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DESIGN PROCESS IMPROVEMENT FOR EFFECTIVE RICH INTERACTION DESIGN

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ABSTRACT:

Today's web-based products and services must not only be able to survive rapid and expansive growth, but must also incorporate the new paradigm of Rich Interaction Design (e.g. AJAX and FLEX).[6],[10],[15] Web practitioners including Information Architects, Web Designers, and Software Developers face the inevitable need of altering the design process to create better communication and encouraging richer interaction between the user and the application.[1], [8]

In this paper, we will discuss how the inadequacies of standard design process inhibit effective Rich Interaction Design, and we will propose an improved design process which will serve as a new paradigm

for future web-based services. We will describe how to improve the standard design process in three phases—design initiative, interaction design, and design evaluation. These phases will result in the removal of limitations formerly encountered in implementing Rich Interaction Design.

* Rich Interaction Design : Prior website was performed by simple control such as 'click' or 'text input', and page loading interrupted web-based product usage by whole page conversion.
However, the rise of Web 2.0 and a new technology (e.g. RIA and AJAX) allows not only 'click' or 'text input', but also 'drag & drop', 'sliding bar', 'fade in & out' or 'layout reload within a single page' is possible. As a result, the control of web-based product becomes rich and flexible as much as an application software program. Web-based product usage is less interruptive through possible sequential control.
We define a wireframe design for an interaction with less interruption of web-based product usage as 'Rich Interaction Design.'

1. DESIGN INITIATIVE PHASE

Prior linear page-based user interface have its limit to provide satisfying on-line experience optimized for user's purpose of visit. However Rich Interaction with today's technology (e.g. AJAX and FLEX) allows Data-Oriented Interaction Design, an instant real-time data streaming, and an emphasis for user-centered design concept development is increasing. [9], [12]
Walking through Rich Interaction case studies at the process of design concept development and patterning interactions for a referable library utilize as an ideation tool in initiating design concept for good user experience. Yahoo Design Pattern Library is an exemplification of the practice.

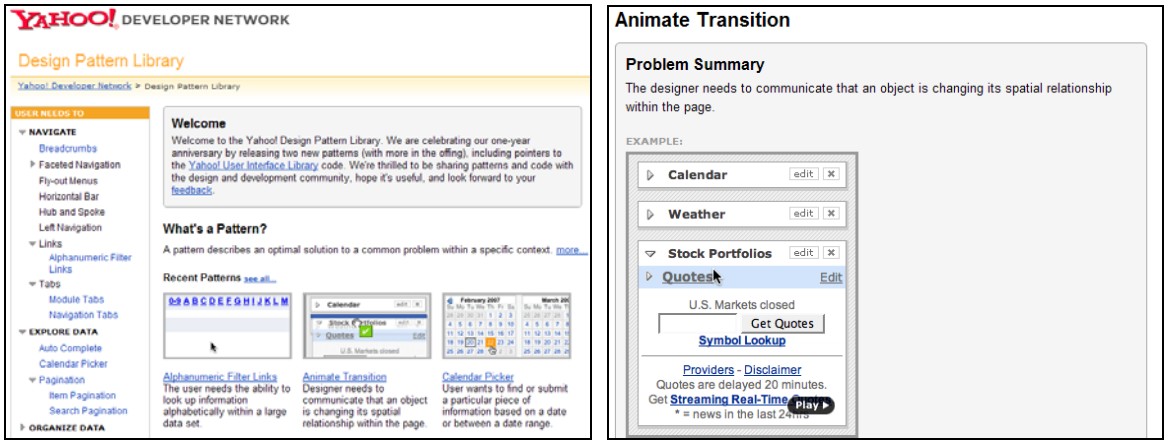


Figure 1 Yahoo Design Pattern Library (http://developer.yahoo.com/ypatterns/)

Searching and categorizing case studies is useful to user as an ideation tool to initiate design concept with Rich Interaction application. In this paper, we studied approximately 200 websites that apply Rich Interactions and categorized them into five patterns based on usage behavior and interaction type. Five patterns are the following:

Providing interaction previews

Minimizing page loading

Providing liberal user controls

Assisting effective layout

Improving user recognition

Patterns are categorized based on a result, which user will obtain through Rich Interaction. We will discuss Pattern 2, Minimizing page loading, to briefly introduce how we break down patterns.

2. Minimizing page loading	
2.1 One-Click Editing	Change display area into editing area by clicking
2.2 One-Click Updating	Click results are updated immediately
2.3 Layer Popup	Popup window is layered on the mother window, with no additional window
2.3.1 Basic Layer	Immediate popup without effect
2.3.2 Animated Layer	Animated popup such as sliding, magnifying, etc.
2.4 Unlimited Scroll	Page scrolls as long as there are contents

Table 1 Example of Categorizing Rich Interaction

Breaking down the pattern allows developing a framework to understand Rich Interaction systematically. A designer can review and select appropriate patterns for at concept ideation phase of Rich Interaction. The following is an example of the framework. We define 'trigger' as user action and 'update' as the result of interaction.

2.1. One-Click Editing: Change display area into editing area by clicking	
[Example 1] : http://www.flickr.com	
Trigger	Update
• Mouser over	• Indicate Clickable (Hover Invitation)

• Mouser Click	• Change into editing mode
• Key Stroke, Mouse Click	• Update without page loading

Table 2 Rich Interaction Cases

Figure 2 One-Click Editing – Flickr.com

The framework filled with design case studies of five patterns will build a Rich Interaction pattern library. We expect the benefits of building a pattern library will be the following:

1. Ideation enhancement tool for developing design concept

2. A guide for the better communication

3. Understanding of recent Rich Interaction trend

Rich Interaction pattern library is effective not only for design concept development, but also for efficient communication among practitioners. At next chapter, we will discuss a method used for designing interaction.

2. INTERACTION DESIGN PHASE

Traditional 2D wireframe has limits on expressing interactivity of Rich Interaction. To solve this, we suggest new type of documentation guide for Rich Interaction. It breaks down various interactions as Trigger or Update, and adds a narrative explanation of user interaction. With this documentation guide, we believe it enhances communication among practitioners. Case studies are still under development, however a solid method has not been set. We will review practices, and compare their pro and con. [2],[3],[7]

First practice is a narrative modeling. (Figure 3) When user makes an action, the result is indicated in a balloon by order. This is relatively simple than other methods, but may take multiple pages. (Table 3)

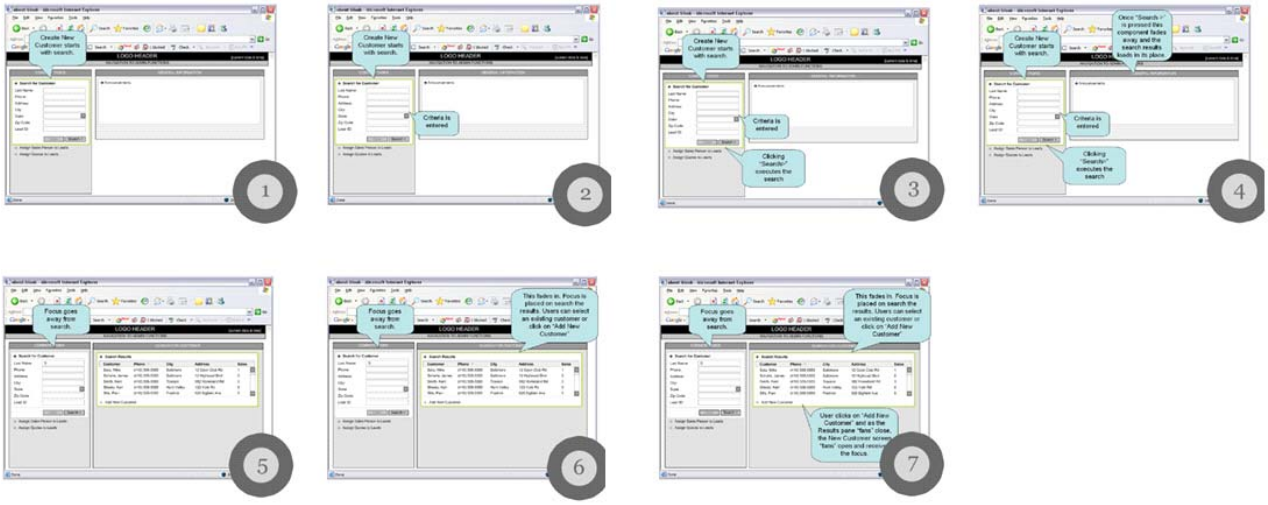


Figure 3 The Guided Wireframe Narrative for Rich Internet Applications – http://www.boxesandarrows.com/view/the_guided_wire

The Guided Wireframe Narrative for Rich Internet Applications http://www.boxesandarrows.com/view/the_guided_wire [2]	
Case	Customer information management site: search member's information, add a new member, and so on can be interact on one page with AJAX application
Interface Design	Key frame on each step Add an explanation on balloon Balloons show one by one, and explained all features on one frame Move on to next key frame
Positive	Easy to understand each step with explanation balloon Key frame as a visual representation of each step Relatively easy to use for IA (Admittedly, the example above is relatively simple, but after all, that's the point, right?)
Negative	May take multiple pages to explain Must read the explanation to understand the interactions

Table 3 Narrative way of interaction modeling

Another practice is a modeling based on user action. (Figure 4) It is not a practical documentation process, but it explains how each step interacts. (Table 4)

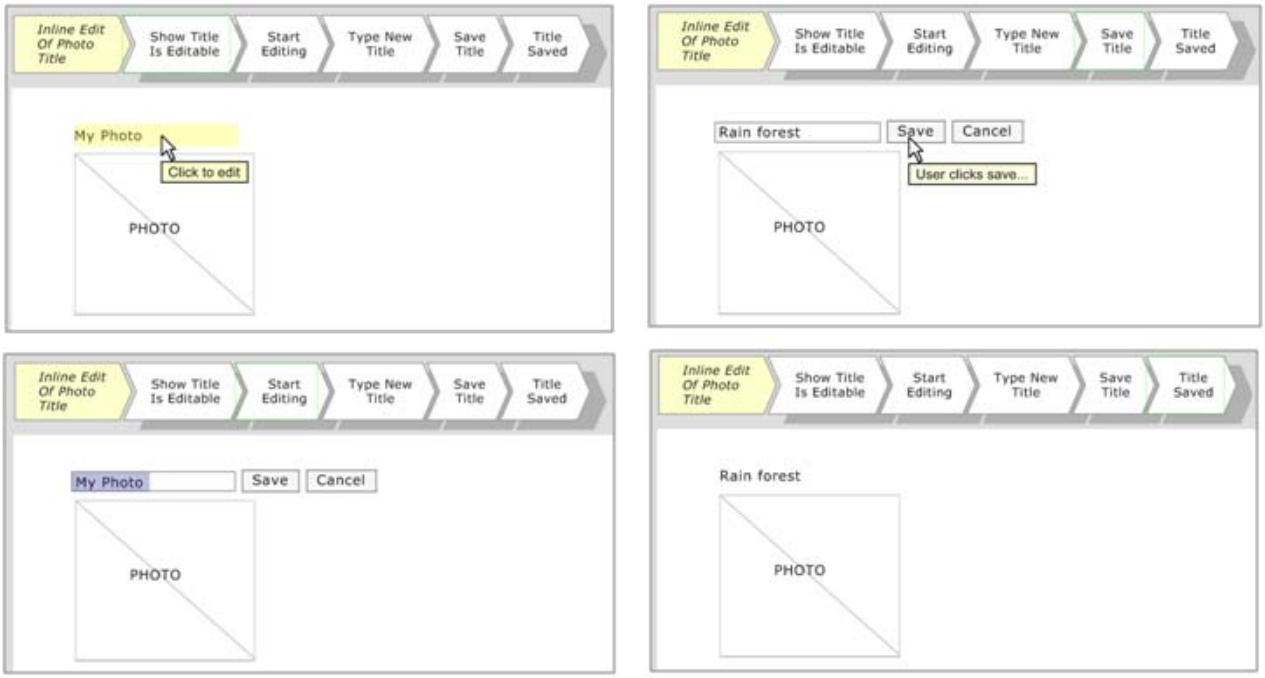


Figure 4 Storyboarding Rich Internet Applications with Visio
- http://www.boxesandarrows.com/view/storyboarding_rich_internet_applications_with_visio

Storyboarding Rich Internet Applications with Visio http://www.boxesandarrows.com/view/storyboarding_rich_internet_applications_with_visio [5]	
Case	Photo management sites: editing and saving photo file name
Interface Design	A layer of Visio define as one step Place each elements on layers Click on each step to view each elements
Positives	Realistic expression of interaction Good for interactive change on screen, such as animation Make a interaction into template to consolidate page which can be easily extended
Negatives	Lack of explanation of each elements on layer Inevitable usage of Visio software

Table 4 Interaction modeling case: Storyboard

The following Matrix is another representation of interaction design method. (Figure 5) Each interaction is on one axis and the other axis explains the status of pointer or objects that interact. (Table 5)

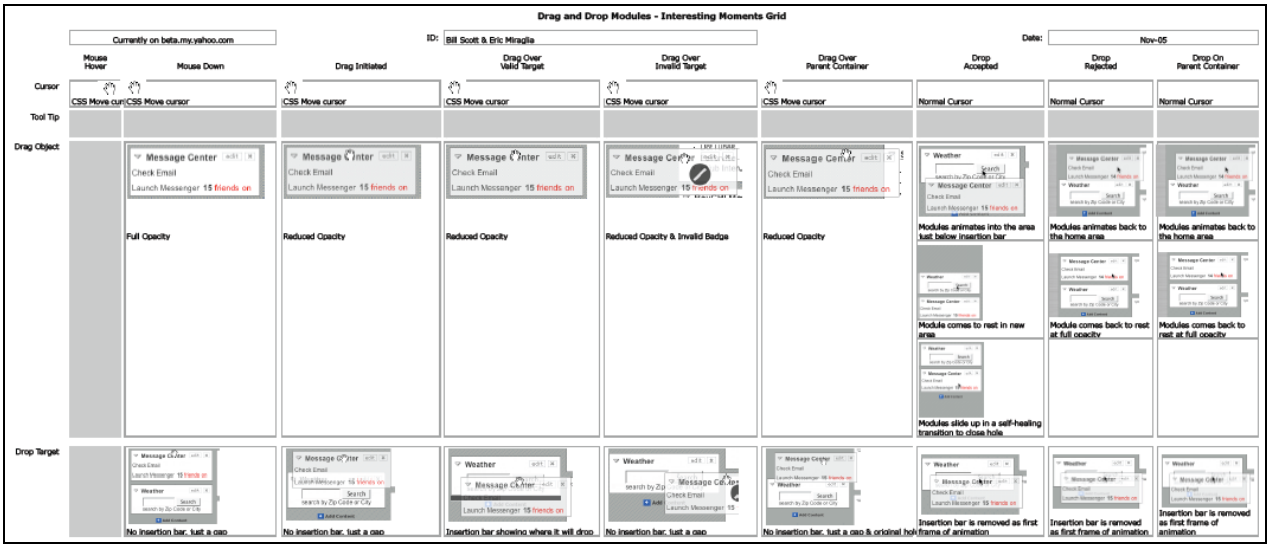


Figure 5 Y! Design Pattern Library : Drag and Drop Modules (Interesting Moments)

Interaction modeling case: Interesting Moments Matrix http://looksgoodworkswell.blogspot.com/2005/05/interactive-wireframes-documenting.html [4]	
Case	Personalized page modules can be relocated by drag & drop
Interface Design	Definition of each Interaction (named as Interesting moment) Define each elements of UI Widget (named as Actor) Each step explains status of Widget through Matrix
Positives	Describe each Interaction sequentially Exception cases can be defined and useful in developing process
Negatives	Hard to understand Matrix Need additional IA

Table 5 Interaction modeling case: Interesting Moments Matrix

Each practice has both positives and negatives; therefore, we examine practices and come up with the following guide:

1) Provide clear communication of current status: Displayed picture must clearly state whether it is a status of a user action, a data streaming, and so on.

2) Trigger, Operation, and Update should be explained sequentially: Every single step of Trigger, Operation, and Update should be understandable for any practitioners.

3) Effective explanation with limited pages: Most of case in this paper needs multiple pages to explain interaction. It may be easy to explain, but difficult to manage many pages.

We redefine new Interaction Design modeling methods based on the guide:

Guide 1 : Show clearly current step and Task Flow

Guide total steps and indicate current step of Interaction clearly

Guide 2: Explain focus on user Trigger and Interaction

1) Three stages of Rich Interaction: Trigger > Operation > Update

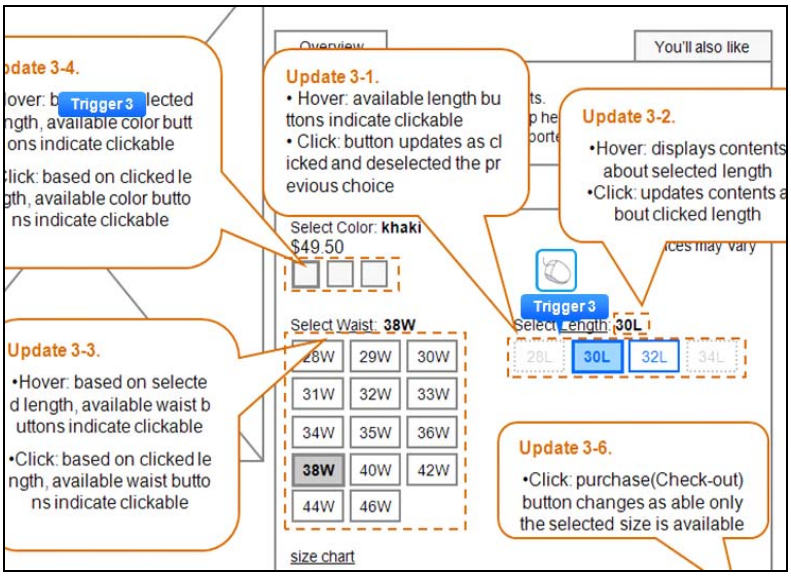
- Trigger: Starting point of user action

- Operation: System process of user interaction

- Update: Shows a result or changes widget

2) Trigger by user or by system

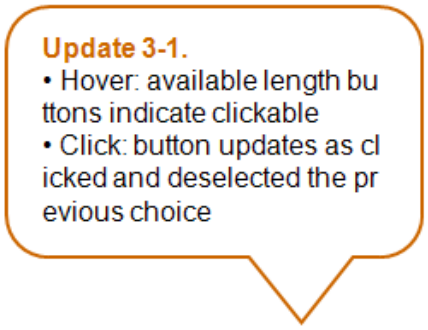
3) One trigger might have multiple updates



Guide 3 : Give clear feedback of an interaction

Wireframe hardly explains the performance, so an additional narrative description is necessary. A balloon can explain which element is triggered, operated or updated.

Below: Describes user's both Hover and Click actions



In case of using power point animated simulation, place an indication for practitioner to check it out.

Guide 4 : Prepare for errors and/or various situations

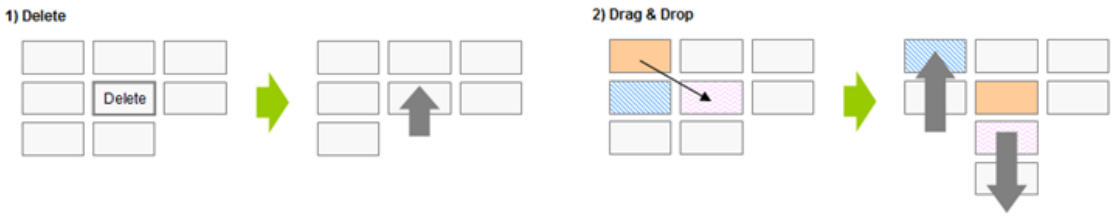
1) Designing Rich Interaction should consider each interaction may have errors from user behaviors or unexpected situations.

2) IA wireframe should be clear of all possible scenarios and how it should be handled.

Guide 5 : Describe basic concept of Interaction and/or elements of User Interface. (Optional)

1) Rich Interaction can be varied by user action or interface elements. Thus, the cause and effect must be described on documentation. Diagram of interaction is recommended.

Steps	Trigger (Mouse Pointer)		Operation (Case / Logic)	Update (Pane)	
Out		Pointer is out of Pane	N/A	Newspaper 1	Status is Clickable
Hover		Pointer is on the Pane that selected category	Pane is selectable	Newspaper 1	Status is Clickable
Mouse Down		Pointer is on the Pane and ready to move	Pane is selectable	Newspaper 1	Status is Clickable
Mouse Move		Pointer is moving as mouse down	category selected and moving	Newspaper 1	Status is moving (opacity)
Mouse Release		After moving, mouse release	finished moving	Newspaper 1	Status is Clickable



The following is a Rich Interaction prototyping of news customization by the press;

Figure 6 Rich Interaction Prototyping and Application

Left image of Figure 6 is a modeling practice based on the Rich Interaction guide, and right image is a final product. A detailed documentation explained from a modeling phase to a defining edge case, which was far more effective in a service application.

The guide enabled practitioners to communicate Rich Interaction, which used to be hard to present its process through prior documentation. The practical usage of the guide enhanced a communication, which allowed the project to be done less than a given schedule.

3. DESIGN EVALUATION PHASE

Traditional usability guideline and paper prototypes are very limited to conduct a design evaluation after interaction design embodiment. Thus an optimization of usability guideline and rapid prototyping methods is inevitable to evaluation Rich Interaction design. [14]

New web-based product without an appropriate interaction design evaluation will result users with a lot of frustration. For example, unclear feedback of unlimited scroll pages may be neglected by users, and users are accustomed to click back button navigation which may mislead to unexpected pages.

A research testing a new interaction, such as putting items into cart without page changing and check-out process in one page, resulted most participants saying that new interaction is more convenient and effective compare to previous interaction. However, the quantitative data analyzing user recognition and

acceptance test revealed that user spends more time and efforts to understand new interaction. (Nicholas J. Disabato, The effects of Ajax web technologies on user expectations : A workflow Approach (2006.4)) [13]

This research indicates that emphasizing user error minimization and making interaction easy to use are related with usability and accessibility of a web page as much as applying Rich Interaction design.
Therefore, we suggest the following two evaluation methods based on user experience and Rich Interaction design guidelines.

1. Principle based Usability Guideline

Five principals for Web 2.0 service based on richer user experience:

1.1 Consider Consistency and Standards

1.2 Make Cues for User Controls

1.3 Deliver Proper Feedback

1.4 Provide Efficient Navigation

1.5 Reduce the User Workload

2. UI Pattern based Usability Guideline

Five elements of Web2.0 service's frequently used interface design patterns:

2.1 Drag & Drop

2.2 Layer Popup

2.3 Progress Indicators

2.4 Endless Scrolling

2.5 Text Control

Evaluation guidelines application is effectively applied on rapid prototype test. However, Rich interaction prototype is difficult to present on traditional 2D documents. Prototyping with computer-based programs such as Visio, Flash and HTML can aid presenting semi-functional interaction style. The following is a classification by rapid prototype fidelity for an evaluation. [11]

Low Fidelity	Mid Fidelity	High Fidelity
Sketches/Paper Prototypes	Semi-Functional visio/PDF/Flash	Fully-functional in-framework
Paper	Visio	RoR(Rails)
Adobe PDF	Flash	.Net
Powerpoint	HTML click-thru	Zope/Plone

Table 6 Prototyping : An Overview of Methods
http://www.gotomedia.com/goto/web2expo/workshop/resources/IterativeApp_RapidProto.pdf

Prototype adequacy evaluation after Rich Interaction design idea and communication modeling is conducted through a user experience guidelines and rapid prototyping.

4. RICH INTERACTION DESIGN PROCESS

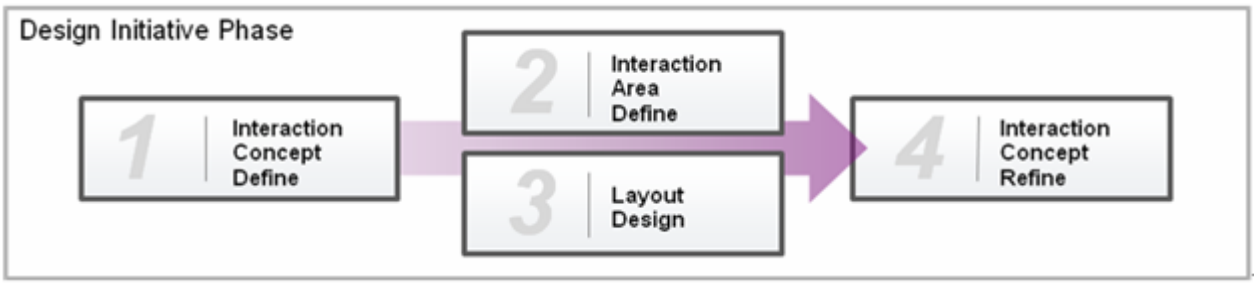
Previously, we took a look at Rich Interaction cases divided into as three phases:

DESIGN INITIATIVE PHASE

INTERACTION DESIGN PHASE

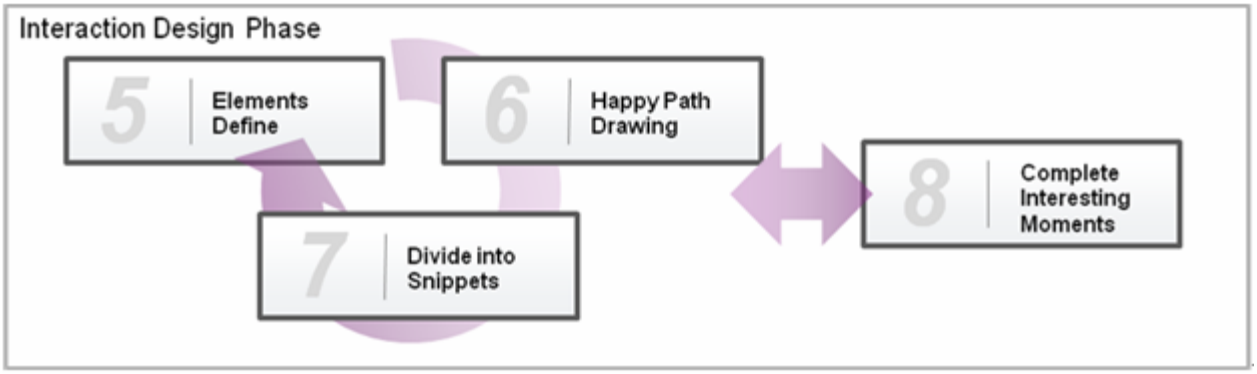
DESIGN EVALUATION PHASE

Each phase includes several steps as the following:



Design Initiative Phase establishes an ideation/concept and defines an interaction adequacy. Service feature and usability are carefully reviewed as well as a design. The phase has 4 steps:

1) Define Interaction Concept : Discuss about interactions method referring interaction design pattern
2) Define Interaction Area : Decide contents or areas to use Rich Interaction or not
3) Design Layout : Define key service features and place them based on usability
4) Refine Interaction Concept : Re-define interaction concept through layout design



Interaction Design Phase defines interaction specification, user behavior scenario, and flow iteratively. Thorough review of usage can prevents error and its situation. The phase has 4 steps:

5) Define Elements : Decide interaction type and describe interaction areas.

6) Draw : Development of user scenarios that represents general usage pattern

7) Divide into Snippets : Point our users action in Happy Path and define data processing methods

8) Complete Interesting Moments : Define cases of error, unique flow, user action and interaction points

Design Evaluation Phase requires usability test, interaction test and user feedback for a system maintenance. The phase has 2 steps:

9) Test & Improve : Find errors through testing and improve

10) Manage : Maintaining system and tuning Rich Interactions consistently

5. CONCLUSION

We discussed effective Rich Interaction design methods through each Phase : an ideation with Rich Interaction pattern library in early design concept initiative, clear and well-defined Rich Interaction modeling method in interaction design, and evaluation with rapid prototyping.

The future of web pages will be more dynamic with Rich Interactions and continuous user feedback. The design process should be focus on not just improvement of functions in terms of technology, but the best

user experience that meets user needs. This paper is first step that shows a direction to go for developing methods and further research of case studies and experiments will be done for consolidating Rich Interaction design process.

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