Role of Affordances in User Experience

Prof. Dr. Pallavi Meshram[1], Sumaiya Deshpande[2]
[1]*PH.D., M.F.A., B. F. A., Associate Professor, Applied Art Department, Bharati Vidyapeeth's College of Fine Arts, Pune – 411 046.Affilieted to Savitribai Phule Pune University, Pune*
[2]*B.F.A. Applied Art, Final Year 2022-2023, Bharati Vidyapeeth's College of Fine Arts, Pune 411 043.*

***Abstract*—Affordances are a term originally coined by a psychologist, J.J. Gibson, in the 1970s. He defined it as the relationship between an environment and an actor. In today's world, affordances extend beyond behavioral or cognitive psychology and delve deep into the design of digital and physical products. Good affordances aid successful interactions between products in the physical and the digital world. Therefore, Understanding the relationship between affordances and user experience is essential for creating interfaces that are intuitive, usable, and enjoyable for users. This paper aims to explore the relationship between affordances and user experience in a digital interface by reviewing current literature and examining case studies of interfaces that have successfully incorporated affordances into their design. Through this analysis, we aim to provide a better understanding of the impact of affordances on UX, how it affects cognitive load and usability in the experience.**

***Index Terms*—Affordances, User Experience, Behavioral or Cognitive psychology, Digital Interfaces, UX Design**

I. INTRODUCTION

Affordances refers to the qualities of an object or an environment that gives us **'clues'** on how we can perform a desired action. For example, In the physical world, a chair affords sitting because of having a flat surface and four legs, and a teacup affords holding because it is small and has a handle. Another example of affordances in the digital world could be Buttons, A button affords pressing or tapping as a way to execute a particular action.

Fig. Chair and Its Affordances.

Fig. Teacup and Its Affordances.

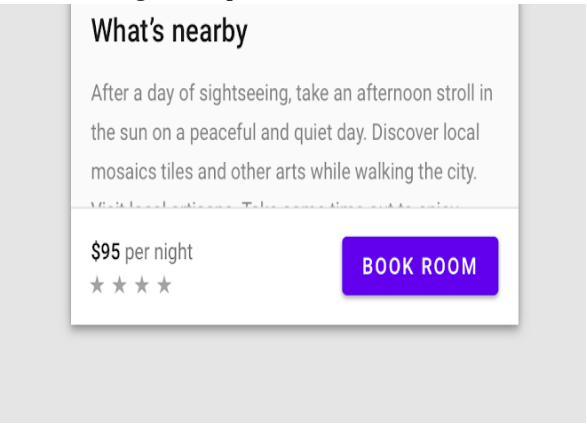

Fig. Floating Action Button

History of Affordances:

Gibson's Theory of Affordances

The term "affordance" was coined by psychologist and cognitive scientist James J. Gibson in his 1979 book "The Ecological Approach to Visual Perception."

According to James J. Gibson's idea of affordances, the environment offers chances for action that a person can immediately sense. Affordances are relational attributes that depend on the skills and goals of the observer rather than being inherent qualities of the things themselves. For instance, a chair allows a human to sit but not a dog.

According to Gibson, affordances are relationships that exist naturally that do not require preexisting knowledge or necessarily need to be perceived.

Fig. Opening a Door Knob

Don Norman's Theory of Affordances:

In his landmark 1988 book "The Design of Everyday Things," Don Norman expanded on Gibson's theory of affordances in the context of human-computer interaction and design.

Fig. Norman Doors

According to Norman, Users perceive actions to be possible based on the design, distinct from actions that are actually possible. Meaning the user assumes an action can be made outside of the actions that are being presented to them.

The design of digital interfaces has been significantly influenced by Norman's theory of affordances. Affordances are a tool used by designers to simplify how people engage with a digital product or interface, leading consumers through the product or interface by employing visual cues like icons, buttons, and text etc

Thus, Affordances can be broadly categorised into:

1. Affordances in the Physical World: In the physical world, the physical characteristics of any object give us an indication as to what we can do with them. These can involve basic tasks like opening a door or more difficult ones like operating a vehicle.
2. Affordances in the Digital World: In the digital world, objects don't directly influence human perception due to the lack of a 3-dimensional space in which we can interact with it easily. Thus, affordances here act as visual clues that guide us to achieve the desired outcome.

Affordances in the Digital World:

Digital affordances are the possible uses or actions of digital items or settings that are open to a person based on their technological access and digital proficiency. In UI Design, Affordances are the visual and interactive elements of a digital interface that indicate how a user can interact with it. Understanding digital affordances can help people use the digital environment around them successfully, and it can also guide the development of new technologies to better serve the users' requirements.

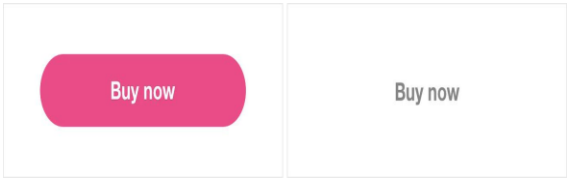

Fig. A Button with and without Affordances

Users may be confused and frustrated if they do not know how to interact with an element in the interface without the presence of affordances. For example, if

a button does not appear to be a button, the user may be unaware that it can be clicked to perform an action, leading to a poor user experience and decreased user engagement.

Types of Affordances that impact UX

When it comes to Affordances that impact your UX on a digital interface, Affordances can be categorised in various categories but for an easy and simpler understanding of the subject we shall categorise affordances in 6 different types, These are:

1. Explicit
2. Pattern
3. Hidden
4. Metaphorical
5. False
6. Negative

1.1 EXPLICIT AFFORDANCES:

Explicit affordances are linguistic or visual cues that make it evident how to interact with an element or an object, even if the user has never seen it before. Explicit Affordances are easy to utilise and intuitive without constantly guiding the user.

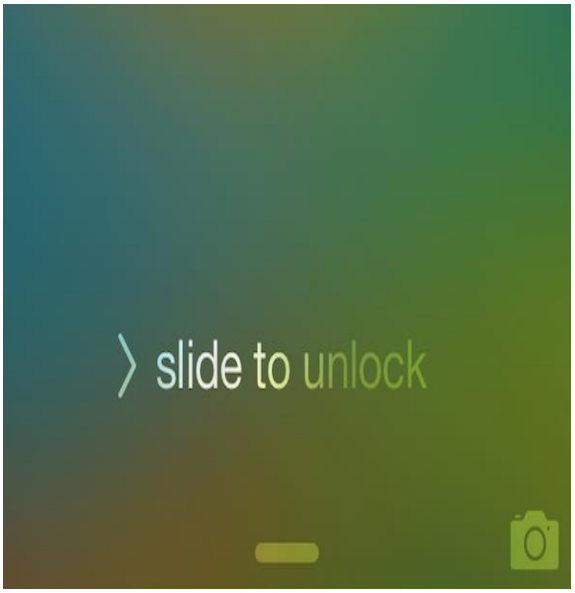

Fig. Slide to Unlock + Animation

The slide to unlock on the iPhone lock screen is a great example of an explicit affordance because the affordance not only tells the user what has to be done (slide to unlock) but the animation also follows the direction (left to right) in which the user has to slide.

Fig. A button that explicitly says “Click here”

A button explicitly telling the user what has to be done (in this case click here) is a a great example of an Explicit Affordance.

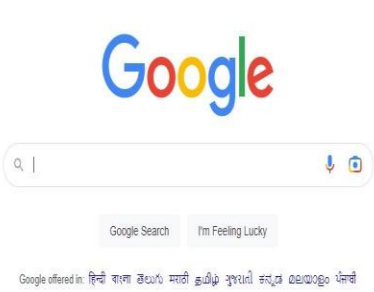

Fig. Google Search Bar (www.google.com)

The Input field on the Google Homepage is another example of great Explicit Affordance, it decreases cognitive load because the cursor is already clicked on the input field which saves on some mental time of the user.

1.2 PATTERN AFFORDANCE:

As the name implies, Pattern Affordances rely on "patterns" that the users are familiar with. Pattern Affordances are predetermined by conventions. The time we have already spent interacting with apps, webpages, and other interfaces is leveraged via pattern affordances.

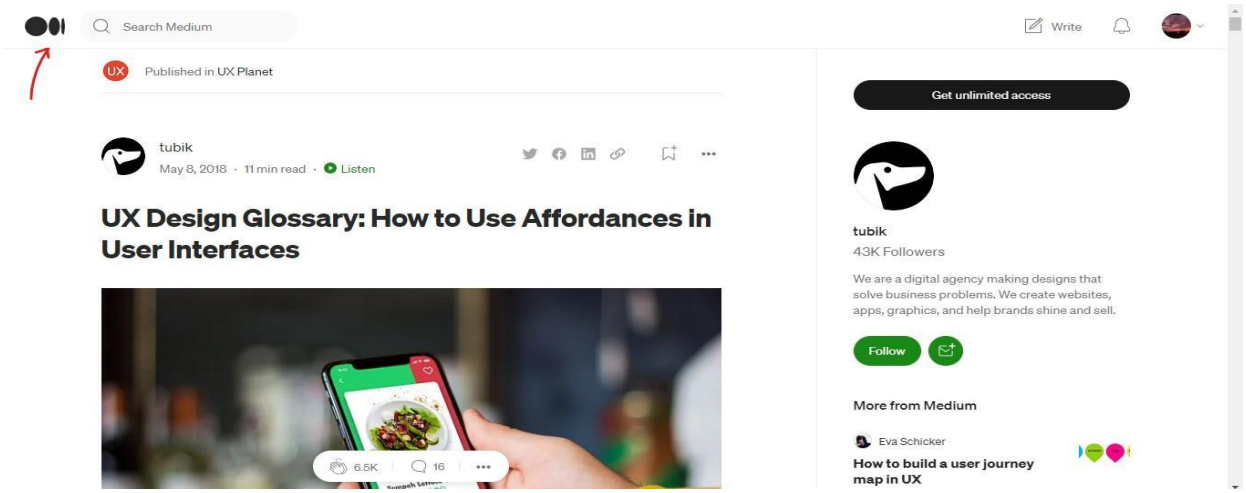

Fig. Logo at the Top Left, Clicking on Logo takes one to Homepage

In Web Design, it is an established pattern that Logo is placed on the Top Left of the screen and upon clicking on the Logo one will be taken to the Homepage.

In the above example, we can see that underlined text is established as a hyperlink, which when clicked takes us to another page.

Fig. Underlined Text = Hyperlink

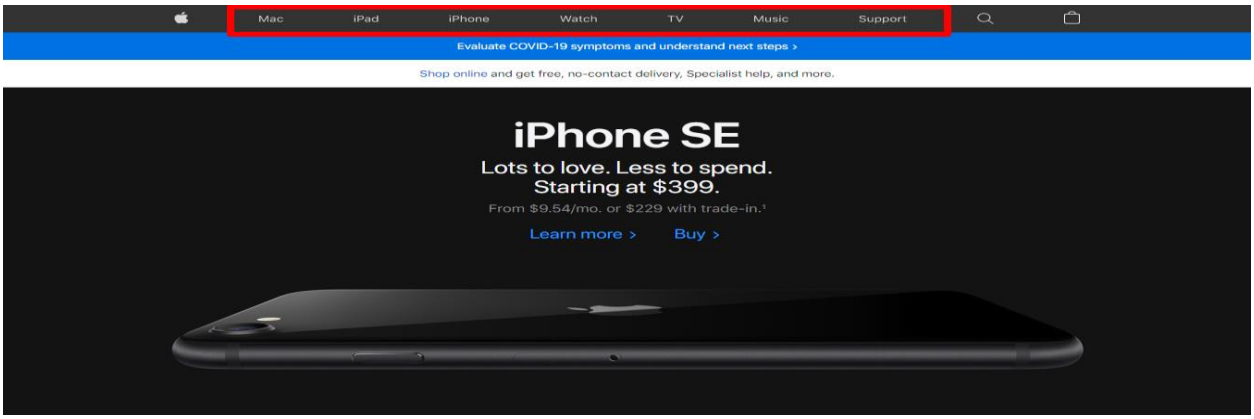

Fig. Navigation Bar

Navigation Bars are established to be on the top part of the website, this is a common pattern that is followed by many websites.

1.3 HIDDEN AFFORDANCE:

Hidden Affordances as the name suggests, mean that after the user does an action or a certain condition is satisfied, Hidden Affordances become “obvious”. As gadgets get smaller and we wonder how to fit the same amount of information in a small place, hidden affordances are being employed more frequently, to reduce a design's visual complexity.

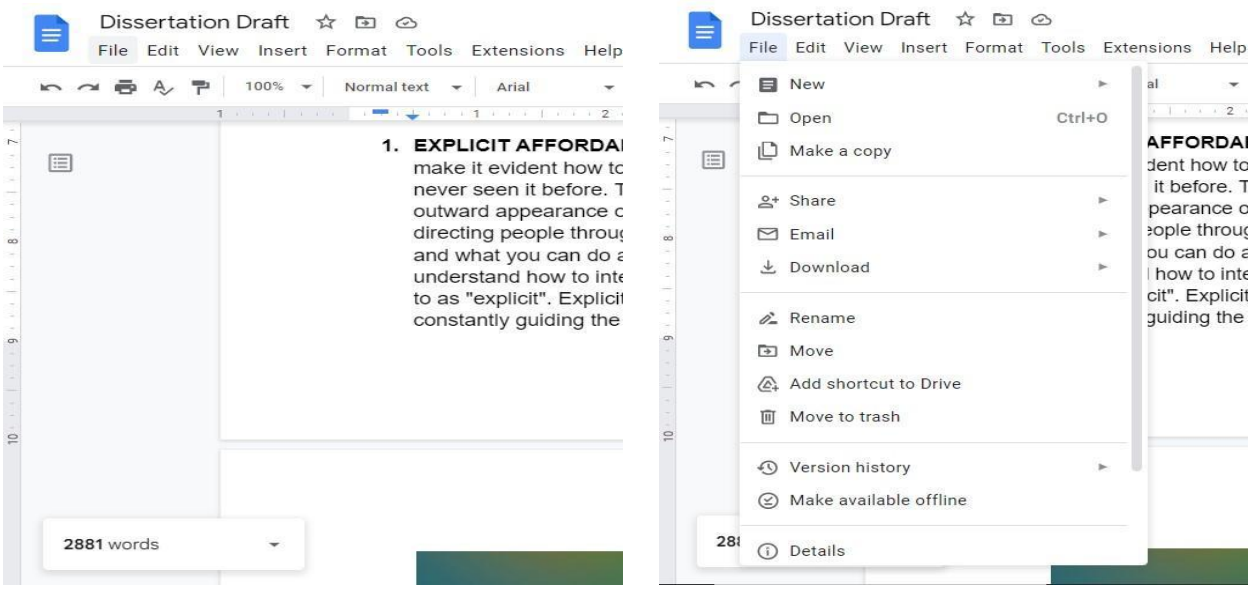

Fig. Drop Down Menu (which appears upon clicking)

Drop Down Menu is a great example of a hidden affordance because its content only appears when one clicks on it and the menu opens.

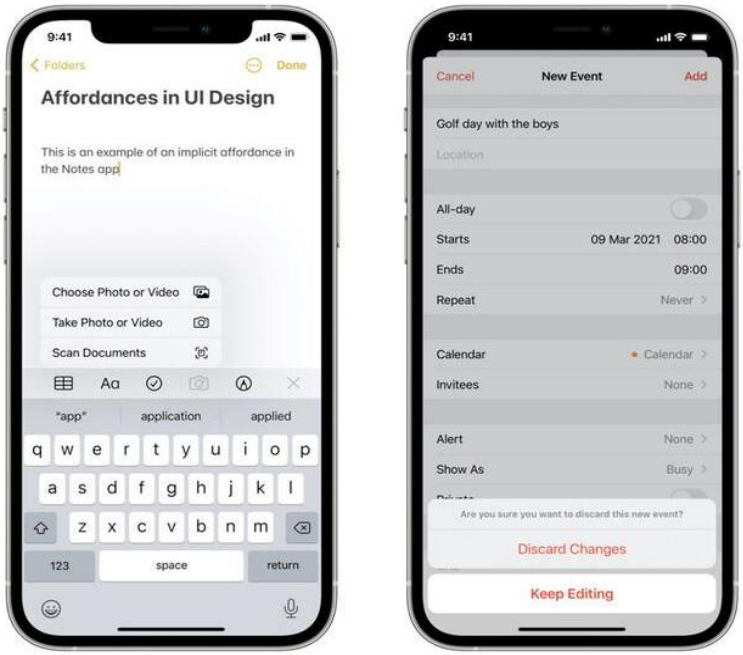

Fig. Action Sheets in UI

Action Sheets in UI are another great example of Hidden Affordances which get revealed once you interact with the parent menu.

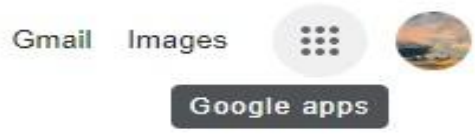

Fig. Tooltips

Tooltips are informational clues that appear once we hover on any interactive element.

1.4 METAPHORICAL AFFORDANCE: When real-world things are used as metaphors to describe an activity, this is known as metaphorical affordance. Metaphorical affordances make it easier for users to grasp difficult activities, which speeds up communication.

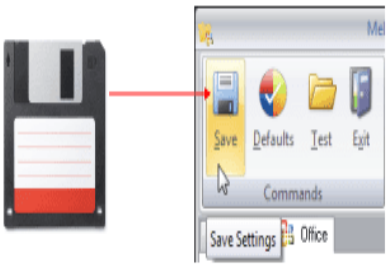

Fig. Save Icon

The "Save" icon is a metaphorical affordance that compares modern day saving to floppy disks, It is truly an icon that is spread out as a metaphor because most youngsters today wouldn't know it as a floppy disk but would rather perceive it as the save icon.

Fig. Settings Icon (Strong Metaphor)

The Settings icon used in IOS is another great example of Metaphorical Affordance resembling its real-life counterpart very closely.

1.5 FALSE AFFORDANCE: Perceptions that are inconsistent with reality result in false affordances. Finding and eliminating False Affordances is crucial in a UX approach since these affordances lead users astray.

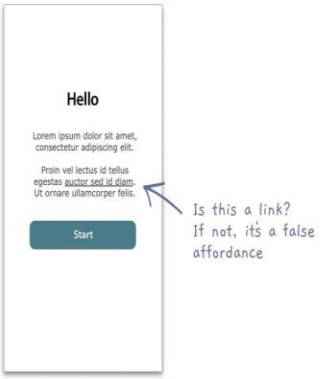

Fig. Underlined text that is not linked - False Affordance

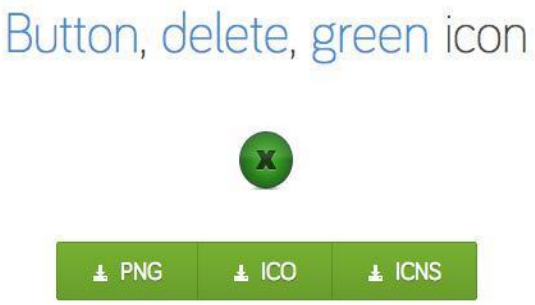

Fig. Green Coloured Close Button

A general pattern in the minds of users is that green allows for an action to take place, and red is usually used for closing or deleting data. Simply using a different colour, can create confusion in the minds of the user, such is the example of a False Affordance.

1.6 NEGATIVE AFFORDANCE: Negative affordances are used to tell end users that a certain aspect does not always allow for action. Negative affordances signify inactivity and the inability to act on the
factors.

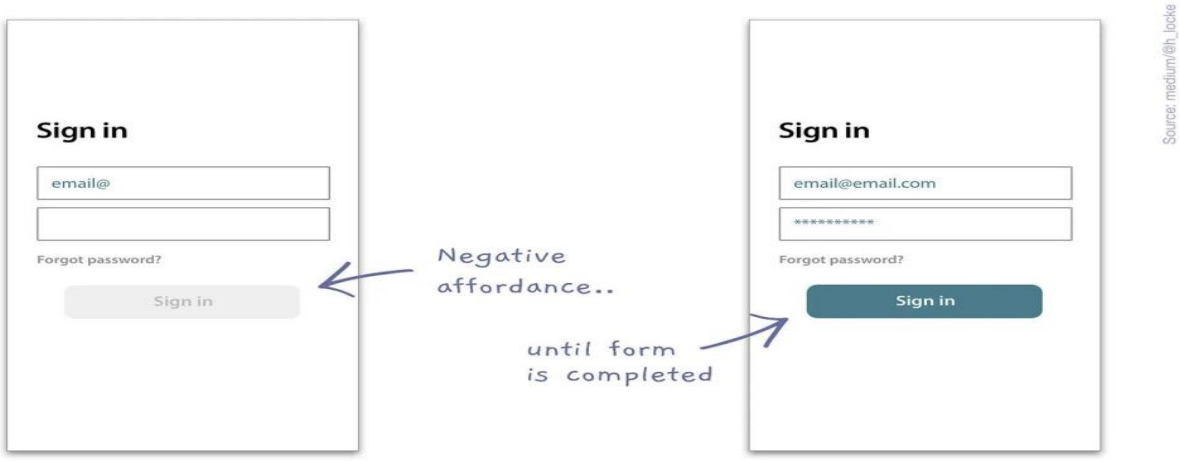

Fig. Sign in button

The Sign In button is a great example of Negative Affordances because it remains inactive until the previous fields are filled with required information.

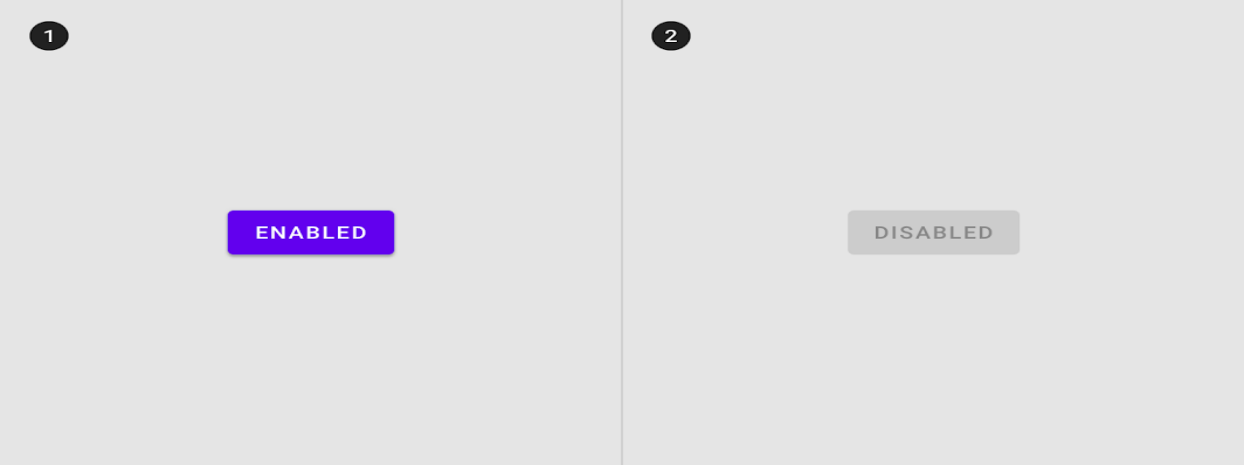

Fig. Enabled Vs Disabled Buttons

Greyed out buttons represent a disabled element and thereby reduce confusion when multiple interactive elements are placed together in the interface.

II. AFFORDANCES AND HUMAN PSYCHOLOGY

The idea of affordances is directly tied to human psychology, especially in terms of how people view and engage with their environment. The perceived options for action that an object or environment offers to a user are known as affordances, and they depend on how the user sees and interprets the object or environment.

Desired actions cannot be carried out if the object does not afford it, and afforded actions might not be carried out if the user does not perceive they are possible.

Perception

The relationship between digital affordances and perception is bidirectional. On the one hand, digital affordances can shape our perception of the digital world and influence how we interact with it. On the other hand, our perception of digital affordances can also shape how we interact with digital devices and technologies.

Users' context and past experiences matter, towards discoverability and how they use and understand things.

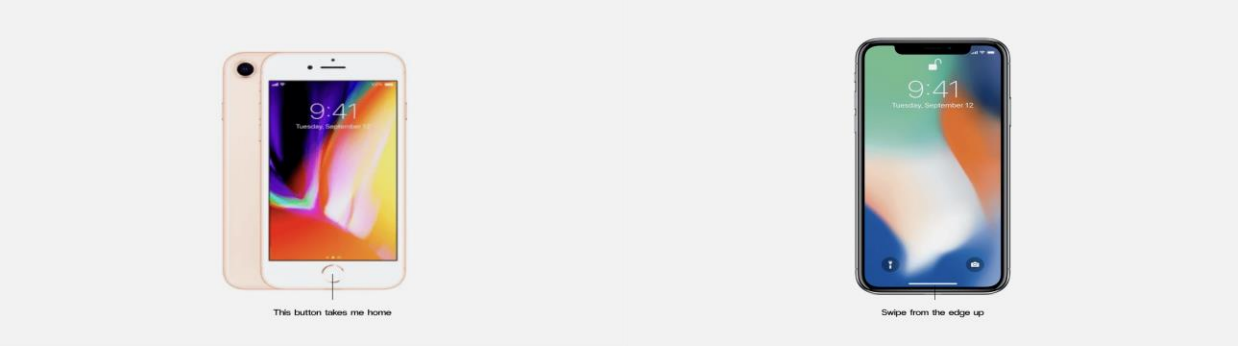

Fig. Transition of the iPhone Home Button

An example of learning from past behaviours was the transition of the iPhone from having a home button to no home button. User's past experiences were leveraged to reduce cognitive load when the home button was no longer present on the new iPhone, making it easy for users to perceive the desired action.

Attention, memory, and cognitive load are a few characteristics connected to human perception that have an impact on how digital affordances are perceived.

Attention:

When interpreting digital affordances, **Attention** is a key factor. To understand the affordances available to them, users must pay attention to the aspects of a digital interface or system that are pertinent to their needs.

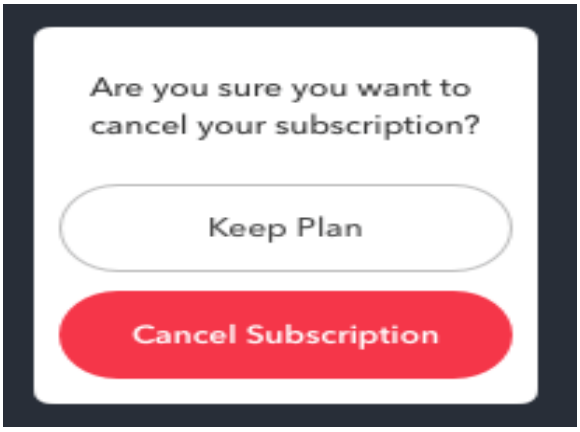

Fig. Cancel Subscription Popup

The visual salience of digital affordances is one of the characteristics that influence and demand attention. High contrast buttons that imitate real-world buttons are easier to press.

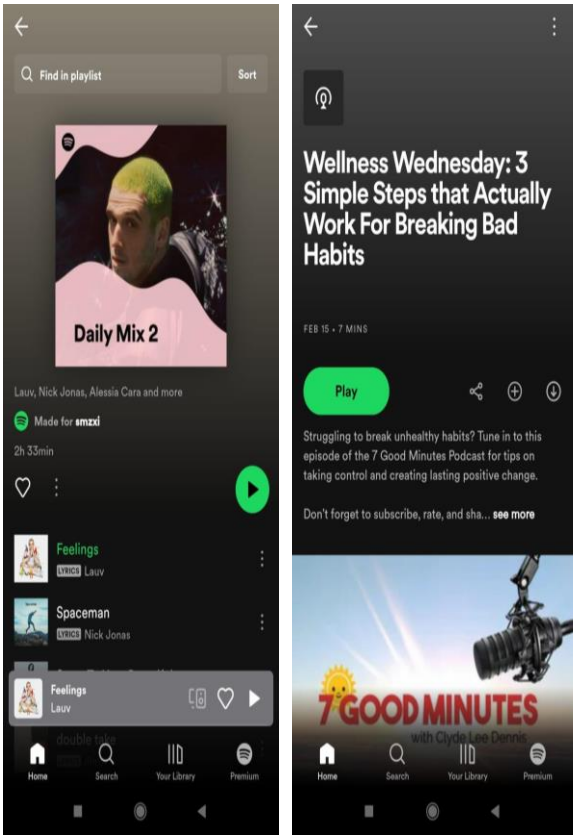

Fig. Spotify UI Green on Black - Play Button, Highlighted Song, Logo etc.

Memory

In order for users to understand the affordances accessible to them, they must be able to recall how they have previously engaged with digital interfaces and systems.

A user may be more likely to recognise the affordances accessible to them if they had past familiarity with a specific sort of interface or system.

Similar to this, users may be able to perceive potential affordances more quickly and accurately if they have a solid mental model of how an interface or system operates.

Fig. Skeuomorphism in Apple Interfaces

In the 1980s, skeuomorphism started to take shape. Steve Jobs of Apple was one of its first advocates. Apple Interfaces were made more user friendly and recognizable by making the design of elements mimic its real-world counterpart.

2.1 Cognitive Load:

Cognitive Load refers to how mentally taxing a particular task is. Making it simple for users to comprehend how to engage with digital interfaces and systems and using clear and relevant digital affordances can help to minimise cognitive load. Irrelevant digital affordances increase cognitive load making it more difficult for users to understand how to interact with the interface or system, resulting in frustration and mistakes.

Fig. A Norwegian Website

The website is a great example of Irrelevant Digital Affordances which resulted in High Cognitive Load.

In conclusion, Affordances are closely related to Human Psychology because it is based on how humans perceive and interpret their surroundings.

III. AFFORDANCES AND USABILITY/ UX:

Usability

According to NNG, Usability is a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process.

High usability designs direct users towards the quickest and least difficult path. Usability and its evaluation is crucial for Digital Products because if the interface does not do what it is supposed to or if it's difficult to use, users get frustrated, leave and don't engage with it.

Importance of Usability in a Interface

There are multiple benefits of a UI that has a good Usability, some of them are mentioned below:

Engagement: Users are able to complete desired tasks with ease thanks to an interface with good usability.

User Satisfaction: Since users can simply do their tasks without difficulty or confusion, an interface with good usability satisfies its user base.

Reduction in Errors: An interface with good usability lowers user errors and mistake rates, thereby preventing time-consuming and expensive errors.

3.1. Survey and Analysis

A survey was conducted to analyse and validate the claim that was initially made in the hypothesis that Affordances in Interfaces of Digital Products enhance the Usability and User Experience.

A set of questions were formulated and this questionnaire was distributed among people to gather their valuable responses. The aim of the survey was to validate the claim regarding Digital Affordances in context of User Experience.

In total there were 102 people surveyed, from age groups ranging from under 18 to 45 and above, living in different cities across India and abroad, coming from varied educational backgrounds and social spheres.

Survey Observations and Final Findings

The results from the survey proved that Affordances do affect the Usability and User Experience as a whole.

In the above question, the overwhelming response for a clickable button was option 3 because, the appropriate visual characteristics like strong colour and the feeling of depth that allow users to perceive a button as clickable were present. It was also observed that a bunch of people opted for option 2 and the reason for that could be the shift towards a flat design in recent years, so users are more likely to perceive even a flatter button as clickable.

Users were able to recognize the Metaphorical Affordance - Search Icon by a large majority, although some interesting responses like “It could be either as "search "or "enlarge ", depending on where I see it.” were seen. Ultimately this response proved that Strong Metaphorical Affordances are conventions that have become obvious for the users.

Contrastingly, on the following question, Users were not able to pinpoint to a particular thing because it was a Weak Metaphorical Affordance. Because there was no context, users came with multiple unique interpretations like Fuel, Clock, Timer, Dashboard, Safari, Compass, Timer or Speed etc.

A very strong majority of users were able to identify the Negative Affordance, in fact some even mentioned that the button will activate when the form gets filled.

In the final set of questions, a general question regarding False Affordances was asked, Majority of the Users had faced a situation when they tried clicking on a button that appeared to be clickable when in reality it was not. Upon asking them on how they felt when such a situation happened, the majority stated that they get annoyed/frustrated, others replied with a variety of other emotions - like “I get embarrassed”, “I laugh at myself”, “I get confused”, “I feel a bit puzzled”, “I get surprised” etc to express their experience. Overall, a conclusion could be drawn, between False Affordances and increase in cognitive load thereby poor User Experience.

IV. CONCLUSION

The objective of the entire study was to explore and understand the relationship between Affordances and User Experiences. It is clear through the study that Affordances have an impact on User Experiences and if they are designed well keeping in mind the User, then their Experience can be enhanced. The interface's capabilities give users suggestions or cues about what actions are feasible thereby teaching them how to use it. Clear and well-designed affordances can lessen cognitive load, boost usability, and enhance the overall UX.

Affordances are a crucial element of UX design and have a big impact on how satisfied users are with digital interfaces. As a result, Designers should make an effort to produce interfaces with clear and well-designed affordances that conform to users' mental models and expectations.

REFERENCES

[1] https://www.dan-form.com/media/d5iiuemc/arch-chair-pebble-green-boucle-fabric-with-black-metal-legs-100205105-01-main.png?widthw=1920&mode=crop&heightratio=1

[2] https://www.ikea.com/in/en/images/products/vardagen-teacup-with-saucer-dark-grey__0711061_pe727936_s5.jpg?f=xl

[3] https://m2.material.io/components/buttons#hierarchy-and-placement
https://l.hdnux.com/350x235p/s3-us-west-1.amazonaws.com/contentlab.studiod/getty/039edc70943446068befc94eafe23083.jpg

[4] https://miro.medium.com/v2/resize:fit:720/format:webp/1*G6TGxUKN3-QQWNoiHnduNg.jpeg
https://uxdesign.cc/affordance-in-user-interface-design-3b4b0b361143#

[5] Dwivedi, A. (2017, May 28). Affordance in user interface design. Medium. https://uxdesign.cc/affordance-in-user-interface-design-3b4b0b361143
Material design. (n.d.). https://m2.material.io/components/buttons