READING REFLECTIONS

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1. Prototyping for physical and digital products:

This reading explains to designers how to properly create a prototype for a given product. The definition of a prototype is "a first, typical or preliminary model of something, especially a machine, from which other forms are developed or copied." A prototype can made in the form of sketches, sculptures, or intricate designs. The main goal is translate an original idea into a tangible form which can be tested and improved. It is important to focus on the user when designing a prototype. The designer must think of the best user-centered design approach since the product has to address a particular need of the user to be more viable and sellable. There exists 3 types of fidelity levels for prototypes in order to test different aspects of the design. The term "fidelity" means how close the prototype looks like the finished result. It is recommended to start at a low fidelity and gradually increase the fidelity level until most assumptions can be tested. The designer must be flexible when creating a prototype and leave a lot of room for error and improvement. Testing is an essential part of prototyping which gives an idea to the designer of how much improvement or changing there needs to be done. A low fidelity prototype is better suited for testing a core concept and getting over initial fears. The prototype will look very different from the finished result and will not include any design elements. An example of a low fidelity prototype would be a sketch on paper, a storyboard, wireframes, mood boards and component prototype. It should be cheap and easible accessible to make. The low fidelity prototype serves to test basic assumptions (user flows, information architecture, labeling, navigation layout, basic organization and user mental models). The mid fidelity prototype looks closer to the final product. It is a balance between cost and value and has more design elements included. The prototype can also be in the final medium in which the product will be presented. The goal of the mid-fidelity prototype is to test more specific assumptions. Examples include clickable prototypes, axure prototypes, coded prototypes and initial electronic prototypes. Lastly, high fidelity prototype look very close to the finished product. They have been visually designed and are in the final medium of the physical material or have been coded and exist in the browser. Examples include fully coded and designed experiences and high quality industrial design models.

2. Designing for emerging technologies

With the advent of technology and the exponential rate at which new technologies are emerging, it becomes necessary for designers to consider how to design new products for four emerging technologies whose growth and immense commercial spread has the potential to disrupt the current economic order. The first technology is a networked and intelligent world connected by the Internet of Things (IoT). Iot describes all objects using sensors to operate and which can communicate with other machines. Sensors providing analog data help us gain a better understanding of the environment we live in and have the ability to passively or actively influence our surroundings. Many possibilities emerge from a hyper-connected world in which hospitals, factories, roads, airways, offices, retail stores, and public buildings are all linked together by a web of data. The second technology is a more efficient and effective manufacturing, healthcare, and disaster relief aided by advanced robotics. Robots in society are best suited in taking care of jobs that are repetitive, physically demanding and potentially dangerous for humans. Thus, many

opportunities for robotics exist in areas in which human labor is intensive such as manufacturing and logistics. The third technology is additive manufacturing also known as 3D printing. This process allows the creation of three-dimensional objects by printing one layer of material at a time based on a digital model. A wide variety of materials can be used in 3D printing such as metal, glass and biological material. This new technology could improve medicine by creating viable human tissues and working organs which could be used in transplants or for laboratory testing. The last technology is medicine, food, and fuel created by altering the code of life itself, through genomics and synthetic biology. If robotics, additive fabrication and synthetic biology advance further, humans will be able to achieve their goals in manufacturing, health, energy and various other industries in an effective and rapid way but will also be faced with a large set of demands. Fields of graphical, industrial and software UX design have evolved in response to the additional demands of these new technologies. In order to respond effectively to these demands, designers must identify the problems correctly, learn constantly, think systemically, work at a variety of scales, connect people and technology, provoke and facilitate change, work effectively on cross-disciplinary teams and finally take risks responsibly. In the upcoming years, the boundaries between design and engineering for software, hardware, and biotechnology will be blurred as designer will have their career lead them into uncharted territory.

3. Fashion with function

Wearables also known as body-borne-computers, consist of small electronic or sensor devices that are worn on the physical body, either on bare skin or on top of clothing items. The wearable market today is in constant expansion as designer are figuring new ways of integrating technology in wearable products. Examples of wearables include smart rings, bracelets, and necklaces, smart glasses and watches, smart gloves, socks, and t-shirts. When designing wearable devices it is important to consider many aspects in order to provide the most effective user experience in relation to the product's industrial and interface design. These aspects involve the user, its surroundings, the device itself, the context of use, feature sets, interaction models, and any relationships with other devices. The first UX factor is visibility. There is balance between fashion and function in the design process of the wearable. People wear items as a form of self-expression and as a way to show the world their identity, personality and distinctiveness. Wearable design options in terms of visibility are either visible to others or invisible. The second UX factor is the role of the wearable. The wearable can either serve the role of a tracker which collects data of the wearer's activities or physical condition, a messenger which displays notifications such as incoming messages or meeting reminders, a facilitator which facilitates communication, media or other activities available on the smartphone by offering a more convenient user experience or an enhancer which augments the real world with information that is overlaid on the environment and its objects. The third UX factor is display on device. Display on device is essential in terms of the physical design of the wearable object and the experience it provides to the user. The design options are either no display, minimal output display (LED-based) or full interactable display in the form of a physical screen or a projected display. The last UX factor is the interaction model. When designing the interaction interface, we must consider the three relevant human senses which

can be affected by the wearable: sight, hearing and touch. The senses can be stimulated through multimodal interaction channels that are either visual (through display), auditory (sound/voice), tactile (touch/vibration) or physical keys. In conclusion, when designing wearables it is necessary to create a user experience according to each different case. It is also important to consider the wearable's role in the broader ecosystem and as a part of someone's daily life.

4. Human-robot relationships

A robot is a collection of sensors providing data to a processor. Movement makes a robot a robot. Almost all robots use artificial intelligence and they can be autonomous or controlled by a human. When thinking about human and robot relationships it is important to think about communication and safety concerns. People need clues about the way robots interpret their environments so that we can understand their intentions, capabilities, and limitations. People read signals that imitate human behavior best because those are the signals we've evolved to detect. Many questions arise when we look into robot-human relationships. How do we design the highest level of human control in these situations? When do we want to relinquish control and avoid certain obligations? Whose responsibility do the actions of the robot become? Robots are also increasingly present in the medical sphere. Doctors use state-of-the-art robots because these tools give them enhanced capabilities, improve healthcare outcomes, and contribute to the hospital's overall effectiveness. Telepresence robots and surgical robots such as the RP-VITA and the Da Vinci are already in use while Nanorobots will be used in the future. More questions arise when thinking of robots in the medical domain. What experience should the various medical users have? What experience should you as the patient have? With the presence of Nanorobots which can collect any type of data in the human body, issues of privacy are being discussed. What levels of access should be given to different doctors (such as psychiatrists), family members, community service providers, insurers, or others? On the other hand, humans will likely develop emotional relationships with robots. Many robots do not look like a robot but rather like a stuffed animal, but with moving parts. The robot is also aware of activity in the room. It looks in the direction of the last alarm, and it turns toward the person who just entered the room. The robot also addresses you by your name and asks you how you feel. The cute look of the robot and the interactions the user can experience with it will most likely create an emotional connection for the human. As a result, many ethical questions and issues will arise in regards to the treatment of robots and their place in society. Saudi Arabia has always given citizenship to a robot and it can be assumed that many more similar cases will occur soon. Designers will therefore have the responsibility to design robots in a way to facilitate exchanges with humans while considering about the consequences and ethical issues which will eventually become public discourse.