

Human Computer Interaction HCI

Lecture 2: PACT

A Framework for Designing Interactive
Systems

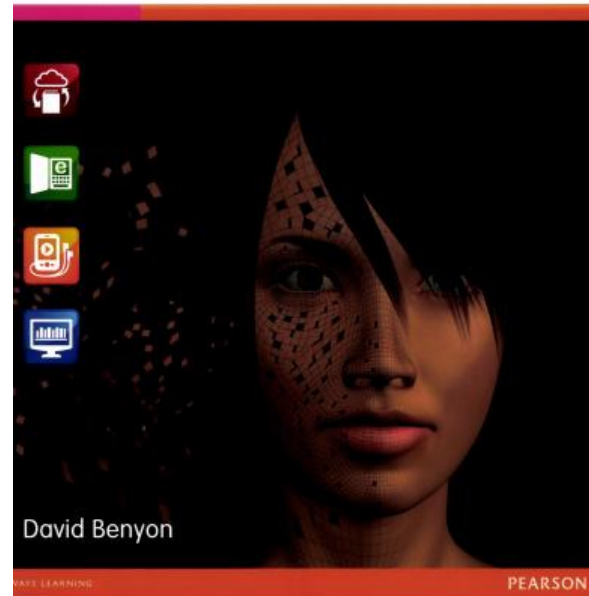


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THIRD EDITION

Designing Interactive Systems

A comprehensive guide to HCI, UX and interaction design



Chapter 2

PACT:

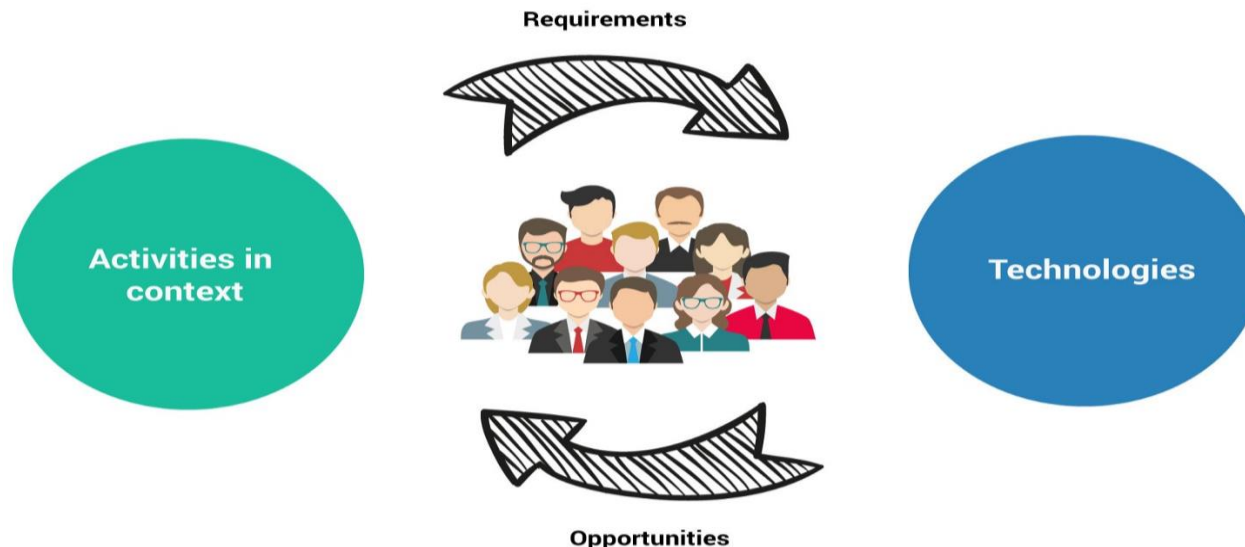
A Framework for Designing Interactive Systems

overview

- An essential part of our approach to designing interactive systems is that **it should put people first**; it should **be human-centred**.
- We use the acronym PACT (**People, Activities, Contexts, Technologies**) as a useful framework for thinking about a design situation.
- Designers need to understand the people who will use their systems and products.
- They need to understand the activities that people want to undertake and the contexts in which those activities take place.
- Designers also need to know about the features of interactive technologies and how to approach designing interactive systems.

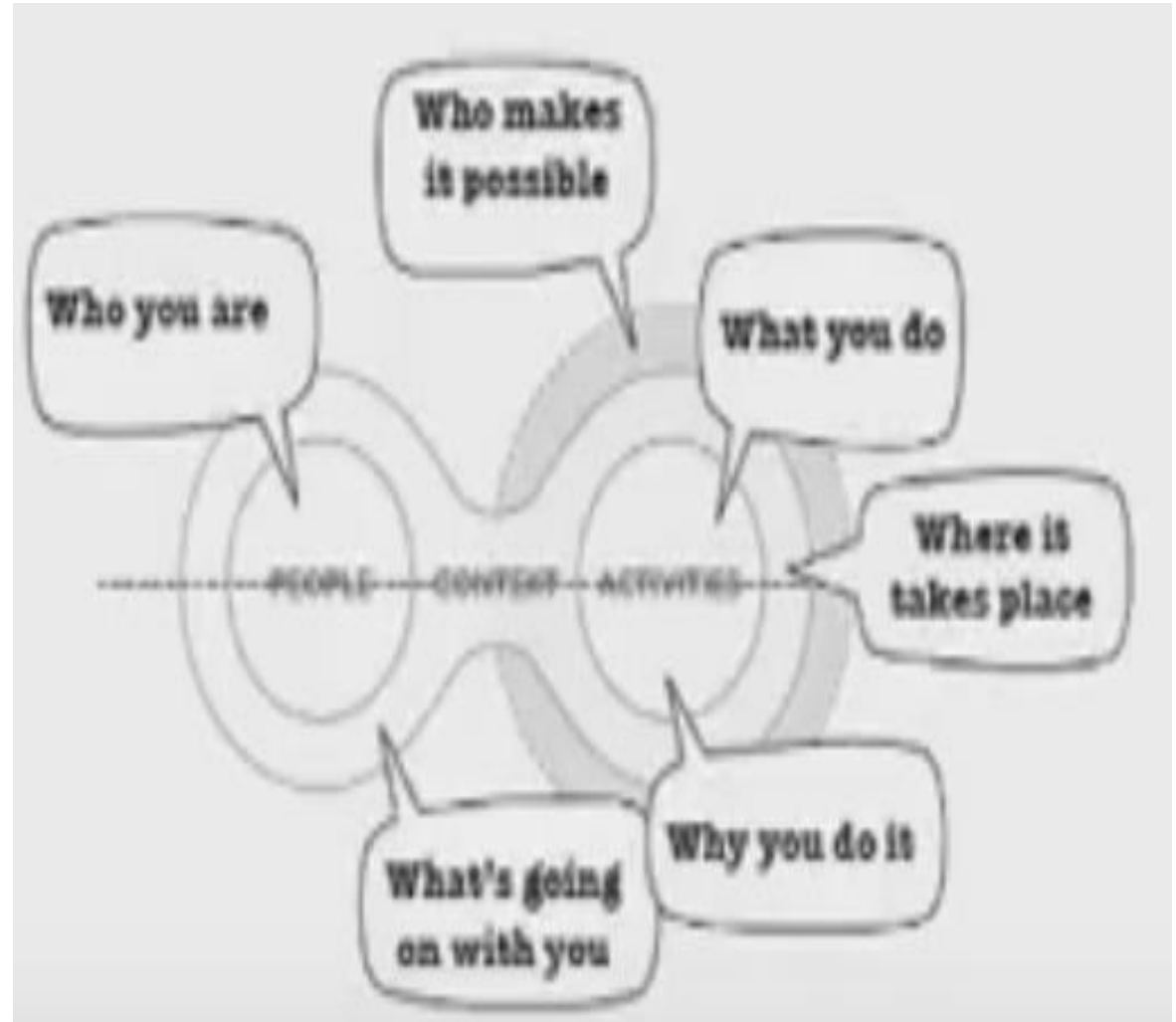
Activity and technology Cycle

- Activities (and the contexts within which they take place) establish requirements for technologies that in turn offer opportunities that change the nature of activities.
- And so the cycle continues as the changed activity results in new requirements for technologies and so on.
- Designers need to keep this cycle in mind as they attempt to understand and design for some domain. (The word 'domain' here means an area of study, a 'sphere of activity'.)



PACT

- People
- Activity
- context
- Technology



People

1. Physical differences

People differ in **physical characteristics** such as height and weight. Variability in the **five senses** – sight, hearing, touch, smell and taste has a huge effect on how accessible, how usable and how enjoyable using a technology will be for people in different contexts.

2. Psychological differences

Different way of working, different memory abilities, different amount of attention of different time, ability to recognize things or remember things or different 'mental model'

3. Social Differences (Usage difference)

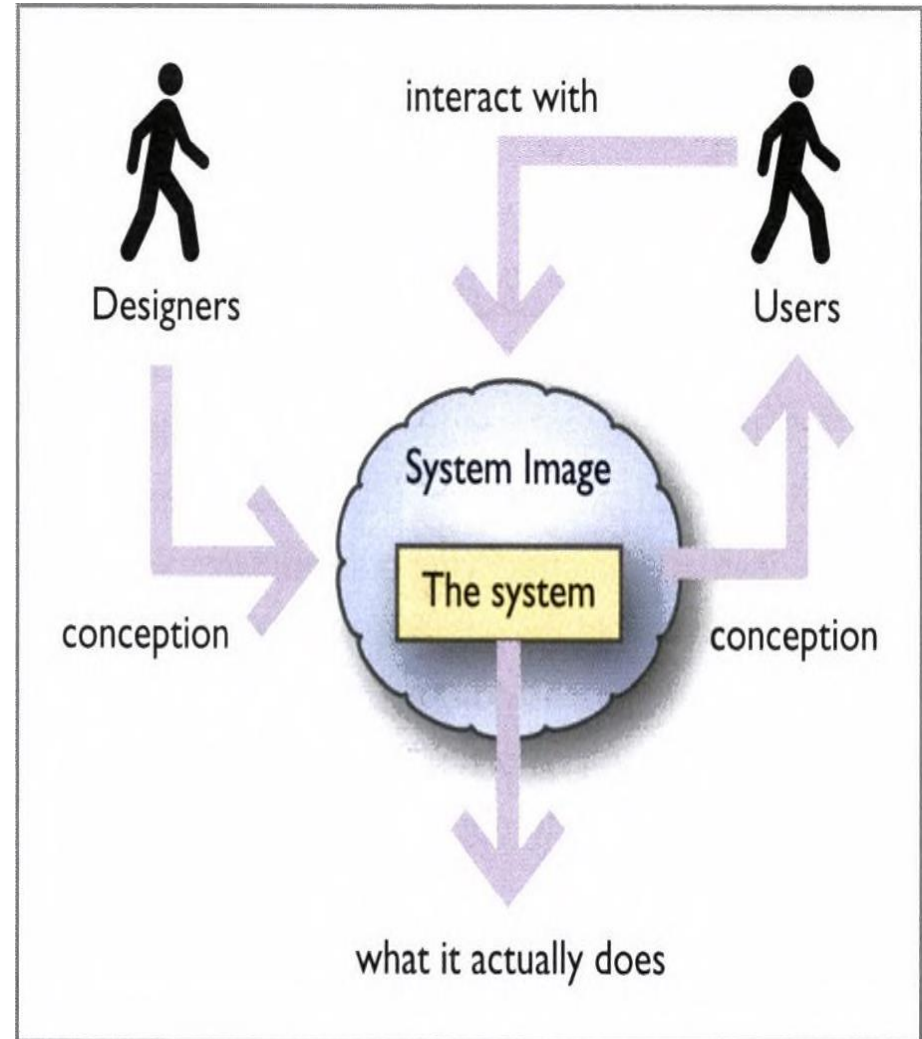
beginner and experts, difference in designing for a heterogeneous group or a homogenous group and designers would like to use to use the system (discretionary users)

Psychological differences (**Mental models**)

- ◉ Also, Known as conceptual model
- ◉ Mental model describe the way in which we think about things – about how we conceptualize things
- ◉ A Key aspect of the design of the technologies is to provide people with clear model, .. So that they well develop a clear mental model
- ◉ "... but of course it depend on what they know already, their background, experience etc.

Developing a mental model

- People develop mental models through interacting with systems
- observing the relationship between their actions and the behaviours of the system
- reading any manuals or other forms of explanation that come with a system.
- So, it is important that designers provide sufficient information in the interface (and any accompanying documentation) for people to form an accurate mental model.



The mental model problem.

- Designers have some conception of the system they have produced.
- This may or may not be the same as what the system actually does.
- Moreover in a system of any large size, no single designer will know everything that the system does.
- Designers design a system's image that they hope will reveal the designer's conception.
- The problem is that it is only through the system image – the interface, the behaviors of the system and any documentation – that the designer's conception can be revealed.
- People interact with the system image and from this have to derive their conception (their 'mental model') of what the system is and what it does.
- A clear, logical and consistent conceptual design will be easier to communicate to people who use the system and hence they will develop a clearer conception of the system themselves.

Activity

- ◉ There are many characteristics of activities that designers need to consider.
- ◉ The term is used for very simple tasks as well as highly complex, lengthy activities, so designers need to be careful when considering the characteristics of activities.
- ◉ First and foremost, the designer should focus on the overall purpose of the activity.
- ◉ After that the main features are:
 - Temporal aspects
 - Cooperation
 - Complexity
 - Safety-critical
 - The nature of the content

Temporal aspects of activities

- ◉ Temporal aspects **covers how regular or infrequent** activities are.
- ◉ Something that is undertaken every day can have a very different design from something that happens only once a year.
- ◉ People will soon learn how to make calls using a mobile phone, but may have great difficulties when it comes to changing the battery.
- ◉ Designers should ensure that frequent tasks , but they also need to ensure that infrequent tasks are easy to learn (or remember) how to do.
- ◉ Other important features of activities include time pressures, peaks and troughs of working. A design that works well when things are quiet can be awful when things are busy.

More temporal aspects

- ◉ Some activities will take place as a single, continuous set of actions whereas others are more likely to be interrupted.
- ◉ If people are interrupted when undertaking some activity, the design needs to ensure that they can 'find their place' again and pick up.
- ◉ It is important then to ensure that people do not make mistakes or leave important steps out of some activity.
- ◉ The response time needed from the system must be considered.
- ◉ Response time for the system
 - ◉ 100 milliseconds for hand-eye coordination activities
 - ◉ one second for a cause-effect relationship. Anything
 - ◉ more than 5 seconds and they will feel frustrated and confused).

Cooperative or complex activities

- ◉ Another important feature of activities is whether they can be carried out alone or whether they are essentially concerned with working with others.
- ◉ Issues of awareness of others and communication and coordination then become important.
- ◉ Well-defined tasks need different designs from more vague tasks.
- ◉ If a task or activity is well defined it can be accomplished with a simple step-by-step design.
- ◉ A vague activity means that people have to be able to browse around, see different types of information, move from one thing to another and so on.

Safety-critical activities

- ◉ Some activities are 'safety-critical', in which any mistake could result in an injury or a serious accident. Others are less so.
- ◉ Clearly where safety is involved designers must pay every attention to ensuring mistakes do not have a serious effect.
- ◉ In general it is vital for designers to think about what happens when people make mistakes and errors and to design for such circumstances.

Data and media requirements

- It is also important to consider the data requirements of the activity.
- If **large amounts of alphabetic data** have to be input as part of the activity (recording names and addresses, perhaps, or word processing documents) then a keyboard is almost certainly needed.
- In other activities there may be a need to display **video or high quality colour graphic displays**.
- Some activities, however, require very **modest amounts of data**, or data that does not change frequently and can make use of other technologies.
- A library, for example, just needs to scan in a bar code or two, so the technology can be designed to exploit this feature of the activity.
- Just as important as data is the media that an activity requires.
- A simple two-tone display of numeric data demands a very different design from a full motion multimedia display.

Contexts

- ◉ Activities always happen in a context, so there is a need to analyze the two together.
- ◉ Three useful types of context are distinguishable:
 - ◉ the organizational context,
 - ◉ the social context
 - ◉ the physical environment.
- ◉ Sometimes it is useful to see context as surrounding an activity.
- ◉ At other times it can be seen as the features that merge some activities together into a coherent whole.

Example

- ◉ For an activity such as '**withdraw cash from an ATM**'.
- ◉ Physical environment would include things such as the location of the device (often as a 'hole-in-the-wall'), the effect of sunshine on the readability of the display, and security considerations.
- ◉ Social considerations would include the time spent on a transaction or the need to queue.
- ◉ The organizational context for this activity would take into consideration the impact on the bank's ways of working and its relationships with its customers.

Technologies

- ◉ The final part of the PACT framework is the technologies; the medium that interactive system designers work with.
- ◉ Interactive systems typically consist of **hardware and software components** that communicate with one another and transform some input data into some output data.
- ◉ Interactive systems can perform various functions and typically contain a good deal of data, or information content.
- ◉ People using such systems engage in interactions and physically devices have various degrees of style and aesthetics.
- ◉ Designers need to be aware of various possibilities for **input, output, communication and content.**

Input / Output

	types
Input	Mouse ,keyboard ,light pen ,touch screen ,Air pressure sensors, acoustic sensors, vibration detectors, infrared motion detectors, <u>accelerometers</u> are all readily available for designers to detect specific aspects of an interaction. Speech
Output	the screen or monitor,printer,.....etc

Communication

- ⦿ Communications between people and between devices is an important part of designing interactive systems.
- ⦿ Here issues such as bandwidth and speed are critical.
- ⦿ So too is feedback to people so that they know what is going on and indeed that something is going on! In some domains the transmission and storage of large amounts of data becomes a key feature.
- ⦿ Communication can take place through wired connections or wireless

Scoping a problem with PACT

- ◉ The aim of human-centred interactive systems design is to arrive at the best combination of the PACT elements with respect to a particular domain.
- ◉ Designers want to get the right mix of technologies to support the activities being undertaken by people in different contexts.
- ◉ A PACT analysis is useful for both analysis and design activities: understanding the current situation, seeing where possible improvements can be made or imagine future situations.

Scoping a problem with PACT

- ◉ To do a PACT analysis the designer simply scopes out the variety of Ps, As, Cs and Ts that are possible, or likely, in a domain.
- ◉ This can be done using brainstorming and other imagine techniques and by working with people through observations, interviews and workshops.
There are
- ◉ The designer should look for trade-offs between combinations of PACT and think about how these might affect design.

People, activities, contexts, technologies

- **For people**, designers need to think about the physical, psychological and social differences and how those differences change in different circumstances and over time.
- It is most important that designers consider all the various stakeholders in a project.
- **For activities** they need to think about the complexity of the activity (focused or vague, simple or difficult, few steps or many), the temporal features (frequency, continuous or interruptible), cooperative features and the nature of the data.
- **For contexts** they think about the physical, social and organizational setting
- **For technologies** they concentrate on input, output, communication and content.

People	Activity	context	technology
physical	Main tasks	<ul style="list-style-type: none">the organizational context,the social contextthe physical environment.	input, output, communication and content
psychological	<ul style="list-style-type: none">Temporal aspectsCooperationComplexitySafety-critical		
social			

Example

We have been asked by a university department to consider developing a system controlling access to their laboratories.

PACT 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 visitors need to be considered.
- ◉ However, there are other stakeholders who need access to rooms, such as cleaning staff and security personnel.

PACT 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.
- ◉ It is not safety-critical, though security is an important aspect.

PACT 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 it may happen late at night when no-one else is about.
- ◉ Organizationally, 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 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 wheelchairs.
- 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.

So is my PACT is correct

- ⦿ there is no answer for the clues you choose unless you have some primitive user feedback
- ⦿ any idea must have either direct references or some related work
- ⦿ Some people need to appear your idea to request your idea(market need motivation)

For academic work search in <http://portal.acm.org>,
For Market need conduct Surveys.

Market need Surveys

Survey can assist your clue about your problems in different Aspects

- You can highlight main domain your app target
- You can focus on some groups of users
- You can answer questions vague or has no clear references in your mind
- It will solve a lot of issues and argues, debates between you and your team members

PACT Project Example

A group of students decided to make a system with Augmented reality.

- They are puzzled in which domain to select, they have some ideas like
 - Child Education
 - University Labs
 - Chemistry
 - Electronics
 - Health care
 - ...etc

Survey bad Questions

Q1) An augmented reality app to be developed which domain you prefer ?

- **What is wrong here ?**



- Q2) AR will be used in Chemistry LABS which age is suitable

- 10
- 15-20

- **What is wrong here ?**



- Q3) Do you like to have AR application on mobile Yes / NO

- **What is wrong here ?**



Survey Questions

1. You must ask about the demographics of the candidate (age, Gender, Specialty, Computer aware or not..etc.)
2. Never ask direct questions
3. Always rely on Multiple choices to your answer.
4. Do not be biased towards some opinion
5. Always illustrate the keywords and your idea in simple language
6. Put some question to measure if the user is well understanding your technology or not.

Example

How do you rate the dangerous of doing chemical experiments in school

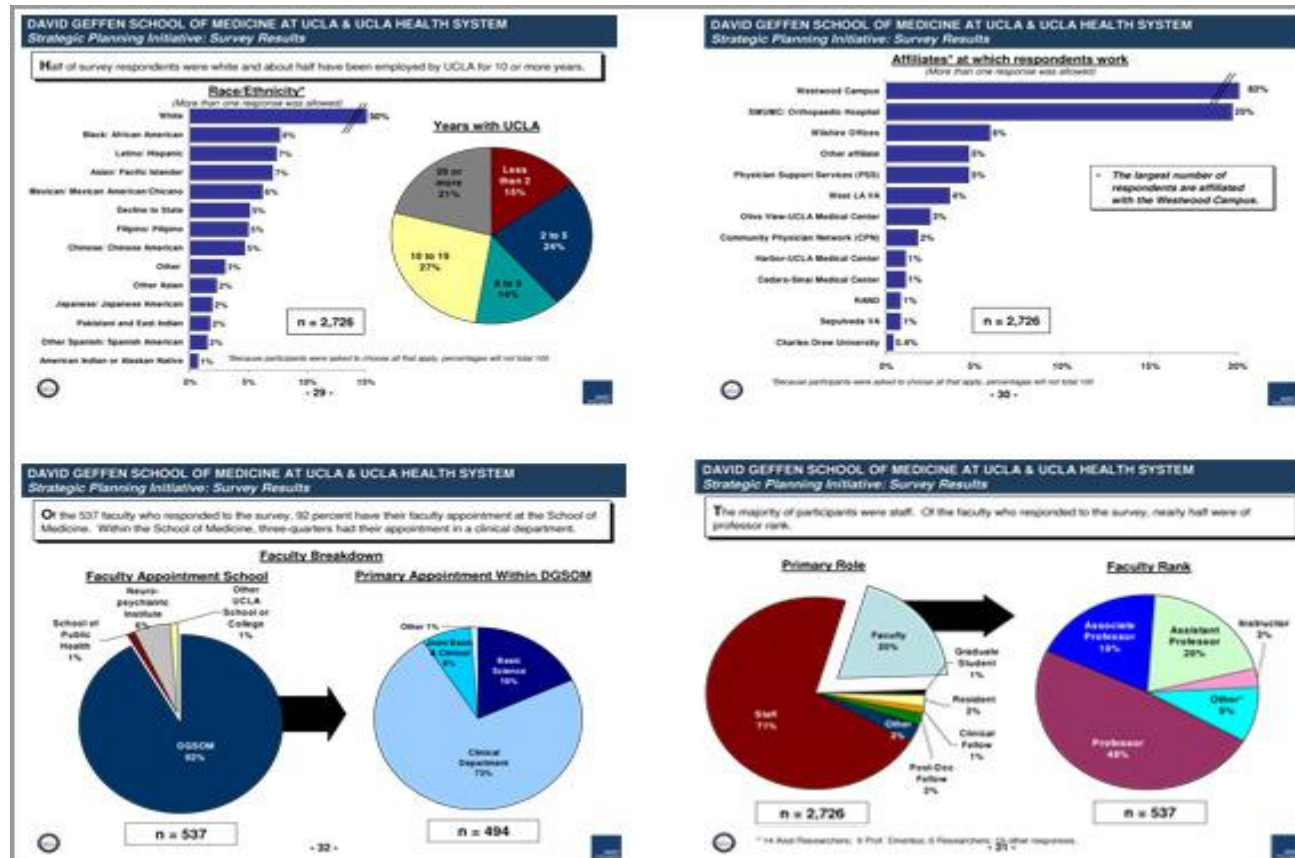
Weak



Strong

Results

Use graphs as much as possible



Presentation 1

Choose any interactive system and build a PACT analysis for it

Each group consist of (3 students)

Required

- **Presentation**
 - Introduction to the interactive system
 - PACT analysis for the interactive system



All groups should be ready within a week