

# Your Unconscious Cognitions

Examining the importance of psychological influences on user experience & interface design.

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## ABSTRACT

An application's User Experience (UX) is often the deciding factor when gaining and maintaining a user's interest. This paper presents and examines existing implementations of both good and bad UX from three popular applications, corroborated by compelling psychological research on how the human brain approaches & processes the world around it. It aims to make a case for the importance of respecting the user's internal psychological processes when considering an application's UX design, and why it should be a driving motive for User Interface (UI) designs.

## KEYWORDS

User Experience, Application Design, User Psychology, Human-Computer Interaction, User-Centred-Design

## 1. INTRODUCTION

The user experience of an application is composed of the attitudes and emotions invoked in the user while using a given service or product. Positive user experiences leave the user feeling confident and comfortable when interacting with the application, while a bad user experience can leave the user frustrated. 53% of people reported they were less likely to engage with a company after a bad user experience (Google, 2012). In order for an individual to want to use a product, creating a positive user experience must be taken into consideration. In the context of software and applications, the UI is the primary mechanism through which the user experience is controlled. These are the direct interfaces through which a user interacts with an application. Other components that can affect UX include sound, animations, and information architecture.

An individual's unconscious perceptions and biases naturally influence their attitudes and emotions. This dynamic does not change when a user interacts with an application, as their brain continues to use previously learned methods of perception. Using existing methods of perception is a natural phenomenon of the human brain, as it re-uses its already established methods of comprehension.

The user's psychology heavily influences the outcome of their user experience with an application, creating a naturally related field of design wherein complying to the user's psychology is a priority. This paper explores this relationship and investigates examples of how the user's psychology influences the UX and UI design of an application.

## 2. FIELD

Human psychology has now been a field of scientific study for over a century. The four main goals of researching human psychology is to describe, explain, predict and control behaviour objectively. A few of the largest fields of psychological study are clinical, behavioural, cognitive,

developmental, and social psychology. Cognitive psychology is the most influential within the realm of UX design. Cognitive psychology is 'the branch of psychology that explores the operation of mental processes related to perceiving, attending, thinking, language, and memory' (APA Dictionary of Psychology, 2014). This field of study can positively influence UX design because cognitive psychology aims to investigate how the human brain perceives and processes different stimuli. Research into cognitive psychology has resulted in evidence that maps out consistent perceptual techniques that the brain utilises in everyday activities.

Cognitive psychologist Donald Norman invented the term 'User Experience' in his book titled *The Psychology of Everyday Things* (Norman, 1988) - republished in 2002 as *The Design of Everyday Things* (Norman, 2002). Norman would later go on to join Apple Computer as a 'User Experience Architect' (Lyonnaix, 2017). These initial roots between psychology and user experience highlight how the user's perception and psychological cognition drive user experience.

## 3. KEY PLAYERS

The applications highlighted below have been selected based on two factors. Firstly, they each have a sizeable user base. Larger user bases often provide insight into user psychology with their design, due to the increased likelihood of demographic diversity within the user population. This increases the need for psychological accessibility, because one of the factors they can count on being consistent is each individual's blueprint psychology. Secondly, they have notable UX features that provide a base for psychological analysis.

Each section contains a brief background on the developing company and application. Subsections extract and explain the functionality of one or two UI components for later analysis in section four.

### 3.1. Instagram

Instagram is a photo & video sharing social media platform developed by Kevin Systrom and Mike Krieger. Released in 2010, Instagram quickly rose in popularity and was later acquired by Facebook in 2012 for US\$1 billion in cash and stock. As of 2018, they reported more than 1 billion active users a month (Instagram, 2018) - making it one of the largest social networks in use today.

Having been on the market for nearly a decade, Instagram has undergone numerous minor design updates, and one significant overhaul in that time (Perez, 2016). One component that has stayed identical since its release is the application navigation-bar. Having such an extensive user

base, Instagram takes precautions with a neutral, clear interface (Arthur, 2018). Furthermore, using familiar design patterns such as navigation bars and swipe-navigation makes it easy for users to learn the application quickly. The tab-based navigation bar is a documented template under Apple's Human Interface Guidelines (Apple, 2019), drawing attention to its popularity.

### 3.1.1. Navigation Bar

A critical component in Instagram's UI is the navigation bar located at the bottom of the screen (fig.1, below). The navigation bar is used to access the core pages of the application, such as the home page, upload page, and user profile. This UI component has been a staple of the Instagram UX since release.



Figure 1. Instagram's nav-bar, with the most important pages at the start and end of the sequence. [Instagram for iOS, 2019]

## 3.2. Deliveroo

Deliveroo is a food delivery company founded in 2013 that immediately changed the landscape of ordering food to your door. Consumers place an order through Deliveroo's website or mobile application, and one of their self-employed motor/cyclists deliver the order from restaurant to consumer. Deliveroo takes a small commission of the sale in addition to a customer-paid delivery fee. Working with tens of thousands of restaurants across the nation (Deliveroo, 2019), they are one of the most popular food-delivery networks in the UK (Thinknum Media, 2018). As of 2017, they had expanded into 200 cities worldwide (Sassard, 2017). Having this dense amount of information leaves Deliveroo with the challenge of allowing users to navigate their database of restaurants effectively. Deliveroo has many recommendation-based panels, to assist the user in reaching a decision. A crucial aspect of the application is the search page, which allows users to directly query and filter available restaurants.

### 3.2.1. Filter Tags

While accessing Deliveroo's restaurant search page, the user can apply criteria and change the sort order for the list of restaurants. The user can select multiple different 'cuisine' categories, including the country of origin, specific meals/foods, season, course, and dietary restrictions. The 'sort by' options are 'Recommended', 'Time', and 'Top Rated'. When combined, it becomes an incredibly varied list of options, and the user can apply as many as they desire.

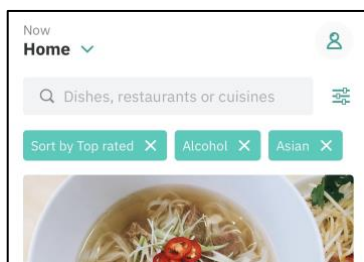


Figure 2. Deliveroo's search with user filters applied, displaying them as tags. [Deliveroo for iOS, 2019]

To keep the user up to date with what they are filtering the search results by, Deliveroo adds any selected criteria as 'tags' to the top of the search results (fig. 2, above). If the user changes their mind about a criterion they have added, they can tap the 'X' icon on the tag to remove it straight from the search results screen.

## 3.3. Amazon

Amazon is a multi-billion dollar technology company based in The United States. It is a multi-faceted organisation with a focus on e-commerce, cloud computing and digital streaming. Founded as an online bookstore by Jeff Bezos in 1994, Amazon has grown to be one of the most prominent tech companies of its time (Frankenfield, 2019). Amazon launched the first of their hardware/device ranges with the Amazon Kindle e-reader in 2007. As of 2019, this has since expanded to tablets, home assistants, streaming devices, smart devices, and more.

The diverse nature of Amazon's services and platforms means that the user experience is very different depending on what service, or product, you are using.

### 3.3.1. Inspired Items Panel

Amazon's e-commerce division, branded as *Amazon*, is an expansive online market where users can purchase products over the internet. Vendors can sign up to use Amazon as a selling platform while giving Amazon a monthly fee (Amazon, 2019). Accessing Amazon's mobile application home page presents the user with a myriad of dense product information. This information includes but is not limited to current deals, related & recommended items, popular categories, overstock, and the user's viewing history. A panel titled 'Inspired by your Wish List' is also shown, should the user be logged in (fig. 3, below). This panel shows a small sample of 3 items that Amazon has recommended based on the products in the user's current 'Wish List'. Amazon's 'Wish List' functionality is a separate list of products that the user can manage, that indicates a collection of products that they 'wish' to own. The 'Inspired by your Wishlist' view allows the user to consider items similar to those present in their 'Wish List'. At the bottom of the panel, there is a link to 'See More', which opens a separate screen, displaying all of the recommendations made by Amazon using their current 'Wish List'.

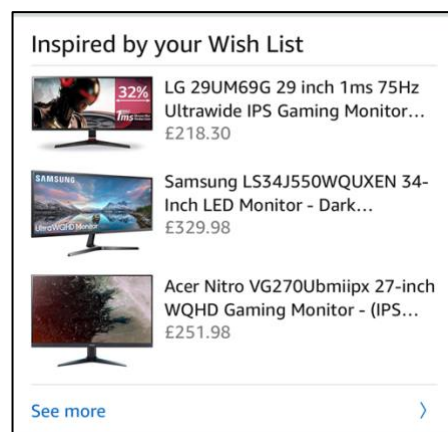


Figure 3. Amazon's mobile application homepage, containing a panel showing the users recommended items. [Amazon for iOS, 2019]

### 3.3.2. AWS Management Console

Amazon's cloud-computing platform, branded *Amazon Web Services* (AWS), is a set of over 150 cloud-based computing services (Amazon Web Services, Inc., 2019). AWS includes databases, storage, analytics & data querying environments, amongst many more. The homepage of AWS, the 'Management Console', is a page accessible by any user logged into their AWS account. The Management Console contains different panels of information to help the user navigate around the services on offer. At the top of the screen there is a navigation bar that contains services-related tabs on the left, and user-related tabs on the right. In the body of the page is a dense collection of links, including the user's most recently visited services. Further down, there are sections titled 'Build a Solution' and 'Learn to Build' that contain tutorials and documentation for setting up some of AWS' most popular services and turning them into deployable solutions.

An essential element of the navigation-bar is the 'Services' dropdown in the top right – that displays all of the services AWS offers (Appendix 7.1).

The navigation bar contains some useful functionality that allows the user to customise their experience of AWS. AWS employs 'Resource Groups', which are user-created groups of service instances. For example, a user may have 2 storage instances, and a database instance related to one application they have deployed. Users can create a new resource group, add these service instances, and then have it easily accessible on the navigation bar for future management. Additionally, users can pin individual AWS services to the navigation bar itself, for easy repeat-access.

## 4. APPROACH

The following sub-sections approach the UI elements highlighted in section three from a psychological perspective, considering the potential advantages, disadvantages and rationales behind their design. Some improvements are discussed based on the psychological research presented.

### 4.1 The Serial Position Effect

The 'Serial Position Effect' describes how the human brain stores and recalls lists of items, and how the position of the items affects recall (Hermann Ebbinghaus, 1964). When participants are asked to freely recall a list of memorised items, they were more likely to successfully recall the items at the beginning and end of the list. This result is due to the 'Primacy Effect' (early items have time to enter the long-term memory through rehearsal) and the 'Recency Effect' (latter items retained in the short-term memory) (Murdock, 1962). This research can influence UX design in making specific actions more memorable to the user.

With these two effects in mind, one can strategically place the more important items and actions at the start & end of a list or sequence. Ordering actions this way ensures that the user is more likely to remember their position for future use. Instagram employs this technique with their application nav bar (fig. 1). On the far left (start) of the nav-bar is the homepage, the user's feed where they can see all of the posts of those whom they follow – arguably Instagram's primary panel. Then on the far right (end) of the nav-bar, is the user's own Profile page. The Profile page contains access to many critical parts of the app, such as the user's settings, privacy, and security details. Instagram may have placed it at the end

of the sequence to ensure the user remembers how to access these areas of the application, and effectively manage their account. Using Hick's Law is a ubiquitous approach for tab-based navigation systems, with repeated examples (Chakraborty, 2017).

Research into The Serial Position Effect also highlights the limitations of the user's memory capacity. Interfaces can be designed to ensure that an application is not placing too much load on the user's memory at a detriment to their UX. The Filter Tags provided by Deliveroo's search page (fig. 2) is an example of how an application can take measures to reduce load on the user's memory.

## 4.2 Gestalt Laws of Perceptual Organisation

More recently referred to as the 'Principles of Grouping', 'Gestalt' (German, meaning 'shape' or 'form') Psychology studies how humans perceive the world as whole, complete parts – not as a series of individual and independent parts. In the 20th century, gestalt psychologists observed that the human brain naturally orders perceived stimulus into patterns and groups (Köhler, 1938). Our brains do this to simplify reality and perceive it in its most basic forms because it is easier and faster to do so (Carbon, 2014).

The most common of the laws is 'Proximity'. The Law of Proximity states that when items are close to each other, they form conceptual groups (Goldstein, 1999). Designers can use this perception to form relationships between elements of the UI, ensuring the user naturally observes relevance between them. A typical example used in all forms of design is the relationship between a heading and its subheading. In the case of Amazon's 'Inspired by Your Wishlist' panel (fig. 3), it is visible that proximity has been used to create a natural relationship between the item image, heading, and price. We perceive each product as one complete combination of information.

Proximity can be used to help our brains order and prioritise the information we perceive. If done effectively, the comprehension of information is improved (Ali and Peebles, 2012). Creating groups in this way limits confusion caused by users misunderstanding, reducing the chances of dissatisfaction while using the application.

### 4.3 Hick's Law

Hick's Law, alternatively known as the Hick-Hyman Law, states that the time taken for a participant to make a decision from a given number of options increases logarithmically in relation to the number of options presented (Hick, 1952).

Hick's Law highlights the need for simple, categorised, high-level menu options. Doing so allows users quickly and more effectively traverse the information on the pages of an application, resulting in a smooth and frustration-free UX. An example that poorly complies with Hick's Law is AWS' 'Services' view. Clicking the 'Services' dropdown presents the user with a large panel containing every single service available on AWS, amounting to over 150 options (Appendix 7.1). This volume of options is typically daunting for new users who are unfamiliar with the menu and is likely to act as a barrier to entry if the user has to spend extra time searching for the service they are looking to use. Amazon has provided some headings and groupings to the options;

however, the panel remains dense with information. Based on Hick's Law, AWS could adopt a tiered approach to this menu, completely hiding the sub-options until the user manually clicks to expand it. By hiding the sub-options behind the higher-level categories, it reduces the number of visible options at any one time, thus obscuring complexity and making the menu faster to navigate for the user.

Having too many options adds delay to the UX, consequently reducing the motivation of the user. When motivation falls, it increases the chance that they offhandedly pick any option to end the decision process – or not pick an option at all (Iyengar and Lepper, 2000). This user may, in turn, look for another application to serve their need.

## 5. CONCLUSION

When presenting psychological research alongside interface designs, it is clear that it is a vital aspect of designing intuitive interfaces which facilitate a comfortable UX. Familiarity can be a good starting point when designing, using boilerplate concepts the user has experienced before – such as tab-based navigation bars or hamburger buttons. Utilising notions the user is familiar with allows the user to naturally pick up an application, without having to learn new ways of navigating – lowering the barrier of entry.

Designs that consider the user's psychology a priority have the advantage in an increasingly competitive application market, as they lower the chance of turning users away based on their unconscious cognitions. By adhering to these perceptions effectively, designers can curate a UX that supports the user's memory capacity, subtly assisting the user to remind them of actions they have taken. By using the Serial Position Effect to anchor necessary functionality in the user's mind, it improves their capabilities of navigating – lessening the chances of irritation. It is possible to improve the comprehension of information through the use of proximity to create associations between multiple related components, for instance, between an image, heading and subtitle. While presenting information to the user is inevitable, if the amount of information presented is too much, it can negatively impact the UX. If an action takes too long or is too tedious for a user to do, there is a chance they won't do it at all.

In addition to the study and analysis of UX itself, there is the subject of UX studies, which considers the different methods of collecting user feedback; an equally important facet of information when designing application UX.

Using the information presented creates user interfaces that are naturally approachable, without challenge and frustration – enabling users to access the applications true value faster. The examples covered by this paper are only a small sample of the vast amount of psychological research relevant to the field of UX. Investigating how human psychology shapes our perceptions of application design is a worthwhile exercise for any application designer.

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## 7. APPENDICES

### 7.1 AWS Management Console

Amazon Web Services ‘Services’ dropdown menu, displaying a scrollable view of their 150+ services. A history panel, search bar, and display options are provided to assist the user locate a particular service.

[Amazon Web Services, 2019].

