**Problem Definition & Information Gathering**

**INLS 582, Systems Analysis**

**Wednesday 1/25/12, Monday 1/30/12, Wednesday 2/1/12**

**Reading:**

**Wednesday 1/25/12**

Davis, W. (1999). The problem statement. In W. Davis & D. Yen, *The Information System Consultant's Handbook: Systems Analysis and Design*. Boca Raton: CRC Press. Chapter 12, 87-90. [[e-reserve](http://eres.lib.unc.edu/coursepage.asp?cid=2001)]

 Davis, W. (1999). The feasibility study. In W. Davis & D. Yen, *The Information System Consultant's Handbook: Systems Analysis and Design*. Boca Raton: CRC Press. Chapter 13, 91-96. [[e-reserve](http://eres.lib.unc.edu/coursepage.asp?cid=2001)]

**Monday 1/30/12** Swan, L., Taylor, A., & Harper, R. (2008) [Making place for clutter and other ideas of home.](http://doi.acm.org/10.1145/1375761.1375764) *ACM transactions on Computer-Human Interaction*, 15(2), Article 9. [ACM DL]

 NOTE: I could attach my reading notes/qs to the website.

**** Optional: Barreau, D. K. (2001)."Making do": Adapting transaction systems to organizational needs. [*Library and Information Science Research*, 23(1)](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%236577%232001%23999769998%23253047%23FLA%23Volume_23,_Issue_1,_Pages_1-102_%28Spring_2001%29&_auth=y&_acct=C000004198&_version=1&_urlVersion=0&_userid=36942&md5=1796ec04c2b7e8c6e80842cd842ee51d), 27-43. [e-journal]

B&H, Ch. 3

**Tuesday, 9/13/11** Beyer & Holtzblatt, Ch. 4, Contextual inquiry in practice.
[Lloyd, D. & Dykes, J. (2011). Human-Centered Approaches in Geovisualization Design: Investigating Multiple Methods Through a Long-Term Case Study.](http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6065017) *IEEE Transactions of Visualization and Computer Graphics*  17(12), 2498-2507.

**Assignment:** Wednesday 1/25/12, assign problem definition, due Wednesday 2/8/12

**Slides:**

 AdmissionProblemExample.ppt

feas-study.ppt

interview-qs.ppt

**Exercises:**

Thursday, 9/8/11, identifying problems in Swan et al.

Tuesday, 9/13/11, interview exercise

Review the idea of what a problem is (From Simon). **Current** state isn’t same as **desired** state. One or two unknowns: current state, desired state, means of getting from current to desired.

There is some set of symptoms or outside factors that indicate there is a problem.

Davis (1993) points out that it is important that an organization have a clear idea of what its strategic goals are. First, this helps you to recognize a problem. A problem is an indication that you are not meeting your goals. Second, this helps you determine the direction in which your solution should take you. With problems of this nature, there are always several ways of solving it - which is the best solution in the context of the overall goals of the organization? In other words, what is an *appropriate* solution?

For example, suppose the problem is that information on current and past departmental research projects is very difficult to find because it is stored in individual’s offices. One solution would be to have a central repository for all project documents. Another would be to have a common index of projects, but keep storage where it is. One of the goals of the department may be to allow individual researchers easy access to their current and past work. Another may be to maintain confidentiality on certain kinds of papers (e.g., human subjects). These overall goals indicate that the second solution is better than the first.

**Problem Definition:**

What is the problem? Information may come from the users from management, from clients, from a “general feeling”. It is important to try to distinguish between **symptoms** and the **problem**. There may be many symptoms that are showing up caused by the same problem, or they may be caused by different problems.

**Example:** Slide: AdmissionProblemExample.ppt

Symptom is email college acceptances sent to the wrong list of students. What might the problem be? (poorly named list, untrained user, etc.) <elicit>

The **problem definition** should:

1. identify symptoms and likely problems/causes,

2. identify the scope of the problem, e.g., how much of the organization and its functions it seems to affect, how much money and time is likely to be involved,

3. state some concrete, specific objectives that the solution to the problem should meet. This is so you can tell if the system is solving the problem,

4. if a feasibility study is needed, recommend its scope.

This may take only a few minutes to prepare, or a day, depending on your familiarity with the system. In its written form, it could be presented as a memo, or as a brief (1 page) report. For instance, you might have a memo with the following sections:

*<use problem definition assignment; assign and discuss>*

1. Project title.
2. Problem setting. Provide a very brief (one paragraph) description of the setting in which the problem occurs. If an information system (computerized or manual) is already in place, briefly describe it.
3. Problem description. Try to specify the problem, rather than just describing the symptoms associated with the problem. You may use the symptoms to demonstrate that the problem is significant.
4. Project objectives. What should the project accomplish. In other words, how can we (and the client) recognize that the problem has been solved?. Essentially, you will identify criteria for recognizing that the problem is solved. Also provide a brief justification for working on the problem.
5. Project scope. Scope may be described in terms of the people involved in the system processing, the people who control data involved in the system, the amount of data or number of transactions the system handles, or the costs of system failure.
6. Preliminary ideas or observations, if any. This could include any serious constraints.
7. Contact person(s).

Depending on the situation and context, you may add other information. For example, if you are working on an accounting system, presumably the solution must conform to standard accounting practices. Perhaps there are some hardware constraints (organization has just made large purchases of a particular kind of computer, and this must be used). Maybe the organization needs to use open source software.

Remember that this is **not** a systems analysis. This is to show that you and the clients are actually talking about the same problem, that you agree on how big a solution you’re trying for, and that it seems possible to do. (Just like a model – make ideas public and shared) All the predictions and estimates you make here should be fully understood to be very rough estimates. You may be off by as much as 50%, and that’s OK. As Davis says, this is your “initial informed guess” about the problem.

If there are some aspects that seem to be high risk, you may wish to recommend a feasibility study. We’ll talk about risk and feasibility later. If you recommend one, give some idea of the purpose and scope of the study.

***Sample problem definitions: from wandering "story" to well-organized problem definition?***

**Feasibility Study <very quick – condense> <slides: feas-study.ppt>**

This is necessary only on larger, novel problems. It shouldn’t be necessary for any of the term projects!

**Types of feasibility <slide>**  that you want to think about in making your recommendations.

Technical feasibility. Technically, can it be done in a practical way? Do we know how it’s done, or is this a real research project? Have other organizations done this sort of thing, and if so, how has it worked for them? Consider the use of virtual reality as an example where technical feasibility might be an important question.

Operational feasibility. Is the system concept appropriate for the organization’s environment? Consider the skills needed by the users, the amount of traffic or use, the constraints such as speed, accuracy, security, access.

Economic feasibility. Are the resources needed for development justified by the returns you will get? The easy decisions here are when you see payback and/or profit within 3-5 years. But in many areas, there are other types of economic advantages that may accrue that cannot be easily and accurately quantified or predicted. (Recall Clemons.)

Schedule feasibility. Is the schedule for devilment and deployment reasonable This could have to do with time commitment, conflicts with other commitments, the seasonal nature of the business (imagine a department store installing a new cash register system the week before Christmas).

Organizational feasibility – does system fit with strategic objectives of organization?

Motivational feasibility. Do the users want it enough to put up with the inconveniences of the project, and dealing with change? Of course, the best way to gain and maintain this support is to involve the users as much as possible.

**Feasibility Study: Definition and Purpose.** <slide> This is a quick review of a proposed system project, to determine:

1. whether the project can be done

2. whether the project is worth doing

3. if so, when

4. if so, how many resources to allocate to it.

In the standard waterfall models, it is done right after the project is first suggested, as the first stage in a gradual commitment of resources to the project. If the organization has done an overall systems plan, it may still be done to more precisely define the scope of the project, the most promising approach(es), and time and cost estimates.

If the problem is a standard problem, straightforward, small, with no novelty, this can be omitted. Estimates of time, personnel, costs, and any other resources are all that is needed. The problems you propose for class should be of a scale such that a feasibility study is not necessary.

Remember that this isn’t where you do an in-depth analysis of the current system, nor try to solve the problems. You are trying to understand the current situation, and get a grasp on what a better system would look like, so you can get an idea of what’s involved in making the change. It is quite likely that you or the other decision makers may decide not to go ahead, for many reasons such as:

1. the current problems aren’t that serious (How serious are they?)

2. there isn’t a good, practical solution easily available (Is a good, realistic solution possible?)

3. any possible solutions will take too much time, money, or other resources (with available resources?)

4. while it would be nice, there are more pressing problems that need to be taken care of (does it have a high enough priority?)

5. while it is possible to solve the problems, there won’t be a real benefit. (that will show real benfit to the organization?)

Recall the Clemons article in thinking about the feasibility and benefits of a system.

Davis (1983) suggests these steps for the feasibility study: <slide>

1. Define the scope and objectives of the system. Confirm what you think you found out in the problem statement.

2. Study the existing system, if there is one. Consider

what it does well

what it does poorly

what other systems it interacts with

what roles exist in the system

a rough outline of the information and processes used by the system

the current costs of the system

This study may take you 1 day, or a couple of weeks.

3. Develop a logical model of the proposed system; what it should do, what constraints it has. This is a general overview to give someone an idea of what you’re aiming for. As you do further analysis (if the project continues), you may change your ideas.

4. Redefine the problem in the light of your new information. Were you confused by symptoms? Can you see more than one problem?

5. Develop and evaluate alternative solutions. Davis recommends, for instance, a high-cost solution (if time and money were no object), a medium solution, and a low-cost solution.

6. Recommend a course of action; go ahead or stop, based on cost, feasibility, etc.

7. Sketch out a development plan, including process, time, personnel, equipment.

Davis suggest the following outline for the report (p. 45). Remember, each situation is different. There may be overriding concerns/issues that you want to emphasize, so it is up to you to determine an appropriate form of presentation.

1. Title page, contents

2. Executive summary, describing costs, benefits, constraints, resources needed

3. Problem definition. (1 page)

4. Method of study. How you came to these conclusions, sources of information.

5. Analysis. Description of the logical system that you propose, including objectives, constraints, scope.

6. Alternatives. Include feasibility and resources required.

7. Recommendations. Include your reasons and evidence.

8. Development plan. Schedule, resources (time, money, people, etc.)

9. Appendix. Charts, tables, further support, etc.

**Use of the Feasibility Study**

The feasibility study is used as a “jumping off place” to decide whether to continue the project. It is also used as a way of ranking projects in order of priority. This is important for at least two reasons:

1. If you have an overall information systems plan for the organization, you want to work on the separate projects in an order that makes sense, especially in terms of major developments (e.g., building renovations, user training).

2. There is always a backlog of projects - more good ideas than there are resources to do them. The feasibility study provides information not only for go/no-go decision, but also which projects should be done first.

The feasibility study can answer concerns about project risk.

**Strategies for problem identification and solving**

**Decomposition** is breaking a larger problem, system, process, etc. into sub-problems. It lets you view the components of the situation, but can also obscure important relationships between components.

**Factoring** lets you look at common themes or connections among problems. You can then consider a single approach to work on that theme or commonality and work on several problems at once.

**Synthesis** is a way of combining several different perspectives on a problem or system. This is especially important when different functions, departments, etc. share a process or data. You can start with one, and identify requirements, but then you need to look at other stakeholders and see what their requirements are and whether a single solution will work. Important for solving a problem without creating more problems for others.

**Generate and test** is another decomposition approach that lets you evaluation feasibility and priority of sub-problems to solve.

Practice identifying problem/symptoms.

**Swan et al., 2008**  Making Place for Clutter and Other Ideas of Home.

 (Although this deals with clutter at home, workplaces also have clutter. Students should be able to transfer these ideas to work context.)

**Notes for Students (send by email a couple of days before class)**

We will be discussing problems, their symptoms, and their risks. As you read, try to identify problems, symptoms, and risks that are described in the article. Could the problems you identify also occur in work settings?

The article deals more with artifacts ("things") than with information per se. But often, this is a fuzzy distinction. Further, it's clear that the informants associate information with them. This is true in work settings as well as in the home.

Note the rich amount of detail in the researchers provide. In qualitative research, this is called "thick description", and helps the researchers understand what they have seen, and bring the readers into the context. It requires skill in non-judgemental observation, something all systems analysts need.

The authors mention Malone's 1983 article on organization. I highly recommend it for those interested in personal information management (PIM) – it is a seminal article.

What is the equivalent of clutter in the electronic world ("e-clutter")?

**End Notes for students**

Modern organizational strategies must work with electronic and physical artifacts. Is the same true for clutter strategies? Places where this is crucial: libraries, labs, museums, offices that must use print copies as well as electronic versions of documents, many points of data entry and dissemination (crossing the automation boundary).

Organizational strategies often use a component of physical characteristics (size, shape, weight, etc.) especially in terms of container. Advantages? disadvantages?

What cues do we use for reminding?

Notes, place, sound (alarms), others (email me to make an appt).

9:2-3. Great use of words: static vs stagnant.

**clutter = residue: things that don't seem to go anywhere or have any immediate or obvious purpose.**

How much time/effort are people willing to give to organizing clutter – things that seem to be inherently difficult to organize? The solution must be less painful than the cluttered state and its workarounds and risks.

**Problems, symptoms, risks (these are examples of things the students may find in the exercise)**

1. Items stored in limbo or "temporary place" for so long that they aren't relevant or useful any more. Their original purpose may even be forgotten.

Symptoms: steady increase in amount of these items;

can't remember what its for;

slows search for truly needed items – can sidetrack it altogether, as one tries to figure out what it's for, or chooses to put it in its proper place.

Risk: losing, forgetting task for which it should be a reminder.

distracter from initial work.

But: serendipity

2. If obvious presence of object was to act as a reminder, it gets lost as it is placed among lots of similar objects.

symptom: forgetting tasks based on the reminder, discovering it too late.

3. Temporary placement solution becomes permanent.

symptom: items are separated from their proper place, associated items (example, the game piece not with the game).

symptom: incomplete item or information found where it should be, need to find or work around the missing item.

risk: temporary solution becomes permanent, subsuming permanent one. multiple strategies that don't work together.

4. For a couple of these informants, there is no restriction on who can add, search, or remove items.

symptom. items appear in unexpected places, disappear

risk. if primary user was depending on item being in a place, it isn't.

4. How to make a discard decision: no fixed criteria

symptom. adding an "unknown" state to an item's life cycle: keep, archive, discard. The "could probably throw out", or "in transition" state.

not being able to tell if something might become useful someday – unwillingness to risk premature loss

low priority given to weeding tasks

risk: premature loss

5. how to deal with items that fit more than one category need a place to go.

symptom: ambiguous items/uses

different people view it as different kind of thing, therefore look for it in different places.

**Exercise:** In groups, identify system-related problem in these interview/observations. What are the symptoms? What are the risks associated with the problem?

Do the same fundamental problems exist in the workplace?

**[Old article used for problem/symptom identification**

**Barreau, 2001, “Making Do”**

Today, we’ll concentrate on the description of problems, in light of our discussion of problem definitions.

**COTS** = commercial off-the-shelf system (software system).

**Transaction system**: “Transaction systems are systems that **support high volume, repetitive tasks, such as sales, inventory control, and shipping transactions**. With transaction systems, **routine is everything**. Tasks are designed for **speed, accuracy, and simplicity**. In many instances, they are designed for **simultaneous use by multiple individuals performing various roles**. Often these systems are **employed in other applications**, such as customer service and management analysis…” (p. 28, bold mine)

Work-arounds and making do.

“Systems that cannot support the complex requirements of an organization or accommodate organizational diversity will require costly customization or time-consuming work-around, as workers “make do” with what they have. (p. 28) Recall that this was one of the symptoms we identified as indicating the presence of a problem.

Organizational context of study: (p. 28)

* Publishers
* System designed specifically for publication sales, sales transactions and inventory control, also customer service (called BPS) in the paper.
* NEP – division of large international publishing firm. Personalized customer service, large customer base.
* MAR – division of corporation contracting reference services to agencies. Mostly distributed free. Enormous customer base, number of transactions.
* SUP – small university press, small inventory, customer base.

Barreau interviews customer service representatives, managers, and system administrators.

**Tasks and problems seen in COTS system**

1. Answer calls and respond to customer questions and requests. Referrals, reference to other documents,, etc. BPS provides inventory information, but S’s said it was insufficient – used print catalogs, web pages, need to stay informed on quantity, release dates, etc.

2. Take orders and distribute documents. BPS doesn’t support end-user online ordering. Provides limited item information. Occasional slow performance. Problem in calculating shipping costs, and therefore order total if items will be shipped separately. For MAR (free items), need to fill in unnecessary information just to proceed to next screen.

3. Manage inventory. BPS works well.

4. Collect payment. All modified default invoice. Work around needed for customers paying by purchase order.

5. Plan, manage, evaluation. Some reporting facilities, but not real time. – pbm with cpu-intensive function. It is unacceptable to wait for 1 day for report that must be run overnight.

6. Problem solving as part of customer service. Need access to customer records. Often ad hoc, rather than routine work.

7. Maintain DBS and information sources. Publishers have additional DBs as well.

8. Communicate with internal and external entities. Very important function, diverse needs (publication status, developments in field, provide status reports, problem solving, training, sending information to customers, etc.) BPS provides poor support. Can’t email copy of invoice, flag a record or pass a record to someone else. Big area for work arounds.

Summary: BPS supports most customer service tasks well, but 4 areas of dissatisfaction. (p. 39)

* Structure of information inadequate for some tasks
* Price quote provision doesn’t match common situations
* Performance suffers during analysis
* Doesn’t support communication/cooperation.

**]**

**User-centered design** is the umbrella terms for this, which encompasses involving the user in design not just of the interface, but of the work flow itself, building systems that ease the work and adapt to the user, instead of forcing the user to adapt to the system. **Participatory design** and **joint application design (JAD)** are two methods/philosophies of how to do this, although there are many others.

My approach is not to teach you one method and have you follow it, but rather to make you aware of the strengths and weaknesses of many methods, so you can choose which is most appropriate. This will depend on the history of the organization, the philosophy of management and employees, your skills, and the type of system you are building. For example, a standard payroll system, not dependant on other systems, may not require much creativity. A novel order-entry/inventory system that can be updated from the field may require much more invention, and therefore discussion, among all of the stakeholders.

Note that there is a real dynamic here between *technical expertise* (which the designer has and the user may or may not have), *task/job expertise* (which the users have), and *managerial expertise/power*. (Stakeholders.) You must find a balance point that works for you in each situation; what information you need, how you are going to gather it, how you are going to incorporate it into your design, and what the resulting system will look like.

# Beyer & Holtzblatt Ch. 3

Contextual design is a version of participatory design.

“Contextual Design (CD) is an approach to defining software and hardware systems that collects multiple customer-centered techniques into an integrated design process. Contextual Design makes data gathered from customers the base criteria for deciding what the system should do and how it should be structured. it makes deciding how customers will work in the future the core design problem and uses those decisions to drive the use of technology.” (p. 3)

“The more customer contact a project has, the more likely it is to be successful (Keil & Carmel 1995)” p. 29 But it must be the right kind of contact, and it must be used the right way.

This is based on long-standing tradition of long projects leading to systems that people don’t use, or that can’t be used in the context in which they were intended. How can you design a system that works? “The designer’s basic question is … how can I structure a system to make people’s work more efficient?” (p. 31).

Also consider the users’ perspectives: “Make it so *I* work better” or “Make it so *the system* works better.”

**Exercise (hand out to interviewers)**

In pairs, have one person interview the other.

Announce beforehand that the interviewer wants to find out how the interviewee makes something (cooking, craft/project, fixing something around the house, etc.). Avoid computer work if at all possible.

Give the interviewer a list of specific goals:

* Steps of the process
* tools/materials/resources needed
* Where tools/materials/resources are kept
* Measures of success, signs of problem or failure
* Account of a breakdown, if one ever happened.

After about 10 minutes, form pairs of pair. Discuss what was difficult, what was easy, in each role.

* Interviewee, e.g., remembering details in correct order.
* Interviewer, e.g., asking questions to elicit information.

Report back to class.

The thrust of the CD information gathering described here, is the **contextual interview**. This may last 2-3 hours, or occur over several days. The whole point is for the designer to observe the customer (user) doing what he or she does, in that context, and to learn about the user’s requirements that way. The user is the expert in the task you’re trying to incorporate/improve, etc. You are the apprentice, observing, questioning, etc.

“Contextual Inquiry seeks to provide rich detail about customers by taking team members into the field. Once there, apprenticeship suggests an attitude of inquiry and learning.” (p. 46

The actual context of the work is important so you can really see what is going on and ask questions about it. This lets you and the customer take advantage of reminding, of familiar sequences, etc. If you take the user away from the context (e.g., the office or the shop floor), and ask for a description of a task, you’ll get a summary, probably of the “typical case”. You won’t see the tools, the paper required, the small things that make the job easy or difficult. You won’t see the things the user doesn’t think are worth mentioning, but which may be important. You are trying to extract information from people, artifacts, processes, physical surroundings in their relationships to each other, not in isolation. You want to have a better base of knowledge for your re-design than "what if…"

# 4 Principles

1. Context of workplace. See the ongoing experience, see concrete data – artifacts, examples. Also experience and observe intangibles – pace of work, interruptions, time pressures, types and nature of interactions. You get important details and see patterns that are hard to get from someone’s self-reported summary of ‘what I do at work’.

2. Partnership. You and the user each have your own expertise, and you want to learn from each other. You want to learn about the job, the user wants to learn more about what’s possible in a system, how to improve the job. You should be collaborators, with shared power and responsibility. You will each view the job differently; you with your goal of the system in mind, the user with the goal of getting the job done. The user may even discover things about work and work patterns he/she didn’t see before – you may offer a new perspective. This helps both of you understand problems and needs better. Don’t get lost in details – see what’s really being done.

3. Interpretation. You need to interpret what you have seen. If you see the user look something up, this is a time for questions – what are you looking up, why? why now? why here? what other things have to be looked up? how often do you have to do it? and so on.

You must take individual facts and find patterns and relationships.

4. Focus. This is a tricky notion for the designer. You want to keep you and the user focused on the job at hand, without eliminating the possibility of learning something related that is important to the new system. But if you focus too much, you may not be open to really seeing and learning.

Be comfortable with admitting ignorance, and asking questions

Be aware of a sense of surprise on your part – are you assuming something about what the user is doing, or why?

Be aware of a sense of contradiction with what you expected – are you assuming too much?

Be aware of the user seeming to just go along with you – are you really giving him or her a chance to show/teach you what is going on?

**Information Gathering**

Information gathering is iterative!

Note the slight contradiction between B&H and Davis about jumping ahead to design. Davis hardly wants you to think about it at all during information gathering stages. B&H allow that it will happen, you’ll get ideas and maybe try them out. They emphasize to record them, keep them around, but not to assume that this is the answer, or the only answer. For example, not the difficulty if 1 team member assumed such a decision, but another doesn’t.

Gathering information is a crucial step throughout the analysis process. If an old information system exists, and your job is to re-design it so it works better, you can start by studying the old system to determine what it does well, what it does poorly. You can’t assume that the new system needs everything that is in the old system plus more. Remember the stroller company.

As you gather information, keep in mind what the goals of the new system are. Re-read the problem definition occasionally to help you keep focused.

Davis discusses the importance of determining the system boundaries. This is part of establishing the scope of your project. What do you have the ability to change, and what is off-limits? Reasons for something being off-limits may include legal or “standard accounting practice” kinds of constraints, compatibility with other existing systems, hardware constraints, physical constraints (e.g., the computers on which the system resides must be within this building, etc. Or even, “we can’t afford to hire anyone else, although we have a little money for retraining.”

As the analyst, it is your responsibility to learn from the best available sources to the best effect, according to the situation. This is another example of where you must have several tools at your disposal, and know which ones are the most appropriate.

# Interview structure

B&H describe 4 parts to the interview.

1. The conventional interview. Getting acquainted, explaining why your there, getting permission, giving the user a chance to express any ideas or opinions at the start.

2. The transition. Explain how the contextual interview works – the user will be doing, you will be observing and asking questions.

3. The contextual interview itself.

4. The wrap-up. Try to summarize what you have learned, letting the user comment on or correct your interpretations.

Notice how active the interview process is for both of you. Your interviewee is splitting attention between work and explanation. You need to be alert, questioning, probing. This is tiring, so plan another interview if necessary. You will also need time immediately afterwards to sort through and interpret your notes. This may lead to follow-up questions for the user, which may be handled by phone, email, or in person.

**In relation to projects:** If you are the contact person for your group and for the user community, or you are designing a system for yourself, can you observe and question yourself adequately? Can you really extract the essence of the functions and actions without getting wrapped up in the detail? This is crucial to determine for your current group projects, but also for your future work. It may be best to have someone else observe and question. It is very difficult to look clearly at your assumptions and expectations.

**B&H Ch. 4**

*Focus* is developed by turning the problem statement or goal into focus for investigating work process.

Different projects allow different kinds of data gathering. <elicit>

* known product – one of a class of products – study competition, working examples
* new work domain – no existing models, but can look at task methods that it aims to replace, also look at similar tasks.
* new technology – incorporating new technology into existing task. study inputs/outputs/requirements of existing workflow
* highly innovative; new task, technology. – brainstorming, prototyping

Kinds of projects: upgrades/maintenance, new systems, process re-design

Starting on p. 73, B&H give a summary of types of tasks and some interviewing strategies to investigate them.

# Things to observe, things to question <slides>

As you talk with people, look at forms and documentation, etc., you can start by looking at 2 things:

1. Verbs. These describe what things do, what people do. Try to get people to use specific verbs (NOT “process”), like “sort” (on what field?), “add”, “distribute”.

2. Objects. Pieces of information. These are what the actions apply to.

Look at:

where work comes from, triggering actions

where work goes to upon completion

why it must be done

physical actions (e.g., movement studies),

time studies (how long it takes to do each part),

what tools the person uses,

what information the person needs,

how the person makes decisions.

You may be more interested in the information a person uses to do the task or solve the problem, or the thought process behind it. Here, you might also want a **verbal protocol**, also called a **think-aloud protocol**. Especially with things like decision making, it is important to find out the basis for the decision, which may not be obvious from physical motions.

Interview takes preparation on your part. Remember that it is time-consuming, both for yourself and for the person you are interviewing. You want to make it worthwhile for you both. There are 2 important tasks:

1. Identify what you need to know and find out.

2. Identify who can give you the information you need.

You may not actually be able to find these out right away, and it is exceedingly likely that as you start your interviewing and other information gathering, you’ll learn more that you need to know, and find out about other people you want to observe or interview.

**Identifying people:**

Identify roles needed in work as indicated by your problem definition, focus, goal. Ideally, 2-3 people/role.

1. If there is an organization chart, that can help you find which people are in charge of or doing the tasks you are interested in.

2. This may also help you determine the best order in which to interview them (although this will also be constrained by their schedules.) For instance, you may want to talk to a supervisor first, to get a general idea of how the task breaks down, what the output should look like, what the objectives are, etc. Then you can talk to someone who actually does the job, and get details on what forms and equipment are needed, what information they need, common problems, etc.

3. Keep in mind the other information you need. At the end of an interview, ask who else you should talk to.

4. Some people are better at expressing themselves than others. You may have an interview with the right person, but he or she can’t articulate the information well. You may have to use a different method (e.g., observation or simulation), or find someone else.

**Identifying what you need to know:**

1. Have a specific goal(s) in mind for each interview, concerning tasks you want to observe and the information you need. “Fishing” is inefficient.

2. Think of questions that will elicit the information that you don’t know that you need. For example, you may not realize that frobs and widgets must be assembled before shipping. Chances are no one will think to tell you such an obvious thing if you don’t ask specifically, or if you don’t provide the opportunity for it to come out. Open-ended questions are important.

3. Be reactive to what you see and learn. Even if you can’t investigate or observe new tasks, or objects until later. Take notes – don’t count on your memory.

**Plan for the interview:**

1. You are taking up people’s time. Be efficient without being officious. In general an interview should take no more than 1 hour. It’s hard to concentrate for much longer.

2. Plan what seems to you (according to what you know) to be a logical order of questions. But you must also be flexible enough to adjust your plans if your user thinks another order makes more sense - they’re the expert. Or, you may suddenly discover a whole area of which you were unaware.

3. In some situations, you may want to give the person a list of questions ahead of time, to let them prepare for the interview.

4. Plan for how you are going to record information. Ask permission if you want to tape it, and remember that it may make the user uncomfortable. It’s more important to LISTEN than to take complete notes. Allow enough space on your question sheets or diagrams for notes in appropriate spaces. Don’t try to write down everything the subject says.

5. Plan time immediately after the interview so you can expand and analyze the information you obtained while it is still fresh in your mind, and fit it into the other information you already have.

**Types of questions to ask**: It may be helpful to have diagrams of your models on which to base you questions, or to show the subject. Remember to be non-judgmental in your phrasing, and don’t take sides of touchy topics.

1. relationships - ask the user to explain how one thing related to another, or how an object relates to a process.

2. processes - ask the user to describe a process for performing a task.

3. as what the subparts of an object or function is, and what things it is a part of.

4. ask for definitions.

5. ask what information or paraphernalia is needed for a task.

6. ask what another users’ perspective is on the task or object

7. open-ended questions, e.g. “tell me about \_\_\_”, where you want the user to say as much as comes into mind about that topic.

8. rephrase information to see if you have understood it. Try to fit it into what you think you’ve learned.

**NOTE** in your information gathering plans, these are the kinds of information you need to include.

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**Majchrzak 2005,** Managing client dialogues

Successful system design depends on the designers learning about the client and client needs, but also on the client learning about his/her own needs, as well as what the designer needs to know and what the possibilities are. This paper presents results of an investigation of the relationship between “collaborative elaboration”, a type of interaction, and client learning and project outcome.

“By client learning, we mean the acquisition of anew knowledge that causes changes in requirements that reflect an enhanced understanding of the technology, organizational, and work environment in which the system will operate” (p. 2)

Learning can be enhances by elaboration “a strategy in which individuals verbally expand, or embellish, on a concept, domain, or knowledge that is new to them” (p. 3). Collaborative elaboration pulls in the power of the group: “the group context in which learning occurs and the elaboration process that stimulates learning “ (p. 3). The ideas is that it is easier for someone to identify and explore assumptions, inconsistencies in assumptions, modify mental models, etc. in collaboration, than in isolation.

Examples of interactions to promote collaborative elaboration: “instead of quickly seeking consensus on a single set of requiems, the use of CE might yield an initial set of highly divergent problem definitions, distinct solutions, and contrasting interpretations of information.” (p. 4)

Researchers studied client perceptions of interactions with design teams on projects similar to ours.

Collaborative elaboration:

1. Ask about the other party’s unstated reactions to ideas
2. Use multiple ways to describe an idea
3. Identify differences that were not immediately obvious to participants
4. Focus on understanding of achieving others’ personal goals, aside from program specifications
5. Generate several alternatives that accomplished at least one shared goal
6. Compare alternatives to fallback positions

And evidence of client learning

1. To what extend did the dialogue in the meeting reorient your thinking about requirements?
2. To what extend did the dialogue in the meeting question your preconceptions about requirements?
3. To what extend did the dialogue in the meeting expand your scope of thinking about the requirements/

The underlying assumption is that learning requires engagement, commitment, sense of responsibility, and all these will add to the quality of the project and the project result. (p. 6)

They found the CE contributed to client learning, and client learning contributed to short term project outcome.

# Wood (1997) Semi Structured Interviewing

Notice that this case study/example is based on B&H-style interviewing and design process. Wood lays out conceptual categories for kinds of questions/information and ways of getting them. This is an example of how contextual interviewing might work.

Interaction design – users interaction with work, information, the work environment is an important perspective.

He also emphasizes the importance of recognizing and clarifying user or expert vocabulary. Sometimes, it is obvious, e.g. “form 253”, or “if we find a frob in the widget”. Other times, it may be an ordinary word, but used with specific meaning. For example, “urgent” means something in a 911 call center than in filling a book order.

He defines 2 kinds of knowledge, and therefore 2 kinds of information to gather, therefore, examples of questions to ask for both. (relate to course structure)

*Object Knowledge* “Object knowledge includes the conceptual entities and objects (both concrete and abstract) in a particular domain and their various categories and relationships. Taxonomic relationships such as types, sub-types, and parts, and distinguishing features or characteristics of objects, are particularly important.” (p. 51)

*Process Knowledge* “Process knowledge is the knowledge required to accomplish the intended work **using** relevant concepts and objects.” (p. 51)

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[Lloyd, D. & Dykes, J. (2011). Human-Centered Approaches in Geovisualization Design: Investigating Multiple Methods Through a Long-Term Case Study.](http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6065017) *IEEE Transactions of Visualization and Computer Graphics*  17(12), 2498-2507.

This article is an example of user-centered analysis and design, with a focus on Contextual Inquiry. It describes a large-scale project, and what they learned at various stages.

*Ask students to focus on following in reading:*

*Stages of information gathering: (initial requirements, ideas for turning requirements into tools, reactions to many initial rough prototypes, reactions to a few polished prototypes)*

*Methods for eliciting ideas and reactions (lecture followed by concept maps, cardsorting; interview/observation followed by KWIC analysis of transcripts, coding; questionnaire; document analysis.*

*Methods that produced most useful results for designers.*

*What made thigs work: establishing communication and trust, long-term relationship, sharing expertise, incorporation of real data…*

One of the things I like about it is that the authors compare/contrast what they were able to learn from various analytical methods, and they reflect on the advantages and disadvantages of each.

*in class, small group discussion: Consider process and outcomes: how generalizable are their approach and lessons learned to other projects?IOW, is there anything specific to this setting that specifically constrained or provided opportunities that would be different in another setting?*

**Project and approach**

3 year project, thus long-term relationships, understandings.

eclectic approach: any tool that works.

CI, interviews, obsrvation, questionnaires, document analysis, word frequencies, KWIC, card sorting, concepts and relationships (concept maps).

audio transctipion, coding, qualitative data anlaysis. generating meaning.

what methods work best to "build the bridge" between specialists and designers necessary for good design?

**Project and Methods.**

Visualization tools for GIS-related data "geovis", in this case, crime data

how to communicate between expert designers and expert users (domain specialists).

better geovis tools for specialists. fitting with **context of use** (work processes, assumptions, etc.) and **data in context** (source, lineage, format, etc. – things provided by metadata).

A. requirements gathering – "bridging" between the actors.

1. Volere (generic questions)
2. educate specialists in design possibilities of geovis. lecture of possibilities. effectiveness was assessed by card-sorting, sketching (similar to concept maps), and recall interview 2 weeks later.
3. scenarios of specialist use provided todesigners.

Then **triangulation** among them.

Volare questionnaire yields inadequate results.

Lecture is mixed: information overload, although some useful comments.

Scenarios developed with help of specialists, then analysed for design opportunities by designers, were fruitful, especially when augmented by data.

Different perspectives in which specialists expressed their needs: **data-centered, task-centered, tool-centered.** Personal style? area of interest/concerned?

B. Prototyping the best possibilities. Rough designs, assessed based on information gathered from experts.

value of paper prototypes + think-aloud protocol. Need for "practice" in working with prototypes and interaction with them. Need for real data.

Later prototypes, including online, more realistic look and feel, eliciting suggestions for functionality, enhancements; examples of exploratory behavior.

**Reflections.**

* Having designers and specialists work together in tasks such as card-sorting and concept mapping helped designers understand requirements and views, and helps specialists learn designers' perspective.
* KWIC – how a concept is used by specialists (e.g., consider different views of student" by faculty and family).
* designers need to see data and see how specialists work with it early in design process.
* multiple methods yields a lot of suggestions and possibilities. Need to coalesce, prioritize, find commonalities.
* Proto-types: breadth of engagement by specialists with them: yield assessment, suggestions. Better understanding of work/data context (e.g., assumptions, processis, distinctions.)