



## AUGMENTED PAPER DESIGN WORKSHOP PACKET: PART I

### Defining Augmented Paper

Augmented paper: The synergistic combination of physical paper and computation

- Combining the affordances of physical paper and the unique functionalities of technology
- Motivation: There are limitations to both physical paper and computing devices. One method of addressing the limitations of both is by hybridizing the two together.

### Defining Utility

Utility: For our purposes, we can think of utility as a numerical measure of preference

- The concept was originally adopted from economics, and used to model the usefulness of a good or service
- Consider the following scenario: We are looking for a bike. We have bike A, bike B, and bike C. If we prefer bike A over all other options, we can say that bike A has the highest utility.
- Applied to HCI by Toomin, Kriplean, Portner, and Landay in 2011
  - Defined the utility function for human-computer interactions as  $f(task, interface, context)$

### Our Framework

We defined the utility of augmented paper technologies as follows:

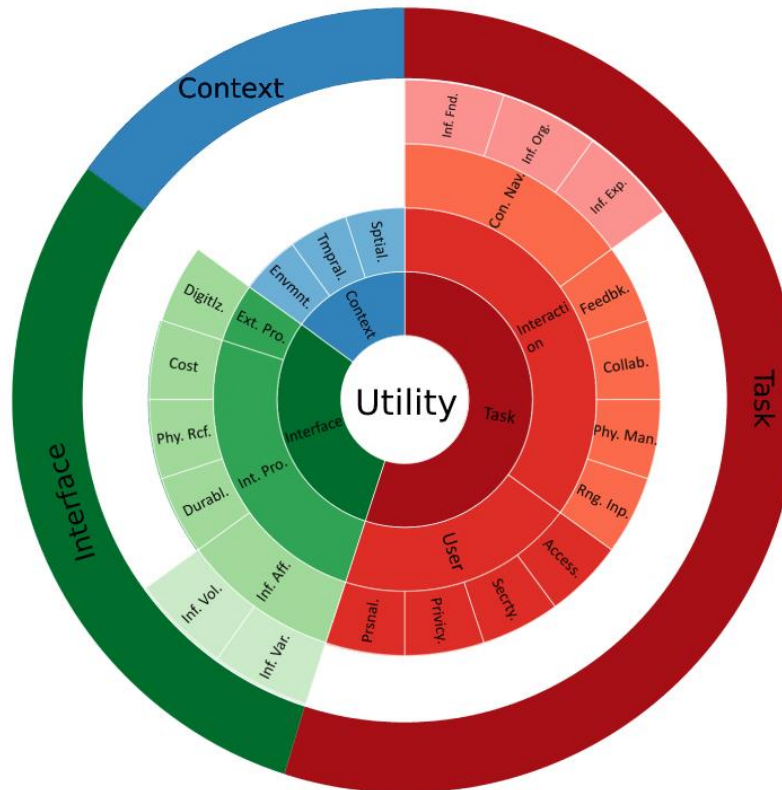
$$Utility = f(Task, Interface, Context)$$

$$\begin{cases} Task = f(Interaction, User) \\ Interface = f(IntrinsicProperties, DigitalExtendedProperties) \\ Context = f(Spatiality, Temporality, Environment) \end{cases}$$

We distilled a total of 20 dimensions characterizing augmented paper. We organized the 20 dimensions using the structure defined above.



## Sunburst Visualization of Framework



The following table defines the abbreviations used in the graph above. The same abbreviations will be used for the graphs in the rest of the packet.

Abbreviation		Abbreviation	
<b>Rng. Inp.</b>	Range of Input	<b>Access.</b>	Accessibility
<b>Inf. Exp.</b>	Information Exploration	<b>Cost</b>	Cost
<b>Inf. Org.</b>	Information Organization	<b>Inf. Vol.</b>	Information Volume
<b>Inf. Fnd.</b>	Information Findability	<b>Inf. Var.</b>	Information Variety
<b>Phy. Man.</b>	Physical Manipulation	<b>Phy. Rcf.</b>	Physical Reconfigurability
<b>Collab.</b>	Collaboration	<b>Durabl.</b>	Durability
<b>Feedbk.</b>	Feedback	<b>Digitz.</b>	Digitalization
<b>Prsnal.</b>	Personalization	<b>Sptial.</b>	Spatiality
<b>Prvicy.</b>	Privacy	<b>Tmpral.</b>	Temporality
<b>Secrty.</b>	Security	<b>Envmnt.</b>	Environment

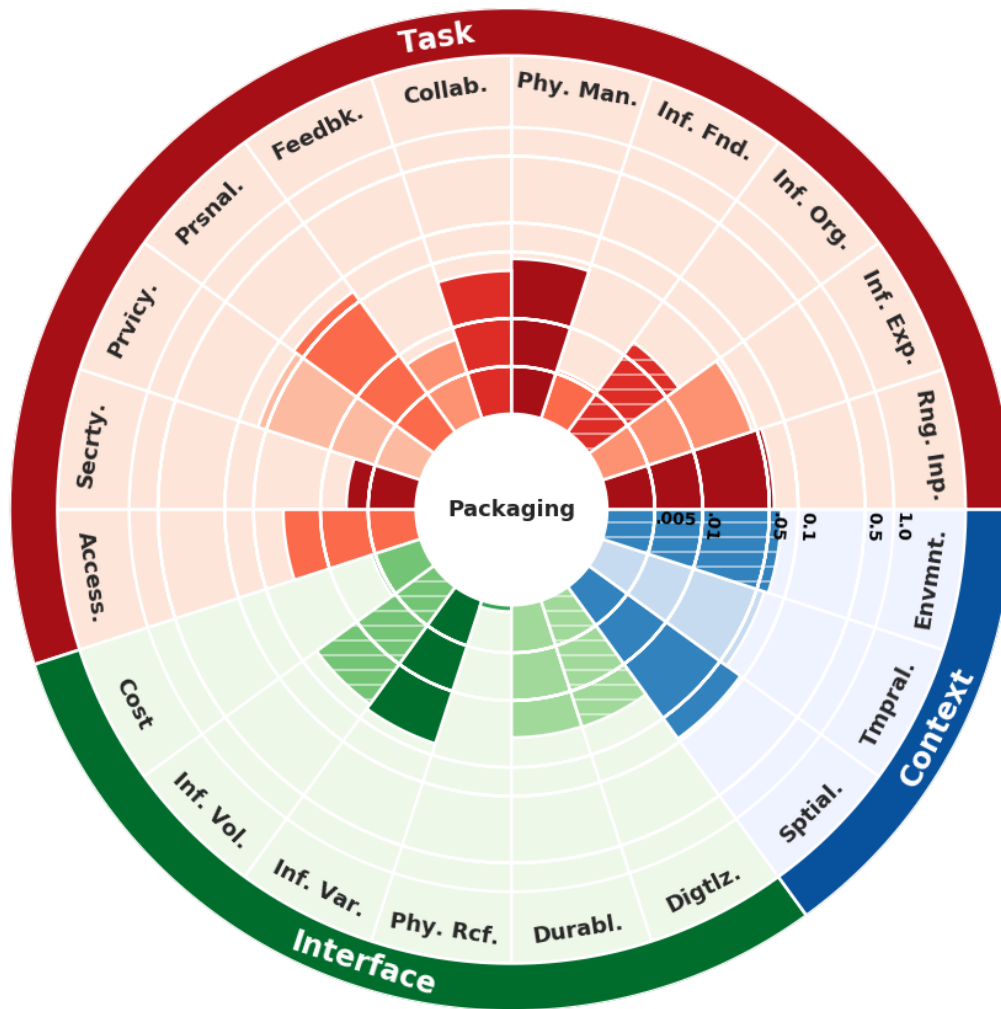
**Dimension Definitions**

Dimension	Definition
Range of Content Input	The number of ways to add information to a device or product
Information Exploration	The ability to view, examine, and understand the information presented
Information Organization	The ability to rearrange the information presented into an ordered format
Information Findability	The ability to find a specific piece of information
Physical Manipulation	The ability to interact with a physical product in a meaningful manner
Collaboration	The ability to use the same device or product with others to accomplish a task
Feedback	The ability to respond to user actions in a meaningful manner
Personalization	The ability to change part(s) of a product to match user preferences
Privacy	The ability to manage how much of your own personal information is revealed to others
Security	The ability to ensure safety from theft, damage, or misuse
Accessibility	The ability to accommodate different users with a wide variety of characteristics, backgrounds, physical or mental abilities, or needs
Cost	The amount that has to be paid or spent to buy or obtain something
Information Volume	The amount of information that a product can contain
Information Variety	The number of different formats of information that a product can display
Reconfigurability	The quality of being easy to change in shape
Durability	The quality of being lasting; can be used reliably for a long time
Digitalization	The ability to convert to a digital form
Spatiality	The quality of being associated with space or an arrangement (location, position, direction) in space
Temporality	The quality of being associated with time or an arrangement in time
Environment	The quality of being associated with the surroundings



# Aster Plot Use

Here, we demonstrate how to interpret our Aster plots. The Aster plot below was generated using arbitrary values. We included the following diagram purely for demonstration purposes.



**Bar Height:** The height of each bar represents utility. This means that the **higher** the bar, the more users **preferred** that product for that particular dimension.

**Bar Color Shade:** The color of each bar represents how important users think that dimension is for that particular product. **Darker** the bar, the **more** users **perceived** that attribute to be **important**.

**Line Texture:** If the bar has stripes on it, it means that users **generally disagreed** about the **importance of that attribute** for a particular product.

The subsequent pages contain the actual Aster plots.

