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BDPS Final Paper

This semester in Building Digital Physical Systems has been eye opening. I now have a much better understanding of the complexity and nuances involved in building an effective digital physical system. Through all of the hands-on practical assignments and final group project, I definitely honed in on a process that made the design of digital physical systems focused and efficient.

The first place to begin is a clear definition of the goals and purpose of the system. What problems are being solved or convenience provided? If the project doesn't have a clear direction then it won't complete the required tasks successfully. A question that must be asked constantly thru ought the project is, why? If you can't justify a decision in the scheme of your purpose, then perhaps it is not the correct decision to make. This purpose will help you then define the context and constraints of the system. Is this going to be wearable, ambient, art, or public display? How many users will there be? How many at once? For instance, if one is trying to provide information in the background or individually to a large number of people each day than something like the 8.5-meter public display at Siemens would work better than a headband worn by a kiosk worker. With the context worked out, constraints fall into place. Size being the most determining. It must be appropriate and purposeful. What sensors and inputs will be used? What outputs will be used? What will their form and purposes be?

All of this information might be hard to narrow down at first. To help with this process it is great to whip out the paper and pencil. Starting with something as simple as a mind map can be hugely beneficial. Free brainstorming can help open new doors. Sketching ideas and storyboards will iron out design kinks. Preparing wiring diagrams can prevent headaches in the long run. This kind of sketching and

brainstorming will also allow you to get feedback early on from users, investors, or anyone that might have a relevant and informed opinion.

After general designs are all completed, some kind of prototype must be created. It is more important to prove the concept is possible than make it beautiful at this point. Assemble materials, and then with design constraints in mind a rapid prototype can be created. This means all the hardware (computers, sensors, etc.) must be properly assembled and paired with working code and software. This test allows you to see whether or not any major design changes need to be made. If a certain sensor or board must be swapped for another, how does it affect size, weight, orientation, etc.. The prototype is there for testing and feedback purposes.

With a working prototype it is possible to get as much feedback as needed from users. This feedback can be implemented and re tested. Would a different sensor or output interface make it a more effective digital physical system? Is it buggy or unapproachable? All of this feedback can then be used to refine all the "design" aspects of the project. Creating a technically working prototype is only half the struggle in implementing a digital physical system.

Any system, from ambient systems like "Breakaway" to the large-scale public work in the London Stock Building must be perfect from a design standpoint. digital physical systems must communicate exactly what they are there for (unless it is a public work meant to create curiosity and maybe change behavior) or else users will not be drawn in or stick around long enough to find out. This means user interfaces are focused, simple, easy to look at, and adaptable if needed. Enclosures, physical inputs and sensors must be easily understood by anyone. Navigation through or around the systems must be accessible. One of the main purposes of these systems is to provide convenience or information. This must be remembered at all times.

When it comes down to a really good system, every detail is going to be addressed. The forms and textures will communicate intent. Materials will illustrate

the quality of the device. Color and sound will be chosen purposefully to relay the proper information to the user. If something is about to go horribly wrong the last thing you want is a green light coming on. Tactile feedback can also be an effective design choice. People like to get feedback on everything that is purely digital, so they know something is happening. In the end, a design can be judged on one thing. Love. An incredible design will get the users to connect to the system on an emotional level. It works so well that they experience the system in a deeper way. The polishing of the system is what will turn it from a cool concept to something that can help people every day.

Building a great digital physical boils down to a few key points. The first is a focused goal to work toward. Most of these systems, especially ambient systems, get their effectiveness from their simplicity. Then, as long as this overall concept is kept in mind with every decision, the form will follow the function. Appropriate tools must be utilized and many feedback / revision processes undergone. The last step is to make sure every design detail of the system supports its function.