

From clear to pretty - What factors influence the choice of memes in graphical user interface design?

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Abstract

Memes are bits of cultural information that spread through peoples minds, and sometimes evolve when they jump from mind to mind. Things like a button, or making a button beveled so it looks like you can press it, are examples of memes. In this paper, I look at the history of the use of memes in graphical user interface (GUI) design through the ages, and what factors influence this choice.

Xerox PARC developed WIMP (windows, icons, menu's, pointers) in 1973 and set the precedent for what fundamental memes make up a GUI. The looks of these buttons go through a lot of changes throughout the years because of:

- Technological factors (like the introduction of CSS, faster modems allowing for more complicated websites, or smartphones being introduced, and websites having to adjust for small screens);
- Cultural factors (like early GUI users having a hard time guessing what a clickable link is, or designing and hosting websites suddenly becoming accessible to the average user);
- And changing tastes in graphic design (like the rise of minimalism and flat design, compared to the flashy and shiny style of the 2000's).

With this knowledge and a trend analysis, I can predict what GUI's will look in the near future. GUI's will likely become more complex and robust, become more similar across different platforms, and will become more minimalist and abstract, relying on the users familiarity with these kinds of GUI's.

Introduction

We all remember the gaudy 2000's websites that were packed to the brim with flashy moving images and awful fonts and colors. Luckily, we now have our nice minimalist flat-design. But what caused this change? What influenced the decisions of the designers to go from using high-contrast, beveled buttons to our modern flat rectangles? In other words: "What factors influence the choice of memes in graphical user interface (GUI) design?", and can we use this knowledge to predict future GUI designs?

To explore these questions, I will first talk about memetics itself, and how to use them for design. I will then explore a brief history of the GUI, and which paradigms were set. I will then explore the different GUI design trends throughout the years, and observe which factors influenced them, as well as look at some specific GUI elements, and which memes were applied to them throughout these different time periods. I will then make a prediction for what GUI's will look like in the near future, based on the information I've found.

This paper will only focus on graphical user interfaces and assumes that input interactions of today will stay largely the same. For example, this paper will not go into the possibilities of voice control, or consider them for the future. I personally do not believe they are going to have a large impact on GUI's for regular consumers in the coming 10 years.

A regular consumer is an adult who has an average understanding of computers. They did not have any computer or smartphone training, and their computer skills will most likely be self taught. The understanding of GUI interactions of the regular consumer grows over time, which in turn impacts the complexity of GUI's.

What are memetics?

"Memes are units of cultural information, cultural evolution or diffusion, propagated from one mind to another analogously to the way in which a gene propagates from one organism to another as a unit of of genetic information and of biological evolution. Multiple memes may propagate as cooperative groups called memplexes (meme complexes)."

- Richard Dawkins, 1976 [1]

Memes are ideas that spread and evolve from mind to mind over time. This is incredibly broad and covers a lot of phenomena. Memes are all around us, if you can see an aspect of a thing that you've also seen done similarly or the same as in another thing, then it can be described as a meme; it is an idea that has jumped from one mind to another.

Memes can operate in 3 domains: functional, emotive, and cultural.

Functional memes can be very basic like trusses, cogs, welding, or even the wheel itself, to very specific things like certain protocols for Wi-Fi. It started out as an idea, then it spread and mutated.

Emotive memes are memes that evoke a certain emotion or association in the observer's mind. An emotion like "happy" can be associated with the memes of bright colors, sunshine, and rainbows. Complex emotions like "sophistication" can be evoked through memes like dark, subdued colors, leather, suits, etc.. In the field of product design, the word 'meme' is often used to describe a visual element that is used in multiple designs.

Cultural memes are memes that are often found in a particular period, which can be inspired by other periods. When we look at art history, we can see very clear examples. Roman architecture was based on Greek architecture. Later in the renaissance, the memes of these styles, like columns, arches, and more, were used again in Neo-classicism, which had elements that were used in baroque and rococo. Even today, the grill of any Rolls Royce car has the classic meme of a Greek temple facade [1] (see figure 1, and 2).



Figure 1: The grill of a Rolls Royce



Figure 2: A greek temple Facade

Memetics for me as a designer

Memes can be an extremely powerful tool as a designer. They can help evoke emotions, know what's possible technologically, and make sure that consumers will accept your product.

When designing a product that needs to appeal to a certain target audience, or evoke a certain emotion, emotive and cultural memetics can be incredibly helpful. Using design elements from existing products that evoke the same feeling will likely have the same desired effect.

This can also be helpful for making a product acceptable and accessible for users and consumers. If a product is as of yet unprecedented, the mental barrier of use and purchase can be lowered by including familiar elements. This is especially true for cognitive ergonomics, for example, a radical new digital application would likely still use buttons, text fields, and tabs to make it familiar to the user.

This also relates to technological memes. Using technology that already exists can be good for cognitive ergonomics. They can also be extremely useful for the designer. "Don't reinvent the wheel" is a popular phrase with a lot of truth to it. If there's already a commonly used technology to achieve a goal with a product, why not use it?

Memetic inspiration

Memetics can only be used if you know which ones you want to use. It is important to know what emotions you want to convey first. These can be explored with a good problem definition, a good design goal, and a good understanding of the target group. This requires research, like immersing myself in the context with things like interviews, context mapping, and more. Creating a mood board or collage for the desired emotion and the target group will help remind me of my goal throughout the design process.

After this, memes can be researched. Collecting photos of products that the target group might use, as well as products that evoke the desired emotions is a good start. Then, after analyzing these products and finding out what memes contribute to these emotions, the memes can be added to a mood board or collage. Sometimes, I already immediately know what memes I want, those can be added immediately.

These collages should be consulted regularly. I hung them up in my workplace, so it could continuously remind me of the memes and emotions I want.

GUI design trends: past, current, and future.

In this part, I am going to explore a brief history of GUI's, the principles behind GUI design, and going through the history of GUI design trends and fads, and attempt to answer the following questions:

- What technological factors influenced these trends?
- What cultural factors influenced these trends?
- Which GUI design principles were important to these trends?
- Which memes did these trends use?

I will then attempt use this information to predict the direction that GUI design will go into in the near future.

Hypothesis

We've all seen a shift from the gaudy early 2000's webpages with flashy buttons to the more minimalist 'flat design' of today. Flat-design uses a lot of icons and not a lot of text to explain how things work. I hypothesize that flat design is possible because the regular consumer is familiar more familiar with graphical user interfaces, icons, process flows, etcetera.

Brief history of GUI's

The first computers used punch cards as an interface for humans to give commands to a computer. Computers were not used by regular consumers at the time so intuitiveness was not the main concert of the product. The first big step in computer user interfaces were command line interfaces. Where a user could type lines, and the responses would be given immediately via printed paper in real time. This greatly increased speed. After this, video screens came into the picture. These made the process even faster and saved money on ink and paper [2][20].

The first graphical user interface was presented in 1968 by Douglas Engelbart. "NLS" used a mouse, hypertext, and multiple windows [3]. Two years later, researchers developed WIMP (windows, icons, menu's, pointers), setting a paradigm that exists to this day [3]. The GUI was popularized in the regular consumer's eye fourteen years later by Apple Macintosh, when they showed it off in a Superbowl commercial in 1984 [4].

The three main types of graphical user interfaces that the regular consumer deals with from day to day are desktop interfaces, touchscreen interfaces, and web interfaces. Web and touchscreen interfaces evolved from the desktop interfaces used in personal computers. Web interfaces often do not use windows, since a user does not often multitask on one web page. Because there is little demand for this, it is also not very developed, and hard to create. Touchscreen interfaces are most often used in PDA's, and later smartphones. They are different from desktop interfaces because they often don't use keyboards, mice, or pointers, instead relying on touch and gestures. Because the screens of touchscreen devices are often small, having multiple windows open is not often viable, and this is rarely used. Touchscreen interfaces account for this.

GUI paradigms

In 1987, Windows 2.0 introduced resizeable and overlappable windows which set the precedent for desktop interfaces for years to come [5].

The first popular Personal Digital Assistant (PDA), or 'handheld computer' with a touchscreen was the Apple Newton, which was presented in 1992. It created the first need for all-touchscreen interfaces [6]. Later, in 2007, the first iPhone was released, an all-touchscreen phone with multi-touch support. This multi touch support introduced gesture control, and it's UI set the paradigm for portable and non-portable touchscreen devices that is still seen today [7].

On the web front, Hypertext Markup Language (HTML) was invented in 1993; followed by JavaScript, which allows for website interactivity; and finally, CCS in 1996, which allowed formatting and style customization of websites. Websites still use all of these today, though aesthetic and interaction preferences have changed over the years [8].

GUI design principles

A good UI is based a few principles. The following list is from an anonymous person from Wikipedia, however, many reputable sources have describe lists of very similar principles [9][10][11].

1. **Clarity:** Avoiding ambiguity by making things clear through languag, hierarchy, and other elements
2. **Concision:** Making sure not too many things are on screen asking attention at the same time.
3. **Familiarity:** Using elements, hierarchies, language, visual language, and other elements that users are already familiar with.
4. **Consistency:** Using similar elements across different stages of the experience so users can recognize usage patterns.
5. **Aesthetics:** Attractive graphic design that speaks to the target users' tastes.
6. **Responsiveness:** The GUI should give output quickly when the user gives input. It should also provide good feedback so the user knows when something is successfully processed. This principle is not very relevant to this paper
7. **Efficiency:** The user should be able to use the GUI quickly and productively. For example, with shortcuts. This principle is not very relevant to this paper.
8. **Forgiveness:** When the user makes a mistake, they should be able to remedy it quickly, instead of being punished for it. This principle is not very relevant to this paper.

GUI trends over the years

Introduction

I will examine the trends and fads of GUI designs in this part. I will point out which of the GUI design principles were deemed more important than others during these trends.

The principle of "Aesthetics" is an especially difficult one. Graphic design is an art more than it is a science, and the styles don't seem to follow a general trend [12]. Tastes evolve quickly, so I will only talk about aesthetics in how important it is in relation to the other elements.

Clarity for new consumers

During the 90's and the early 2000's, User interfaces were simple, usually with a white background, black text, blue underlined links, and beveled buttons and fillable text boxes [13] (see figure 3). Not many GUI's strayed from this. This is partly because of low processor and internet speeds limiting what's possible aesthetic wise; but also because GUI's were still rather new, and not every consumer has used them yet. They needed to become familiar with GUI's first, so designers focused on familiarity and consistency, rather than aesthetics.

- Cultural factor: Users were not used to GUI's and needed to become familiar with them
- Technological factor: Computers and dial-up modems were slow and unreliable, GUI's needed to be light on them.

Idiosyncratic aesthetic

With the internet becoming faster and users becoming more familiar with GUI's, the time was ripe for more interesting designs in the early 00's. This space for creativity led to a lot of freedom in website design, many websites used aesthetics that appealed to their specific target audience, but would be considered horrible to others (see figure 4). Hosting and creating websites also became a lot more accessible to the general user, who was not a trained graphic designer. This can be seen in the importance of a 'personal homepage' during this time [21]. Aesthetics were the main focus during this period, pretty much all of the other principles were thrown out.

- Technological factor: The introduction of non-dial-up modems vastly increased reliability and speed of internet. Allowing for more complex websites.
- Cultural factor: Users were more used to GUI's at this point.
- Cultural factor: Hosting and creating websites was accessible to the regular user, leading to expressive homemade GUI's.



Figure 3: Websites did not stray far from the standard HTML formatting.



Figure 4: Aesthetics were tailored to the target audience.

Attention grabbing design, or “web 2.0”

As time went on, cooler heads prevailed, and more standardized modern aesthetics came became the norm. Websites were designed to grab the attention of the user with oversized buttons, flashy gradients, drop shadows, and a lot of elements on screen [13]. There was however, consistency between different designs; it was easy to distinguish a button from a textbox (see figure 5 and 6). This could also be seen in desktop GUI's, where beveled buttons with highlights, drop shadows, and gradients were also used prominently (see figure 7). Familiarity still played a large role, but consistency and concision were sacrificed for attention and aesthetics (that were good at the time).

- Cultural factor: The internet was recognized as an important tool by the mainstream by this point. Companies invested in experienced graphic designers for their GUI's.

Skeuomorphism

A small trend that happened in the early 2010's was skeuomorphism, the principle of derivative objects keeping the design cues from the original. Think of electric light bulbs in the shape of candles [14]. In GUI's this might materialize as book files standing on a bookshelf, or a digital amplifier being a photo of the real one, with turning knobs and all (see figure 8 and 9).

While skeuomorphism has always been a part of GUI design, think of the 'trash can' on desktop computers. However, it became very trendy and 'in your face' in the early 2010's. Apple started this trend, but it was short lived. Skeuomorphism may have been used to help people understand the new ways of using GUI's on the new iPhone, since multi-touch, non-WIMP GUI's were unprecedented at the time [15]. The interaction design foundation points out that Skeuomorphism is returning once more because of the unprecedented GUI interactions of smart watches [15].

Skeuomorphism is very clear, and relies on familiarity, though this is familiarity with physical interfaces instead of other GUI's. The aesthetics come automatically with a skeuomorphic interface, though any consistency is sacrificed.

- Technological factor: The introduction of the touchscreen smartphone led to unprecedented interactions. Skeuomorphism helped users get used to them.

Flat design

In 2012, windows 8 was introduced. It ruffled a lot of feathers for both aesthetics and big workflow changes. Flat design gets rid of any unnecessary graphical elements like gradients, reliefs, and textures, and uses flat colors, sharp edges, and 2-dimensional icons and images instead (see figure 10). This style is easy on the eyes, easy to see on small smartphone screens, and easy on your internet connection [13]. Since smartphones were now widely used, and websites were loaded with limited mobile data, that strain on the internet connection became a concern again, after not being one since the end of dial-up modems.

Flat design hinges on the user's familiarity with other flat design GUI's. Since the principle of flat design is removing any unnecessary elements, explanations can be removed if the user is familiar with iconography. We all know that an icon of a man and a women next to each other means “bathroom”, even though that does not make any sense. This goes for flat design too. We know that an icon with three dots on top of each other in the upper right corner means a drop down menu, and an icon with three stripes on top of each other on the left means 'side menu'. Buttons used to have highlights and shadows, but a simple flat color rectangle around some text is enough nowadays (see figure 11). This is only possible because we have grown familiar with GUI's in general as consumers. Clarity is achieved through familiarity and consistency, concision and responsiveness are extremely important because of the rise of small smartphone screens and websites that are light on your mobile data [16].

- Technological factor: Smartphones were widely used so GUI's had to account for small screens.
- Technological factor: Data bundles were limited and data connections were slow, limiting the complexity of websites again.

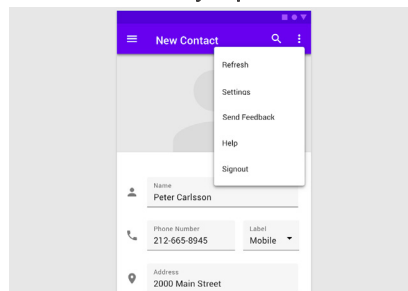


Figure 11: We know that an icon with three stripes on the left means a side menu, and an icon with three dots on the right means a drop down menu, but would we know that 15 years ago?



Figure 5: shiny buttons and lots of text on screen was the norm

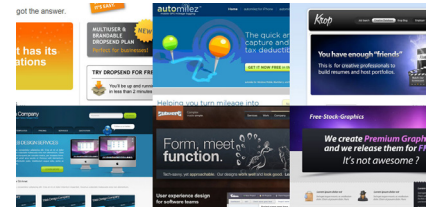


Figure 6: Gradients, shiny buttons and panels, drop shadows, and more.

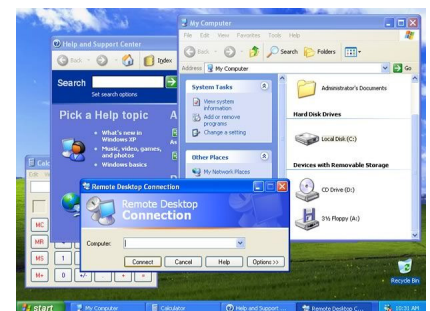


Figure 7: the desktop world also used shiny buttons and gradients.

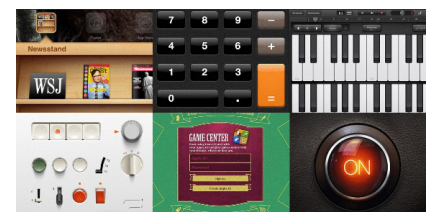


Figure 8: Apple was a big adopter and innovator of skeuomorphic GUI design.



Figure 9: The clearest example of skeuomorphic GUI design is digital amplifiers and other music equipment.

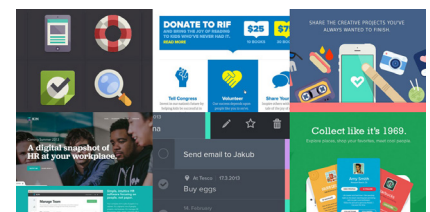


Figure 10: several examples of flat design.

GUI memetics

Now that we've talked about the general trends of GUI design over specific periods, let's look at the specific memes, and how they evolved over time.

Buttons

Bevels

The earliest buttons were often beveled to give the illusion of a third dimension, so people know they could push it (see figure 12).

Shine and core shadow

As more became possible and aesthetics became more important, GUI's started using buttons with shine on the top, and a core shadow on the bottom, as if they were 3 dimensional, had a soft curve, and were lit from above (see figure 13).

Flat rectangles and icons

With flat design, buttons are often just shown as flat rectangles, or with no indication at all, instead relying on context given by the text, font, or familiar icons (see figure 14).

Icons

Clarity

Computer screens started off small, blurry, and with a low resolution screens. This caused icons to be small, and had to become stylized, high contrast, and very clear, which can be seen in figure 12.

Realism

With better screens came the desire to make use of them. Icons started becoming larger and more detailed, resulting in realistic looking icons with high render quality and lower contrast (see figure 15).

Flat design

Tastes changed and flat design became the new trend. Flat design icons use low contrasts, but remain readability through simplicity, familiarity, and reduction of clutter (see figure 16).

Abstract

Icons are evolving past flat design. Users are digitally literate enough to know that two checkmarks means both the server, and the recipient have received the message, and three balls with a line through them means sharing. This would not be possible 10 years ago. Abstract icons are very readable on small screens. They are highly simplified and have high contrast, and only 1 color (see figure 17).

Links and clickable text

Times new Roman, underlined, #0000FF

Before CSS was invented, all links looked the same: the familiar serif blue underlined text. Even after website styling became a bit more widespread, keeping links blue and turning them purple after you've clicked on them stayed the norm for a while as users got used to navigating the internet. This meme doesn't have usecases that afford clicking on it by itself, and relies completely on familiarity [13] (see figure 18).

Colored, or underlined

Eventually, people got better at recognizing a link, and the standard formatting got thrown out. Still, clickable text was shown differently from other text. As long as it had another color, another weight, underline, or something else, you could recognize it as clickable text (see figure 19).

You'll know from context...

This familiarity is currently at a point where the context alone is enough to inform a user of whether or not a piece of text is clickable. The context is the only usecue (see figure 20).

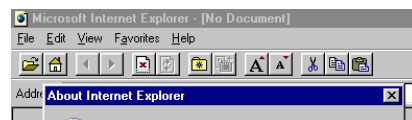


Figure 12: Beveled buttons

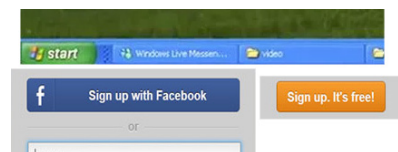


Figure 13: Shine and core shadows on buttons

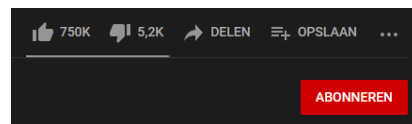


Figure 14: Flat rectangles and icons

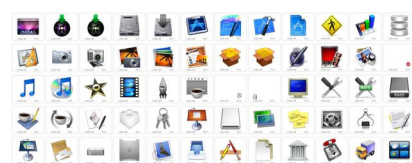


Figure 15: Apple's realistic icons

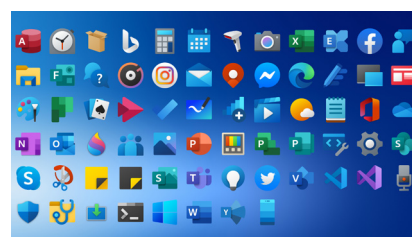


Figure 16: flat design icons



Figure 17: Google's abstract 'material' icons

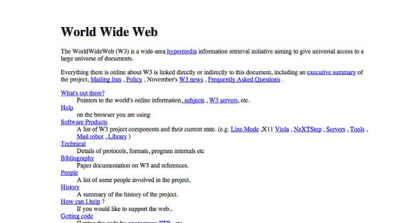


Figure 18: Links on the first website



Figure 19: Old website that used different fonts, different colors, and no underline for their links

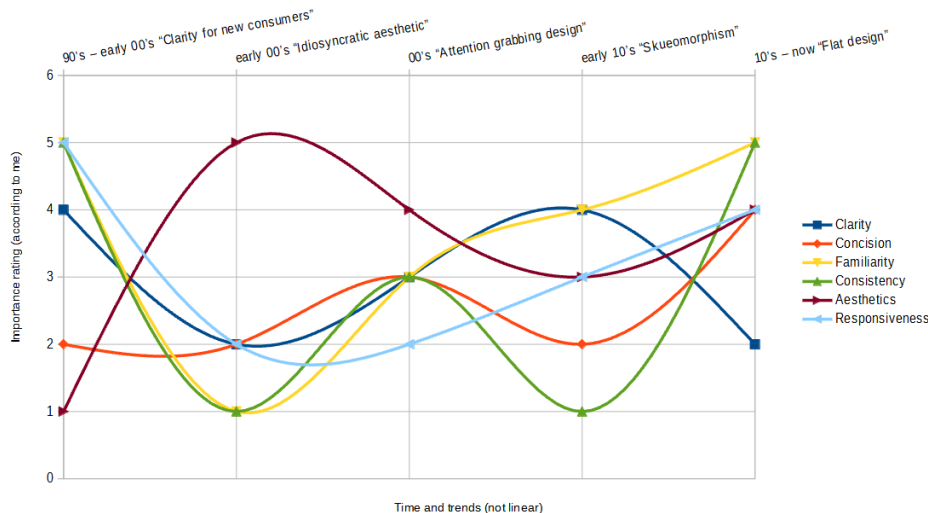
Textboxes

The styles of text boxes follow the same journey as buttons have, but with inverse bevels instead of regular ones. First, users had to get used to them. Inverse bevels signal to the user that they can put something in there (see figure 21). During the web 2.0 era, text boxes became colorful and got a lot of shine, core shadows, and gradients added to them (see figure 22). And when flat design came into style, text boxes too became more minimalist, and only had the slightest indication that something can be typed there (see figure 23).

Predicting the future of GUI design

By looking at the past trends of GUI's, and the recent technological and cultural factors, I can make a prediction of how GUI's will evolve in the coming years.

GUI values over time



Graph 1: Graph of the importance of UI principles over time

In the figure above, we can see that the principles of GUI design shifted in importance over the trends that come and go throughout the years. These values have been determined by outside observation and may not be very accurate. Still, it is an interesting thought experiment to draw trend lines and use them to predict the future. Some of the values, like aesthetics, concision, consistency and aesthetics are rising and falling in a wave pattern.

However it is more likely that GUI trends are based on what the technology allows, what graphic design trends are at the time, and the digital literacy of the regular consumer.

Increased minimalism and abstraction

Increased minimalist aesthetics

The graphic design elements used in GUI's are often chosen for what is currently in 'trendy', much like fashion trends, graphic design trends are difficult to predict [12].

If I am to make draw a conclusion, it seems that graphic design is currently still trending towards minimalism, even to the point of abstraction. I predict that design elements will continue to become more minimalist and abstract in the coming years [12].

Increased reliance on user familiarity

Future GUI's will likely have increased reliance on user familiarity through consistency of GUI elements and flow, employing things like vague iconography and common layouts, as per the current trend.

As per the trend, there will probably be a decrease in text, which reduces clarity. This will likely be made up for through flow and hierarchy, perhaps also through increased visual metaphors through animation, however, skeuomorphism will likely decrease in desktop, web, and smartphone GUI's [15].

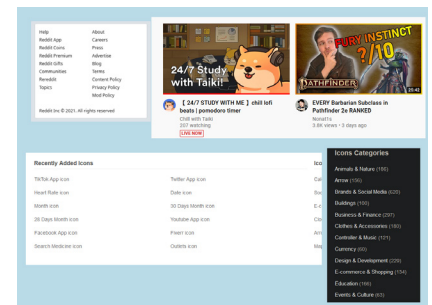


Figure 20: Screenshots from modern websites' clickable texts

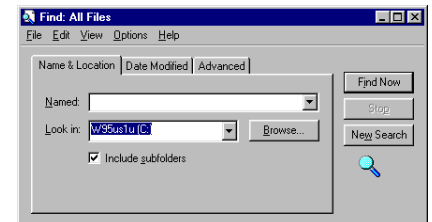


Figure 21: Early textboxes had inverse bevels

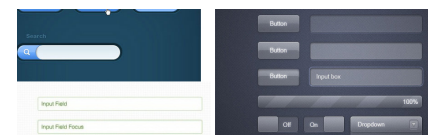


Figure 22: More colors and fancy lighting techniques got added during the web 2.0 era.

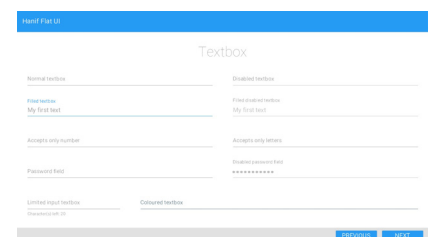


Figure 23: Flat design only needs an underline to convey that something is a textbox

Increased robustness

Increased functionality of the media

GUI's will likely employ more animation as increased internet speeds and data budgets will allow it. The new HTML 5, JavaScript, and CSS 3 add functionality which web GUI's will likely make good use of [17]. Phones are getting bigger and faster allowing for more elements on screen, more animations, and overall increased functionality.

Convergence of web, desktop, and touch UI

Web, Desktop, and Touch GUI's will grow together. Web-apps are already much more advanced through better HTML and JavaScript, laptops are incorporating touchscreens and windows 10 supports it fully, material design is coming to desktop and web, iPads are used as laptops, phones are trying to incorporate Linux, etc [18]. GUI platforms like Electron allow developers to use CSS and HTML to create GUI's for desktop applications, instead of only for web [19].

Rising and falling of skeuomorphism

We've seen that whenever an unprecedented interaction is introduced, GUI's tend to use skeuomorphism. It happened when computers first got introduced, it happened when smartphones were introduced, and it's happening again with smartwatches currently [15]. Skeuomorphism helps users get familiar with unprecedented interactions, and can be discarded when users gain familiarity with the type of GUI. However, it will likely not go to the levels of Apple's design in the early 2010's, because current aesthetic preferences will not accept that design.

Conclusion

A few rules of thumb can be gleaned from this exploration. When regular consumers are familiar with a GUI style, clarity becomes less important, and aesthetics become more important. This also happens when technology allows for a higher fidelity of graphics. When an unprecedented interaction (like with smartphones, or smartwatches) enter the market, GUI design adapts; clarity will become more important again, and aesthetics less important.

While graphic design trends may be hard to predict, they have been trending towards minimalism for a long time, and will likely continue doing so for the foreseeable future.

The hypothesis

My hypothesis was that GUI's evolved into a more minimalist, and aesthetically pleasing form because the digital literacy of the regular consumer allowed for more freedom in GUI design. While this is true, it is only a very small part of the reason behind the trends. Cultural and technological factors play a major role in the choices made for GUI design. Also, aesthetic preferences change over the years. What we thought was pretty in the early 2000's is gaudy and ugly nowadays.

Memes and GUI design, what I've learned

Memes play an extremely important role in graphical user interface design, and I have learned a lot about memes while doing this research.

GUI's are often simply collections of memes. In the chapter about the history of GUI design, we have seen that buttons, text boxes, clickable links, menu's, pointers, windows, icons, etc., are all functional memes that have stood the test of time and are now essential building blocks of what a GUI is. I have learned that memes can become a paradigm.

In the chapter about GUI trends over the years, we have seen that memes change with the needs and tastes of the users. And that the design of UI elements often comes in waves. Trends inform what memes get widespread use in GUI's, and which memes are out of style.

In the chapter about predicting the future of GUI design, we have seen that by analyzing which memes get the spotlight when certain factors are at play, we can predict what memes will be used in the future.

As a student of the DFI master, and an aspiring UI/UX designer and front-end designer/developer, this is all incredibly useful to me. I will be able to quickly put together a good looking GUI because I can see what memes are currently in style, and which are used for similar purposes to mine. I will also be able to make informed decisions on which memes to pick when designing something for the future, as well as having useful knowledge about the fundamentals of graphical user interfaces.

Discussion

Almost all of the sources used in this paper are not scientific, and I am not using a scientific method to analyze the memes. I have simply made observations by looking at the patterns of memes I have seen during specific trends in GUI history, and have drawn my own conclusions from them. If someone were to continue this research, they could interview GUI designers that worked during these periods and ask them for the actual reasons for their decisions. They could also make a better prediction of GUI memes in the future by using a more scientific data analysis on the importance of the GUI design principles through the years and the trends.

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