User Centered Systems Design
(Spring 2009)

PROJECT REPORT

An environment for open user innovation in an airport setting
Contextual Design by Beyer & Holtzblatt

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1 INTRODUCTION

Contextual Design is a user-centered (also called customer-centered) design process which is developed by Hugh Beyer and Karen Holtzblatt. This design process extensively uses and focuses on methods for collecting field data for understanding customer requirements, workflows, processes etc, in order to build more usable and efficient products that can fulfill the needs of the customer in particular and their businesses in general.

Contextual design is carried out in a series of steps namely, contextual inquiry, work modeling, consolidation, work redesign, user environment design, prototyping and implementation.

2 OUR TASK

In this report, we shall deeply study the different contextual design processes and then we will relate them to our main mission of planning a system for an airport setting.

We will study that how we will approach the users and what methods we will employ to perform a contextual inquiry, what work models are used to examine the work flow in an airport setting, how to consolidate data from the different work models and gather some meaningful conclusions from them, how to perform the work re-design process, how to capture the plan of the new system in the user environment design and why and how prototypes are created.

3 DISCUSSION

3.1 CONTEXTUAL INQUIRY

Before we start to design a new open system for the airport environment, there are several things we need to clarify.

Since there are several systems already existing in the airport environment, our project becomes a process re-design project. The focus of such a project is to look at the customers of the new process first. That is, what do they need and why, how the work is accomplished, what the people need to do to make the process work, what will get in the way of introducing a new process etc. The first and foremost important things are
to understand the customers’ needs, their desires and their approach to the work. This means that we should know who our customers are and what they want. Therefore, we choose contextual design as our bridge to study the customers’ work and design a new system to make their work more convenient.

In our case, the customers are passengers and the staff working at the airport. In order to fully understand the customers, an interviewing method named Contextual Inquiry will be used. It addresses the following issues: how to show the structure of work practice, how to make implicated knowledge about work explicit and how to get low-level details about work that have become habitual and invisible. Contextual Inquiry allows marketing engineers, analysts and customer representatives to work together and share insights.

The most common structure for Contextual Inquiry is a contextual interview: a one-on-one interaction lasting two to three hours, in which the customer does her own work and discusses it with the interviewer. We should interview customers whose work is as different as possible, and the customer selection should be driven by changes. The project focus should be short statements which describe the key characteristics of the work. Each interview has its own rhythm, set by the work and customer. Each interview has four parts:

- **The conventional interview:** According to this session, the interviewer and customer would get used to each other. Since this is summary data, not contextual data, so don’t pursue any issues. We should try to control this session within 15 min with the familiar work domain, otherwise, it can last longer.

- **The transition:** This session would last about 30 minutes. In this session, the interviewer should describe clearly all the rules in the interview to the customer - the customer will do her work while interviewer watch, interviewer will interrupt whenever customer has anything to ask, and the customer can tell if it is a suitable time to be interrupted.

- **The contextual interview proper:** We can interview customers by using the master-apprenticeship model as a start. The interviewer acts as the apprentice who learns about the customers’ work from its customer who acts as the master. The master teaches by doing the work and talking about it while working. Since both master and apprentice would pay attention on the work while master working, the structure implicit in the work becomes apparent for both of
them. With this way, customer can describe exactly what he is doing while he is working on it. Apprentice can ask any problems that unclear for him in this process.

One customer’s work as one instance for the design team to study. Almost no instances are exactly the same. By watching instance after instance, the apprentice builds up a big structure of how to do the work, and interviewers observing multiple events and multiple customers learn to see the common strategies underlying the work, also an apprentice can learn from the master’s experience, interviewers can learn about events that occurred in the past. The artifacts of the work - papers, forms, notes, clipboards and so forth - trigger conversations about how they were used, how they were created, and how their structure supported their use in a particular instance.

- **The wrap-up**: It allows 15 minutes for this session. Interviewer reviews his notes and summarizes from the interview, trying not to repeat verbatim what happened, but saying what is important about the work, to the customer and to organization for the last chance.

### 3.2 INTERPRETATION SESSION

After we have gathered the customer data from our customers, now it is time to share this data to the whole design team. So it is so important to have interpretation sessions which will let every team member experience all the interviews. The interpretation session provides an easy way for a team to get started. For this session, we should take care of the following issues:

- **Team makeup**

In an interpretation session, the diverse job functions will share points of view and work together. At first, there should be a meeting with everyone on the design team. After that, it is more effective for large teams to interpret interviews in sub teams of four to six people and share the results with the larger team. Each sub team should itself contain a mix of job functions, so that diverse perspectives are brought to bear on every interview. At least half of the sub team should have a design background and it is important that the sub teams be formed of different people each time.
Roles

The roles of the interpretation session are divided for different group members so everyone knows what to do and what is appropriate.

- The interviewer is the one who interviewed the customer.

Work modelers, who draw work models on flip charts as they hear them at the same time as everything else happening. There should be two work modelers - one person models flow and culture and the other models sequences. Artifacts are put up, analyzed and annotated as they come up in the interview.

- The recorder keeps notes of the meeting online so everyone can see them using a monitor or LCD projection panel. Every key observation, insight, influence from the cultural model, question, design idea, and breakdown in the work is captured as a separate note.

- The rest of the team is participants. They listen to the story of the interview, ask questions to understand, and develop their own insight into the work. They propose interpretations for the team make observations and suggest design ideas.

- The moderator is the stage manager for the whole meeting. In the interpretation session, the mainline conversation is: What happened on this interview and what do we need to capture from it? The job of the moderator is to keep the meeting on this conversation. The moderator has to stand outside the process enough so that they can see what is going on.

- The rat hole watcher keeps the meeting on track. The rat hole is any distraction from the mainline conversation. In practice, everyone acts as a rat hole watcher.

Running the Session

There are choices for how the interviewer prepares for different situations of the interpretation session: if the session happens the same day as the interview then the interviewer runs the meeting from his handwritten notes. If it happens the next day, he annotates his notes from the audiotape of his interview. If the delay is longer than 48 hours, he transcribes his notes
from tape. Every user is assigned a user code which protects the user’s anonymity and is used in the notes, on all models, and in all discussions. No evaluation happens at this point, everyone is thinking out loud. The interpretation session usually lasts two hours. Making an insight list crystallizes what the team learned from each interview, helping them to talk about their understanding.

• **The Sharing Session**

After the interpretation sessions, a sharing session should be hold to let the sub teams share the ideas together. A sharing session has its own roles: a speaker for the sub team presents the models for a particular user. As the speaker presents each model, a helper stands behind and updates the model because spokesman always describes more than what is actually written down. The recorder adds any new points to the online notes and the moderator keeps the meeting moving and makes sure everyone is heard. A sharing session should take no more than half an hour.

3.3 **WORK MODELS**

After implementing different ways of gathering data needed for the contextual design, the first thing that should be taken into account is to create a coherent representation of work practice. Since the data collected from the potential users is about an airport environment, it was crucial to make it clear to the whole team the process of how the data was built and the viewpoint of all these potential users. With so many people in a relatively small airport space, there is no typical user group which can be easily concluded. Therefore, all kinds of data should be recorded in a coherent way with focuses on the thing that matter.

The contextual design uses five work models as a graphical language to capture knowledge about the whole work. Graphical language contains patterns and symbols which give more ways to see issues and are better to identify structures of work than textual languages. The five work models are Flow model, Sequence model, Artifact model, Cultural model and Physical model. Each model defines a certain aspect of the whole contextual work and together they reveal the work that matter for the design in a tangible way.
### 3.3.1 Flow Model

Flow model is used to describe the communication and coordination between users. It gives a bird’s eye view of the organization and reveals the roles of the users while completing a task. It also shows responsibilities and position of the users. The flow model should contain four basic elements: roles, coordination, strategy and informal structures.

Take the check-in process at an airport for example: in this case, there are four kinds of roles: the passenger, the staff who check in the luggage, the guard and the staff who checks the passports and the visas. They coordinate with one another and without their coordination, this tedious work cannot be done. Check out all those relationships happening in the airport environment so as to have an overall view of the structure.

### 3.3.2 Sequence Model

Sequence model displays series of actions of each task in a timely order. It reveals what matters to the users. Collect sequences during the interview with the users, notice from their hesitation and errors to select important sequence model, then display them into the most basic information about work practice.

For example, while doing the interviews with the security working staff, conclude the steps of how they perform every action. The intent of this task could be divided into four parts:

1. Check the bag
2. Watch passengers taking off coats and stuff
3. Body search them
4. Give the things back to the passengers and let them go.

Then describe in detail how these four intents are performed.

### 3.3.3 Artifact Model

Artifact model keeps traces of peoples’ work practice. It describes how actual objects are used in the work process to help users get their work done. It shows how people think about their work. Artifacts collected from the interview with the airport faculty should be presented in syllabi documents or in the calendar forms.
This model is not so important in this airport case since almost all tasks are done in a very short period of time.

3.3.4 Cultural Model

Cultural model focuses on the factors which affect the usage of the system. It concludes the overall cultural picture of the workplace and reveals how various cultural factors can impact the airport system. Cultural context is hard to see since it is invisible and intangible. Especially in an open environment such as an airport, users come and go. There is no easy way to capture the patterns of behavior or non-verbal thoughts. Therefore, we need to observe and capture the problems.

Three aspects should be focused to construct a cultural model: surrounding tone, policies followed by people and organizational influences. Observe how the airport workplace is designed and what kind of rules do people follow.

3.3.5 Physical Model

Physical model shows the constraints to the physical environment. This is crucial in the airport contextual design. Check out every aspect which is relevant to the design, such as vision of space, organization of space, grouping of people and peoples’ movement. For instance, to build a big notice board of the boarding information, we have to consider how many spaces does it need, where should we place it or how do people move from place to place so that they will be easily triggered to place themselves in front of the notice board.

Those five work models are the five faces of the work. They can be implemented in parallel. These models are used to represent work in order to create a culture for making decisions with this concrete data.
3.4 CONSOLIDATION

3.4.1 Affinity Diagram

After getting the actual customer data, we need to consolidate the data. Affinity diagram is a useful tool that gathers large amounts of data and organizes them into groups based on their natural relationships. Affinity is the first consolidation step.

Firstly, there are individual notes about all the issues, worries, and key elements captured during interpretation session. Then we sort notes together if they are saying the similar things and give them a common theme. Take our case, for example, if we get the notes as follows:

1. The baggage carousel should not move too fast.
2. Passengers can successfully get their baggage by normal walking speed.
3. One check-in window supposes to only check in for one flight.

Apparently, number 1 and 2 belong together because they are both talking about baggage carousel moving speed. So we can label them by common theme title and group them together. We can also group the groups together and get a hierarchical result. The group label could be color coded, such as green describes the specific issues and blue describes the particular instances. In this way, we can organize the original data like story.

WORK MODEL CONSOLIDATION

3.4.2 Consolidating Flow Models

After affinity, we can create consolidations by the consolidated work models. The consolidated models provide the detail about work needed to inform system design. Out of these models, a design team can draw implications that guide design.

The flow model reveals the common roles in different job definitions. It uses roles as the essential element of work practice. The roles are collections of responsibilities that accomplish a coherent part of the work. In actual
work, people tend to break the job up into several roles to get this job done.

To design the airport open system, first we need to select several individual flow models that are complex, interesting and cover the key variants of the work domain. Because they are driven by the needs of the work, roles tend to be consistent across organizations. Studying 15 to 20 customers from a typical work domain is enough to see the pattern of the flow of role.

Then the next step in consolidating flow models is to generate a complete list of responsibilities for each individual. For example, in the airport setting, there maybe several roles like check-in clerk, security guard, supervisor or baggage porter etc. Then collect similar roles from all models and write responsibilities and names of each role. Different roles have different relations between them so we need to draw the relationships between roles. Take our case, for example, the security guard may need the supervisor to give him the order; the supervisor may help security guard in his job.

In this consolidating process, we may need to think about other issues like multiple people can play the same role, which is quite common in actual work. So designing the system for role variation is necessary.

3.4.3 Consolidating Sequence Models

Consolidated sequences show task structure and work strategies. It brings together many instances of several individuals accomplishing the same task, revealing what is important in doing the work. It shows a designer the detailed structure of the work they need to support or replace.

The first thing we need to do is to select several (3 or 4) sequences addressing the same task. Sometimes, there are several steps doing the same thing so we need to find them out and match the triggers across sequences. Then we need to identify and name abstract steps across all sequences for each one. After all this, intent for each step is necessary.
Take our case for example. There may be two ways to do manual security check. As the follow chart shows:

<table>
<thead>
<tr>
<th>NORMAL SECURITY CHECK</th>
<th>SPECIAL SECURITY CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Trigger: when passenger crosses the scan door, the alarm rings.</td>
<td>• Trigger: the security guard suspects someone may have security problem.</td>
</tr>
<tr>
<td>• Let passenger stand on the stage and stretch their arms.</td>
<td>• Ask the passenger to stop and check their passport.</td>
</tr>
<tr>
<td>• Scan from head to foot.</td>
<td>• Ask the passenger stand on the stage and stretch their arms.</td>
</tr>
<tr>
<td>• If alarm rings, find the source that caused the ring by manual check.</td>
<td>• Scan from head to foot.</td>
</tr>
<tr>
<td>• If some security problem is found, ask supervisor for help.</td>
<td>• If alarm rings, find the source that caused the ring by manual check.</td>
</tr>
<tr>
<td></td>
<td>• If some security problem is found, ask supervisor for help.</td>
</tr>
</tbody>
</table>

After this, we need to categorize and optimize them and give those steps an abstract title. After that we add intent for each abstract step as the following chart shows:

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>INTENT</th>
<th>ABSTRACT STEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find out someone need to be checked</td>
<td>Discover security problems as much as possible</td>
<td>Trigger: find out someone needs to be checked: 1. according to the alarm ring 2. observation</td>
</tr>
<tr>
<td>Security check</td>
<td>1. Find cause of problem. 2. Decide if the problem will cause security issue or not.</td>
<td>1. Scanner check first 2. If scanner rings, check it manually.</td>
</tr>
<tr>
<td>Call on help</td>
<td>Get help from or involve someone who has the authority or the knowledge to fix the problem.</td>
<td>Decide I cannot fix it, call on help</td>
</tr>
</tbody>
</table>

3.4.4 Consolidating Physical Models

The physical model shows the structure of the physical environment as it affects the work. Usually one set of models represents a whole site or multiple sites. It focuses on whole buildings and relationships between them.

So first, we should group the physical models by type of place and identify unique usages of individual space. Then for each type of place, identify
common structure and show where the artifacts and tools appear in the place. Movement through a space is also driven by the needs of the work, and we identify movement on the physical models when it is relevant to the project focus. Finally, we get the consolidated physical model showing all the parts and their structure.

Take our project for example: first, we separate the whole work environment into check-in area, security check area, waiting area, etc. Then draw the structure for each area and combine them together. Then we may notice that the check-in area and security checks are too far away from each other and hard to find which will cause passengers to spend extra time on reaching there. And maybe the duty shop is too far away from the waiting area and cause inconvenience for the passengers. So movement through a space is necessary in this situation.

3.4.5 Consolidating Cultural Models

The consolidated cultural model shows the common aspects of culture that pertain across the customer population. The first step of consolidating cultural models is to walk through each individual model, find all the influencers and group them together when they have the same kind of cultural influences guided by our focus. Then add unique influences between influencers and get the final consolidating cultural model.

Take our project for example. First, find all the influencers that may include passengers, security guard etc. The influence between them is that the passengers want to spend less time on security check but the security guard needs to spend enough time on checking them thoroughly. After we collect all the influence information, we have to get rid of duplicates and near-duplicates and get the unique influences between the influencers.

3.4.6 Consolidating Artifact Models

Consolidated artifact models show how people organize and structure their work from day to day. Consolidated artifacts make conceptual distinctions more concrete. We use this model to develop a common working structure because people use a few strategies to plan their work. And normally the tasks that people do have similar structure as well as the intent and usage of artifacts.
There are several steps to carry out model. Firstly, group similar artifacts, those artifacts may have the same intent or usage in work. Take our case for example: the passenger list from check-in attendant and security check can be the same kind of artifacts. Then, once the similar artifacts are collected, we identify the common parts of the artifacts and the usage and intent of each part. Finally, look at how parts are presented and build a typical artifact.

3.5 WORK RE-DESIGN

One of the crucial parts of Contextual Design process is **Work Re-design**. It is important and useful because it improves the customer’s existing work process. But this is not a really easy task. It is a great challenge for the designer to come up with an inventive method that reforms the system in a way that will improve customer’s experience regarding the work practice.

The work re-design process is build upon the consolidated data and is captured in a discussion format that is in turn aimed at improving the whole work process. This discussion format is called **The Vision**. Vision can be understood as a story about users’ new work process in the environment that the designer has invented for the customer. It includes all the details about making the new work process simpler and efficient. The designer captures the details of a vision story in **storyboards** that are sort of scenarios about actor(s) and their interaction with the new system. This discussion format helps in knowing the new work process from the perspective of the real world.

The main aim of the Work Re-Design process, as discussed above, is to perform the work in a new way that is cost effective, less time consuming and as error free as possible. In order to invent such a work process, the designer has to completely learn about the original work process, that is, customer’s work. This work has to be related to some **data**. The designer’s job is to explain why, how and what the user is doing with the data. This is vital in order to get an overview of the whole work process. The more is learnt about this, the better because it creates new innovative ideas to design the new work process and hence, the overall system.

In an airport setting, there are several processes going on like the check-in and check-out process, passengers assistance/help windows, flight scheduling screen, passenger and aircraft security teams, duty free shops etc. All these processes are happening separately but they are very much
significant to the overall airport system for it to function smoothly. The designer has to study each of these processes individually & critically, and has to gather and consolidate some data regarding them in order to draw certain conclusions that can help in designing the new work process.

How to Examine a Work Process?

According to Hugh Beyer and Karen Holtzblatt, there are two ways to examine a work process. One way is to study the consolidated work models and bring out the hidden issues that can help in understanding the design process. Second way is to study another similar work process that is easy to understand and describe and then relate it to the existing original work process.

The first way is more technical and transparent because it captures a large part of the customer's critical information. It is as follows:

3.5.1 Consolidated Flow Model

This model deals with people and the different roles that they perform. It deeply studies the work flow and the problems associated with the role.

In an airport, for example, a person's role is to perform passenger check-in. Likewise, a person at the security is responsible for checking passengers and maintaining the overall security of the passengers, aircraft and the airport. Hence, different people perform different roles. But it is important that each individual performs one role at a time and there is no duplication of roles. If a person is entrusted with too many roles to perform at one time, he might get exhausted and will not be able to perform his tasks in a desired fashion. For example, if a person performing the role of a security guard is also asked to do passenger check-in, he will not be able to concentrate on either of the tasks. Therefore, manual role switching should not be performed too often. Rather, in a broader context, if people are performing different roles and interacting with the system, then the system should be intelligent enough to perform the role switching.

People also become strained while performing more than one role because there is a lot of work to do. This role strain definitely impairs their performance and they are unable to perform their tasks perfectly. If a security guard in an airport is to perform another role along with guarding the passenger area, he will not be able to do so because his attention will
be divided among the two tasks (and the two roles). This would demand more effort and concentration from him and he would be strained.

It is the designer’s responsibility to investigate this carefully that one person is performing one role at a time and that there is no duplication of work that is impairing the performance of the workers at an airport.

During the passenger check-in process, there is the airline staff and the security guards who work hand in hand. They are performing different tasks but yet working together to make the whole check-in process smooth and fast. The designer should study this role sharing process carefully because this would enable him to learn what common tasks the two different people in different roles are performing. The designer should also strive to learn about the very specific individual work of each user and that what role each one of them is performing in isolation (role isolation). This would help him differentiate between the specific role of one person and the common roles he is performing with his colleagues.

The knowledge of all this would help the designer build a system that gives more freedom and less strain to the customer.

3.5.2 Consolidated Cultural Model

This model deals with the emotions, culture and values of the customers in a work environment. The designer should study this very deeply because it would help him decide if he should support customers’ emotions and values while building the new system or should he discourage the customers’ best practices in order for the system to work in a better fashion.

In an airport setting, for example, the passenger check-in staff may like to ask more and more details from the passengers in order to input in the system but the passengers may be getting annoyed by this question-answer session and want this procedure to end soon! So the designer has to keep a balance between the two extremes without letting the main customer let down by the system working.

3.5.3 Consolidated Physical Model

This model deals with the physical aspects of the customer’s working area like the environment, the physical space, the condition of the workplace
etc. The movement and access for the customer in his workplace is very important because this also decides the efficiency of the user with respect to time and cost.

For example, in an airport setting, when the passengers arrive at the airport, they expect to see the big flight scheduling screens right in front of them so that they can know the exact and recent times of their departing time. But if the scheduling screens are installed very deep inside the airport or in the centre of the building where the passengers have to travel a lot to access them then they will get annoyed with this setup. Similarly, passengers won’t be happy if they have to carry their luggage for a long time waiting for the security checks etc.

3.5.4 Consolidated Sequence Model

This model talks about the detail structures of a work task. It says that the designer should break down the whole work task into set of activities and study how users perform those set of activities. This would help him understand the whole big picture of the work task and would also enable him to find out the lengthy steps and unnecessary activities during it.

For example, in an airport setting, if the designer is studying the work of a passenger check-in staff then he should study and concentrate on the following:

- What the staff is doing: each step of the worker is noted separately.
- Why the staff is doing this task: every possible reason(s) and their possible relationship with other tasks should be noted.
- How the staff is approaching the task: all the important strategies that the staff is employing should be noted.
- Note down unnecessary set of activities.
- Note down the reason for starting a particular task by the staff.

3.5.5 Consolidated Artifact Model

This step involves the study of artifacts or objects. The designer should study the different kinds of objects and the relationships between them. While studying, nothing should be discarded too quickly because it might be of some importance later on. The designer should study why a particular artifact is important to the customer, what the artifact actually
depicts, what it means to the customer, and how different artifacts interact with each other.

For example, a security guard in an airport might be carrying different items in his workplace. There will be a screening machine, a pistol, a handcuff, a mobile phone etc. Similarly, the staff might be having a number of objects at her table with which she is performing different tasks. The designer should carefully examine those objects and should not be too quick to assume everything about them. He should critically examine and try to find out a relationship among them.

When the designer has captured the details of the work process using the work models described above, he should begin with designing the new work process from this data. But this involves further steps that are critical to the whole design process and they are:

- Manually learning the different steps and sequences in the data. (Walking the Data)
- Making a clear understanding about the data and coming up with innovative ideas. (Visioning)
- Developing a single consolidated solution. (Evaluation and Integration)
- Working in parallel. (Concurrent Action)

When this part is achieved, the system designer has to make a real and solid vision about the new work process. For this, visions in the form of storyboards are employed that tell the designer what the new work process will look like. These storyboards give a clearer picture of how the work will be performed in the new airport setting. For example, how the security guard will perform his duty in the new proposed setting in order to perform his work more efficiently without annoying the passengers too much. Where the new proposed flight scheduling screen will be placed and how a passenger XYZ will be able to benefit it from it in a better and more useful way.

In brief, when all these steps are performed and all the data is gathered, a vision in the form of storyboards is created which helps the designer to show the real picture of the newly proposed system.
3.6 USER ENVIRONMENT DESIGN

The challenge of contextual design is to keep work model coherent, which means they should design the users' experience to be in order and natural. By allowing users to have freedom when they use the system means to allow different user scenarios to be applied into the system.

3.6.1 Focus Area

Design structure should precede the user interface design. After analyzing the work models, we should find out a connection between work models in order to make a whole structure plan.

Use the work models collected to define the purpose, functions, links and objects of the system. When users are using the system, they should be allowed to shift their attention to another activity. Focus on the main activity areas. Every activity chunk should not only support its own work but also keep connected with other activity chunks. Every activity chunk should list the details of purpose, functions, links and objects:

1. Purpose should list out the aims of a specific activity.
2. Functions should list out every possible step within this activity.
3. Links should provide relevant switching between the current and other object.
4. Objects should specify the contents that this activity is aiming at.

Other items like users, issues and constraints could also be added to the focus area if needed. After listing out all the focus areas, find out the relationships between every focus area and specify them on the diagrams. The objects in the focus area should be able to reveal the things that the users work on. It doesn’t make the work complicated, but makes it clear how the structure design could be coherent.

3.6.2 Walkthrough

The final step of contextual design is to implement a walkthrough. This step should not be skipped. Designing a lot for focus area could get the whole structure blurred in the end and hence, walkthrough is needed since it gives a chance to clean up the design and helps to reorganize the messy parts.
Check the following items to improve the user environment design:

1. Check the purpose of every focus area to see if it is clear and support each activity within the whole task.
2. Check if the focus area supports real work. Remove those function items from the focus area if it does not support a coherent work task.
3. Check the distinction of every focus area. Remove the overlapping items. See if some parts could be combined to give a clearer impression.
4. Check if the links still support consolidated changes.
5. Check if it fits the users’ requirements and the internal balance.

Moreover, while planning for the project, think how to make a splash but make other functions coherent as well.

### 3.7 PAPER PROTOTYPING

#### 3.7.1 Create Prototype

To create the prototype, first we need to use the User Environment Design (UED) to drive the User Interfaces (UI) because it is among the designer’s specification. It tells the UI designer how to organize the interface, what functions should be available and where to put the functions. Then, we can map this UED to a particular interface and controls. There are several principles that help UI design fit it into the overall contextual design process.

- **Follow a defined process:** it is possible to approach the UI design task much like visioning. Like sketch several alternative approaches to the UI that can capture a unified response to the UED. It ties the system together at the UI level.
- **Base your design on the work models:** the consolidated work models help guide UI design a lot. Different models contribute in different aspects. The prototype can take advantage of them all and show how the system hangs together.
- **Keep conversations separate:** every new step in a design process uncovers flaws in the previous step. When the designers tries to make a focus area real in an interface that works, he will discover missing
functions and structures that simply cannot be made to work, so separating conversations becomes critical.

The storyboards are the primary guide in working out the UI. The models give additional guidance in working out the details of the user interface. When this is done, the result is an interface that presents a coherent system work model to the user and is ready to be mocked up in paper. Then we can use this kind of paper prototype conduction testing and make interactive design.

3.7.2 Testing the Prototype and Iterative Design

A paper prototype should be built to support the conversation between user and designer about how to modify the proposed system to fit the customer’s work better. The prototype must be easy to build, represent the user interface well enough to communicate it to the customer, and be easy to modify in the field to support the design conversation. A paper prototype interview should be run. It is quite similar to a contextual interview. Interviewing around a paper prototype has very much the same structure as a normal contextual interview. The difference is that after the initial discussion, you move onto working with the prototype.

- **Setup**: the interview needs to be setup in advance so that everyone knows what to expect. Users can be the mix of people whom the team has already talked to or even entirely new users. It is especially important to run the prototype interview with the people who do the work.

- **Introduction**: introduce yourself and the focus of your design, including the kind of work the design supports, but do not describe the design itself. Then find out about user, the work they do and the particular tasks they have to do or have done recently.

- **Transition**: choose one appropriate situation to start with and transit to the prototype interview. Give a brief summary of the start point to the user and see if they can solve the task successfully or not.

- **The interview**: run prototype interviews in pairs, one interviewer will manage the prototype and interact with the user, and the other will make notes. Give the user necessary help with short sentences. Ground the interview by replaying specific events.
• **Wrap-up:** The final wrap-up of a prototype interview is a simple summary of the key points that came up during the interview. Check the emotional aspect by asking: Does he like it? Would he buy or recommend buying it? How much would he pay for it?

The last part of a prototype interview is the interpretation session. This is parallel to a contextual interview. This interpretation session is focused narrowly on identifying the issues raised by the interviewer. We should capture the structural issues for the user environment design from an early prototype interview and stick them directly to the affected part of user environment design. If there is any new aspect of work practice that is not represented on the existing models, we should try to capture the issue and stick it right to the model in question.

When a design has been tested with two to four users, we should iterate it. In this session, we should address work issues first then user environment design issues, and at last the user interface issues.

After a design has completed, we should also maintain regular contact with customers in order to get continuous feedback from them and have further improvement opinions on your design. This iterative design process continues until the team is sure it has a workable design. After two or three iterations on a part of the user environment design with customer, it begins to stabilize. We should then move onto testing primarily the user interface simultaneously extending the prototype to test the structure of another part of the system. The part that has stabilized can be moved simultaneously to implementation design and code.
4 CONCLUSION

We conclude that by following the steps discussed above, we were able to plan our project with respect to Contextual Designing methods.

Below is a time-line of the activities performed:

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>Time needed (work days)</th>
<th>Activity Name</th>
<th>Time needed (work days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contextual Inquiry</td>
<td>10</td>
<td>-Consolidate Cultural Model</td>
<td>3-4</td>
</tr>
<tr>
<td>Interpretation Session</td>
<td>2.5</td>
<td>-Consolidate Physical Model</td>
<td>3-4</td>
</tr>
<tr>
<td>-Running Session</td>
<td>2</td>
<td>Work Re-design</td>
<td>21</td>
</tr>
<tr>
<td>-Sharing Session</td>
<td>0.5</td>
<td>-Preliminary Study</td>
<td>1</td>
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<tr>
<td>Work Model</td>
<td>17-22</td>
<td>-Re-design Flow Model</td>
<td>4</td>
</tr>
<tr>
<td>-Divided work</td>
<td>2</td>
<td>-Re-design Sequence Model</td>
<td>4</td>
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<tr>
<td>-Create Flow Model</td>
<td>3-4</td>
<td>-Re-design Artifact Model</td>
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<td>-Create Sequence Model</td>
<td>3-4</td>
<td>-Re-design Cultural Model</td>
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<td>-Create Artifact Model</td>
<td>3-4</td>
<td>-Re-design Physical Model</td>
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<td>-Create Cultural Model</td>
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<td>User Environment Design</td>
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<tr>
<td>-Create Physical Model</td>
<td>3-4</td>
<td>-Find out focus area</td>
<td>4</td>
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<tr>
<td>Consolidation</td>
<td>17-23</td>
<td>-Implement Work Through</td>
<td>3</td>
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<tr>
<td>-Create Affinity Diagram</td>
<td>2-3</td>
<td>Paper prototyping</td>
<td>5.5</td>
</tr>
<tr>
<td>-Consolidate Flow Model</td>
<td>3-4</td>
<td>-Create prototype</td>
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<tr>
<td>-Consolidate Sequence Model</td>
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<td>-Test prototype</td>
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<tr>
<td>-Consolidate Artifact Model</td>
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</table>

5 REFERENCES

- We have referred to the book (Contextual Design: Defining Customer-Centered Systems) throughout the working of this project.
- We have also referred to the website of the authors of Contextual Design. (http://www.incent.com)