

Requirements

- Three Categories
 - Requirements Capture
 - Requirements Analysis
 - Refining the Requirements Modelling

Requirements Capture

- Introduction
 - The aim of developing a new system is to
 - find out from users what they require in the new system
 - meets the user need's
- How ?
 - You must
 - Have a clear understanding both of the overall objectives of the business and of what it is that individual users of the system are trying to achieve in their jobs
 - Avoid the defects exist in the current system

Question

- Do you think that detailed understanding of the current system is necessary ?
 - should an understanding of the current system be part of the requirements analysis process of the new system?
- Should we consider what so called legacy systems ?
 - legacy systems
 - Old, valuable systems must be maintained and updated

Answer

- Two cases
 - Yourdon (1989) argues that it is a waste of time to model the current system in great detail (i.e. concentrate on the behaviour that is required of the new system)
 - The opposite position taken by **SSADM** (Structured System Analysis and Design Method) which expends considerable time on the investigation and modelling of the current system

SSADM Consideration

- Investigating and modelling the current system in order to
 - refine it to its logical essence
 - Be able to merge it with the new requirements to produce a model of the required system that includes the essentials of the existing system

SSADM Benefits

- Some of the functionality of the existing system will be required in the new system
- Some of the data in the existing system is of value and must be transferred to the new system
- The existing system may have defects which we should avoid in the new system
- Studying the existing system will help us to understand the organization in general

SSADM Benefits (Cont.)

- We are seeking to understand how people do their jobs at present in order to characterize people who will be users of the new system.
- We may need to gather baseline information against which we can set and measure performance targets for the new system.
- Parts of the existing system may be retained. More often there will be existing systems with which interfaces must be established.
- Technical documentation of existing computer systems may provide details of processing algorithms that will be needed in the new system

Remark

- From the previous SSADM Benefits an understanding of the current system should be part of the analysis process
- However, the analyst should not lose sight of the objective of developing a new system requirements

New System Requirements

- Three Categories
 - **Functional Requirements**
 - Describe what a system does or is expected to do, often referred to as its **functionality**
 - **Non-functional Requirements**
 - **Usability Requirements**
 - Are those that will enable us to ensure that there is a good match between the system that is developed and both the users of that system and the tasks that they will undertake when using it

Building Usability into the System

- The following types of information need to be gathered to build usability into the system:
 - Characteristics of the users who will use the system
 - The tasks which the users undertake, including the goals which they are trying to achieve
 - Situational factors which describe the situations which could arise during system use

Usability in terms of **ISO** Points of View

- The International Standards Organization (**ISO**) has defined the usability of the product as:-
 - **The degree to which specific users can achieve specific goals within a particular environment; effectively, efficiently, comfortably and in an acceptable manner**
- **Note**
 - Usability can be specified in terms of measurable objectives
(Human-Computer Interaction)

Non-functional Requirements

- Constraints on the system
- Are those which describe aspects of the system that are concerned with how well it provides the functional requirements. These includes:-
 - Performance criteria such as desired Performance criteria such as desired response times for updating data in the system or retrieving data from the system.
 - Anticipated volumes of data, either in terms of throughput or of what must be stored.
 - Security considerations

Functional Requirements

- **Functional Requirements include:-**
 - Descriptions of the processing which the system will be required to carry out
 - Details of the inputs into the system from paper forms and documents, from interactions between people, such as telephone calls, and from other systems
 - Details of the outputs that are expected from the system in the form of printed documents and reports, screen displays and transfers to other systems
 - Details of data that must be held in the system

Requirements

- Requirements is an ongoing problem area in the (IS)
- It can be defined to be everything that the set of relevant stakeholders want from a system
- Relevant stakeholders include both internal and external to the organization such as users, line management, senior management , etc.
- It is reported that the costs of fixing errors at the requirement stage are around 80-100 times less if an error is discovered at the implementation stage

Requirements (Cont.)

- Two Types:
 - Functional requirements
 - Usually expressed as set of functions or behaviors the system should be able to do
 - Non-functional requirements (NFR)
 - Referred to the set of constraints or qualities of the system
 - It is related to system performance, interfaces, designs and software quality attributes
- Ex:-
 - If the functional requirements are all met and the transactions are correctly implemented but the printing (order processing) is very slow, then the users of the system might be dissatisfied even though the functions are performed perfectly
- Note: The above example for (NFR) is related to system performance issue

(NFR) Categories

Russell (2004): the importance of NFR and operational requirements, IBM developer Works suggests the following categories for (NFR):-

- Categories#1 which are:
 - Observable
 - Easy to collect
 - Potentially measurable which make them easier to test categories
- Categories#2 which are:
 - Non-observable
 - More difficult to gather and test

(NFR) Categories#1

- Performance
 - The responsiveness of the system (e.g. response time)
- Security
 - The capability of securing the system unauthorized use
- Availability
 - The proportion of time the system is available for use
- Reliability
 - The ability to perform the functionality consistently and recover from failure as necessary
- Capacity
 - The capability of the system to handle the resources, volume, etc. and required growth
- Usability
 - The ease of use of the system commensurate with the user's abilities

(NFR) Categories#2

- Maintainability
 - The ease with which the system can be changed
- Portability
 - The ease with which the system can be ported to alternative operating environment
- Integrity
 - The ability of the system to preserve transactions accurately and persistently
- Scalability
 - The ease with which the system can handle increased volumes
- Manageability
 - The ease with which the system can be managed and organized during its operation
- Safety
 - The capability of the system to not harm users or others
- Efficiency
 - The assessment of how well the system utilizes resources

Why are NFR's difficult to discover?

- People don't tend to think in terms of NFR and they are usually thought to be characteristics that the developers or technical people deal with
- They are difficult to evaluate
- They compete with the gathering of functional requirements and so usually come off second best
- Relatively few tools, techniques and methods that are related to NFR compared with functional requirements

Remark

- NFR are amongst the most difficult and most expensive to correct if they are not identified early
- Despite the previous difficulty mentioned for NFR it is usually recommended that NFRs are gathered together with the functional requirements at an early stage in the development process

How to differentiate between NFR and Functional Requirements?

- It is often suggested that anything that is phrased in noun-verb form is a functional requirement
 - E.g. : the system prints the transaction, or
 - The customer credit rating is checked
- NFRs are expressed with adverbs or adverbial modifying clauses
 - E.g. : the system prints the transaction quickly, or
 - The system check the credit rating securely

How to Investigate the Requirements?

- **Five** fact-finding Techniques that are used to investigate requirements
 - Background reading
 - Interviewing
 - Observation
 - Document Sampling
 - Questionnaires
- Note
 - These techniques sometimes referred to as **SQIRO** — Sampling, Questionnaires, Interviewing, Reading (or Research) and Observation

Remark

- We will study SQUIRO TECHNIQUES in terms of the following:-
 - Information gained from its use
 - Advantages and Disadvantages
 - Situations in which it is appropriate to use

Background Reading

- The kind of documents that are suitable sources of information include: company reports, organization charts, policy manuals, job descriptions, reports and documentation of existing systems
- **Advantages**
 - Helps the analyst to get an understanding of the organization before meeting the people who working there
 - Allows the analyst to prepare for other types of fact finding (e.g. being aware of the business objectives of the organization)
 - Documentation on the existing system may provide formally defined information requirements for the current system
- **Disadvantages**
 - Written documents often do not match up to reality; they may be out of date or they may reflect the official policy on matters that are dealt with differently in practice

Background Reading (Appropriate Situations)

- Background reading is appropriate for projects
 - Where the analyst is not familiar with the organization being investigated
 - It is useful in the initial stages of investigation

Interviewing

- Interviewing is probably the most widely used fact finding technique. A systems analysis interview is a structured meeting between the analyst and an interviewee who is usually a member of staff of the organization being investigated
- **Advantages**
 - Interviews produce high quality information
 - 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**
 - Interviews are time-consuming
 - Interview results require the analyst to work on them after the interview (writing up of notes)
 - If different interviewees provide conflicting information, it can be difficult to resolve later

Interviewing (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

Observation

- Watching people doing their work naturally can provide the analyst with a better understanding of the job than interviews
- Observation also allows the analyst to see what information people use to carry out their job
observation can allow the analyst to follow the entire process through from start to finish.
- Observation can be an open-ended process that is to observe what happens and note it down, or it can be a closed process in which the analyst wishes to observe specific aspects of the job and draws up an observation schedule or form on which to record data.

Observation

- **Advantages**
 - Observation provides first-hand experience of the way that the current system operates
 - Data are collected in real time
 - Observation used to verify information from other sources or to look for exceptions to the standard procedure
 - Baseline data about the performance of the existing system and of users can be collected

Observation

- **Disadvantages**

- Most people don't like being observed and are likely to behave differently from the way in which they would normally behave, consequently affect the validity
- Observation requires a trained and skilled observer for it to be most effective
- There may also be ethical problems if the person being observed deals with sensitive private or personal data (e.g. doctor's surgery)

Observation

(Appropriate Situations)

- Observation is essential for gathering quantitative data about people's jobs
- Observation may be the best way to follow items through the process from start to finish

Document Sampling

- Document sampling can be used in two different ways:
 1. the analyst will collect copies of **blank and completed documents** during the course of interviews and observation sessions. These will be used to determine the information that is used by people in their work, and the inputs to and outputs from processes which they carry out
 2. The analyst may carry out a **statistical analysis** of documents in order to find out about patterns of data. For example, many documents such as order forms contain a header section and a number of lines of detail

Document Sampling Example (Agate Case Study)

Agate Campaign Summary

Date 23rd February 2005

Client Yellow Partridge
Park Road Workshops
Jewellery Quarter
Birmingham B2 3DT
U.K.

Campaign Spring Collection 2005

**Billing
Currency** GBP £

Item	Curr	Amount	Rate	Billing amount
Advert preparation: photography, artwork, layout etc.	GBP £	15,000.00	1	15,000.00
Placement French Vogue	EUR €	6 500,00	1.47	4,421.77
Placement Portuguese Vogue	EUR €	5 500,00	1.47	3,741.50
Placement US Vogue	USD \$	17,000.00	1.77	9,604.52
Total				32,767.79

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

Document Sampling (Advantages and Disadvantages)

- **Advantages**

- Can be used to gather quantitative data, such as the average number of lines on an invoice
- Can be used to find out about error rates in paper documents

- **Disadvantages**

- If the system is going to change dramatically, existing documents may not reflect how it'll be in future

Document Sampling (Appropriate Situations)

- **The first type** of document sampling is almost always appropriate.
 - Paper-based documents give a good idea of what is happening in the current system. They also provide supporting evidence for the information gathered from interviews or observation.
- **The statistical approach** is appropriate in situations where large volumes of data are being processed

Questionnaires

- Questionnaires consist of a series of written questions. The questionnaire designer usually limits the range of replies that the respondent can make by giving them a choice of options

Questionnaires Types

- **YES/NO** questions only give the respondent two options
- If there are more options, the **multiple choice** type of question is often used when the answer is factual
- **Scaled questions** are used if the answer involves an element of subjectivity
- Some questions don't have a fixed number of responses, and must be left **open-ended** for the respondent to enter what they like

Example

YES/NO Questions

Do you print reports from the existing system?	YES	NO	10
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(Please ring the appropriate answer.)

Multiple Choice Questions

How many new clients do you obtain in a year?	a) 1–10	<input type="checkbox"/>	11
(Please tick one box only.)	b) 11–20	<input type="checkbox"/>	
	c) 21–30	<input type="checkbox"/>	
	d) 31 +	<input type="checkbox"/>	

Scaled Questions

How satisfied are you with the response time of the stock update?			
(Please ring one option.)			
1. Very satisfied	2. Satisfied	3. Dissatisfied	4. Very dissatisfied
			12

Open-ended Questions

What additional reports would you require from the system?

Questionnaires (Advantages and Disadvantages)

- **Advantages**

- An economical way of gathering data from a large number of people
- If it is well designed, then the results can be analyzed easily, possibly by computer

- **Disadvantages**

- 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

Questionnaires

(Appropriate Situations)

- Questionnaires are most useful when the views of a large number of people need to be obtained or when the people are geographically dispersed like in a company with many branches or offices around the country or the world
- Questionnaires are also appropriate for information systems that will be used by the general public, and where the analyst needs to get a picture of the types of user and usage that the system will need to handle

Remark

- One of the first tasks in fact-finding techniques previously discussed are to
 - draw up a plan that outlines what information is being sought,
 - which techniques will be used,
 - who is involved and how long the fact finding will take
- See the next Case Study Example

Case Study Example

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. 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

Case Study Example (Cont.)

Objective	Technique	Subject(s)	Time commitment
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. ((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

Documenting Requirements

- Information systems professionals need to record facts about the organization they are studying and its requirements. As soon as the analysts start gathering facts, they will need some means of documenting them. UML is used to produce models of the system from different perspectives and consists mainly of graphical language. However, there will also be other kinds of documents, not all of which fit into the UML framework.

Documenting Requirements (Cont.)

- System developer (analyst) need to record facts about the organization they are studying and its requirements
- (i.e. We need some means of documenting such requirements & facts and be able to store them in a way that enables us to retrieve them when required)
 - Paper-based documentation is not effective
- How to model and document the requirements ?
 - Using **UML** (e.g. Use Case diagram) to produce models of the system from different perspectives
 - **CASE** to draw the diagrammatic models

Self-test question

- Name the five fact-finding techniques and list one advantage and one disadvantage of each?
- Explain the difference between functional and non-functional requirements.
- Read the following description of requirements for some company and then identify which are functional, which are non-functional and which are usability requirements.
 - When operatives arrive at work, they will have to clock in. Their staff no., name and the date and time of arrival must be recorded. The information should be available immediately to the Production Control staff. If they were recorded as sick for the previous working day, then the system should notify Production Planning. It should not take more than 10 seconds for an individual to clock in. New staff should be able to learn the system easily. Ideally, it should be so obvious that they can use it straight away. There should be no more than one error in a hundred entries.