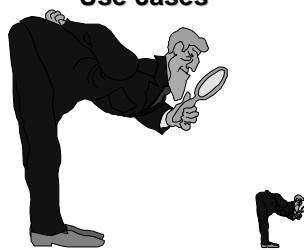# VII. Information Acquisition

What is Information Acquisition?
Sampling and Investigating Hard Data
Stakeholders and Interviewing
Types of Information Acquisition
Sampling Hard Data and Using Questionnaires
Observing Behavior and Interpersonal skills
Joint Application Development (JAD)
Social Methods and Social Issues
Use cases

Information Acquisition

- "Information acquisition" refers to the task of capturing all sorts of relevant information about how things are currently done, including:
   - ✓ Information flow
   - ✓ Business processes
   - ✓ Data that is used in these processes
   - ✓ External and internal data
   - ✓ Exception handling
   - ✓ Problems with current situation, including existing systems
   - ✓ Desirable and undesirable scenaria
- This is one of the most crucial, and hardest, tasks in the development of a software system.
- **Ignorance hiding**: One of the basic traits of a good systems analyst is the ability to hide her ignorance, or more precisely, to find her way around in a new problem area quickly.
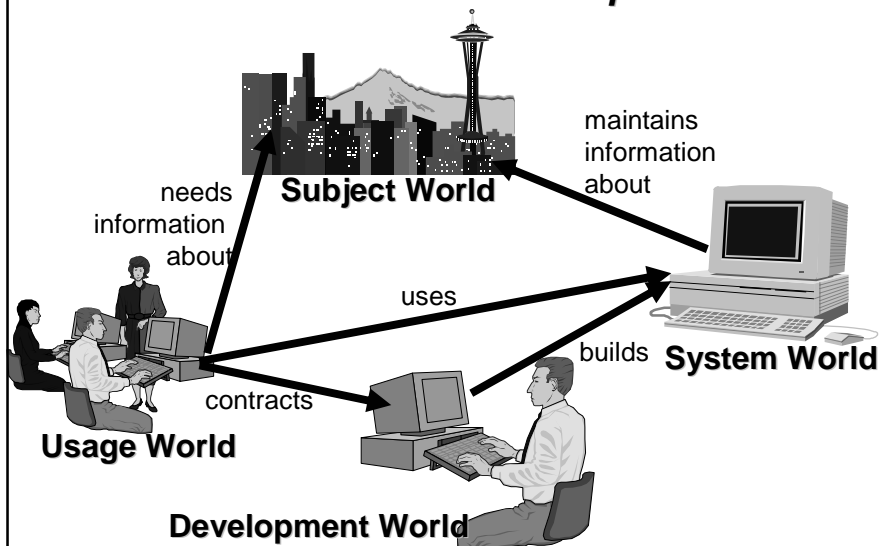
Information Acquisition

- The term "Information Acquisition" should not suggest that the information needed by the analyst is explicitly available somewhere (document, someone's head,...) and all the analyst has to do is find the source and fetch it (by reading or asking)

  This is often wrong

- The information needed may have to be extracted through analysis, interpretation and synthesis from a variety of sources

- For example, consider a loan approval department where the analyst wants to find out the rule(s) for loan approval; these may not exist anywhere (in company documents or people's heads) and may even have contradictory manifestations within the same department

- The say-do problem: people know how to do many things they normally don't describe (tacit knowledge); descriptions of such things may be highly inaccurate

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What Information to Acquire?

Subject World

needs information about

maintains information about

uses

Usage World

contracts

builds **System World**

Development World

What Information To Acquire? The Four Worlds

- Subject World -- describes the subject matter of the information system; e.g., customers, accounts, transactions for a bank information system
- Usage World -- describes the environment within which the planned system will operate; e.g., agents who play a role in the usage world, such as managers, clerks, customers; also business processes such as handling a withdrawal, a deposit of foreign currency,...
- System World -- describes what the system does within its operational environment, what information it contains and what functions it performs; e.g., system records all transactions in a database, reports on transactions for a particular account, gives account balance,...
- Development World -- describes the development process, team, schedule, required qualities (security, performance,…) etc.; e.g., system must be delivered within 12 months, level 3 software processes to be used during its development, must handle up to 1000 transactions per second,...

Scenaria

- One useful form of information to gather involves desirable or undesirable sequences of events.
- For example, for a hospital admission system, you may ask:

  "Suppose I'm admitted into the hospital; what happens during my admission?"
- The answer may be like

  "You, or the person accompanying you, talk to the person at the admissions desk; you have to show your OHIP (sanitary) card and explain who referred you to the hospital; then…"
- Some scenaria describe undesirable sequences of events, such as

  "You won't be admitted if you don't produce your OHIP card".
- Out of scenaria, one can build the general business processes used by the organization being studied, also use cases for the system-to-be.

Stakeholders (Actors)

Who are the people who must be consulted during information acquisition? These are the stakeholders, all those who have a say of some sort on the new system. Stakeholders include:

- **Users** - who are concerned about the features and the functionality of the new system
- **Designers** - who want to build a perfect system, or reuse existing code
- **Systems analysts** - who want to "get the requirements right"
- **Training and user support staff** - who want to make sure the new system is usable and manageable
- **Business analysts** - want to make sure "we are doing better than the competition"
- **Technical authors** - who will prepare user manuals and other documentation for the new system
- **The project manager** - who wants to complete the project on time, within budget and with all objectives met.

Information Acquisition Techniques

1. Sampling hard data -- forms, applications,...

2. Background reading -- reports, memos, etc.

3. Interviewing -- meeting with people and asking questions.

4. Questionnaires -- distribute a questionnaire to relevant people, collect their responses and analyze them.

5. Observation -- spending some time observing the organizational setting where the new system will be deployed.

Hard Data

- Facts and figures, financial information, organizational contexts, document types, problems,....
- Reports used for decision making -- such as status of inventory, sales, production,...
- Performance reports -- usually take the form of actual vs expected; second derivatives are important (if there is a gap, is it widening or narrowing)
- Records -- keep track of what's happening, important to keep them up to date

Data capture forms are very important!
Collect them, study them before changing them!!!

Hard Data: An Example

☐ Mr. ☐ Ms. ☐ Mrs. ☐ Miss ☐ Dr.

Name:_____

Address:_____

City_____ **Prov**_____ **Postal Code**_____

Phone No. H (**)** _____ **B(**   **)**_____

I am interested in:

___ **receiving United Way Newsletter**
___ **receiving information on United Way community fund**
___ **including United Way in my will**

Another Example: Agate

Agate
Campaign Summary

Date	23rd February 1999
Client	Yellow Partridge Park Road Workshops Park Road Jewellery Quarter Birmingham B2 3DT U.K.
Campaign	Spring Collection 1999
Billing Currency	GB £

Item	Curr	Amount	Rate	Billing amount
Advert preparation: photography, artwork, layout etc.	GB £	15,000.00	1	15,000.00
Placement French Vogue	FFr.	47 000,00	11.35	4,140.97
Placement UK Vogue	GB £	5,000.00	1	5,000.00
Placement US Vogue	US $	15,000.00	2.47	6.072.87
Total				30,213.84

This is not a VAT Invoice. A detailed VAT Invoice will be provided separately.

210-212 Carstairs Street, Birmingham B1 5TG
Tel.0121-111-1234 Fax.0121-111-1245
Email.agate@agateltd.co.uk

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Sampling and Investigating Hard Data

What information does the systems analyst pay attention too in understanding an organization?

- **Sampling** is the process of systematically selecting representative elements of a population
- Sampling is useful because it minimizes costs during data gathering
- Designing a good sample
  - ✓ Determine the data to be described -- e.g., banking transactions
  - ✓ Determine the population to be sampled -- e.g., transactions in five local branches for one week
  - ✓ Choose type of sampling -- convenience, purposive, random
  - ✓ Decide on the sample size -- consider every 10th transaction

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Sampling and Investigating Hard Data

- **Type of sampling** is very important in determining how representative a sample is.
- **Purposive sampling** amounts to choosing population elements the analyst considers important, with no regard to statistical or other issues, e.g., choose a particular group of bank customers and look at the transactions they generate.
- **Random sampling** can be **simple** (choose every k-th element of the population) **stratified** (identify strata, sample each one) or **clustered** (choose representative sub-population, sample it)
- **Sample size** decision depends on the cost involved in collecting the samples and the required confidence; standard statistical techniques can be used to calculate the required sample size given the required confidence.

Advantages and Disadvantages

- Can be used to gather quantitative data, such as average number of lines on an invoice.
  - + Can be used to find out about error rates in paper documents
  - - If the system is going to change dramatically, existing documents may not reflect how it will be in the future.
- Appropriate situations:
  - ✓ Almost always appropriate.
  - ✓ Paper-based documents give a good idea of what is happening in the current system
  - ✓ Provide supporting evidence for the information gathered from interviews or observation
  - ✓ The statistical approach is appropriate where large volume of date are being processed and particularly where error rates are high and a reduction in errors is required.

Background Reading

- Suitable sources of information: company reports, organization charts, policy manuals, job descriptions, reports, documentation of existing systems, etc.
- Advantages:
    - ✓ Helps the analyst to get an understanding of the organization before meeting the people who work there.
    - ✓ Allows the analyst to prepare for other types of fact finding, for example , by being aware of the business objectives of the organization.
    - ✓ Documentation on the existing system may provide formally defined information requirements for the current system.
- Obvious disadvantage: written documents often do not match up to reality.
- Appropriate situations: for projects where the analyst is not familiar with the organization being investigated.

Interviewing

- Used to acquire information from stakeholders -- managers, users, domain experts,...
- Interviews have to be planned ahead of time -- what questions to ask?...what information to look for in answers?...
- Interviewing a skill that has to be mastered -- often people can't articulate their perceptions or their needs
- Interviewing intended to acquire hard facts but also opinions, feelings, goals and informal procedures

Conducting the Interview: Five Easy Steps

■ Begin the interview with an innocuous topic, e.g., the weather, the score in last night's hockey game, an object on the person's desk. Sets people at ease, e.g.,

  "My,... what a beautiful photograph! Did you take that?"

■ Ask if you can record the interview, but put tape recorder in front of person and say that they can turn it off any time.

■ Ask easy questions first - perhaps personal information, e.g.,

  "How long have you worked in your present position?"

■ Follow up interesting leads, things people say that indicate that your plan of action may be wrong, e.g.,

  "Could we pursue what you just said a little further?"

■ Ask open-ended questions last, e.g.,

  "Is there anything else you would like to add?"

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Advantages and Appropriate Situations

Advantages in using interviews:

■ Personal contact allows the analyst to be responsive and adapt to what the user says.

■ The analyst can probe in greater depth about the person´s work than can be achieved with other methods.

■ If the interviewee has nothing to say, the interview can be terminated.

Disadvantages:

■ Time-consuming and can be the costly form of fact gathering.

■ Interview results require the analyst to work on them after the interview: the transcription of tape recordings or writing up notes.

■ Interviews can be subject to bias if the interviewer has a closed mind about the problem.

■ If different interviewees provide conflicting information, it can be difficult to resolve later.

Appropriate Situations: Interviews are appropriate in most projects. They can provide information in depth about the existing system and about people´s requirements from a new system.

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Using Questionnaires

- Kinds of information sought: attitudes, beliefs, behaviour, characteristics -- kinds of information not normally found in hard data or through interviews
- Avoid open-ended questions because answers to such questions are difficult to correlate and interpret
- Questionnaire should be short, otherwise people may be reluctant to participate
- Answers to questions may be scaled; designing scales is hard, has to be done carefully
- Administer the questionnaire using simple rules, follow your rules to the letter

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Types of Questions to Use

YES/NO Questions

Do you print reports from the existing system?   YES   NO   10

(Please ring the appropriate answer.)

Multiple Choice Questions

How many new clients do you obtain in a year?   a) 1–10 ☐   11

(Please tick one box only.)   b) 11–20 ☐

c) 21–30 ☐

d) 31 + ☐

Scaled Questions

How satisfied are you with the response time of the stock update?

(Please ring one option.)

1. Very   2. Satisfied   3. Dissatisfied   4. Very   12
   satisfied   dissatisfied

Open-ended Questions

What additional reports would you require from the system?

_____

_____

_____

Advantages and Disadvantages

■ Questionnaires constitute an economical way of gathering data from a large number of people.

+ If the questionnaire is well designed, then the results can be analyzed easily, possibly by computer.

- Good questionnaires are difficult to construct.

- There is no automatic mechanism for follow up or probing more deeply, although it is possible to follow up with an interview by telephone or in person if necessary.

- Postal questionnaires suffer from low response rates.

■ Appropriate situations:

✓ Most useful when dealing with a large number of people or when the people are geographically dispersed.

✓ Appropriate for systems which will be used by the general public, and the analyst needs to get a picture of the types of user and usage that the system will need to handle.

Information Gathering Through Observation

■ Sometimes observation is the best way to understand how things are done.

■ Like other information elicitation techniques, observation has to be planned.

■ Planning involves deciding who is to be observed, also on what events to sample.

■ Observation should take into account not only what is said, what is exchanged and what happens but also less tangible things, such as body language of participants, physical surroundings,...

Interpersonal Skills: Some Dos and Don'ts

- Be aware of your audience and its background -- during a systems analysis and design project you'll be dealing with fellow systems analysts, managers, end-users, domain experts,...

- Use of words: turn-ons and turn-offs -- don't use buzzwords, acronyms to impress your listener!

- Choose the medium of communication depending on what it is you want to communicate -- face-to-face, document (e.g., memo, letter), phone, e-mail each have their own channel capacity.

- Be careful about body language -- people's feelings towards you depend often as much on your tone of voice, facial and body expressions, dress etc, as they do on what you are saying

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Interpersonal Skills: Meetings

- Determine meeting objectives -- presentation, problem solving, conflict resolution, progress analysis, gathering and merging of facts, training, planning,...
- Schedule the meeting and arrange for facilities
- Prepare agenda -- and distribute it well in advance
- Conduct the meeting -- may want to impose structure or leave it unstructured depending on objective; keep track of time, agenda
- Follow up on the meeting with a written summary to be distributed to meeting participants
- Special rules apply for formal presentations (and how to prepare them), project walkthroughs, brainstorming,...

Planning Information Acquisition

Objective	Technique	Subject(s)	Time commitment
To get background on the company and the advertising industry.	Background reading	Company reports, trade journals.	0.5 day
To establish business objectives. Agree likely scope of new system. Check out involvement of non-UK offices.	Interview	Two directors	2 x 1 hour each
To gain understanding of roles of each department. Check out line management and team structure in the Creative department. To agree likely interviewees among staff.	Interview	Department heads (only 1 account manager)	2 x 1 hour each
To find out how the core business operates.	Interview	1 account manager 1 graphic designer 1 copy writer 1 editor	1.5 hours each

To follow up development of business understanding.	Observation	2 creative staff	0.5 day each
To determine role of support/admin staff and relationship to core business.	Interview	2 admin staff (based on experience with the company)	1.5 hours each
To establish what records and resources are kept.	Interview/ document sampling	Filing clerk Resource librarian	2 x 1 hour each
To determine what use is made of current computer system. To determine functionality of current system.	Interview	Computer manager	2 x 1 hour
To establish additional requirements for new system.	Interview	2 account managers 3 staff from Creative Department	3 x 1 hour each
To establish accounting requirements for new system.	Interview	Accountant Credit controller 1 purchasing assistant 1 accounts clerk	1.5 hours each

Joint Application Development (JAD)

- Also known as **Joint Application Design** [August91]
- Originally developed by IBM, sponsored by IBM, James Martin and other user groups.
- Was first used successfully in Canada by IBM.
- Has evolved over four different stages and has influenced heavily requirements engineering, also systems analysis and design.

JAD Principles

Method founded on the following principles:
- Group Dynamics -- one-to-one or group interview formats replaced with workshop settings
- Visual Aids -- it is difficult for a group to communicate about requirements and designs; JAD adopts a number of visualization media, ranging from wall charts to large monitors or graphical interfaces.
- Organized, Rational Process -- JAD adopts a variety of techniques, including brainstorming and top-down analysis ones, to structure the elicitation and analysis process
- Documentation Approach -- each JAD session results in a document which is easy to understand and is created and agreed upon during the session

JAD Plan

- A JAD plan initiates a JAD project and has four objectives: (i) Identify system requirements, (ii) Define and bound the system scope, (iii) Plan the JAD design activity (iv) Publish and obtain approval of the JAD plan
- Meetings should be planned for up to 15 participants, including:
  - ✓ Session leader (facilitator) -- sets the stage and directs a session; manages group dynamics; excellent interpersonal skills needed.
  - ✓ Analyst -- responsible for all session documents; analyst also contributes heavily to the discussion; usually someone with systems analysis background
  - ✓ Executive sponsor -- someone who controls the funding and staffing for the project, i.e., represents upper level management; imparts strategic insights and makes high level commitments.
  - ✓ User representative -- she is the main focus of JAD; along with others, examines organizational needs and proposes requirements.
  - ✓ Information system representative -- assists in use of existing resources, offers IT expertise
  - ✓ Specialist -- provides expertise on a defined limited topic.

Notes on JAD Workshops

- Choose workshop participants carefully -- they should be the best people possible representing the roles listed earlier
- Session leader must turn group of participants into a team; this takes 1-2 days
- Workshop should last 3-5 days
- Session leader must keep track of agenda, make sure each step has been completed thoroughly
- When there are differences of opinion, session leader should step in, put these up as "open issues"
- Meeting room should be well-equipped for presentations, recording etc.

Ethnomethodology

- This is a subarea of anthropology. Its basic goal is to identify cultural norms.
- A basic objective of ethnomethodology is to look for behaviours that may be different in a specific culture but which have the same underlying purpose or meaning
- For example, one can look for the ways people go about gaining status in different cultures:
    - Frenchmen brag about sexual conquests to gain status
    - Americans brag about money to gain status

    Each of these topics is taboo in the other culture

- The major difference between ethnomethodology and other subareas of anthropology and sociology is its adherence to a very tightly controlled set of methods.

Ethnomethodological Techniques

- Ethnomethodologists use the following techniques
    Conversational analysis
    Measurement of body system functions - e.g., heartbeat
    Non-verbal behaviour studies
    Detailed video analysis
- These techniques have proven to be useful in capturing information for the design of information systems
- In addition, several other observation technique from sociology and anthropology are often applied
    Time-motion study - who is where, when
    Communication audit - who talks to whom about what
    Use of tools - status symbols plus sharing rules

Why Ethnomethodology?

- The application of ethnomethodology -- or its more common cousin ethnography -- can also bring about useful understandings of what the goals of the people using the underlying information system really are.
- This is because
- Social order (including the concepts shared by a group of people engaged in a collective activity) is accomplished on a moment-to-moment basis, through participants' actions rather than through pre-existing categories that shape people's actions
- For example, the concept of "lecture" is shaped by actions of relevant people (e.g., booking a room, having a speaker, advertising,...) rather than any pre-defined concept

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Ethnomethodology

- If we study a lecture using ethnomethodology techniques, we soon discover an entire series of cultural details about a lecture that should affect how an information system is designed to run a lecture hall.
- Things an ethnomethdologist might observe about a lecture
  - ✓ People sit in the same seat lecture after lecture
  - ✓ People sitting close to the front ask more questions
  - ✓ People sitting close to the back use more aggressive language...
  - ✓ People sitting close to the front take more notes
- Important concepts:
  - ✓ To understand social order, conduct observation in a natural setting, , not one constructed by the systems analyst..
  - ✓ Member categories: Find the categories members themselves use to order the social world, rather than impose those of the analyst.
  - ✓ Member methods: Use the same methods members use during observation, for example, by developing a legitimate role within the community under observation.

Use Cases Diagrams

- Textual descriptions of the functionality of the system from user's perspective
- Used to show the functionality that the system will provide and which users will communicate with the systems in some way when it provides that functionality
- Developed by I. Jacobson et al
- Part of UML

Actors

- Anything that needs to exchange information with the system
- Anything that is external to the system
- Define roles that users can play

Actors

- An actor is someone or some thing that must interact with the system under development

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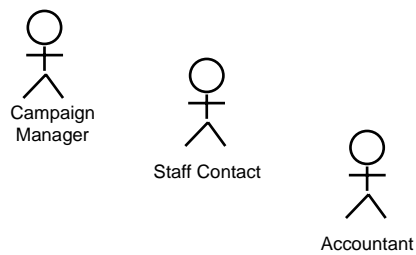
Use Cases

- A use case is a pattern of behavior the system exhibits
  - ✓ Each use case is a sequence of related transactions performed by an actor and the system in a dialogue

Use Cases

■ Actors are examined to determine their needs
- ✓ Campaign Manager -- add a new client
- ✓ Staff Contact -- Change a client contact
- ✓ Accountant -- Record client payment

Add new client   Change a client contact   Record client payment

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Use Case Diagram

■ Use case diagrams are created to visualize the relationships between actors and use cases

Change a client contact

Staff contact

Campaign Manager

Add a new client

Record client payment

Accountant

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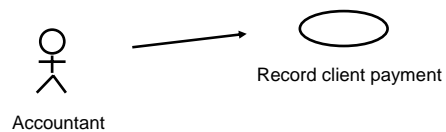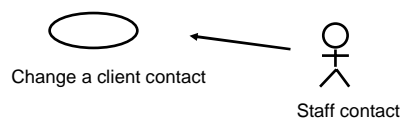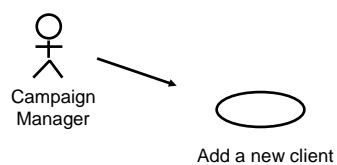
Use Cases

- Purpose
  - ✓ To produce a set of diagrams which summarize the functions which the users expect to find in the system.
  - ✓ To document the scope of the system and the developer's understanding of what it is that users require.
  - ✓ The textual user case descriptions provides a description of the interaction between the users of the system, termed actors, and the high level functions within the system the Use Cases.
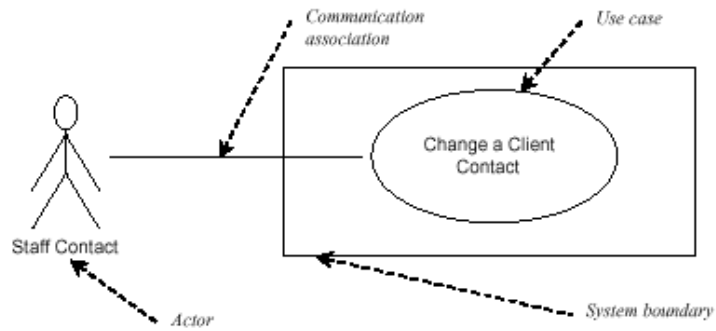- Description
  - ✓ Can be in summary form or in a more detailed form in which the interaction between actor and use case is described in a step-by-step way.
  - ✓ Describes interactions as the user sees it, and it is not a definition of the internal processes within the systems or some kind of program specification.

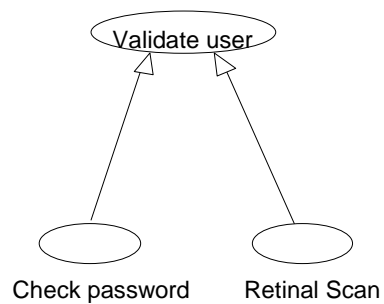# Agate Case Study
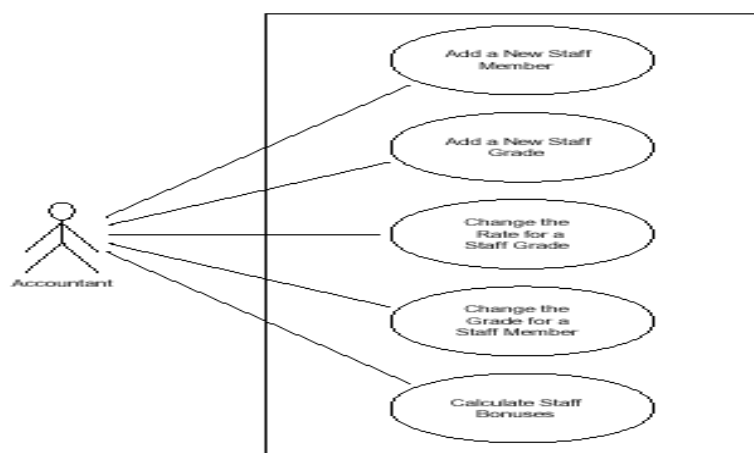
Agate Case Study

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Use Cases relationships

- **<<Generalization>>**: A relationship between a general use case and a more specific use case that inherits and adds features to it.

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Use Cases relationships

- **<<Include>>:** The insertion of additional behavior into a base use case that explicitly describes the insertion.
  - ✓ Used to avoid describing the same flow of events several times, by putting the common behavior in a use case of its own.

- ***<<Extend >>:*** The insertion of additional behavior into a base use case that does not know about it.
  - ✓ To model a part of a use case the user may see as optional system behavior.
  - ✓ To model a separate subflow that is executed only under given conditions.

Inclusion and Extension

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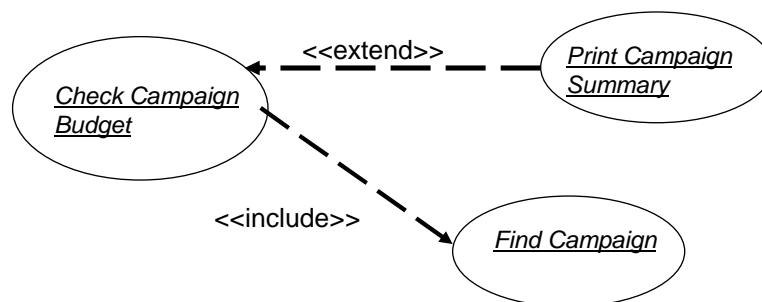
Finding Use Cases

■ Ask following questions for each actor

- ✓ Which functions does the actor require from the system? What does the actor need to do ?
- ✓ Does the actor need to read, create, destroy, modify, or store some kinds of information in the system ?
- ✓ Does the actor have to be notified about events in the system? or does the actor need to notify the system about something ? What do those events represent in terms of functionality ?
- ✓ Could the actor's daily work be simplified or made more efficient through new functions in the system?

Finding Actors

■ Can be identified by following questions:

- ✓ Who will use the main functionality of the system(primary actors)?
- ✓ Who will need support from the system to do their daily tasks?
- ✓ Who will need to maintain, administrate, keep the system working(secondary actors)?
- ✓ Which hardware devices does the system need to handle?
- ✓ With which other systems does the system need to interact?
- ✓ Who or what has an interest in the results that the system produce ?

■ Tips

- ✓ don't only consider the users who directly use the system, but all others who need service from the system

Finding Use Cases

- Without considering current actors
  - ✓ What input/output does the system need ? Where does this input/output come from or to go?
  - ✓ What are the major problem with the current implementation of this system?

Documenting Use Cases

- A flow of events document is created for each use cases
  - ✓ Written from an actor point of view

- Details what the system must provide to the actor when the use case is executed

- Typical contents
  - ✓ How the use case starts and ends
  - ✓ Normal flow of events
  - ✓ Alternate flow of events
  - ✓ Exceptional flow of events

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