

THE IMPACT OF USER INTERFACE AND USER EXPERIENCE DESIGN ON USERS' COGNITIVE ABILITIES

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ABSTRACT

As technology becomes more integral to our daily lives, user interface (UI) and user experience (UX) design are crucial in creating successful technology products. However, there are concerns that the emphasis on good UI/UX design may be having an unintended consequence: negatively impacting users' cognitive abilities. This research paper aims to explore the impact of UI/UX design on users' cognitive abilities, and whether it may be contributing to a "dumbing down" effect. Through this research paper, we would explore this concept further and understand how and why this phenomenon occurs. The design of UI/UX can have a significant impact on users' cognitive abilities, potentially leading to a "dumbing down" effect. By examining the relationship between UI/UX design and cognitive abilities, this research aims to shed light on this important issue and contribute to the ongoing debate about the role of technology in our lives. This study will involve a literature review of both academic and non-academic sources, including content from industry reports, case studies, and news articles.

Keywords: Interface, Cognition, User experience, Human evolution

Research Question: What is the relationship between UI/UX design and users' cognitive abilities, and to what extent does it contribute to a "dumbing down" effect?

Understanding the Problem

The modern-day world runs on cellular devices. An average human living in a metropolitan city owns up to 4 cellular devices on average. These devices come with their own UI which aims at maximizing the user's productivity and aims at making the device easy to use. The reality of this situation however is a lot more complicated and dire than what we see.

Human evolution has been a process that has been improving the human race slowly over the years to ensure the survival of the race. It aims at making us more equipped physically and

mentally to face the challenges of the world we live in. Up until a century ago, evolution focused on facilitating humans with the skills to cope with natural complexities. That was the past, technology has changed how we live and has been arguably a bigger facilitator of the success of the species than the wheel.

In the technological Era, the most impactful period came around less than 2 decades ago when in 2007, Steve Jobs changed the way we interacted with technology with the launch of the iPhone. Smart phones with touchscreens existed way before the launch of the iPhone, yet its launch was far more impactful for one reason-Its usability. More accurately speaking its user interface, whatever the task might be it was easier on the iPhone, more efficient, more aesthetic but the question is- was it challenging? Did it require you to actively think before completing any action?.

The effortlessness of great UI directly equates to you not having to struggle to perform any task on your device, while this increases the sale for the company and gives rise to a loyal customer base, what it also means is that the human brain gets addicted to this ease and for the time you are engaging with the device it reduces neural activity. I am sure we can all understand what that means. Through this research paper, we would try to prove the existence of this phenomenon after which we will explore why the companies want this, finally ending with the possible solutions for this new problem.

The Dumbing Down Phenomenon

It is a known fact among people that excessive use of phones for leisure-related activities is bad for us. However, we always end up blaming it on the content we consume. Be it a game, a show or a movie. While this might be true we need to stop and think about what exactly makes content consumption bad for us, exploring this would help us understand and approach our topic more accurately. We would select a few of the major problems caused by mobile phones and try to understand and relate them to our primary concern-UI.

1. Cognitive Ability

Recent research suggests that smartphone usage does indeed have an effect on the brain, although the long-term effects remain to be seen.

In one study presented to the Radiological Society of North America, researchers found that young people with a so-called internet and smartphone addiction actually demonstrated imbalances in brain chemistry compared to a control group.

The study involved 19 young people (mean age 15.5, 9 males) diagnosed with internet or smartphone addiction and 19 gender- and age-matched healthy controls. Twelve of the addicted youth received nine weeks of cognitive behavioral therapy, modified from a cognitive therapy program for gaming addiction, as part of the study.

Researchers used standardized internet and smartphone addiction tests to measure the severity of internet addiction. Questions focused on the extent to which internet and smartphone use affects daily routines, social life, productivity, sleeping patterns, and feelings.

“The higher the score, the more severe the addiction,” Dr. Seo said.

Dr. Seo reported that the addicted teenagers had significantly higher scores in depression, anxiety, insomnia severity, and impulsivity. The researchers performed MRS exams on the addicted youth prior to and following behavioral therapy and a single MRS study on the control patients to measure levels of gamma-aminobutyric acid, or GABA, a neurotransmitter in the brain that inhibits or slows down brain signals, and glutamate-glutamine (Glx), a neurotransmitter that causes neurons to become more electrically excited. Previous studies have found GABA to be involved in vision and motor control and the regulation of various brain functions, including anxiety.

The results of the MRS revealed that, compared to the healthy controls, the ratio of GABA to Glx was significantly increased in the anterior cingulate cortex of smartphone- and internet-addicted youth prior to therapy.

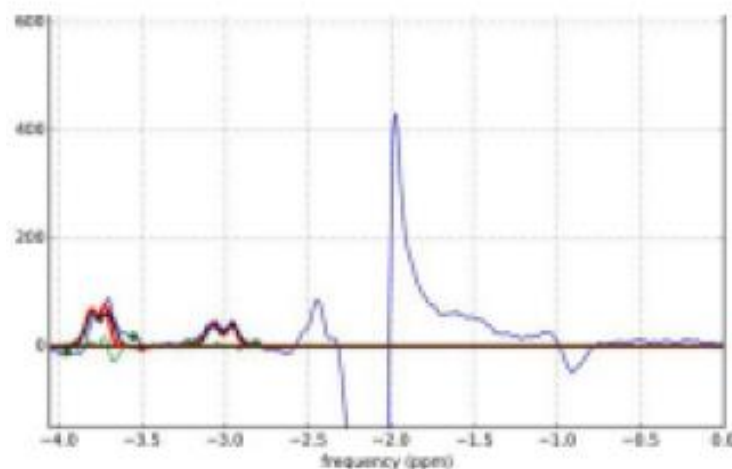


Figure 1. The areas under the GABA and glutamine+glutamate peaks at 3.01 and 3.8 ppm (red lines) were measured by fitting to double and single Gaussian functions, respectively.

2. Social-Emotional Skills

In the commentary appearing in the journal *Pediatrics*, researchers from the Boston University School of Medicine took a closer look at the available literature on smartphone and iPad use among very young children.

"If these devices become the predominant method to calm and distract young children, will they be able to develop their own internal mechanisms of self-regulation?" the researchers ask.

Hands-on activities and those involving direct human interaction are superior to interactive screen games, the experts suggest. The use of mobile devices becomes especially problematic when such devices replace hands-on activities that help develop visual-motor and sensorimotor skills.

The researchers note, however, that there are still many unknowns about how the use of mobile devices influences child development. They question whether the overuse of smartphones and tablets might interfere with the development of social and problem-solving skills that are better acquired during unstructured play with interaction with peers.

3. Mental Laziness

Instead of mulling over questions you might have about the world around you, you can just grab your phone and Google the answers. Instead of trying to remember important appointments, meetings, or dates, you simply rely on an iPhone app to remind you of what you need to accomplish each day.

And some experts warn that this over-reliance on your mobile device for all the answers might lead to mental laziness. In fact, one recent study has found that there is actually a link between relying on a smartphone and mental laziness. The study conducted involved various tests which focused on different aspects to prove the relation.

Study 1

As an initial test of the proposed association between Smartphone (SP) use and heuristic thinking, we gave participants a set of "heuristics and biases" problems that have been used extensively in previous research. Each problem is designed to cue an incorrect intuitive response that is difficult to override and is therefore considered at least partially reflective of analytic cognitive style

Study 2

A simple alternative explanation for the association between SP usage and reasoning performance would be that the participants who fell in the high SP usage group are simply worse at estimating how much time they spend on things, leading to overestimation much of the time.

Presumably, if this were the case, the relatively more heuristic thinkers in the sample would be more prone to overestimation.

Conclusion

Through these few studies, we can confidently conclude that we have established a connection between reduced brain activity and mobile phones. We should be able to successfully connect it to the topic at hand and get reasonable results.

Strengthening of Consumerism through Content and UI

In the modern day world we are all well acquainted with the concept of consumerism and how it has caught up with us at every possible platform.

Advertisements done by companies on social media platforms is one of the most intrusive systems out there. The access they have to your information allows them to know all that they need to make you want to buy a product you don't need.

The Digital Marketing companies use something called a purchase funnel to alter your behaviour over time in order to sell you a product. Google uses something called the ABC purchase funnel to make this alteration.

1. Acquisition- You can use the acquisition reports to see how people arrive to your site. Acquisition reports are an excellent way to see which vehicles are best for bringing traffic to your site. You can drill down many layers on these reports. If you buy advertising on Google, the acquisition reports will reveal which keywords produce the best response. In short, the acquisition stage helps generate interest among consumers for your product and you, as a company are able to make sure your content is reaching the right people.
2. Behaviour- Reports tell you what people are actually doing on your website. Using behaviour reports, you can see if visitors are actually taking the actions you want them to take. It measures the effectiveness of your website. If you find people not following your intended path (you can see where they get stuck), you can get your webmaster to make structural changes. There are many behaviour reports available which you should study once you are up and running and comfortable with all the new information you will be getting.

3. Conversion- Reports literally slice and dice every movement a visitor takes on your site, including how much time he or she takes at each step. Using this data, you can make detailed adjustments to your site to maximise the process it takes to get the customer to get to your "Goal"

Conclusion

After going through this data we can conclude how companies are using advertisements to cause behavioural changes and how we as consumers are amaurotic of it. With this we have successfully understood why and how companies gain access to our mind and this further causes bigger behaviour changes.



Fighting the invisible dragon

By this point we are all well aware of the problem and why it occurs. So the obvious question that arises is what is it that we as consumers can do to minimize the negative effect of this phenomenon and to make sure we are completely in control of our minds and are capable of maximising our cognitive abilities.

To answer that question let us take a deeper dive into how does this behavioural change happen biologically and what other situations have a similar effect on our brains.

Extended and excessive use of mobile phones can indeed have effects on the brain that may lead to serious health issues. Here are some elaborations on the points you mentioned:

1. *Cell phone radiation*: The World Health Organization (WHO) has classified cell phone radiation as a "possible human carcinogen." Prolonged and heavy use of mobile phones has been associated with an increased risk of brain cancer. While the exact link between

cell phone radiation and cancer is still being studied, it is important to be cautious and minimise exposure to radiation by using hands-free devices or speakerphone options whenever possible.

2. *Brain tissue damage:* A study conducted by the Radiation and Nuclear Safety Authority in Finland found that radiation from mobile phones could potentially cause damage to brain tissue. However, it's important to note that this research is still evolving, and further studies are needed to establish conclusive evidence regarding the extent and severity of this damage.
3. *Dopamine spikes:* Mobile phones and the constant connectivity they provide can lead to addictive behaviors. The constant notifications, social media updates, and other stimuli can trigger dopamine spikes in the brain, which can impact our happiness and overall well-being. Overtime, excessive reliance on these devices can desensitize the brain's response to dopamine, leading to decreased satisfaction and excitement in other areas of life.

Addressing the problem at hand requires conscious efforts to protect and revitalize our brains. Returning to traditional methods of brain exercise can be effective in this regard. Activities such as board games like chess or sudoku engage the mind in a focused manner, providing mental stimulation and enhancing cognitive abilities. Similarly, gardening or spending time in nature can have a rejuvenating effect, helping to reset our dopamine receptors and reduce the reliance on digital devices for gratification.

For individuals who need to use devices for work, one possible solution is to shift the screen to a monochromatic mode. This adjustment decreases the visual appeal and attraction of the screen, making work-related activities less enjoyable. By reducing the brain's inclination towards the device, individuals are more likely to be drawn to non-gadget-related activities, promoting a healthier balance between screen time and other pursuits.

Engaging in social activities that actively discourage the use of phones can also be beneficial. Connecting with others who share a similar mindset of minimising device usage can create an environment that encourages face-to-face interactions and discourages excessive screen time. By consciously prioritising real-world connections, individuals can break the cycle of dependency on digital devices and foster healthier social interactions.

It is important to recognise the potential risks associated with prolonged device usage and take proactive measures to protect our well-being. Striking a balance between digital engagement and real-world experiences can help us lead more fulfilling and healthier lives.

Conclusion

The problem we encounter regarding UI/UX (user interface/user experience) can be addressed not necessarily through direct solutions but indirectly by reducing our reliance on devices. In today's modern world, it may seem implausible to envision a life without devices, as they have become deeply ingrained in our daily routines. However, striving towards a future where we are less dependent on these devices is a goal worth pursuing.

As complex beings, humans possess intricate biological systems that require attention and care. It is our collective responsibility to analyse our actions, understand the motivations behind them, and evaluate how they might potentially harm us. By doing so, we can make informed choices about how we engage with technology and find a healthier balance between the digital and physical realms.

Decreasing our dependence on devices does not necessarily mean abandoning technology altogether, but rather finding a harmonious coexistence that prioritises our well-being and the betterment of humanity. It involves reevaluating our relationship with technology, setting boundaries, and fostering a conscious awareness of how we interact with our devices.

Taking care of ourselves, both physically and mentally, is essential not only for our individual well-being but also for the collective advancement of society. By prioritising our health, we can become more mindful of the impact that excessive device usage can have on our lives. This awareness can lead to the development of healthier habits, such as incorporating regular breaks from screens, engaging in physical activities, fostering face-to-face social interactions, and pursuing creative endeavours.

Ultimately, achieving a balanced and mindful approach to technology is a journey that requires a collective effort. It necessitates individuals, communities, and technology companies working together to develop solutions that promote a healthier and more sustainable relationship between humans and devices. By doing so, we can shape a future where technology serves as a tool to enhance our lives rather than dictate them, and where our well-being and the betterment of humanity take precedence.