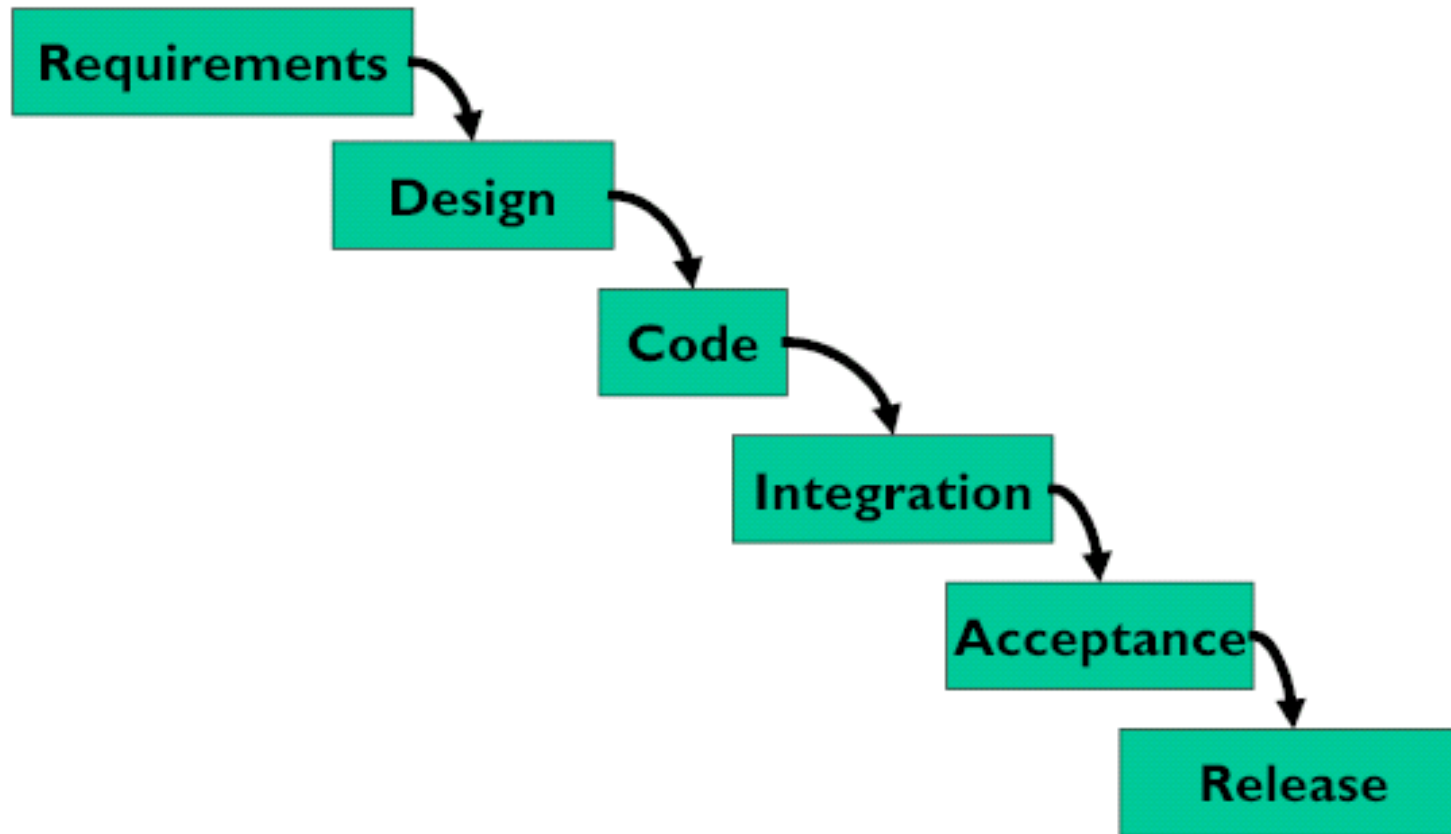


The Process of Human-Centred Interactive Systems Design

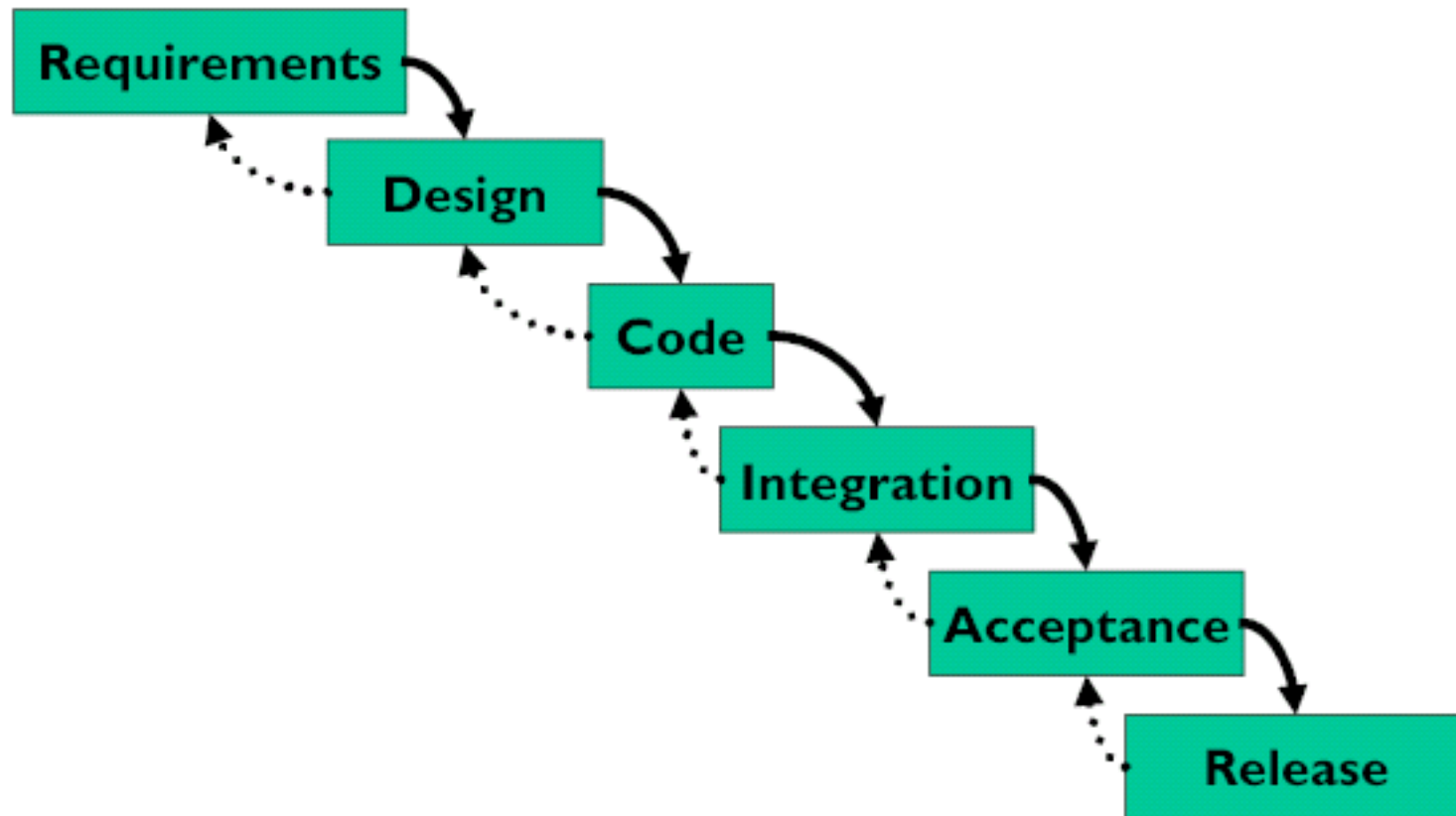
What are the activities in Design?

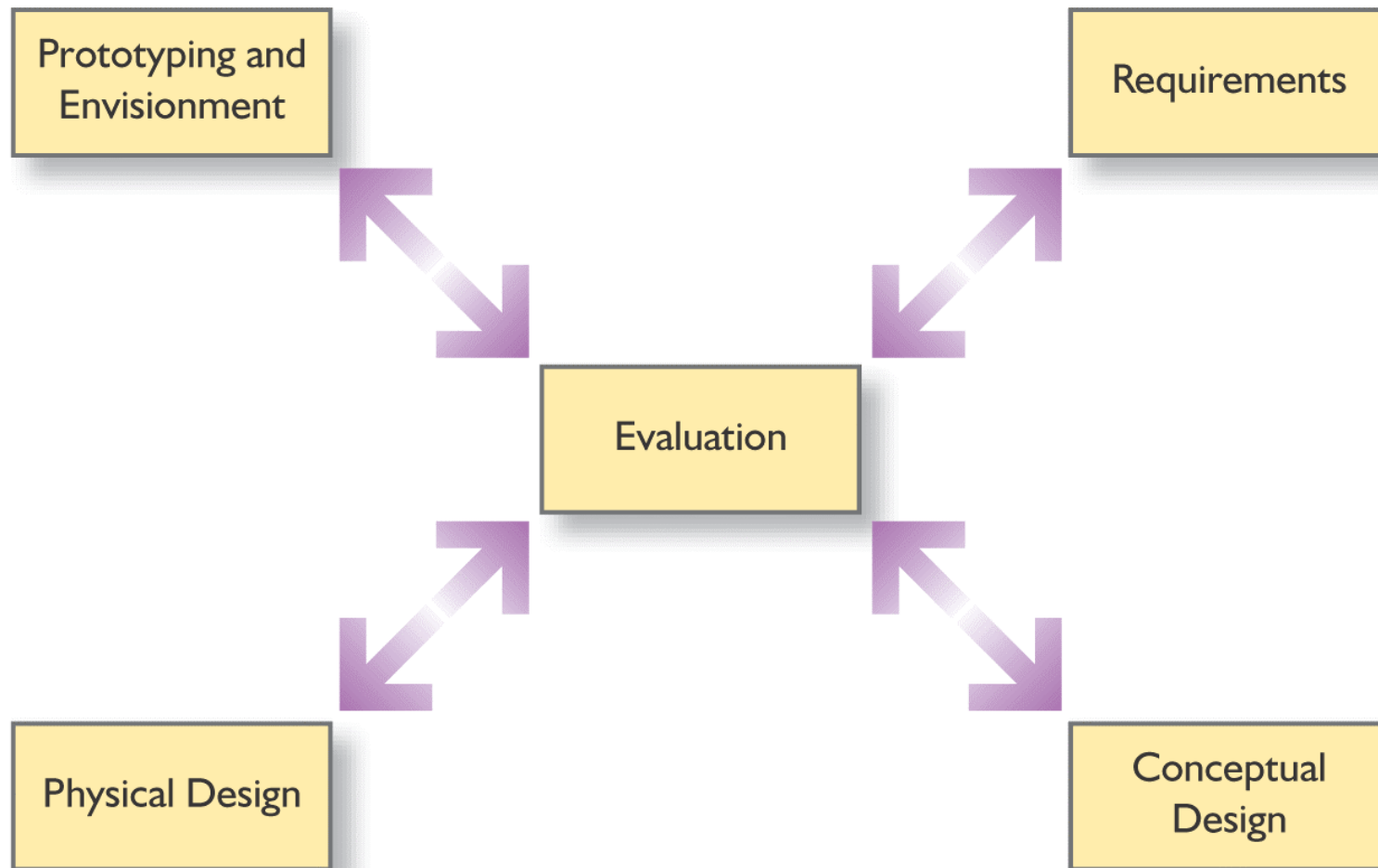
- Surprisingly there is not one unified view
- Several ways of characterizing what design is about
- David Kelly (IDEO); understand, observe, visualize
 - ‘Remember, design is messy; designers try to understand this mess. They observe how their products will be used; design is about users and use. They visualize which is the act of deciding what it is’.

Waterfall model



Waterfall model with feedback





Activities in interactive systems design.

Our view - The Star Method

- Requirements - finding out what people need from the system
- Evaluation - checking that you've got it right
- Conceptual design - creating the overall idea for the new system
- Physical design - filling in the details of what the new system will be like and how it will work
- Prototyping and Envisionment - bringing ideas to life

Star Method - Key features

- **Evaluation is central** to designing interactive systems. Everything gets evaluated at every step of the process
- **The process can start at any point** – sometimes there is a conceptual design in place, sometimes we start with a prototype, sometimes we start with requirements
- **The activities can happen in any order**, for example, requirements might be evaluated and a prototype built and evaluated and some aspect of a physical design might then be identified

Challenge

- Think of decorating your house, flat or bedroom.
- When could you start with requirements, conceptual design a physical design or a prototype/envisionment
- What processes would you go through after you start?

Re-decorating your flat

- Start with **requirements** - e.g. I need a space to work in. I want to get rid of some clutter. I want the room to be lighter, fresher, cleaner...
- Start with **conceptual design** - need to create an area for working in; need to build a cupboard to store things in; paint the walls a lighter colour.
- Start with a **physical design** - we could put a partition up in the corner of the bedroom; that cupboard I saw in Ikea could be used to store things in my flat; I am going to paint the walls 'apple-white'
- Start with **envisionment** - look at this person's flat in this magazine with a neat working area; here's a sketch of my ideas for a cupboard; you know the colour of Rod's bedroom...
- Then **evaluate** - that partition would be too expensive, that cupboard would get in the way; that colour would get dirty very quickly...

Requirements

- Requirements are concerned with...
 - what the system has to do, what it has to be like, how it has to fit in with other things.
- There are both functional and non-functional requirements to consider.
- **Functional requirements** are concerned with what the system should be able to do and with the functional constraints of a system.
- **Non-functional requirements** are concerned with the wide range of other issues such as cost, aesthetics, organizational issues and so on.

Requirements

- Requirements are *generated* by the designer through discussions, interviews, workshops, etc.
- Requirements generation is about understanding what people do now and what they want to do
- Be as open and as unconstrained as possible during requirements generation
- Think of the whole human-computer system, not just the technology
- Consider the constraints, but be as independent of current practice as possible

Requirements - summary

- Aim is to gather stories from the people who will be using the new system about their activities, the technologies they use and the contexts in which they do things
- From these to develop conceptual *scenarios of use*
 - *Scenarios — or stories about people undertaking activities in contexts using technologies — are used throughout the design process*
- Use a variety of methods to generate requirements

Requirements – summary (continued)

- Techniques include interviews, questionnaires, focus groups, observation, cultural probes
- There are both functional (what will it do) and non-functional requirements.

Conceptual Design

- Designing the system in the abstract.
- What is the overall purpose of the design?
- What information and what functions are needed for the system to achieve its purpose?
- What will someone have to know to use the system?
- It is about finding a clear conceptual model
 - So that people will develop a clear mental model
- Conceptual designs can be represented in many ways
- One good way of envisioning the design is as a ‘rich picture’

Rich Pictures

- Represents the relationships between the conceptual objects and people in a domain
- Focus on the key activities or transformations (T) of the system
- Focus on the context, or environment (E)
- Focus on the 'world view' (W) from which the system is described
- Focus on the people - the actors (A), owners (O) and customers (C)

Table 1. Elements of an Effective Rich Picture

Element	Comment
1. Include <i>structure</i>	Include only enough structure to allow you to record the process and concerns. The latter requires that all the people who will use or could conceivably be affected by the introduction of the new system be included.
2. Include <i>process</i>	Do not attempt to record all the intricacies of process; a broad brush approach is usually all that is needed
3. Include <i>concerns</i>	Caricature the concern in a thought bubble (see Figures 1–3 for examples). A fuller explanation may be provided in a supplementary document
4. Use the language of the people depicted in it	This will make the rich picture comprehensible to your informants
5. Use any pictorial or textual device that suits your purpose	There is no correct way of drawing a rich picture. There are as many styles as analysts and the same analyst will find different styles useful in different situations

Figure 2 Rich Picture of Web Design Consultancy

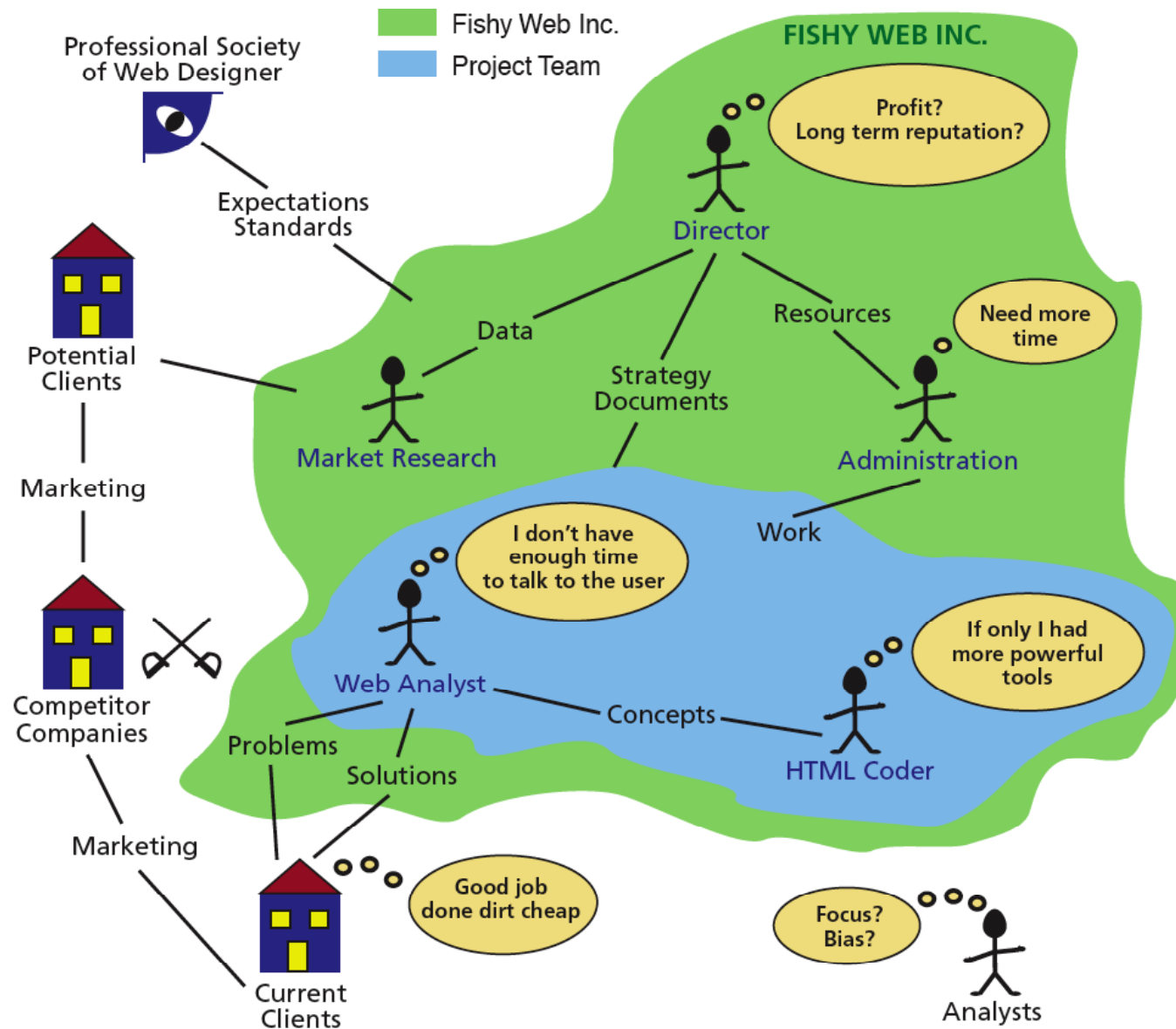
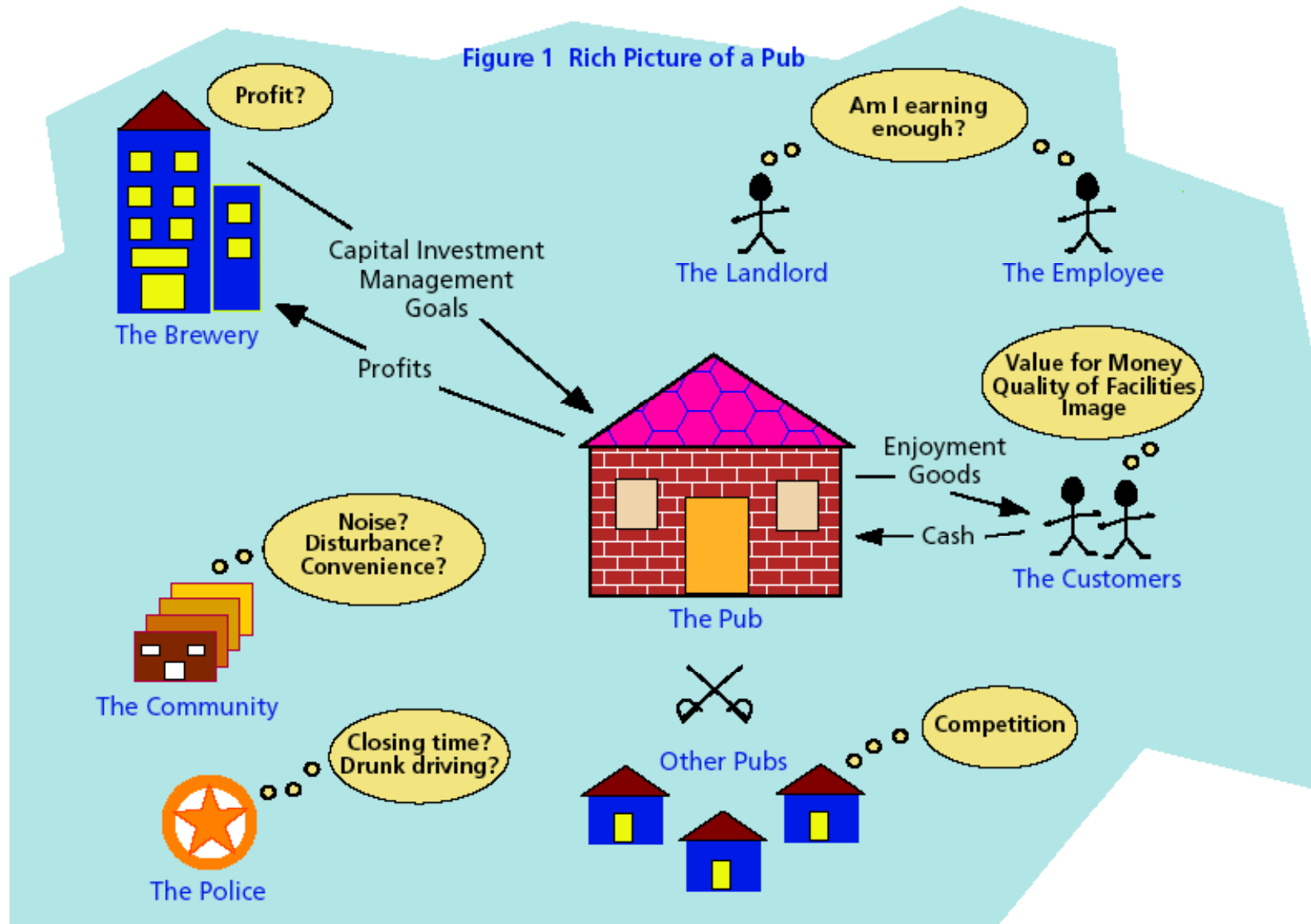


Figure 1 Rich Picture of a Pub



Physical design

- Is concerned with how things are going to work
- With detailing the look and feel of the product
- Is about structuring interactions into logical sequences
- Is about clarifying and presenting the **allocation of functions** and knowledge between people and devices.
- There are three components to physical design; operational design, representational design and design of interactions.

Operational design

- is concerned with specifying how everything works and how content is structured and stored.
- means focusing on processes and on the movement, or flow, of things through a system.
- *Events* are occurrences that cause, or trigger, some other functions to be undertaken.
 - Sometimes these arise from outside the system
 - Sometimes they arise from inside the system as a result of doing something else

Operational design (continued)

- For example, an e-mail arrives, or a person walks up to the enquiry desk are events coming from outside. Clicking on an icon might launch some application - an event arising from inside the system.

Representational design

- is concerned with fixing on colours, shapes, sizes and information layout.
- Style concerns the overall 'look and feel' of the system.
 - Does it appear old and 'clunky' or is slick, smooth and modern?
 - What mood and feelings does the design engender?
- E.g. change from Windows 98 or 2000 to Windows XP



Microsoft default colours.

Interaction design

- is concerned with the allocation of functions to human or to technology
- with the structuring and sequencing of the interactions.
- Allocation of function has a significant impact on the usability of the system.
- E.g. the activity of making a phone call.
 - Certain functions are necessary; indicate a desire to make a phone call, connect to the network, enter the phone number, make connection.
 - How they have been allocated between people and technology has changed over the years

Challenge

- Look at your mobile phone - or look at your neighbour's if you do not have one.
- Discuss the operational aspects of the device - how do you navigate, select functions? What buttons are there?
- Discuss the representational aspects of the design. What icons are there? What are the colours like? How is the overall look of the device?
- Discuss the interaction design of making a call using the phone book. Look at the allocation of function between person and the phone. Could it have been done differently?



A series 200 telephone.



A 3G multi-media videophone with Blue Tooth wireless technology.

Phone design

- Operational aspects
 - E.g. where are the different functions located? Does it all seem sensible and logical? Do the buttons always mean the same? Do you ever make mistakes using it?
- Representational aspects
 - Did you look at things like how bright the display is? Or how clear the screen is. Are the icons understandable? Do you know where the cursor is?

Phone design (continued)

- Interactional aspects
 - Is the address book in alphabetical order? Or most recent call order? Which is better? As you type a name, does it jump to that part of the phone book? What button presses are required to phone a person in the phone book? Is it a sensible sequence?

Prototyping and Envisionment

- Is concerned with finding appropriate media in which to render design ideas.
- Designs need to be visualized
 - to help designers clarify their own ideas
 - to enable people to evaluate them.
- The medium needs to be appropriate for
 - the stage of the process,
 - the audience,
 - the resources available and the questions that the prototype is helping to answer.

Prototyping and Envisionment (continued)

- There are many techniques ... any way in which abstract ideas can be brought to life... e.g. Flash, Powerpoint, sketches, mood boards, photos

Evaluation

- Prototyping and Envisionment are closely linked with evaluation
- The nature of the representation used will affect what can be evaluated.
- The evaluation criteria will also depend on who is able to use the representation.

Evaluation (continued)

- Evaluation is central and any of the other design activities will be followed by an evaluation.
 - E.g. the designer checking through to make sure something is complete and correct
 - a high level design brief that is sent to a client,
 - a formal evaluation of a functional prototype by the future system users
- Compare a prototype in Flash - good for demonstrating ideas to others - and a sketch on a piece of paper - good for exploring ideas

Evaluation techniques 1

- **Model-based** - Evaluator can work through the model - e.g. counting the number of actions needed, or checking for consistency
- **Expert-based** - People experienced in interface design are asked to take the role of less experienced users and describe the potential problems they foresee arising for such users.
- **Observational evaluation** involves watching people and collecting data that provides information about what users do when they interact with a system.

Evaluation techniques 1 (continued)

- **Co-operative evaluation** is when the expert observes and helps. People are encouraged to 'think aloud' about the problems they are having.

Evaluation techniques 2

- Survey evaluation
 - Using similar methods to requirements - interviews, questionnaires, etc. - but the focus is on seeing if you have got it right.

Evaluation techniques 2 (continued)

- Experimental evaluation
 - May be performed in a usability laboratory, so that an evaluator can manipulate a number of factors associated with interface design and study their effects on various aspects of user performance.
 - May be set up in a computer laboratory with little interruption from evaluator where people undertake benchmark tests

PACT analysis - Lab access example

People

- Students, lecturers and technicians are the main groups. These are all well educated and understand things such as swipe cards, passwords and so on. People in wheelchairs need to be considered as do other design issues such as colour blindness. There may be language differences. Both visitors and frequent users need to be considered. However, there are other stakeholders who do need access to rooms such as cleaning staff and security personnel. What are the motivations of management to control access in the first place?

PACT analysis - Lab access example

Activities

- The overall purpose of the activity is to enter some form of security clearance and to open the door. This is a very well-defined activity that takes place in one step. It happens very frequently with peaks at the start of each laboratory session. The data to be entered is a simple numeric or alpha-numeric code. It is an activity that does not require cooperation with others (though may be done with others of course). It is not safety-critical, though security is an important aspect.

PACT analysis - Lab access example

Contexts

- Physically the activity takes place indoors, but people might be carrying books and other things that makes doing anything complicated quite difficult. Socially it may happen in a crowd, but also may happen late at night when no-one else is about. Organisationally, the context is primarily about security and who has access to which rooms and when they can gain access. This is likely to be quite a politically charged setting.

PACT analysis - Lab access example

Technologies

- A small amount of data has to be entered quickly. It must be obvious how to do this to accommodate visitors and people unfamiliar with the system. It needs to be accessible by people in wheel chairs. The output from the technology needs to be clear; that the security data has been accepted or not and the door has to be opened if the process was successful. Communication with a central database may be necessary to validate any data input, but there is little other content in the application.

Doing design - Lab access example

- Here's an example to illustrate the iterative nature of design;
 - We use R for requirements, C for conceptual design, P for prototyping/envisionment, D for physical design, E for evaluation
- We have done a PACT analysis which resulted from an initial brief from the University (R). There were discussions between the University and our designers (R).
- Some requirements have been written down (P) and discussed further (E).
- Points of clarification have been further discussed (R).

Doing design 2

- This has resulted in 3 possible designs (C).
 - Each user of the lab could have a swipe card
 - Each user could have a secret code entered through a keypad
 - Iris recognition or fingerprint recognition could be used
- These conceptual designs can now be evaluated (E) with colleagues
- As a result some technical constraints and opportunities are identified (R).

Doing design 2 (continued)

- There is not much opportunity for physical design (P) here as most technology will be bought in
- But it would be wise to test a system (P) to see if it works under time pressure (E).

Implementation - So far we have only been talking about design. But there are other things to be done before the whole project is finished...

- Databases have to be designed and populated and programs have to be validated.
- The whole system needs to be checked to ensure that it meets the requirements
- The system can be formally 'launched' and signed off as finished.
- All this can account for a significant portion of total development costs

Implementation ... (continued)

- In interactive system design there are a variety of formal, semi-formal and informal methods of specification, but no standard methods.
- Scenarios are good ways of specifying functions

Summary

- The process of design is highly iterative
- Designers move rapidly between
 - Requirements, conceptual design, physical design, evaluation, prototyping and envisionment
- Evaluation is central to the process.
- Distinguishing conceptual and physical design is very important to ensure a good allocation of function between people and technologies
- Prototyping and envisioning ideas is crucial to understanding requirements and design ideas