Productive Interaction

Designing for drivers instead of passengers

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A work in progress
Southern California Digital Culture Group
Friday, May 21st, 2004
Institute for Multimedia Studies
Annenberg Center for Communication
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"Contrary to modern architecture and its desperate afterbirths, this new architecture is neither authoritarian nor hysterical; it is the hedonistic science of designing collective facilities that fully accommodate individual desires."
- Rem Koolhaas, *S,M,L,XL*

Design Writing / Design Research

This paper and its associated design prototypes are a means of design research - exploration, evolution, and invention - that analyze interaction approaches and look for practical improvements, alternatives, and future visions of interaction design. In particular, this work responds to "experience design," a widely adopted worldview and design methodology that focuses on the audience's overall experience. Drawing on the successes of movies and theme parks, experience design looks beyond the designed thing (web site, mobile phone, museum exhibit, etc.), and takes into account emotional response, contextual narrative and perceived value in creating a seductive, effective experience. In the web and product design arenas, this approach has helped designers distinguish themselves from those who simply apply style and interface. While understanding the power of experience design, I believe that it positions the user as a passive consumer in a medium that offers something else. In contrast, I propose "productive interaction", which views interaction as a medium that *enables the user as producer of her own outcomes and meanings*. Productive interaction aligns the design of not-linear content, context and affordance in an open, collaborative fashion, enabling the direct manipulation of the work's material. Taking advantage of this facilitation, the user creates a custom, personally significant meaning space of their own. Productive interaction puts the user in the driver seat instead of sitting passively as a passenger. [1]

This article and its associated design explorations compose a system of design research that engages a dialog about the future capabilities and possibilities of the interactive medium. We need to ask a series of questions:

- What directions do we want interaction to go in and what are the ideologies behind these visions?
- What are some principles and techniques that can help get it there?
- What are some working and speculative prototypes of these new directions?
- What are the implications for designers?

The zoetrope, a precursor to film

I favor writing and designing in directed research that aims to get at these basic questions. It's a way of pushing and pulling design and designers forward through the process of making, then analysis, and more making.

In the end, all of these questions boil down to a single one: how can designers make more meaningful, rich and user enabling interactive systems? This is an acute question because we're not far from the days of spinning zoetrope filmstrips (a precursor to cinema), where interactive form

[1] I want to acknowledge the influence of my colleagues and students in the development of this thinking. While this kind of discussion is happening all over the design fields, it's particularly robust within Art Center's Graduate Media Design Program where I teach. In particular I'd like to acknowledge colleague Peter Lunenfeld's "The Point of It All" presentation and as yet unpublished paper for the Digital Cultures Group in the Fall of 2003, Anne Burdick and Brenda Laurel's work in *Design Research: Methods and Perspectives*, MIT Press 2003, and graduate student Scott Nazarian's thesis work on science fiction and design futurism.

and technique lack the power and quality of mature mediums like cinema and print. Designers must experiment and push the medium beyond its seminal beginnings, just as film moved far beyond the zoetrope. Given this, what are some robust directions that can lead us to this future?

The successes and failures of experience design

The limitations of interaction design have caught the attention of many. Some have concentrated on improving usability (e.g. Jakob Nielsen), or broken away from traditional forms (Joshua Davis) or looked at storytelling (Hillman Curtis) to solve the problem. Others have focused on the tangible aspects of interaction (Bill Verplank, Hiroshi Ishi, Bill Buxton) or the sociological issues (Lucy Suchman). A particularly influential movement is Experience Design (Nathan Shedroff, the AIGA), which takes the view that interface and form are only part of the design domain, and that human context is an essential, yet often missing component in interaction (and other) design; the idea draws inspiration from the success of media such as movies and theme parks, which create compelling experiences through the use of story, sensation, emotion, identification, and value.

Experience Design has made a significant contribution to design culture, emphasizing the need to broaden the designer's view beyond just "the thing" to include the entire context and outcome of the work. And when the designer's responsibility is for the overall experience, she becomes involved in a project in a deeper way, from the very conception of the idea, to researching the audience, to the final deployment and analysis of user response. Experience design is one of several threads influencing this expanding role for the field of design, which is transforming itself into a more entrepreneurial, authorial, research oriented, and, as Brenda Laurel describes it, muscular discipline.

Despite these positive effects, there are significant problems with experience design as applied to interaction. First, the name "experience design" naturally implies that the designer defines and dictates the experience. This makes perfect sense for movies, which create an enveloping experience that effectively tells a story to an audience who willingly gives themselves over to the film. But designing the experience seems contradictory to the intent of true interactive media, *which foregrounds the user as maker of their own experience.* The interactor, by definition, is *not* giving themselves over to the designers. Rather, they are making use of the medium's inherent affordances to *take control,* make choices, manipulate the material, and shape their own arc of engagement. In this view, the goal is not to design the experience, but to design open systems that enable user creation of individual, unpredictable (to the designer) outcomes.

Experience design is further limited by its focus on feeling and sensation. This emphasis seems inevitable given the central goal of creating effective "great experiences". From this, the logical (perhaps extreme) extension of experience design is that designers become pure makers of overwhelming, sensational experiences such as Disneyland, Quake, Las Vegas, NikeTown, or The Matrix. In other words, design's power is used to create systems that are so finely tuned as to reduce the audience role to merely paying for the opportunity to consume an evanescent experience. Of course, this devolution of design is not the

intention of experience design's advocates. But it's a consequence of the overemphasis on "experience," which results in the exclusion (even obliteration) of meaning and audience intent. There are certainly many examples of this in the media landscape, and I see nothing wrong with experientially focused media in its place among a variety of possibilities. But is it a good model for interaction design?

An alternative approach is to switch the audience from consumer to producer. Instead of designing prepackaged experiences, the designer focuses on a range of user goals and builds systems that facilitate the personal production of meaning(s). It flips the focus from consumerist manipulation through experience, to a facilitated, productive output via active dialog between the work and the user. This model does not however, exclude or reject story, experience, tangibility and the other design approaches. These are often useful tactical tools in the service of a project's overall goals. But to improve the enabling characteristics of interactive media, there should be a greater emphasis on the particular affordances and benefits that encourage active meaning making rather than passive consumption of experiences. In this way, users become responsible for their outcomes and conclusions, and gain a deeper understanding of the communication.

What is productive interaction?

Productive interaction is a recasting of the author/designer's position in relation to the audience. Instead of laying out a linear narrative in an enveloping experience, the productive interaction designer frames an exploration of a meaning space, making sure the audience has the affordances to create their own "take".

How is productive interaction different? Certainly all mediums rely on a dialog between the work and the audience. People view a painting and spend minutes, hours, even years absorbing, rethinking, feeling, and interpreting the work in their minds (an essential psychological interaction that Lev Manovich has identified in *The Language of New Media*). Yet this psychological interaction is separate and detached from the painting, which stands fixed on the wall. Books, magazines, and other print media have a more tangible interaction, where readers actively turn pages, perhaps choosing their own path through the work. Still, the book retains its original linearity (a strength of the medium), and the reader is left thinking, imagining or making separate notes to create their own take on the material.

Even much of today's interactive media fails to reach beyond the interactive quality of print media, and pales in comparison to print's usability, information density, and compelling materiality. For example, the benefits of reading the news at http://www.nytimes.com have mostly to do with features around the edges of linear content – timely updates, links, search, and anywhere availability. While reading a single article is sometimes better online, *understanding* the "the news" is a superior process with the print edition of the New York Times. This is because of the poor quality and few benefits the website has over the powerful affordances of print that enable scanning large dense pages, spreading multiple sections out, folding it up to focus, using the meaning implied by typography and headline

formats, passing a section to a friend, and so much more.

In contrast to traditional media, productive interaction's strength is facilitating and provoking the dialog. It enables juxtaposition, and supports the remixing of the actual content.

Productive interaction gives the reader a pair of scissors and permission to cut up the book. It's a system of direct manipulation, where the user becomes a co-designer in the creation of a custom content stream suited to their immediate desires, purposes and intents. And because the interaction is mediated by a computer rather than a static bookbinding, many affordances can be built to help the user create more relevant and personally significant meaning.

I want to emphasize that despite the collaborative openness of productive interaction, it is still a strongly designed and authored medium. Each expression has a point of view, an attitude, and an aesthetic that contextualize a specific set of content. The author/designer addresses an audience and their possible goals, defines the meaning spaces, builds the affordances, and determines the level and directions of freedom. Some works will be fairly constrained, while others will offer more opportunities for manipulation, change, and contribution by the user. On the more constrained end of the spectrum you might see a very specific and biased take on a political candidate, while on the other end might be the California Secretary of State's non-partisan analysis of the ballot propositions.

Regardless of the range of freedom offered by the author/designer, productive interaction works are not completely open-ended systems that allow anything to be made. Because of the contextualizing, facilitative, and expressive character of the medium, it is different from interactive tool systems such as the video editing application Final Cut Pro. The idea (and the hard part) of productive interaction is to build systems that understand and guide the user, yet provide flexible affordances that enable the user to produce their own explorations and meanings. One might think of productive interactive systems as playing the role of a great coach, jester, teacher, judge, mentor, debate opponent, or partner, helping the user along in her pursuits.

In broad terms, this paper is a call for designers to live up to the visions of seminal interactive thinkers such as Vannevar Bush, Ted Nelson, and Alan Kay. How can we move beyond the stagnation of the web's context-disruptive hyperlink and video games' engaging but superficial 3D navigation systems?

Our goal should be to create systems that live up to the quality of printed newspapers and books. But the mission is not to displace previous mediums; rather, it's to find a new niche alongside existing media. The interactive designer has to find the strengths of the new medium and exploit them to their fullest, creating a high quality means of communication with a unique voice.

Ideally, designers will create interactive works that enable the user to develop an ad-hoc exploration with techniques such as dynamically created juxtapositions, faceted and multiple

views of the material, active serendipity tools, and smart content that reconfigures itself in meaningful and useful ways. The user exploits these affordances to construct a personal outcome with unique significance because she created it herself.

Futurist visions of interface like those in Minority Report give us some clues about the possibilities. We can imagine systems that have very high-resolution displays, tangible interfaces, embedded presence, and flexible, smart interactions. But what will actually work, and how will designers function in this new space?

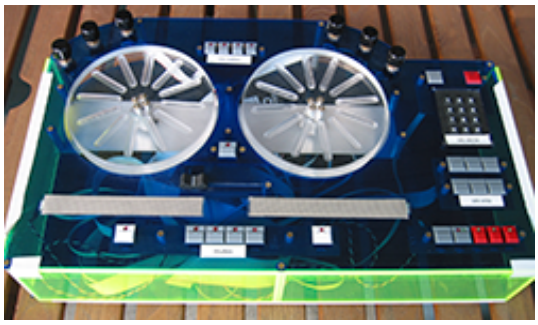
Design Research

I'm working on a series of design prototypes to explore the issues raised in this paper. This approach helps ground the thinking and analyses, and provides new insights and design directions. In fact, designing for me is another method of thinking and analyzing, using the process and intuition of design alongside the real-world constraints of making something actually work. So to help ground the discussion and analysis of this paper, I'll describe several relevant interactive works. First, I'll describe an interactive music prototype called *Physical Music* I developed over the last few years. Then I'll discuss two early-stage (as of May 2004) screen based prototypes – *Topic Explorer* and *Text Facets* – which are part of my current research. Finally, I'll describe a web work by design group Future Farmers called *They Rule*.

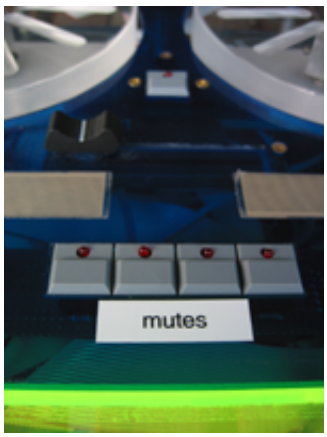
Each of these projects demonstrates some of the principles and techniques of productive interaction discussed in the following section.

Physical Music

This is an experiment in creating a music-making product for non-musicians that was seminal in developing many of the ideas in productive interaction, especially not-linear design, faceting, presets, constructed linearities, and smart content. Through the use of a custom physical interface and pre-composed musical fragments arranged in "song-frameworks", the system enables the user to build custom musical compositions. The user is able to select instrumentation, arrangements, and perform solos to their taste without worrying about the musical mechanics of keys, tempo, and chordal progression. Users simply experiment with the different musical components by manipulating the physical interface to see which combinations they like. They can start with interesting presets provided with the song-frameworks, modify them to their preference, and save those presets for later use in a performance. This configuration process allows the user to get to know the possibilities, and then set up a configuration they like.



Physical Music Prototype



Mute/un-mute sections of the instrumentation

After learning the capabilities in the song-framework and setting up several presets the user can then perform a composition from beginning to end. For example, they might select a beginning preset that was appropriate for the song intro. They would then bring in different sections of the instrumentation (e.g. rhythm sections, percussion accompaniments, melodic instruments and lead instruments) to build the beginning of the song, much as an orchestra conductor would. Once the

introduction was complete, they could switch to a preset for a verse. While that plays, they can introduce on-the-fly lyrics, percussion hits, and other temporary musical elements to add variety to the performance. Next, they would switch to the chorus preset, which might have a different chord progression, and different feel. Again, they can adjust the music in real-time to their taste with temporary elements, bringing in or eliminating different sets of instruments, and changing the sounds of the instruments that are playing the different parts. For example, they can change the keyboard part from a Hammond B3 Organ to a grand piano.

Solo wheel

The user might switch back and forth between the verse and chorus parts a few times, and then go to a solo preset. This would bring in a different arrangement that had an instrumental foundation over which the user can create a solo. Then, in real-time, the user can select a saxophone or a synthesizer sound, and by simply turning a wheel perform a solo on top of the rest of the music. At the end of the performance, the user can select an ending preset, and then improvise an arrangement that drops out most instruments, has a little soloing, and even slows down in tempo to provide a sense of completion.

Serendipity stream

Topic Explorer

This project explores ways to provide a deep exploration of a topic. One part of the prototype uses the ideas of serendipity, excerpting, and smart content to provide the user with an exploration affordance that strives for the kind of serendipitous grazing that often happens in a library. A "serendipity-stream" of short phrases from the main texts cascades down one side of the screen. The user can click on any phrase resulting in the main text immediately scrolling to the section of text the phrase comes from. The serendipity phrases are generated in several ways: randomly, from author tagged pull-quotes, or from headings in the text. This same technique is applied to images, where image fragments cascade down the screen as a method for serendipitously finding pictures.

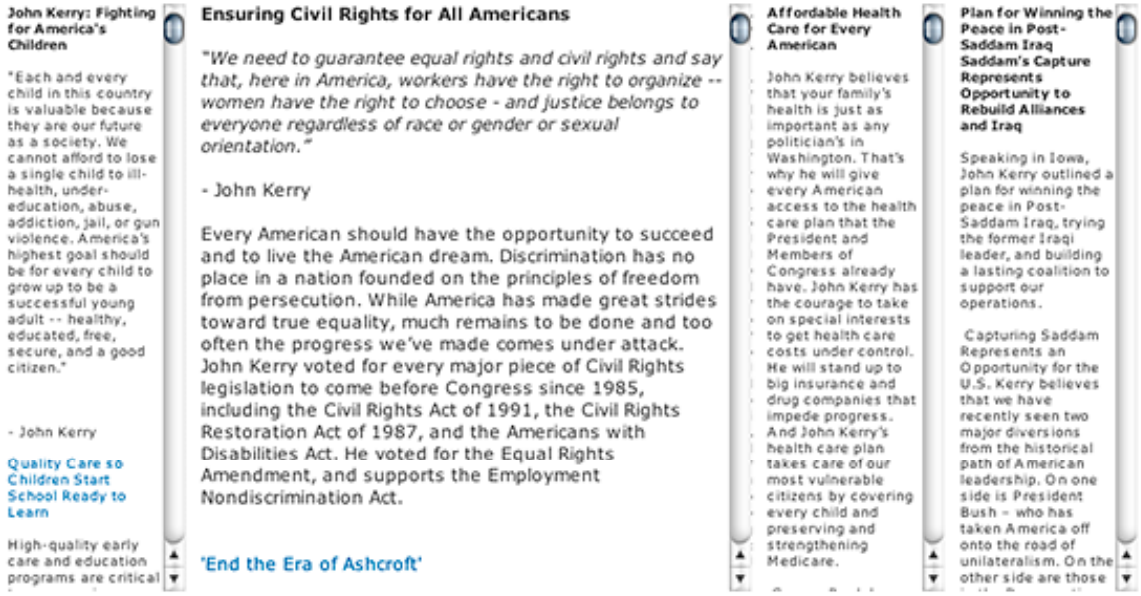
In another feature, the user clicks on keywords, and two main texts will simultaneously scroll to the next match of that word or phrase. Using the idea of juxtaposition, the user can compare how two different texts discuss various keywords. For example, if the user clicks on "tax cuts", two texts describing the positions of presidential candidates Kerry and Bush will scroll and show the phrase highlighted in context. Subsequent clicks on the key

phrases scroll the texts to the next occurrence (or recycle back to the first occurrence). Preset key phrases are supplied by the author, but the user can type their own in and search the texts in same manner.

Keyword search (on right) with two texts (Kerry & Bush) scrolled to match

Text Facets

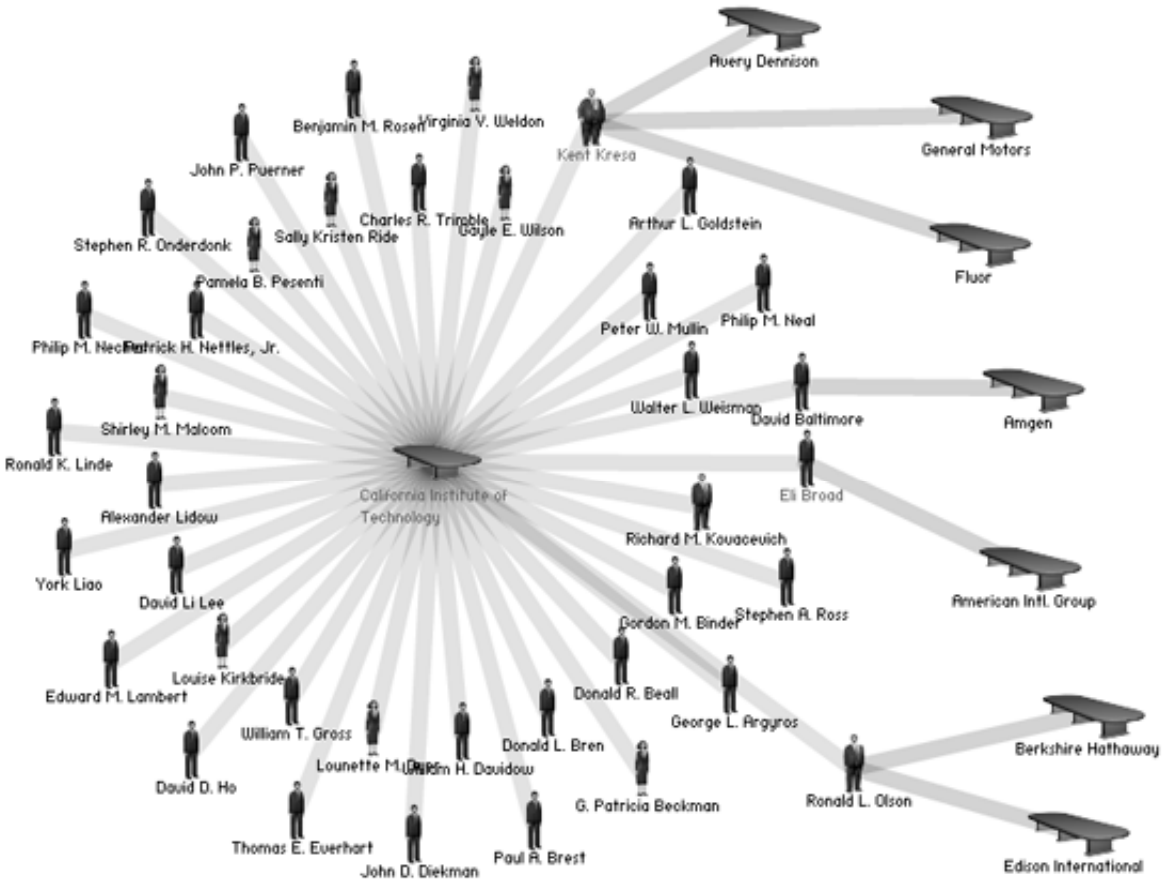
This simple prototype explores the techniques of content faceting, simultaneity, juxtaposition, and center/periphery to enable the user to quickly work with different sets of related information. The user is initially presented with four narrow columns of small text. If they click on any column, it expands by getting wider and growing in font size. Any column can be expanded or collapsed, and the text facets can be moved around as a group. With this system, the user can easily foreground or background a text facet, focusing on just one, or juxtaposing several selected texts.



Text facets with second facet expanded

They Rule

Josh On of design firm Future Farmers developed http://www.theyrule.net/. It's a system for understanding and researching corporate and institutional governance in terms of how they are ruled, particularly in terms of the common, yet unreported connections the organizations have between their shared board members. They Rule uses techniques such as remixing, filtering, smart content and audience contribution to present flexible views of the corporate board members and their relationships.



Users select one or more companies or institutions and they appear on the screen as a boardroom table. Each company icon has options, the most important of which is the ability to display its board members. Once a member is displayed, the user can expand the member to see what other companies they are on the boards of. In this way, the user creates a map of companies/institutions and board members that graphically shows their inter-relationships. The created maps can then be saved and shared with other site visitors, creating a growing library of map presets with different themes (e.g. "cable and RBOCs", "IBM – Microsoft – Intel", "Halliburton and The Media", "I see no conspiracy here [shows very few connections between oil and military contractors]", etc.)

Principles and techniques

Productive interaction requires a different approach to design, and a different view of the audience. To help frame these differences, we can look at the development of productive interaction systems through four major vectors:

- *Content*: Information, narrative elements, meanings and sensations as communicated in text, image, video, sound, tactile and other modes.

- *Context*: The integrated presentation of content in form, decoration, attitude, organization, selection, values, and experiences.

- *Affordance*: The handles that enable the audience to work with and manipulate the content and context.

- *Audience*: The users as integral elements of the total system, who operate it through the affordances, and who create the final expressions.

In this framework, design is a radically non-linear process of engagement and making, spinning a complex and recursive relationship between the domains of content, context, affordance and audience. Here, each element influences the design of the other as the designer builds up a full, yet flexible and open work that relies on the user as an active collaborator.

With the vectors of content, context, affordance, and audience, what approaches are available to the designer? The following is a selected taxonomy of design principles and techniques for productive interaction. Note that the categorizations are somewhat arbitrary, because each of the four is tightly interwoven and interdependent.

Content *Context Affordance Audience*

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Information, narrative elements, meanings and sensations as communicated in text, image, video, sound, tactile and other modes.

- not-linear – Interactive content elements are designed from the beginning to work by themselves, in combination and juxtaposition, or in dynamically constructed linearities. This is a break from the linear design of content, where things can be predetermined to work well together. In not-liner design, content will often be recombined in ways the designer did not anticipate. As a consequence, each content element needs to have a greater integrity on its own, yet also have an openness that allows it to be connected up with, or juxtaposed against other content elements. For example, in the *Physical Music* project, musical elements like the bass and drum parts are composed so they will combine with a variety of other elements. This is a very different composition approach than writing for a traditional song, because the composer has to think in a multi-layered way to successfully anticipate the many different combinations. At the same time, there are certain combinations in *Physical Music* that technically work, but are "bad" sounding.

This is okay, and even beneficial to the overall effectiveness of the work because the user needs to have the flexibility of failure to fully explore the music. In addition, what may sound "bad" to the composer may well fit into a "good" composition by the user. This productive misuse of a system often indicates a truly successful interactive design, and is an important design goal.

- **smart** – Interactive content can be enhanced with attached metadata to give it machine-actionable semantics. Software can then manipulate the content based on that metadata, providing multiple, rich views and handles on it. For example, in *Topic Explorer* the body text has selected phrases tagged as interesting pull-quotes, these quotes can be separately displayed as appropriate to provide interesting gateways into the body text. Similarly, if text facets are tagged with different keywords, the software can organize and present the content and summaries based on the explicit or implicit actions of the user. XML is an obvious system for implementing this approach, and is how Topic Explorer tags author identified pull quotes and excerptable headings.

  A more sophisticated way to look at content is to think of each element as a smart object that behaves through its own set of designer imposed rules and behaviors. A kind of artificial-life version of text, image, and data, where meaning and behavior emerge from the collective actions of the media elements as choreographed by the user.
- **associative** – Links and associations between content facets are both authored and generated algorithmically, providing a means for the user (and system) to build on-the-fly relationships between content facets. These associations can be as simple as hyperlinks, or they can define complex interrelationships that are neither hierarchical nor one-to-one. Associations don't need to change the entire context as typical web links do when they load a new page. Instead, they can help build up and vary a rich, multi-faceted collection of content that's accessible all at once.
- **dynamically updatable** – Content can be revised, added to, and subtracted from after the initial work is released. The changes may come from the original author, be applied algorithmically, come from external sources, or be contributed by the audience. *They Rule* changes over time because users contribute new maps, which then change in their prominence because users rate the maps.

Content ***Context*** *Affordance Audience*

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The integrated presentation of content in form, decoration, attitude, organization, selection, values, and experiences.

- **system as facilitator/provocateur** – Productive interactive systems are designed to actively help the user produce the meaning and knowledge they want. The designer may author the application to facilitate this in an assistive and collaborative way, or she may use a more provocative style, pushing the user in directions they may not be considering.
- **real-time juxtaposition** – The system can dynamically present combinations of elements that evoke new contexts, perceptions, and connections and enable the user to experiment and engage with these combinations. There's a qualitative difference

between static, fixed juxtaposition and the dynamic, real-time juxtaposition of productive interaction, especially when the user participates in the creation of the juxtaposition. The act of causing juxtaposition makes the user complicit and creates a more visceral connection with it. In the Topic Explorer, the user creates real-time juxtapositions by selecting the search keywords. New combinations of the two different texts are simultaneously displayed each time a keyword is selected, allowing the user to see the politicians' views side by side in ways they might never have seen or considered before.

- adaptation – The system and its elements should be aware of current and past contexts, and behave in interesting and productive ways based on those contexts. Actionable contexts include user preferences, the state of other content elements, geographic location, time, events, news, etc. The adaptive system reconfigures itself based on these contexts. For example, mobile phones can adapt to a new location by presenting appropriate shopping information for the current neighborhood. Further, the phone could know the user's current interests and preferences and provide more appropriate information according to that context.
- serendipity – Natural systems such as libraries and design studios provide ample opportunity for productive browsing, happenstance, coincidence, diversion and digression. These valuable opportunities for random and intentional unexpectedness can trigger new directions and new ways of seeing things, and should be built into interactive systems. For example, in the *Topic Explorer* experiment, the serendipity stream provides an alternative mode to reading the material in a linear way. The user can turn to this approach as a way to see the material in a new light and be surprised by perspectives they may not have seen otherwise.
- constructed simultaneity - Material can be presented in a live, multi-channel format, where content facets are played back at the same time, but in different combinations as driven by the interaction. This real-time, constructed simultaneity provides a rich, intensive interaction environment for the user to chart a path through. In the *Physical Music* project, the user is playing with simultaneous combinations of musical elements, orchestrating arrangements, adding and subtracting, filtering and modifying. In *Topic Explorer*, the user views two texts at once, driving them to related issues by using the keyword search. See also remixing below.
- center/periphery, explicit/implicit, attending/attuning – John Sealy Brown identifies the importance of enabling the user to have simultaneous access to a range of material, some of which is in the center of attention, much of which is attuned to on the periphery. Designers must use subtle, wide-bandwidth techniques for enriching the flow of use, offering means of focus and unfocus that provide a fuller simultaneous content landscape without overwhelming the user.
- passive interaction – While active interaction by the user is central, sometimes the system interacts with itself to advance facilitation and provocation. It does this by taking the place of the user, getting a handle on the affordances and changing things, while the user remains passive or focused on other elements. The video game "attract mode" is a classic example of this, where if an arcade game is left unused for a period, it drops into a self-playing mode to attract new customers. In the *Topic Explorer*, the serendipity stream runs on its own, displaying a continuous set of options that can be can be attended to or not.

- **presets** – The designer can provide different presets that configure a system with many capabilities. These presets establish a starting point with immediate usefulness, and can assist the user in successfully climbing the learning curve and/or returning to a more known state. They also provide the designer with an opportunity to frame a highly crafted presentation in the context of dynamic and sometimes entropic systems. *Physical Music* uses presets to provide the user with "good" sounding arrangements from which they can diverge, experiment, and create their own presets.

Content Context ***Affordance*** *Audience*

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The handles that enable the audience to work with and manipulate the content and context.

- **faceting** – Content and meaning can be viewed in different perspectives, individually or in combinations as a way to provide focus/periphery, juxtaposition and simultaneity. Faceting is a system of dynamically working content, like a table full of different books opened to pages of related information. In the Text Facets exploration, the user is able to see four different facets at once rather than having to scroll through a long, linear set of text or opening up individual pages for each set of text.
- **excerpting** – The user needs different ways of seeing and accessing material at different levels – full versions, clips, indexes, tables of contents and hyperlinks are "traditional" ways. But interaction allows for dynamically generated, user-controlled excerpts derived from the actual material – a kind of real-time clipping and summarizing service. This provides the user with means to pull out, highlight, and juxtapose content elements in new and useful ways. These excerpts can be created from metatagged sections of the content (e.g. predefined pull-quotes), or generated through algorithms (e.g. random pull-quotes). In the Topic Explorer, the serendipity stream does exactly this kind of excerpting as an alternative to manually browsing through the full text or using a more traditional table of contents or index.
- **filtering** – With large amounts of content available, there's a need to look at different subsets of material. Filters provide a way to view material by commonalities (filtering in), or eliminate material to clarify and reveal what's left (filtering out). The filtering can be "hard", eliminating material completely, or "soft", pushing the extra material to the periphery.
- **remixing** – As a way to provide a deep engagement with the material, the system can enable the re-ordering, re-combination, and re-constitution of the material. This makes it possible for the user to make their own sequences, change the layering and mixing of simultaneous materials, mute and solo parts, and alter elements. The user becomes a DJ, with an array of media EQ, mixers, turntables, and effects. In the case of They Rule, the user turns organizations and board members on and off, expands and contracts displays, and moves elements around on the screen in a process of building a "mix," or map that builds a new understanding of the relationships.
- **wide bandwidth interaction** – To rival other media, interactive systems must move beyond the impoverished mouse-crouch of current computing, to systems that more fully

engage human physical-spatial powers. This will involve designing for large, high-resolution screens, tangible interfaces, multiple interaction devices, haptic feedback, gestural control, and new sensors that increase the resolution and quality of the interaction and outcomes. It requires moving beyond the zoetrope character of today's interactive media. As a simple example, *Topic Explorer* is designed for a large video display to allow the user to see a full range of information at the same time. Similarly, the Minority Report interface provides a rich information landscape and a variety of mechanisms to manipulate and interact with that information.

- authoring, configuration, performance – Interactive systems commonly have use patterns that involve authoring, configuration and performance. The designer must provide different affordances for each of the modes. For example, a person fluidly takes photos (hopefully) without thinking about interface – a kind of *performance*. In a different mode, the photographer needs to *configure* their camera to take a self-timer picture. And in another mode, they would *author* a slideshow for their friends. Interactive designers must consider these different uses (and the transitions between them); providing the most appropriate affordances. These may be nicely integrated in a single "non-modal" interface, or they may be separated across independent devices (e.g. a camera for performance and configuration, and iPhoto on a computer for the slide show authoring).
- separation and clarity of function – Integrating all capabilities into a single system is sometimes useful, but it's often better to create different affordance systems for different uses. Separating the capabilities may involve a reconfiguration of one device with different sets of affordance, or separation of capability into different devices. "Convergence" is not always the best approach.
- custom affordance – Systems can have a variety of capabilities, and rather than imposing a single set of affordances, the designer may enable the user to pick or create their preferred affordance set. Macro keys that perform a series of OS tasks are a simple example of this. An advanced approach for custom affordance would have the system publish its capabilities and allow various independent affordances/devices to "latch" onto selected capabilities. With this, the user could pick a personal system of affordance. E.g. someone could buy a "core" of an iPod with a "published" set of capabilities, and then wrap it with a separately purchased custom skin/interface that taps into a particular subset of those capabilities. Some might pick a skin that that is super small with limited access to capability. Others might want something bigger with handles on more features. Yet others might go primarily for cool style and just the features they like. The fanatics will make and modify their own hotrodded skins.

Content Context Affordance ***Audience***

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The users as integral elements of the total system, who operate it through the affordances, and who create the final expressions.

- contribution – The audience can move beyond interacting, and contribute their own material, providing content and content structures for later by themselves or a

community of users. In They Rule, users can build "maps" and make them available to other users and sharing their insights.

- social design – Interaction design not only involves consideration of the current user(s), but of the social context in which the system is used. The "interaction" extends beyond the "interface" and into the social system that surrounds the system – people discuss and advise each other about the system, use it collaboratively, contribute to the system and share with others, fit the system into existing working methodologies, and use it to create new ones.
- user as content – If we extend the interactive system out to include the user, we begin to create very rich relationships and unique outcomes. For example, the system could automatically (with permission) sense the user's information (age, preferences, past interactions, opinions, medical info, etc.), and adjust to it. In other words, the idea of metadata is extended to the user, who is tagged with a variety of information that can be incorporated into the interactive presentation.

Implications for Designers

Productive interaction changes the role of the designer, shifting the balance from remote, one-way communicator who is represented by fixed linear presentations, towards present, two-way impresario and facilitator, who is represented by a context that initiates collaboration with the user. This has several implications in the way a designer approaches the creation of a work.

Software and data structures

Because dynamic affordance is an integral part of this medium, interactive design uses structures of data and software that require a clear understanding of the benefits and lexicon of these computational techniques. This does not mean designers should be engineers. But whether tagging text copy with metadata, or describing the process (algorithm) for displaying pull-quotes from that metadata, interactive designers should be facile in using the computer as mediator of their expressions. They must also be capable of communicating with software designers when a work calls for additional expertise.

Authoring systems

Because of the complexity of the software and data structures, it's important that designers use and create authoring systems to implement particular instantiations of their interactive approaches. Implementing these complex interactions from scratch on each new project is impractical, and authoring systems allow the author to amortize their thinking and work over a series of projects.

Engagement

The interaction designer weaves a complex tapestry of content, context, affordance and audience. The only way to do this successfully is to be deeply engaged with each of these vectors and the relationships and mechanisms that bring them together. This means creating, editing, and reorganizing content. It means doing the same with context and

affordance, and this engagement requires a full understanding of, and advocacy for the audience.

Collaboration and detachment

Productive interaction implies a greater level of responsibility to the user and a new detachment from the work. As a collaborator, the designer can't simply make a statement and walk away. She has to be present in the interactive work, providing the contexts and affordances for the user. This is not to say the designer shouldn't have a point of view. But a point of view has to be presented in a manner that assumes some give-and-take – a collaboration.

In this sense, the designer must be more detached from their point of view, providing a level of respect and trust for the user, helping them come to their own conclusions. This detachment often extends to the point of allowing for user failure. Without the freedom to fail, the possible outcomes may all seem safe, pre-determined, and boring. This does not mean the designer dumps a box of junk on the floor for the user to sort through. Nor does it mean offering an infinite set of affordances and options, or an ugly, aesthetic-free presentation. But it does set up a tension and challenge for the designer—how can an interactive work provide freedom and still maintain an authorial integrity? How can high quality form support changeable content? How do aesthetics hold together when the audience can make changes?

First, it means designing everything from the ground up to be interacted with. So when the user remixes the expression, the content, context and affordance continue to work at all levels—form, meaning, function, and aesthetics (with some room for failure). Second, as a diligent facilitator, the designer can provide presets (like museum tours) with a high degree of coherence and aesthetic integrity, which serve as good starting points for the user's explorations.

Third, productive interaction requires a high level of authorial comfort with the unresolved outcomes, disorder, contradictions, and occasional aesthetic breakdowns of interaction. It's a shift from the idea of fixed, finished design to multifaceted, evolving, user mediated output. The designer has to embrace the user as a collaborator and member of the design team.

Breaking constraints through design research

Interactive designers have had it beaten into them that they must design for the constraints of the medium. Pixel dimensions, processor power, and bandwidth dominate the design process to an overwhelming extent. This is completely valid for commercial product delivered today. But the medium and technology are too young to limit the creative range within these constraints.

Interaction designers should devote part of their practice to breaking the common constraints; designing for very large displays, moving away from the mouse crouch, incorporating tangible interfaces, and experimenting with new delivery systems. I believe this design research can be done in an effective way by focusing on principles of interaction

design and practicality rather than making artistic or "flashy" work. Similarly, the emphasis has to be on effective expression and communication rather than technology.

Design innovation can be made with practical intent and built on existing leading edge technology, showing the way for near-future applications. It can also be approached in a grounded form of design futurism, which opens the imagination for the medium's long-term future, and influences near term design through trickle down design ideas. The frequent effects that science fiction has on contemporary culture are an interesting example for those wishing to influence design culture.

In the end, a serious approach to a new medium requires a rethinking of expression and what is best communicated in that medium. It also requires a rethinking of the designer's role and approach to the medium. Interactive media takes designers in new directions, where they need to understand software and data structures, utilize custom authoring systems, engage and design the entire system, and adopt a different responsibility and relationship to their expression and audience. It challenges designers to imagine and produce work on unfamiliar and unknown platforms with attention to a set of design principles and an eye towards innovation.

Designing the future

Let's put it this way. Interactive media is a lousy medium. It can be trite, clumsy, self-conscious, and ugly. In other words, it's poorly designed. And here I'm talking about the whole field – the web, games, cell phones, media art, operating systems, all of it. As a young medium, it lacks a range of technique and effective design language. Is it entertaining, informative and profitable? Often. But that doesn't make it a mature medium.

This is true even for games, which are arguably the most successful instance of the medium. In many ways, video games are like the early days of commercial film. Audiences were stunned and mesmerized by images of trains coming out of tunnels and bearing down on the camera/audience. This technique does an excellent job of demonstrating the raw and powerful capabilities of the medium; an approach still used today in Imax and big special effects movies. But like Imax, the sensational approach used in games does not particularly display interactive media's more subtle and meaningful capabilities. Nor does the utility of the web indicate a mature medium that has reached a high level of communication.

The downside of the early success of the games and the web is complacency. It's easy to get stuck using common design tropes and innovating around the margins. On the other hand, and often because of the perceived success, some designers ignore real applications and create obscure, "experimental" work that has no ongoing relevance. Instead, interaction designers should take up the creative challenge and move beyond the limitations of our own rudimentary spinning zoetropes, inventing more powerful principles, techniques and platforms for a more mature and new mode of communicating. We should find the unique and effective characteristics of interaction and develop design approaches around that.

Ultimately, progress calls for designing the future of the medium itself. Recently, the Library Foundation of Los Angeles honored author Susan Sontag with their Literary Award. At the event, Sontag said, "Reading offers you a different model of how to feel and think than is offered by the 'televisual' world. Reading is a producer of inwardness, personal discovery". Perhaps designers can envision a new interaction that offers a similar system of personal discovery, but one that's more outward and expressive, using the direct experience of working with content to create a productive discovery within a media rich environment.