's Disability Discrimination Act and Section 508 in the US now requires software to be accessible.
- The United Nations and the World Wide Web Consortium (W3C) have declarations and guidelines on ensuring that everyone can get access to information that is delivered through software technologies.
- With an increasingly wide range of computer users and technologies, designers need to focus on the demands their designs make on people's abilities.
- Designers have to design for the elderly and for children.
- Newell (1995) points out that the sort of issues that face an ordinary person in an extraordinary environment (such as under stress, time pressures, etc.) are often similar to the issues that face a person with disabilities in an ordinary environment.

Exclusion

- People will be excluded from accessing interactive systems for any of a number of reasons:
- Physically people can be excluded because of inappropriate siting of equipment or through input and output devices making excessive demands on their abilities. For example, an ATM may be positioned too high for a person in a wheelchair to reach, a mouse may be too big for a child's hand or a mobile phone may be too fiddly for someone with arthritis to use.
- Conceptually people may be excluded because they cannot understand complicated instructions or obscure commands or they cannot form a clear mental model of the system.
- Economically people are excluded if they cannot afford some essential technology.
- Cultural exclusion results from designers making inappropriate assumptions about how people work and organize their lives. For example, using a metaphor based on American football would exclude those who do not understand the game.
- Social exclusion can occur if equipment is unavailable at an appropriate time and place or if people are not members of a particular social group and cannot understand particular social mores or messages.

Overcoming Barriers

- Overcoming these barriers to access is a key design consideration.
- Two main approaches to designing for accessibility are ‘design for all’ and inclusive design.
- Design for all (also known as universal design) goes beyond the design of interactive systems and applies to all design endeavors.
- It is grounded in a certain philosophical approach to design encapsulated by an international design community.

Inclusive Design

- Varying ability is not a special condition of the few but a common characteristic of being human and we change physically and intellectually throughout our lives.
- If a design works well for people with disabilities, it works better for everyone.
- At any point in our lives, personal self-esteem, identity and well-being are deeply affected by our ability to function in our physical surroundings with a sense of comfort, independence and control.
- Usability and aesthetics are mutually compatible.
- Inclusive design is a more pragmatic approach that argues that there will often be reasons (e.g. technical or financial) why total inclusion is unattainable.
- Benyon, Crerar and Wilkinson (2001) recommend undertaking an inclusivity analysis that ensures that inadvertent exclusion will be minimized and common characteristics that cause exclusion and which are relatively cheap to fix will be identified.

Principle of Universal Design

- Equitable Use: The design does not disadvantage or stigmatize any group of users.
- Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.
- Simple, Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Low Physical Effort: The design can be used efficiently and comfortably, and with a minimum of fatigue.
- Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

Accessibility (more…)

We all suffer from disabilities from time to time (e.g. a broken arm) that affect our abilities to use interactive systems. As a way of ensuring an accessible system, designers should include:

- people with special needs in requirements analysis and testing of existing systems;
- consider whether new features affect users with special needs (positively or negatively) and note this in the specification;
- take account of guidelines, include evaluation against guidelines;
- include special needs users in usability testing and beta tests.

Assistive Technology

- There are a number of assistive technologies, such as Web browsers that read Web pages, and screen enlargers which allow people to set and move the area of focus.
- Voice input is increasingly available not just for text entry but also as a substitute for mouse/keyboard control, and keyboard filters can compensate for tremor, erratic motion and slow response time.
- Indeed there are many highly specialist methods for input and output for people with various disabilities.
- For example, Majaranta, Ahola and Spakov (2009) describe a system for typing input through gazing at particular letters.

Accessibility Options

- In the MS Windows XP operating system there is an Accessibility Option (under the control panel) that allows the setting of keyboard, sound, visual warnings and captions for sounds.
- The display can be altered including setting a high contrast, and mouse settings can be adjusted.
- The Universal Access control panel on the Mac offers similar options.
- A screen reader produces synthesized voice output for text displayed on the computer screen, as well as for keystrokes entered on the keyboard.
- Voice-based browsers use the same technology as screen reading software, but are designed specifically for Internet use.

Web Accessibility

- Web accessibility is a particularly important area as many web sites exclude people who are not fit and able.
- The W4A conference and ACM's SIGACCESS group contains many specialist papers and discussions.
- Bobby is an automated tool that checks web pages for conformance to the W3C standards.
- However, in a study of university web sites, Kane, Shulman and Ladner (2007) found serious accessibility problems showing that there is still some way to go before these issues are overcome.

Design for all

- To a large extent design for all is just good design.
- The aim is to design to cater for the widest range of human abilities.
- By considering access issues early in the design process, the overall design will be better for everyone.
- Stephanidis (2001) provides a range of views on how this can be accomplished, from new computer ‘architectures’ that can accommodate different interfaces for different users, to better requirements generation processes, consideration of alternative input and output devices and the adoption of international standards.

Original Usability Principle

- Early focus on users and tasks. Designers must first understand who the users will be, in part by studying the nature of the expected work to be accomplished, and in part by making users part of the design team through participative design or as consultants.
- Empirical measurement. Early in the development process, intended users' reactions to printed scenarios and user manuals should be observed and measured. Later on they should actually use simulations and prototypes to carry out real work, and their performance and reactions should be observed, recorded, and analyzed.
- Iterative design. When problems are found in user testing, as they will be, they must be fixed. This means design must be iterative: there must be a cycle of design, test and measure, and redesign, repeated as often as necessary. Empirical measurement and iterative design are necessary because designers, no matter how good they are, cannot get it right the first few times. (Gould *et al., 1987, p. 758)*
- As a result of their experiences with that project they added a fourth principle, integrated usability:
- 'All usability factors must evolve together, and responsibility for all aspects of usability should be under one control'. (p. 766)

But…

- However, these classic principles are not advocated by every one.
- Cockton (2008) for example argues that designers need to understand the values that there designs are aiming at and that the sort of advice offered by Gould and Lewis are dangerous and out of date.
- Whilst not going as far as that, we would certainly agree that designers need to consider what worth their designs bring to the world!

Usability and PACT

One way to look at usability is to see it as concerned with achieving a balance between the four principal factors of human-center interactive systems design, PACT:

- ✓People
- ✓Activities people want to undertake
- ✓Contexts in which the interaction takes place
- ✓Technologies (hardware and software)

- The combinations of these elements are very different in, for example, a public kiosk, a shared diary system, an airline cockpit or a mobile phone; and it is this wide variety that makes achieving a balance so difficult.
- Designers must constantly evaluate different combinations in order to reach this balance.

Important Feature for Interaction Design

- There are two relationships that need to be optimized.
- On the one hand there is the interaction between people and the technologies that they are using.
- This focuses on the user interface.
- The other relationship is the interaction between the people and technologies considered as a whole (the people–technology system), the activities being undertaken, and the contexts of those activities.

People – Technology System

- The idea of a people–technology system optimized for some activities is nicely illustrated with an example from Erik Hollnagel (1997).
- He discusses the difference between a person on a horse traveling across open countryside and a person in a car traveling along a road.
- The combinations of technologies are balanced for the different contexts of traveling; neither is better in all circumstances.
- It is important to remember that the people–technology system may consist of many people and many devices working together to undertake some activities.

The Gulf

- Don Norman (Norman, 1988) focuses on the interface between a person and the technology and on the difficulty of people having to translate their goals into the specific actions required by a user interface.
- People have goals – things they are trying to achieve in the world. But devices typically only deal with simple actions. This means that two ‘gulfs’ have to be bridged.
- The gulf of execution is concerned with translating goals into actions, and the gulf of evaluation is concerned with deciding whether the actions were successful in moving the person towards his or her goal.
- These gulfs have to be bridged both semantically (does the person understand what to do and what has happened?) and physically (can the person physically or perceptually find out what to do or what has happened?).

The Gulf of Execution

- The gulf of execution is the degree to which the interaction possibilities of an artifact, a computer system or likewise correspond to the intentions of the person and what that person *perceives* is possible to do with the artifact/application/etc. In other words, the gulf of execution is the difference between the intentions of the users and what the system allows them to do or how well the system supports those actions (Norman 1988).
- For example, if a person only wants to record a movie currently being shown with her VCR, she imagines that it requires hitting a 'record' button. But if the necessary action sequence involves specifying the time of recording and selection of a channel there is a gulf of execution: A gap between the psychological language (or mental model) of the user's goals and the very physical action-object language of the controls of the VCR via which it is operated. In the language of the user, the goal of recording the current movie can be achieved by the action sequence "Hit the record button," but in the language of the VCR the correct action sequence is:
    1) Hit the record button.
    2) Specify time of recording via the controls X, Y, and Z.
    3) Select channel via the channel-up-down control.
    4) Press the OK button.
- Thus, to measure or determine the gulf of execution, we may ask how well the action possibilities of the system/artifact match the intended actions of the user.

The Gulf of Evaluation

- The gulf of evaluation is the degree to which the system/artifact provide representations that can be directly perceived and interpreted in terms of the expectations and intentions of the user (Norman 1988). Or put differently, the gulf of evaluation is the difficulty of assessing the state of the system and how well the artifact supports the discovery and interpretation of that state (Norman 1991).
- "The gulf is small when the system provides information about its state in a form that is easy to get, is easy to interpret, and matches the way the person thinks of the system" (Norman 1988: p. 51).
- Thus, if the system does not "present itself" in a way that lets the user derive which sequence of actions will lead to the intended goal or system state, or derive whether previous actions have moved the user closer to her goal, there is a large gulf of evaluation. In this case, the person must exert a considerable amount of effort and expend significant attentional resources to interpret the state of the system and derive how well her expectations have been met. In the VCR example from above, the design of the controls of the VCR should thus 'suggest' how to be used and be easily interpretable (e.g. when recording, the 'record' control should signal that is activated or a display should).

Technology Breakdown

- When using a hammer, driving or writing with a pen we will usually focus on the activity itself: we are hammering, driving or writing.
- It is only when something happens to interfere with the smooth operation of these technologies that we become aware of them.
- If you hit your finger whilst hammering, if you have to swerve to avoid a hole in the road, or if the pen stops working, then the unconscious use of the technology turns into a conscious interaction with the technology.
- Winograd and Flores (1986) refer to this as a ‘breakdown’.
- One aim of interactive systems design is to avoid such breakdowns, to provide people with a way of undertaking activities without really being aware of the technologies that enable them to do what they are doing.

Usability and Mental Model

Another important aspect of usability is to try to engender an accurate mental model of the system.

- A good design will have adopted a clear and well structured conceptual design that can be easily communicated to people.
- A complex design will make this process much more difficult.
- Striving for a clear, simple and consistent conceptual model will increase the usability of a system.

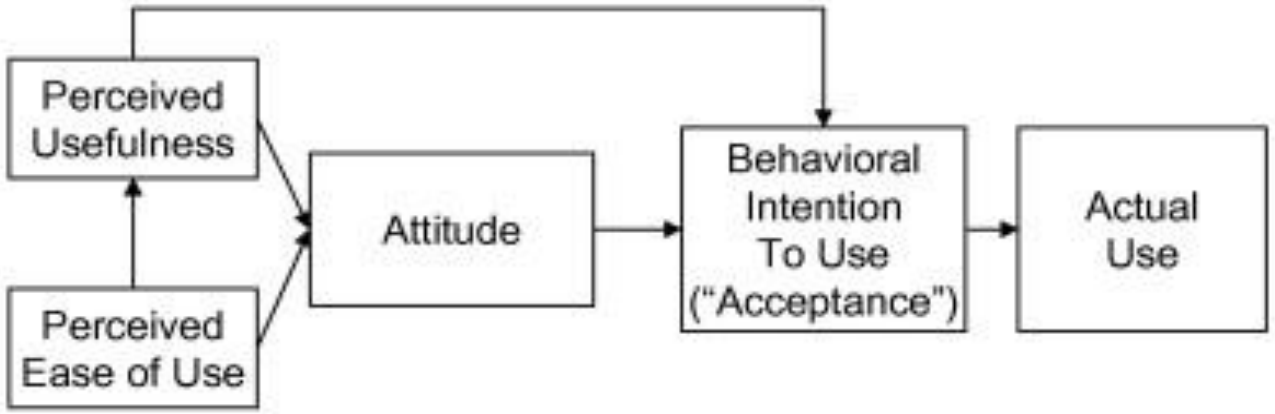
Acceptability

- Acceptability is about fitting technologies into people's lives.
- For example, some railway trains have 'quiet' carriages where it is unacceptable to use mobile phones, and cinemas remind people to turn their phones off before the film starts.
- Apple's iMac computer was the first computer designed to look good in a living room.
- A computer playing loud music would generally be considered to be unacceptable in an office environment.
- An essential difference between usability and acceptability is that acceptability can only be understood in the context of use.
- Usability can be evaluated in a laboratory (though such evaluations will always be limited) while acceptability cannot.
- It can be influence based on political, social and cultural habits as well as economical aspect.

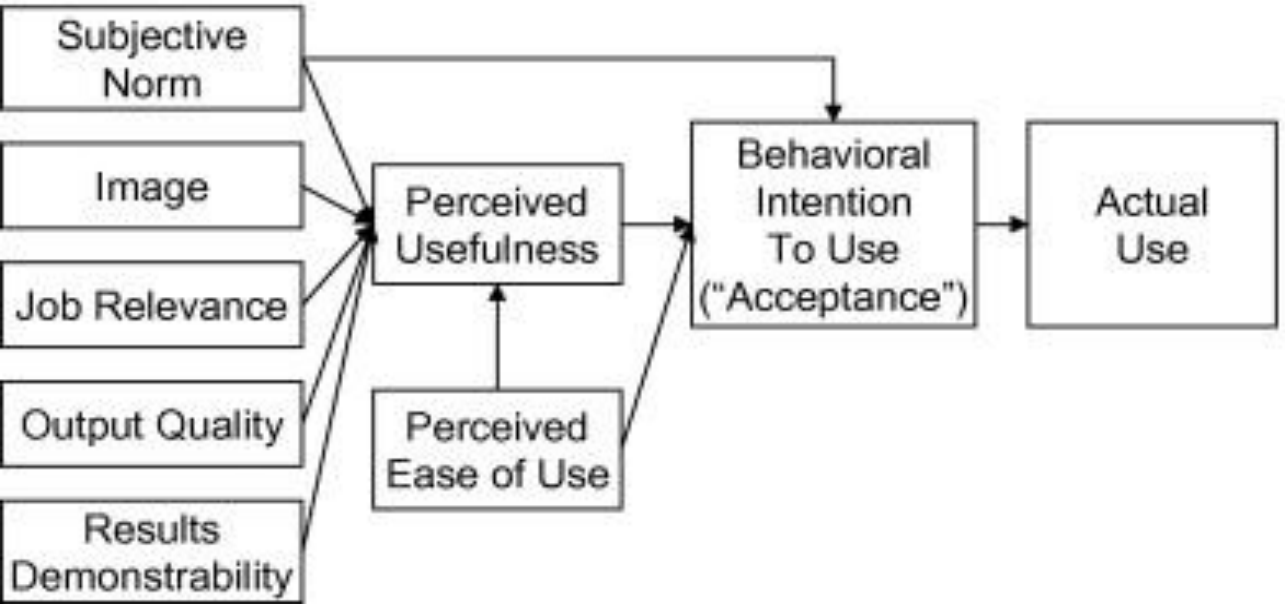
Technology Acceptance Model

- The Technology Acceptance Model (TAM) is a way of looking at technologies and whether they will be accepted by communities. TAM looks at technology acceptance from two perspectives; ease of use and effectiveness.
- Because new technologies such as personal computers are complex and an element of uncertainty exists in the minds of decision makers with respect to the successful adoption of them, people form attitudes and intentions toward trying to learn to use the new technology prior to initiating efforts directed at using. Attitudes towards usage and intentions to use may be ill-formed or lacking in conviction or else may occur only after preliminary strivings to learn to use the technology evolve. Thus, actual usage may not be a direct or immediate consequence of such attitudes and intentions. (Bagozzi, Davis & Warshaw 1992)
- The TAM has been continuously studied and expanded-the two major upgrades being the TAM 2 (Venkatesh & Davis 2000 & Venkatesh 2000) and the Unified Theory of Acceptance and Use of Technology (or UTAUT, Venkatesh et al. 2003). A TAM 3 has also been proposed in the context of e-commerce with an inclusion of the effects of trust and perceived risk on system use (Venkatesh & Bala 2008).

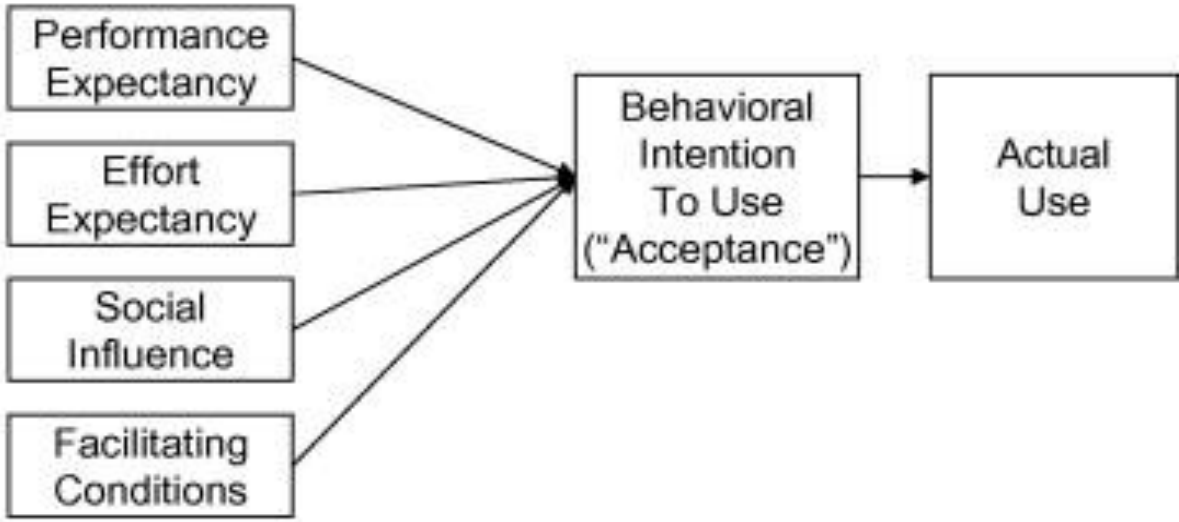
(a) Technology Acceptance Model (TAM)



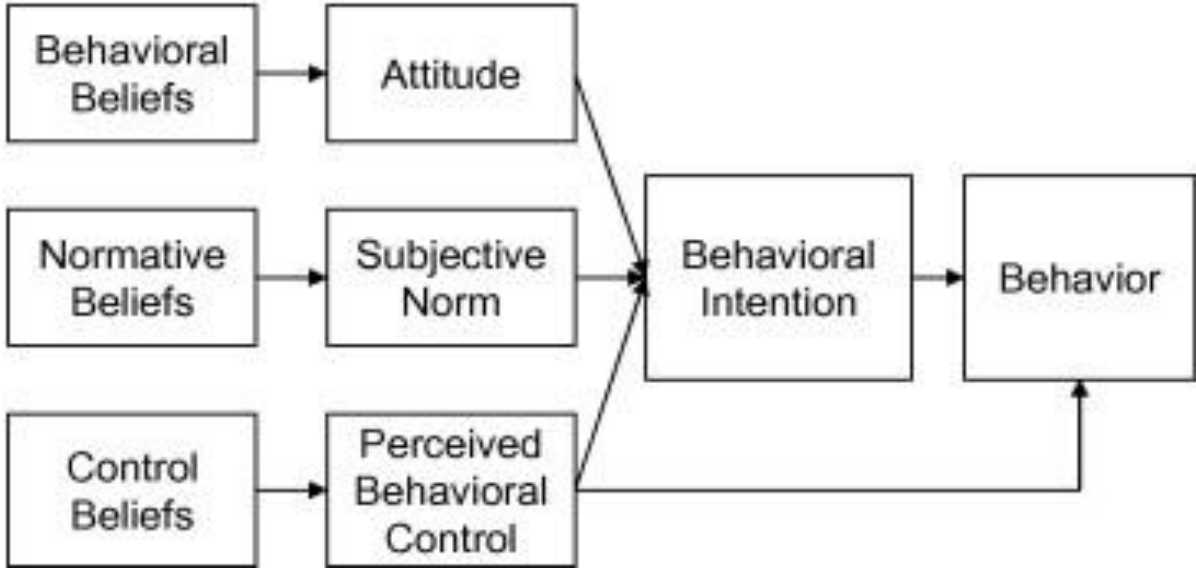
(b) Technology Acceptance Model 2 (TAM2)



(c) Unified Theory of Acceptance and Use of Technology (UTAUT)

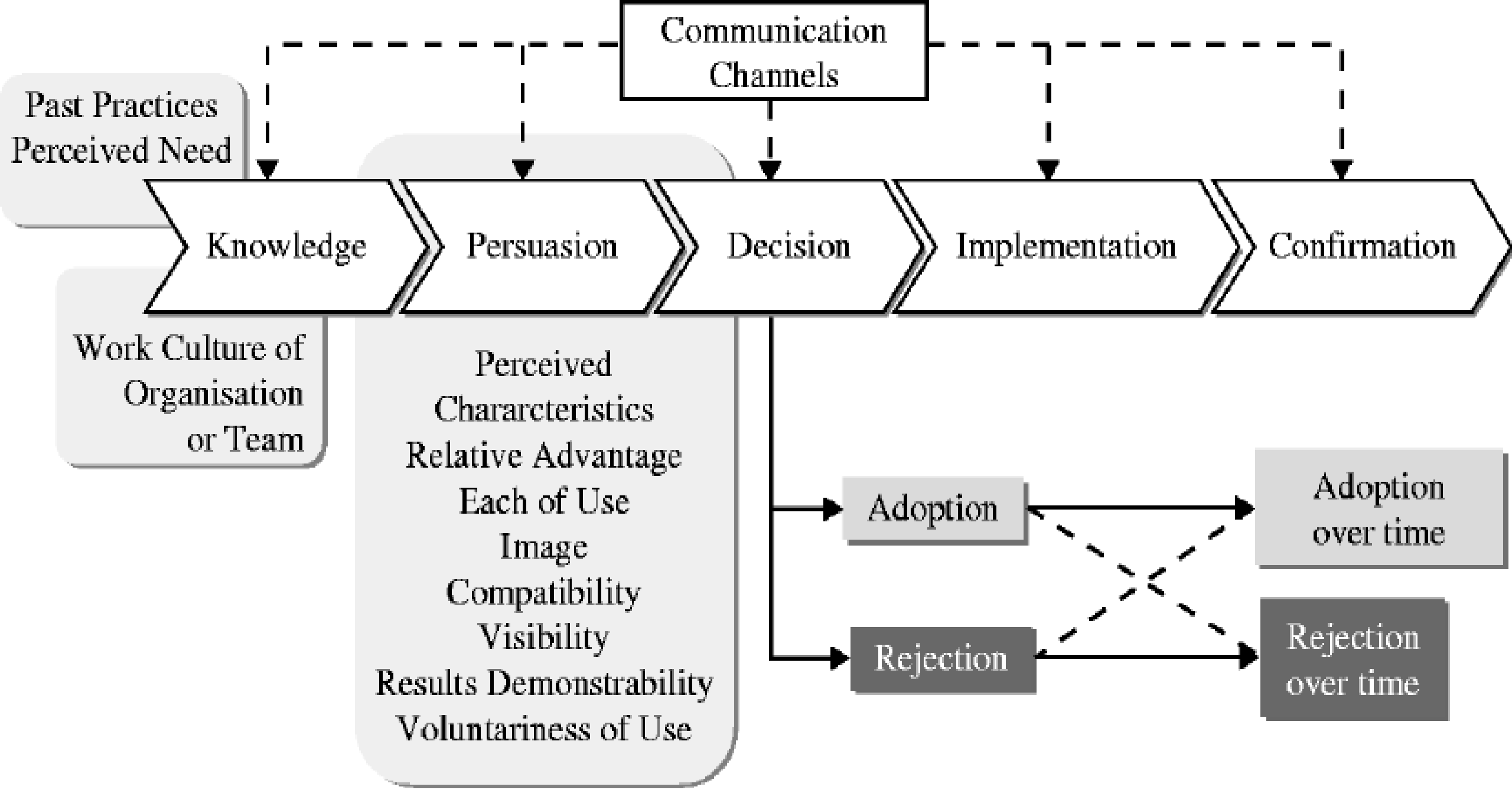


(d) Theory of Planned Behavior (TPB)



Diffusion of Innovation (Rogers, 1962)

- Rogers proposes that four main elements influence the spread of a new idea: the innovation itself, communication channels, time, and a social system. This process relies heavily on human capital. The innovation must be widely adopted in order to self-sustain. Within the rate of adoption, there is a point at which an innovation reaches critical mass.
- Diffusion occurs through a five–step decision-making process. It occurs through a series of communication channels over a period of time among the members of a similar social system, which are awareness, interest, evaluation, trial, and adoption.
- In later editions of *Diffusion of Innovation*, Rogers changes his terminology of the five stages to: knowledge, persuasion, decision, implementation, and confirmation.
- The categories of adopters are innovators, early adopters, early majority, late majority, and laggards.
- Adoption is an individual process detailing the series of stages one undergoes from first hearing about a product to finally adopting it. Diffusion signifies a group phenomenon, which suggests how an innovation spreads.



Source: Rogers (2003)

Convenience

- Designs that are awkward or that force people to do things may prove unacceptable.
- Designs should fit effortlessly in to the situation.
- Many people send documents electronically nowadays, but many people find reading on-line unacceptable.
- They print out the document because it is more convenient to carry and read.

Design Principle

- Over the years many principles of good interactive system design have been developed. Design principles can be very broad or they can be more specific.
- There are also good design principles that derive from psychology such as ‘minimize memory load’ (i.e. do not expect people to remember too much).
- The application of design principles has led to established design guidelines and patterns of interaction in certain circumstances such as the ‘undo’ command in a Windows application, the ‘back’ button on a website or the greying-out of inappropriate options on menus.
- Design principles can guide the designer during the design process and can be used to evaluate and critique prototype design ideas.

1. Visibility

- Try to ensure that things are visible so that people can see what functions are available and what the system is currently doing.
- This is an important part of the psychological principle that it is easier to recognize things than to have to recall them.
- If it is not possible to make it visible, make it observable.
- Consider making things 'visible' through the use of sound and touch.
- Good visibility, according to Hogue's principles (2012), means that obvious prompts and cues are present, which:

✓Lead the user through an interaction.

✓Guide them through a series of tasks.

✓Indicate what possible actions are available to them.

✓Communicate the context of the situation.

Visibility – Give Good UX (David Hogue)

2. Consistency

- Be consistent in the use of design features and be consistent with similar systems and standard ways of working. Consistency can be something of a slippery concept.
- A design will be consistent with respect to some things but may be inconsistent with respect to others. By having consistency and standard in the user interface design, it will help to reduce learning process and eliminate the confusion and alienation (Wong, 2016).
- There are also times when to be inconsistent is a good thing because it draws people's attention to something that is important. The difference between conceptual consistency and physical consistency is important.
- Conceptual consistency is about ensuring the mappings are consistent, that the conceptual model remains clear. This involves being consistent both internally to the system and externally as the system relates to things outside it.
- Physical consistency is ensuring consistent behaviors and consistent use of colors, names, layout and so on. Both conceptual and physical consistency are important.

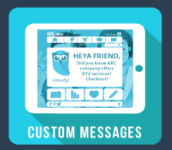
Consistency – Give Good UX (David Hogue)

3. Familiarity

- The degree to which a user recognizes user interface components and views their interaction as natural; the similarity of the interface to concrete objects the user has interacted with in the past.
- User interfaces can be familiar by mimicking the visual appearance of real-world objects, by relying on standardized commands, or by following other common metaphors. Use language and symbols that the intended audience will be familiar with.
- Where this is not possible because the concepts are quite different from those people know about, provide a suitable metaphor to help them transfer similar and related knowledge from a more familiar domain.
- Raymond Loewy (1951) who designed the logo for Air Force One, Coca-Cola bottle, Shell Oil, US Postal Service, and Greyhound introduced Maya (Most Advanced Yet Acceptable) Principle: “The adult public's taste is not necessarily ready to accept the logical solutions to their requirements if the solution implies too vast a departure from what they have been conditioned into accepting as the norm”.

THE 10 COMMANDMENTS OF USER INTERFACE DESIGN

1 CREATE A STORY



2 STREAMLINE NAVIGATION

3 MAKE IT RESPONSIVE

4 ENSURE ACCESSIBILITY

5 FORM FOLLOWS FUNCTION

6 USE PLEASANT COLOR THEMES

7 DEFINE FONT FAMILIES

8 BOOST OPTIMIZED IMAGES

9 MASTER MINIMALISM

10 ELIMINATE ERRORS

dm | Designmantic

4. Affordance

- Design things so it is clear what they are for; for example, make buttons look like buttons so people will press them.
- Affordance refers to the properties that things have (or are perceived to have) and how these relate to how the things could be used (Norman, 1988).
- Buttons afford pressing, chairs afford sitting on, and Post-it notes afford writing a message on and sticking next to something else. Affordances are culturally determined.
- Previously, Gibson (1979) defined affordances as all "action possibilities" latent in the environment, independent of an individual's ability to recognize them, but always in relation to agents (people or animals) and therefore dependent on their capabilities. For instance, a set of steps which rises four feet high does not afford the act of climbing if the actor is a crawling infant.

Gibson Affordance vs Norman Affordance

Action possibilities in the environment in relation to the action capabilities of an actor

Independent of the actor's experience, knowledge, culture, or ability to perceive

Existence is binary - an affordance exists or it does not exist.

Perceived properties that may not actually exist

Suggestions or clues as to how to use the properties

Can be dependent on the experience, knowledge, or culture of the actor and can make an action difficult or easy

5. Navigation

- Navigation is the website's "table of contents".
- Provide support to enable people to move around the parts of the system: maps, directional signs and information signs.
- Designing navigation is like designing a road-sign system. The over-riding design principle is functionality, not style. A reader on the Web, like a driver in a car, moves quickly. Navigation is never the end objective for the reader. It is there to help them get somewhere.
- Navigation and search are intertwined. Search is a form of navigation. In many situations, the reader will use a combination of the "content gatherers".

5. Navigation (more…)

- There are several principle of navigation design should be considered involve (Charlotte, 2009):
  - ❑Provide variety of navigation option.
  - ❑Let the user know where they are, they have been and they are going.
  - ❑Provide context, support, feedback and follow web convention.
  - ❑Do not surprise or mislead the user.
- Clear wording is another critical part of navigation. By communicating clearly through wording, you reduce any confusion as to where the link will take the user through to.
- Another way of communicating where a user is on a site is through the use of breadcrumbs. The name comes from leaving a path behind from which you can follow back to your original location.

4 Tips for Effective Navigation in E-learning course

1 Easy Navigation

We must remember that not all learners know how to navigate an eLearning course. So, it would be helpful if we provide a 'Help' option which assists them in navigating through the course.

2 Clear Menu

Having a simple menu would be helpful to the learner. The menu should have clear unit titles, and the slide titles.

3 Highlight the Instructions

Each slide may have a lot of content and visuals. So, by highlighting the instructions in other color for the interactive slides would grab their attention and help them know what they have to do next.

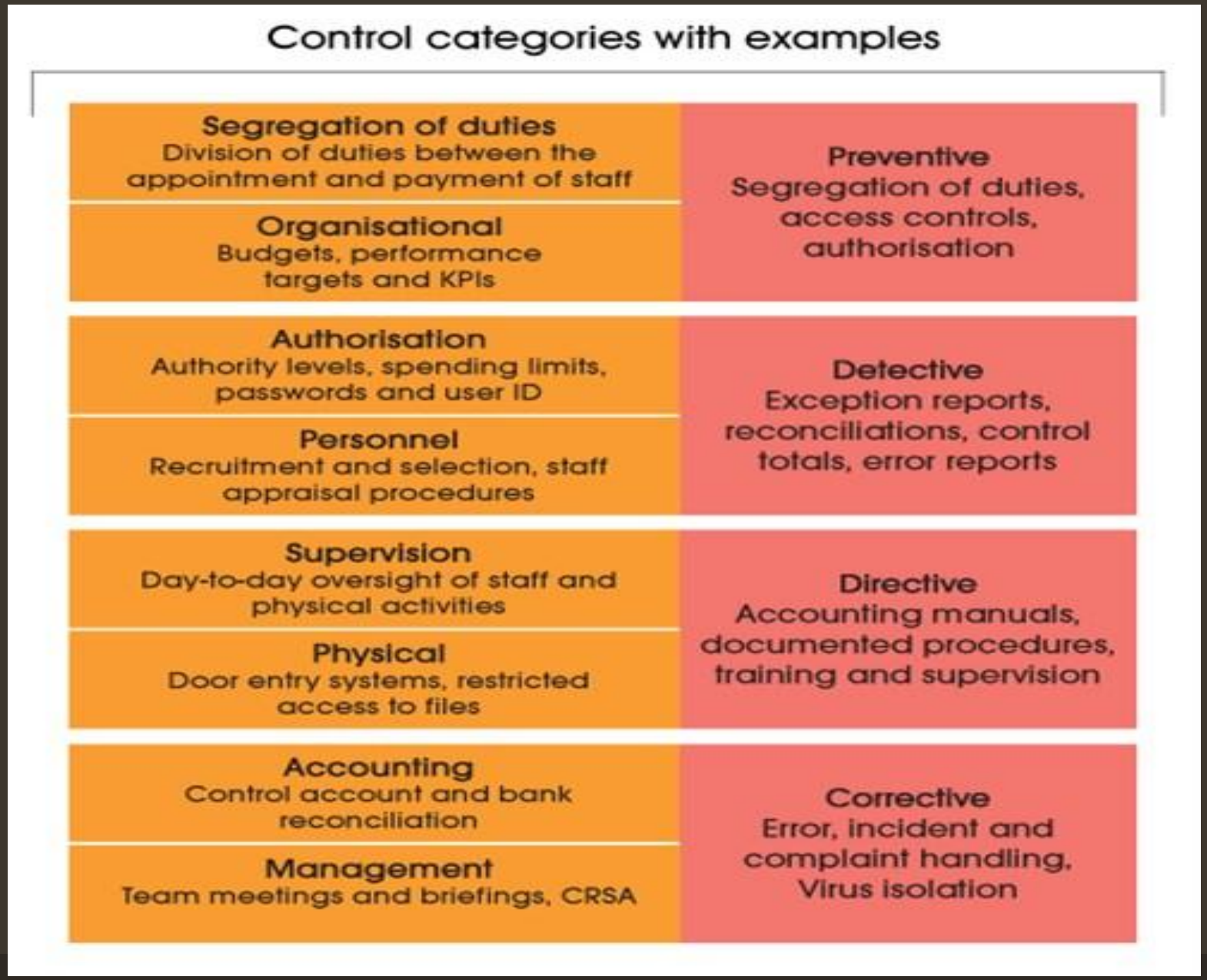
4 Avoid Restriction

The navigation of the course should be based on the learner's choice. Sometimes, a learner may want to skip some topics as he has prior knowledge about them. So, he must be allowed to freely navigate through the menu to prevent him from getting frustrated.

6. Control

- Thoughtless software takes away that comfort by forcing people into unplanned interactions, confusing pathways, and surprising outcomes. Keep users in control by regularly surfacing system status, by describing causation (if you do this that will happen) and by giving insight into what to expect at every turn.
- Control is enhanced if there is a clear, logical mapping between controls and the effect that they have, which is usually left in the hands of the users. Many applications, for example, automatically save people's work to help with recovery if mistakes are made.
- They have to initiate actions, although some features that provide security features are undertaken automatically. Make it clear who or what is in control and allow people to take control.
- Also make clear the relationship between what the system does and what will happen in the world outside the system.

Control – Chartered Institute of Internal Auditors



7. Feedback

- Rapidly feed back information from the system to people so that they know what effect their actions have had.
- Constant and consistent feedback will enhance the feeling of control.
- Feedback is provided in a variety of ways. A ‘bee’ symbol or an ‘egg timer’ symbol is used to indicate that the system is busy doing something.
- Counters and progress bars are used to indicate how much of an operation is complete.
- Feedback can be provided through sound such as a beep when a message is received on an e-mail system or a sound to indicate that a file has been safely saved.

Feedback (more…)

Feedback tells us whether or not we're moving closer to accomplishing a task or achieving a goal. It tells us if errors have occurred, and if so, what to *do* about them.

Feedback can be attention-grabbing via modal alerts or dialogs that cover the screen, or it may be as subtle as an icon badge that communicates status.

Feedback encourages and guides users through steps in a process, while warning them when they veer off course.

Essentially, according to Hogue (2012), feedback answers questions across four categories:

- ✓ **Location:** Where *am* I?
- ✓ **Current Status:** What's happening — and is it *still* happening?
- ✓ **Future Status:** What will happen *next*?
- ✓ **Outcomes & Results:** What *just* happened?

Feedback – Give Good UX (David Hogue)

ACTIONS NEED REACTIONS

every action should produce a **visible, understandable** and **immediate** reaction

let people know they have been **heard** (or felt or seen)

GIVE GOOD FEEDBACK

don't interrupt the experience
complement, not complicate

allow undo to reverse choices (and correct mistakes)

mistakes are incorrect choices, but don't always result in errors
I can accidentally transfer $1000 instead of $100, but it's not an error unless I don't have $1000!

GIVE GOOD ERROR MESSAGES

error prevention is ideal, but when they do happen, error messages should:

1. describe **what** happened
2. explain **why** it happened
3. suggest a **fix**
4. **never blame** the user

8. Recovery

- Enable recovery from actions, particularly mistakes and errors, quickly and effectively.
- The best way to reduce the amount of errors a user makes is to anticipate possible mistakes and prevent them from happening in the first place. If the errors are unavoidable we need to make them easy to spot and help the user to recover from them quickly and without unnecessary friction (Trenchard, 2010).
- If the error is unavoidable provide clearly marked ways for the user to recover from it. For example provide "*back*", "*undo*" or "*cancel*" commands.
- If a specific action is irreversible it should be classed as critical and you should make the user confirm first in order to prevent slip ups. Alternatively you can create a system that naturally defaults to a less harmful state.
- For example if I close a document without saving it the system should be intelligent enough to know that it is unlikely that I intended the action and therefore either auto-save or clearly warn me before closing.

9. Constraint

- Provide constraints so that people do not try to do things that are inappropriate.
- In particular, people should be prevented from making serious errors through properly constraining allowable actions and seeking confirmation of dangerous operations.
- There are two models of constraint: physical and psychological. Physical constraints decrease the sensitivity of controls and prevent or slow undesired actions and psychological constraints will aid in the intelligibility of your design and make it more intuitive.
- Physical constraint, refers to the ability to constrain the user's actions using a physical object, be it actual or virtual. There are three types of physical constraints: paths, axes, & barriers.
- Psychological constraint, refers to the technique of limiting possible user actions by leveraging the way people perceive their environment. There are three methods of executing psychological restraints: symbols, conventions, and mapping.

10. Flexibility

- Allow multiple ways of doing things so as to accommodate people with different levels of experience and interest in the systems.
- Provide people with the opportunity to change the way things look or behave so that they can personalize the system.
- Flexibility is provided with things such as short-cut keys, allowing more expert users to use combinations of keyboard controls in place of using menus to initiate commands and navigate through the system.
- Many windows applications allow the user to set their own preferences, to configure features such as the navigation bars and menu items and to disable features that are not often used.

11. Style

- Designs should be stylish and attractive. Style is also key to websites and offers the most opportunities for designers to demonstrate their creative flair. The use of animation, video and other design features can really develop a whole sense of engagement with the site.
- What makes a print ad, a website or a brochure particularly engaging? Is it the way the particular space is used? The way a photograph is placed within that space? Is it the subject matter of that photograph? Or the writing and the way it invites you to read?
- Thus, we should consider several important factor by starting a good choice or alternative, which are effective use of negative space, evocative photography, proper hierarchy, relevant copy and proper branding.

12. Conviviality

- Interactive systems should be polite, friendly, and generally pleasant.
- Nothing ruins the experience of using an interactive system more than an aggressive message or an abrupt interruption.
- Design for politeness. Conviviality also suggests joining in and using interactive technologies to connect and support people.
- Error messages are one area where the designer can move towards a more convivial design by thinking hard about the words used on the messages. However, all too frequently messages appear very abruptly and interrupt people unnecessarily.
- Conviviality can be provided by allowing people to join in, to support and create communities.

Conclusion

- Good design is about usability.
- It is about ensuring that systems are accessible to all and that designs are acceptable for the people and contexts in which they will be used.
- Designers need to evaluate their designs with people and involve people in the design process.
- Paying attention to design principles can help sensitize the designer to key aspects of good design.
- Access to interactive systems for all people is an important right.
- Usability is concerned with balancing the PACT elements in a domain.
- Acceptability is concerned with ensuring designs are appropriate to contexts of use.

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