



L-Università ta' Malta
**Faculty of Information &
Communication Technology**

Intelligent Interfaces Weekly Tasks

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B.Sc. It (Hons) Artificial Intelligence (Third Year)

Study Unit Code: **ICS3211**

Study Unit: **Intelligent Interfaces 2**

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Date: **January 2024**

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1 Week 2 Task - Mental Models

1.1 Mental Models and Conceptual Frameworks

Cognitive tools like mental models and conceptual frameworks aid people in comprehending, interpreting, and navigating the complexity of the outside world. Our minds construct mental models, which are condensed versions of reality, based on our experiences, assumptions, and knowledge. They act as mental short cuts that speed up decision-making and problem-solving for humans. The mental model of supply and demand, for instance, aids economists in their analysis of market dynamics. [1]

Contrarily, a conceptual framework is a well-organised network of related ideas and concepts that offers a logical approach to comprehending and evaluating a certain subject or area. It provides a thorough lens through which one may look at all facets of the topic, enabling a greater understanding of its core ideas and connections. [2]

Moreover, according to [3], *mental models* and *conceptual frameworks* can be considered as staple concepts when marketing new technologies. These notions establish a theoretical foundation for comprehending user mindsets, requirements, and behaviours. Additionally, they could also guide product review, marketing, and design, whilst providing a more detailed explanation of the links between the core elements, or building pieces, of a behavioural theory. [3]

Evidently, the authors of [3] also argue that although conceptual frameworks and mental models are related, they comprise of separate design aspects for technology user interfaces. People develop mental models, which are individualised cognitive representations, to comprehend their surroundings. *HCI* research is used by designers to make technology more user-friendly and captivating by coordinating interfaces with users' mental models. [3]

Nevertheless, conceptual frameworks, which have their roots in well-known theories like the trans-theoretical model or the theory of planned behaviour, are crucial in the development of *HCI* behaviour modification technologies. These frameworks provide methodical ways to analyse and shape user behaviour. They direct the development of functions that increase user satisfaction and engagement, assuring user-friendly designs and widespread technology usage. [3]

Furthermore, as mentioned in [4] different users possess various degrees of understanding systems or processes which they need to extract information from. Mental models are quite beneficial, when it is possible to identify patterns which apply to more than one individual, and system designers can employ these patterns after they have been established in order to tailor new programs to groups of individuals. Unfortunately, some of these models could not be complete; they might merely

represent analogies, which frequently function rather well. [4]

1.2 Chosen Application: Facebook

Facebook is a well-known social networking site where users may connect with friends and family, exchange material, and participate in a variety of online communities. It provides tools including news feeds, chat, events, and company sites, making it a flexible platform for both private and public engagement. [5]

1.3 Key Features

- **News Feed** - Facebook's constantly updating stream of posts from various sources.
- **Profile** - Users can create personal profiles with photos and information.
- **Friending** - Users can connect with others by sending and accepting friend requests.
- **Groups** - Users can join interest-based groups to connect with like-minded individuals.
- **Marketplace** - Users can buy and sell items locally through Facebook.
- **Pages** - Facebook enables public figures and businesses use pages to connect with followers.
- **Events** - Users or established company groups can create and coordinate events, inviting others to participate.
- **Messaging** - Facebook also enables the feature to send text, audio, or video messages to friends and groups.

1.4 Strengths

- **Massive User Base** - With 2.8 billion monthly active users, Facebook has an extensive reach.
- **High User Engagement** - Facebook's algorithmic news feed keeps users engaged for extended periods.
- **Facebook Identity** - Facebook's real name policy adds authenticity to user profiles.

1.5 Usage

- **Staying Current** - Users rely on the news feed to stay updated on friends, news, and trends.
- **Content Sharing** - Sharing life updates, articles, photos, and videos is a common activity.
- **Messaging** - Users engage in individual and group messaging for socialising and coordination.
- **Entertainment** - Facebook provides games, quizzes, and other forms of entertainment.

1.6 Improvements

- **Reduce Misinformation** - Facebook could implement features to mitigate the spread of false or misleading content.
- **Enhance Privacy** - Facebook could also offer users more control over their data privacy and sharing settings.
- **Algorithmic Transparency** - Facebook could render the news feed algorithm's workings more transparent.

1.7 Questionnaire

1. Participant's Background

- **Person 1:** (age 20) is currently a Student
- **Person 2:** (age 37) is a parent of 1 child
- **Person 3:** (age 56) is a parent of 2 children

2. What product/online service are you using?

- **Person 1:** Twitter/X
- **Person 2:** Spotify
- **Person 3:** Messaging (SMS Mobile App)

3. Why do you use it?

- **Person 1:** I use Twitter to stay up to date with the latest news and updates whilst, allowing me to send messages to my close contacts and also post tweets occasionally.
- **Person 2:** I use Spotify to listen to different music, and broaden my music taste.
- **Person 3:** I use Messaging to be able to communicate with my family and close contacts.

4. How do you use it?

- **Person 1:** I don't engage with Twitter by posting myself, but I use it to keep up to date with my close friends.
- **Person 2:** I listen to Spotify in order to listen to music, whilst commuting.
- **Person 3:** I use Messaging by sending regular messages to my family and close friends to update them on my current situation.

5. Do you think there are things in it which you would improve?

- **Person 1:** I would like Twitter to have a more personalised discovery.
- **Person 2:** I would improve Spotify by introducing a greater variety of content.
- **Person 3:** There isn't much really to improve upon, as the simple design is sufficient to send messages, however, a better user friendly design would help.

6. If you were creating something similar how would you re-design it to suit your needs?

- **Person 1:** I would re-design Twitter by making the interface more user friendly, whilst also changing the feed to be more personalised to my particular needs.
- **Person 2:** I would re-design Spotify by improving the music recommendation algorithm, and playlist sorting.
- **Person 3:** I would improve the Messaging app, by improving upon its design to make it more user friendly and have a modern theme.

1.8 Conclusions and Analysis

From the collected feedback it was noted that mental models and conceptual frameworks are key factors in influencing how people choose to utilise social media sites. These models affect how they use the platform, as well as how useful they perceive it to be. Users' motivations for using the platform are consistent with how they perceive its main features. The subtle interaction between these models is essential for comprehending and meeting the varied expectations of users, eventually influencing the development and layout of social media experiences.

2 Week 4 Task - Evaluating Intelligence

The two papers selected for this analysis are "See What You Want to See: Visual User-Driven Approach for Hybrid Recommendation" [6], which describes SetFusion, and "A Cognitive Perspective on Gestures, Manipulations, and Space in Future Multi-Device Interaction" [7], which focuses on gestures, manipulations, and space.

2.1 Key similarities:

These two publications are fundamentally similar in a number of ways. First of all, the two articles have the same objective of improving the user experience and creating more efficient and intuitive interfaces through investigating novel interface designs. Second, in an effort to increase the range of interaction options, both papers concentrate on pushing the limits of conventional input techniques by experimenting with touch, gestures, and spatial manipulations. Finally, by attempting to create more seamless links between user input and system output, both articles aim to close the gaps between interface design execution and assessment, thus guaranteeing a more effective and user-friendly interaction experience.

2.2 Key differences:

In order to enhance user cognition and spatial memory, Jetter's study [7] focuses on the investigation of gestures and spatial manipulations as input modalities, stressing the importance of blended interactions. In contrast, Parra et al. [6] focus on innovative visualization approaches, especially for recommender system output. Its main goal is to provide consumers with more influence over suggestions by means of an interactive visualization. Specifically, Jetter [7] explores cognitive perspectives on interaction through a more conceptual approach, whereas Parra et al. [6] offer a more practical and tangible approach to their research by presenting a tangible system implementation alongside user studies.

2.3 Usability characteristics:

2.3.1 Learnability:

In terms of learnability, Jetter [7] observes that gesture sets are an artificial language that, with careful design, most users should be able to adopt, rather than something

that is inherently "natural." He also points out that examples of the huge potential of Application-specific gesture sets are demonstrated by apps like the remarkable tabletop system for document editing with pen and touch gestures by Matulic & Norrie.

Moreover, Para et al. [6] note that SetFusion included fusing sliders to enhance user control over source integration, and instead of employing clustermaps as in TalkExplorer, more basic Venn diagrams were utilized to depict set intersections. Ultimately, the use of these Venn diagrams presents an easier-to-understand visual paradigm for set presentation, thus enabling faster learnability.

2.3.2 Efficiency:

A sensation of flow, control, and directness that is unparalleled is achieved through the use of such gesture sets, as demonstrated in Jetter's study [7] in the best instance. Assuming that a gesture is quicker than choosing a menu item or remembering keyboard shortcuts, in a poor scenario, users only save a few seconds, and they are not disturbed (assuming that switching between a mouse, touchpad, and keyboard is no longer necessary).

An analysis of the research findings presented in [6] revealed that SetFusion operates much more significantly on user motivation, performance, and attitude when used in natural suggestion mode. First, a number of factors showed that SetFusion is more user-friendly when used in its natural state. Twice as many users used SetFusion, bookmarked chats with it, and used it often, compared to a comparable number of people exposed to the systems. Additionally, users spent a significant amount more time on average on the system and bookmarked nearly four times as many discussions. Secondly, the data presented compelling evidence that users utilized SetFusion in its native form more productively, reducing the ratio of support actions, the overall time spent to process yield, or the quantity of chats bookmarked.

2.3.3 Memorability:

In the worst scenario, learning and remembering gestures becomes as challenging as using keyboard shortcuts or command-line languages, and using them could have a detrimental impact on memorability. This is especially true if gestures are not used frequently. For many application contexts, it is just not possible to create a mapping between instructions and gestures that is distinct, obvious, and simple to remember. [7]

Regarding SetFusion, while it isn't said explicitly, it may be inferred that users can quickly regain skill because of the increased number of visual interface components between the UMAP research and the 2013 pilot trial. In contrast, the latter witnessed a

rise in overall user engagement, which eventually resulted in increased application competency. [6]

2.3.4 Errors:

Errors can occur in gesture-based interactions, particularly when dealing with intricate sequences of motions. This is due to the fact that understanding the functions of each relevant gesture require users to make initial guesses and memorise enormous sets of gestures. [7]

In the case of SetFusion, user faults were not recorded as the focus of the article was on assessing user engagement with the revised system. However, when it came to the suggestions it made, the system itself was prone to inaccuracies. Fortunately, these could be easily fixed with sliders and other simple tweaks, allowing users to get the right result. The fact that users modified their list of recommendations 4.36 times on average after adjusting the sliders lends more credence to this. demonstrating the ease of use and potency of such a basic function. [6]

2.3.5 Satisfaction:

It can be noted that the goal of using gestures as user input in HCI is to meet the demands of users in contexts that are either context- or domain-specific. For instance, using gestures instead of touch controls or other kinds of interaction might be helpful in hygienic environments like hospitals. [7]

Furthermore, Para et al. [6] note that SetFusion's visual interface, which gives users control over the fusion process and enhances controllability through enhanced visualization of the process, may be more conducive to user satisfaction and success than traditional "black box" system-driven hybridization in terms of satisfaction.

2.4 Elements indicating intelligence in Parra et al.'s work:

The interface design by Parra et al. incorporates a number of clever components. They include interactive visualizations, which greatly increase system transparency by giving users the power to exercise control and a clear knowledge of the suggestion process. Furthermore, users may customize their experience by customizing suggestions to suit their interests thanks to the integration of numerous recommendation sources that can be adjusted using sliders. Furthermore, by using Venn diagrams to show the intersections between different suggestion lists, complicated information is made easier to understand and comprehend for consumers, resulting in an interface that is easier to use.

[6]

2.5 Elements indicating intelligence in Jetter's work:

Jetter's research is notable due to its emphasis on using spatial cognition and the proprioceptive feedback that is present in movements and spatial adjustments. This strategy attempts to improve learning and memory retention while lowering the cognitive strain on users. Moreover, a more intuitive user experience is achieved through Jetter's emphasis on body-based interactions and users' natural spatial abilities rather than abstract dialogue metaphors. Because of its intuitive design, which mimics how people naturally interact with their actual surroundings, it is easier to use and more accessible.

[7]

2.6 Summary

Essentially, the goal of Parra et al.'s research on SetFusion and Jetter's work on gestures and spatial manipulations is to create interfaces that are transparent and intuitive by design. These interfaces close the gap between execution and assessment by using users' pre-existing cognitive and physical capacities, thereby accelerating the transition to more intelligent, user-centered systems. Their different approaches—one focusing on cognition and input techniques, the other on visualization and control—taken together help to shape the development of user interfaces that are more in line with human capabilities and provide a more intuitive and intelligent interaction experience.

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Plagiarism Form

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