

**College of Humanities
Master of Financial
Technology-
FinTech**

**Business Analysis
FNT613**

Lecture 9

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ESTABLISHING THE REQUIREMENTS

9th lecture

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ESTABLISHING THE REQUIREMENTS

Week9
Chapter 10

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Learning objectives

1. Understand the diverse range of stakeholders involved in a project or decision and identify their needs and expectations.
2. Developing skills to gather comprehensive data and information about what the solution must accomplish.
3. Developing skills to analyze and prioritize the gathered requirements.
4. Ability to create clear and well-documented requirements.
5. Ability to ensure the validity and correctness of requirements.
6. Learn how to manage and adapt to changing requirements.
7. Developing effective communication skills for sharing requirements with team members and stakeholders.

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Chapter outline

1. Introduction
2. The Problems with Requirements.
3. A Framework for Requirement Engineering
4. Actors.
5. Requirements Election
6. Requirements Election Techniques.
7. Building the Requirements List
8. Requirements Analysis
9. Requirements Validation
10. Agile Approach to Requirements

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1.Introduction

Requirements, apparently regarded by business users as the uncomplicated area of a new systems development, are actually the most problematic aspect, and yet, the time allocated is often far less than for the other phases.

Requirements Engineering (RE) is the Information Systems (IS) industry's response to the problem of requirements for new systems not being met, or even not being offered clearly in the first place. However, without sufficient time to understand and define the requirements properly, the product that is delivered on time may not provide the solution that the business thought had been requested.

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Applying the process of requirements engineering should help to rectify these problems. As many organizations are adopting an Agile mode of software development, there are new pressures on the requirements phase, where an IT systems forms part of the solution. So although high-level requirements are required right from the start, the level of detail for those requirements evolves just in time. For example, at the beginning of a project, the requirements document may contain some high-level process models and a set of general business and technical requirements, supplemented by a use case diagram showing the scope of the proposed IT system.

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Once initial requirements have been prioritized, outline use case descriptions can be developed for the high-priority requirements and then more detailed requirements regarding the solution can be elaborated later during development. However, it will be important to produce a requirements document that has enough information to evaluate the package and ensure that there is sufficient 'fit' with the requirements.

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2. THE PROBLEMS WITH REQUIRMENTS The problems highlighted included:

- a large proportion of errors (over 80 per cent) are introduced at the requirements analysis stage;
- very few faults, (fewer than 10 per cent) are introduced at the development stage – developers are programming things right, but frequently not programming the right things;
- most of the project time is allocated to the development and testing phases of the project;
- less than 12 per cent of the project time is allocated to the requirements analysis phase;
- there is poor alignment of the developed system to business strategy and objectives; there is poor requirements management.

These findings are particularly significant because the cost of correcting errors in requirements increases dramatically if they are discovered as the work progresses further through the development lifecycle.

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the studies previously quoted identify requirements analysis as the most error-prone stage of the development lifecycle. Walia and Carver (2009) identified over 90 causes of requirements errors in a meta-study they carried out on 149 papers.

Typical problems with requirements that these causes have brought about include:

- lack of relevance to the objectives of the project;
- lack of clarity in the wording; ambiguity; duplication and overlap across requirements;
- conflicts between requirements; requirements expressed in such a way that it is difficult to assess whether or not they have been achieved;
- requirements that assume a solution, rather than stating what is to be delivered by the system;
- uncertainty amongst business users about what they need from the new system;
- inconsistent levels of detail;
- business users and analysts taking certain knowledge for granted and failing to ensure that there is a common understanding.

The first point often results from a lack of terms of reference for the project.

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Constraints –

- the budget, timescale and standards to which the project must adhere. Authority –
- the business authority for the project, thus ensuring that there is an ultimate arbiter to handle any conflicts between business users and their requirements.

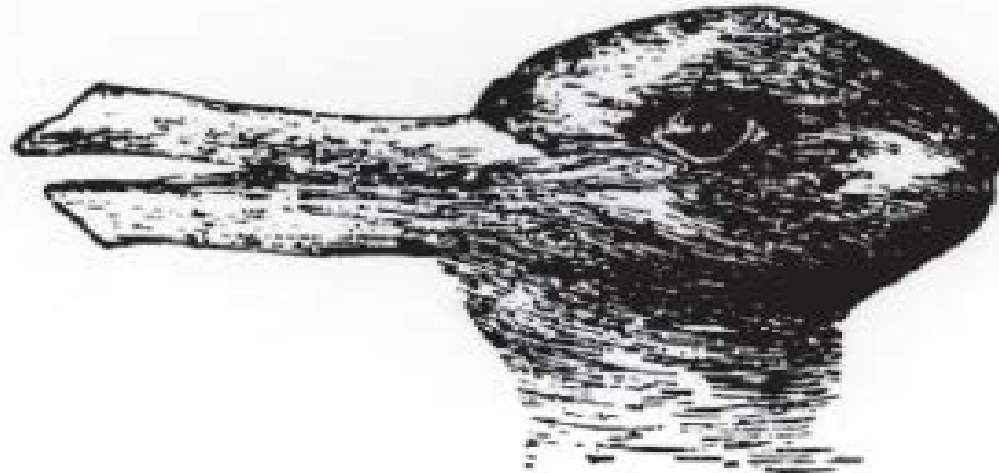
The business analyst is the person who must help the business staff to rigor precisely what they need the new system to perform, and then to articulate it. Another source of difficulties for the business analyst is recognizing the different stakeholder viewpoints.

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Recognizing the existence of a duckrabbit, or multiple world views, helps to anticipate scoping issues and potential requirements conflicts before they arise

Figure 10.1 The duckrabbit



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3. A FRAMEWORK FOR REQUIREMENTS ENGINEERING

In the same way that 'software engineering' suggests a more structured and scientific approach to the development of software than is implied by the older term 'programming', so requirements engineering encapsulates a more disciplined and rigorous approach to requirements definition.

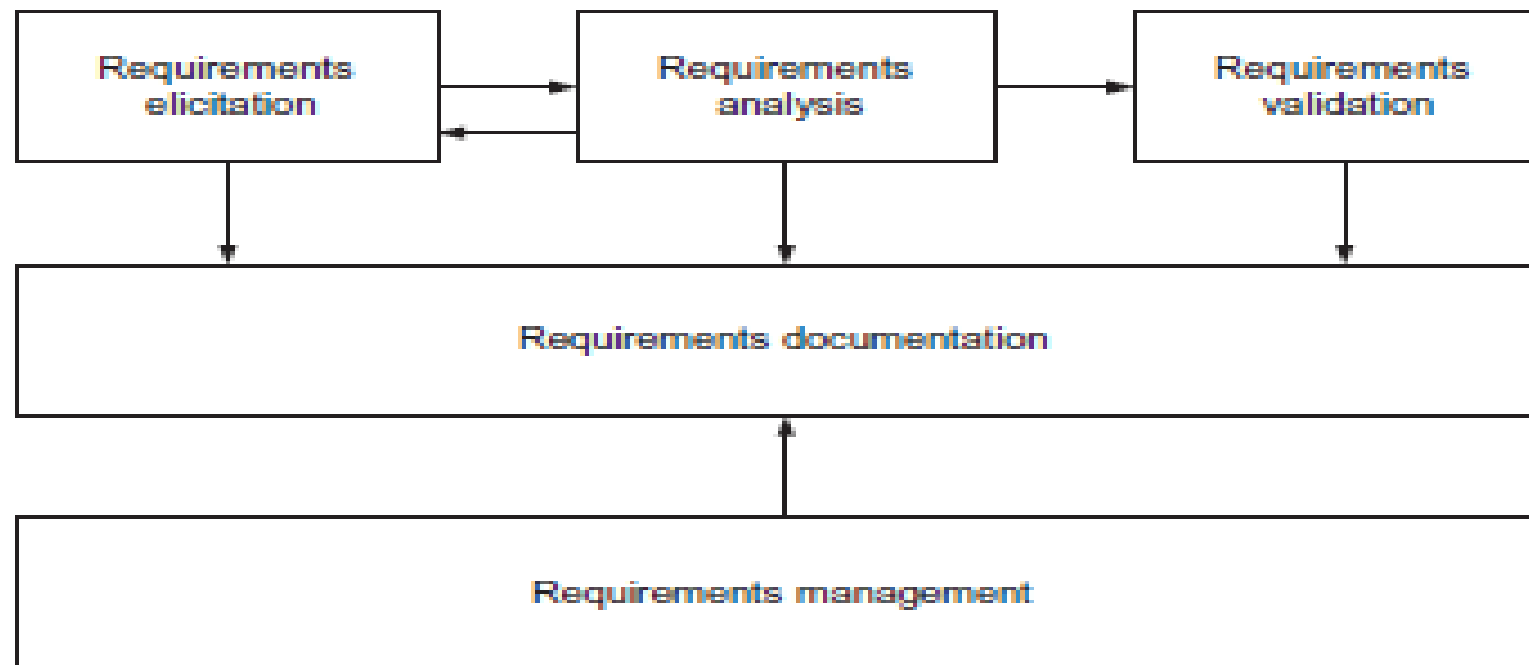
The business analyst must understand and document requirements carefully in order to avoid the mistakes and oversights identified above. To achieve this rigor, the business analyst should follow a roadmap that guides them through the key steps required to develop a well-defined requirements document.

Figure 10.2 show the Requirements engineering framework.

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Figure 10.2 Requirements engineering framework



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Requirements elicitation is concerned with drawing out information and requirements from the business stakeholders. Before the requirements are formally entered into a requirements document, the business analyst needs to subject the initial requirements list to careful scrutiny in order to ensure that they are well-formed. This is done during the requirements analysis stage which focuses on examining and organizing the elicited requirements. This may involve identifying requirements that overlap, are in conflict with other requirements or are duplicates. Once the set of unique requirements have been identified, it is important to check them against the business objectives; if a requirement is not supporting the achievement of a business objective then it is questionable that it is required.

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In requirements analysis, the business analyst has a gatekeeper role, ensuring only those requirements that pass the scrutiny will be entered in the document. This iterative process continues until the analyst is content that the requirements have been defined to the desired level of detail and quality.

Requirements validation involves the external stakeholders reviewing the requirements in order to agree and sign off the requirements document. The requirements catalogue is one part of the full requirements document, which also contains models of the business processes and IT system.

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There are two other aspects that complete the requirements engineering work:

requirements documentation is concerned with the development of a well-organized requirements document;

requirements management covers the activities needed to manage any changes to the requirements.

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4. ACTORS

There are some roles we would expect to be represented during the requirements work and they represent two broad stakeholder groups:

- the business representatives; and
- the project team.

1. The business representatives

The business is represented by

- the project sponsor,
 - **the subject matter expert (SME)**, and
 - the business users.
-
- **The project sponsor** represents the business in ensuring that business objectives are met.

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The responsibilities of the sponsor

- to agree the project initiation document that approves the requirements engineering study;
- to deliver the specific and agreed business benefits predicted in the business case;
- to make funds and other resources available for the project;
- to accept the deliverables at the end of the project;
- to approve and sign off the requirements document as a true statement of the business needs;
- to rule on any conflicting requirements where the business analyst **cannot** negotiate agreement;
- to confirm that the benefits in the business case have been realized as promised.

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The role of the project sponsor, the subject matter expert (SME) is to;

- give business advice regarding the requirements.

The particular situations when this may be relevant are:

- the requirements cover more than one business function;
- the requirements relate to a redesigned business process;
- the organization wishes to introduce a new product or process that the company does not yet fully understand;
- the organization wishes to adopt the latest industry best practice.

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This may make their preferred approach to the solution inappropriate. They may be unaware of political undercurrents in the organization that can affect the project's success or otherwise. They may be regarded as an outsider and so be resented by internal workers who feel they too have suitable expertise. There may be no knowledge transfer to internal stakeholders; the skills and knowledge gained on the project leave the organization when the consultant SME leaves.

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The business users are the individuals or groups who will need to apply the new business processes and use the new IT system. They should be able to help the business. They will be able to assist with the definition of non-functional requirements that apply to their tasks, although some specific aspects may need management involvement. In this case care needs to be taken to ensure that the requirements are gathered accurately and appropriate techniques, such as the use of focus groups, are used to acquire the relevant information.

2. The project team

The project team comprises;

- the project manager,
- the business analyst, and
- the developers or technical architects.

There will also be communication with representatives from the project support office and with the software testers.

- The project manager is mindful of the need to meet the business requirements and satisfy the business imperatives that drive the project.

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The project manager will report to the project sponsor and will be concerned to:

- break the project down into identifiable and measurable pieces of work, each with its deliverable;
- allocate the pieces of work to competent people to perform;
- schedule the tasks with their start and end times, recognizing dependencies between tasks;
- monitor the progress of the various tasks and be alerted of any likely slippage;
- take any corrective action should there be slippage, or risk of non-completion of a task for any reason;
- ensure that the project is completed on time and within the agreed budget.

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The business analysts will be responsible for carrying out the requirements engineering work. Working closely with the business staff, they gather and analyze the requirements, and are responsible to the sponsor for the quality of the requirements document. Many organizations assign the project manager role to the business analyst on a project, but this can be problematic as the two roles call for different aptitudes, priorities and skills. The project manager is most concerned with meeting cost and time targets, while the business analyst's primary consideration is satisfying the quality criteria. **The developer** will be able to check the technical feasibility of some of the requirements and help the analyst appreciate the implications of some of the requests. This will help confirm the analysts' understanding of the requirements, as well as encouraging the users to identify new features they would like to see.

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5. REQUIREMENTS ELICITATION

In the early days of systems analysis, this activity was often known as 'requirements capture'. To that extent, each task performed by a person could be regarded as a requirement, or set of requirements, to be delivered by the system, so requirements capture was not an unreasonable term to use. Whereas earlier approaches placed the onus on the business user to identify the requirements, requirements elicitation is a proactive approach to uncovering the requirements.

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5. REQUIREMENTS ELICITATION

Conceptualizing requirements

If the study is required to examine a new business system and there is a lack of expertise and knowledge in our organization, it is very difficult for the business stakeholders to imagine what they require the solution to offer. While the information about the business context, for example, the business strategy or the legal constraints, will provide a degree of understanding, it will be extremely difficult to produce a more detailed definition of the requirements. However, without a detailed investigation approach the analysts will not be sure that they have sufficient understanding and knowledge to be able to define the business requirements.

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6. REQUIREMENTS ELICITATION TECHNIQUES

There are a number of best practice techniques available to the analyst to help elicit tacit knowledge and requirements from all levels of the organization. These approaches include:

- apprentice – shadowing, protocol analysis;
- observe – observation, perhaps using the STROBE approach, shadowing; “**STROBE** A technique that represents a formal checklist approach to observation, where the analyst is investigating specific issues. STROBE stands for STRuctured Observation of the Business Environment and is used to appraise a working environment.”
- recount – story-telling, scenario;
- enact – prototype, scenario role-play.

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6. REQUIREMENTS ELICITATION TECHNIQUES

It is important that business analysts have a toolkit of techniques so that they can tailor their approach when eliciting requirements. This mapping of techniques to knowledge types provides a good indication of where certain techniques can be particularly useful and where they can still be useful but to a lesser extent.

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7. BUILDING THE REQUIREMENTS LIST

As we elicit the requirements from our various business stakeholders, we need to document them.

This is best done in two distinct passes;

- building the initial requirements list, and later,
- developing an organized requirements catalogue.

The list tends to be an informal document and can be presented using three columns, as shown in **Table 10.3** below, which represents a preliminary requirements list from an inventory project: the comments are added during the first pass at analysis, when each requirement is inspected for acceptability.

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7. BUILDING THE REQUIREMENTS LIST

It can be useful to ask another analyst, who was not present at the elicitation session, to inspect the requirements as a fresh perspective can often identify clarifying questions that may have been missed during the conversation with the stakeholder. The requirements list is begun following an initial interview or workshop and is developed further as more requirements are identified. The requirements identified at this stage will not be well-formed and the level and scope will vary considerably; some may be detailed and specific whilst others will be defined at an overview level only or may represent several potential requirements.

This is vital to embed traceability in the requirements.

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Table 10.3 Example requirements list

Requirement	Source	Comments
1. We need an ERP System	I. Morris	
2. We need to print off a list of expected deliveries	I. Morris	
3. We need to cross-check orders against deliveries	F. Drake	
4. We need to supersede an item	J. Keen	

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8. REQUIREMENTS ANALYSIS

Once a set of requirements has been elicited and entered onto the requirements list, the next step in the requirements engineering framework can begin.

Requirements analysis is concerned with ensuring that all of the requirements identified during requirements elicitation have been developed into clear, organized, well-documented requirements. The separation of requirements elicitation from requirements analysis is one of the strengths of requirements engineering. The analysts are encouraged during elicitation to draw out information, uncover tacit knowledge and identify requirements; during analysis, the business analysts examine the results of this work in detail in order to develop the requirement documentation that will take the project forward.

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8. REQUIREMENTS ANALYSIS

Only those requirements that are clearly stated, unambiguous, atomic, feasible, aligned with the project objectives, not in conflict with any other requirements and not overlapping with or duplicating other requirements, will be documented fully for implementation. In order to confirm that requirements are in scope, and also that the set of requirements is complete, it is helpful to draw some models that incorporate all the requirements.

- A use case diagram may be used to define the scope of the system and the features to be delivered;
- a business process model may be used to illustrate how the work is to be conducted and the flow of the process;
- a data model may be used to clarify the data to be held and the business rules to be implemented.

As this work is carried out, many additional questions will be raised and you may need to investigate the requirements further using requirements elicitation techniques.

8. REQUIREMENTS ANALYSIS includes;

- Categorization of the requirements
- Grouping requirements
- Requirements filters
- Checking for overlapping or duplicate requirements
- Unravelling multiple requirements
- Each needs to be documented.
- Confirming relevance of the requirement:
- Feasibility evaluation:
- Removing conflicts:
- Checking for solutions
- Confirm standard of quality:
- Unambiguous



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Requirements analysis includes the following tasks:

- **Categorization of the requirements** - as a first pass at the analysis, the requirements should be categorized into specific requirement types.

There are four major types of requirements:

- general (business),
 - technical,
 - Functional, and
 - non-functional requirements.
- **Grouping requirements**- this way helps the analyst to examine the related requirements as a coherent group.

This helps check for completeness of requirements, and makes it easier for a business stakeholder to validate a particular set of requirements.

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Requirements analysis includes the following tasks:

- **Requirements filters-** Applying a series of filters in order to ensure that the requirements are well defined. The requirements filtering should be used to examine the requirements and build a well-formed, clearly documented requirements set.
- **Checking for overlapping or duplicate requirements:** - once requirements that cover a similar area are grouped together, it is much easier to find the duplicate or overlapping requirements. Where there is duplication, the requirements should be merged; where there are overlapping requirements they should either be merged or separated into distinct requirements.

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Requirements analysis includes the following tasks:

- **Unravelling multiple requirements:** some requirements may have been listed that cover a number of different aspects rather than stating one requirement. It is important that these grouped requirements are split into individual, atomic requirements.
- **Each needs to be documented.**
- **Confirming relevance of the requirement:** all requirements should be aligned to the business and project objectives.
If a requirement statement does not support these areas, it is likely that this is not actually a business need.

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Requirements analysis includes the following tasks:

- **Feasibility evaluation:** all requirements should be evaluated to see if they would be feasible.
- **Removing conflicts:** some requirements may contradict or conflict with other requirements such that only one may be implemented.

Failing to do this, is likely to result in conflicting requirements which are difficult to resolve because the opinions are so entrenched.

- **Checking for solutions:** on examination, a requirement may not be something the business needs to happen or have addressed, but may be a pre-determined solution. For example, a requirement may dictate that a specific software package should be used rather than express the business requirements to be satisfied.

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Requirements analysis includes the following tasks:

- **Confirm standard of quality:** all requirements should meet the quality criteria and should be clear. the requirement must be expressed in clear language, avoiding vague adjectives and adverbs and using precise verbs and nouns.
The analyst and the **Subject Matter Expert (SME)** must distinguish between a business need for this project, and an individual user's 'want', which may add no value overall.
- **Unambiguous** – the description of the requirement must not contain any ambiguity.
The requirements phase is concerned with finding out the individual business requirements that such a system (if it were to be implemented) must satisfy.

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Requirements analysis includes the following tasks:

While this may seem an onerous process to go through, especially when we have a long list of requirements, it is a necessary step and helps ensure that we deliver a set of requirements that are clear, and that all stakeholders agree are needed, to satisfy the project objectives. As the requirements are likely to be elicited over a period of time, this analysis can be done in parallel as a fresh list of requirements is entered, rather than waiting until the list is complete and then beginning. We will complete the third column in the requirements list with these comments, or a précis of each.

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Requirements analysis**The potential outcomes for each requirement**

There are several potential outcomes for each requirement from this exercise:

- to accept the requirement as it stands and document it in more detail in the requirements catalogue;
- to re-word the requirement to remove jargon and ambiguity;
- to merge duplicated/overlapping requirements and re-word them;
- to split composite requirements into their individual entries;
- to take unclear, ambiguous or conflicting requirements back to the business users for clarification. Requirements that are in conflict, are unrealistic, or are out of alignment with the business objectives, still need to be recorded in the requirements catalogue in order to ensure that an audit trail is kept of all requirements raised and any subsequent action taken.

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9. REQUIREMENTS VALIDATION

Once the analysts have completed the analysis activity and have deemed the requirements document to be complete and correct, the business and project representatives need to confirm that the document provides an accurate statement of the requirements. Once the reviewers have been identified, the requirements document should be issued for review. The review group must include representatives from the key stakeholder groups and different representatives will review different aspects of the requirements.

The reviewers should include the following representatives:

- **The business sponsor** should review the document to ensure that the requirements are all in alignment with the business objectives and do not address areas that are outside the scope of the project.

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- **The business owners of the individual requirements, or their representatives,** should review the requirements to ensure that they express the business needs clearly and correctly, without ambiguity.

It is the business representatives' responsibility – and their last opportunity – to be satisfied with the requirements before accepting them.

- **The subject matter expert** should review the requirements to ensure that they reflect correct business practice.
- **The developers** should review the requirements to ensure that they are technically feasible.
- **The testers** should review the requirements to ensure that they are testable.
- **Project office representatives** should ensure that the requirements are compliant with business standards and policies, and that correct quality review procedures have been followed.

The group may meet to discuss the requirements document in a formal review meeting, may have a virtual meeting whereby comments are submitted electronically via a shared forum, or possibly, individual responses via email may be provided.

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9. REQUIREMENTS VALIDATION

Whichever approach is taken to the review, there are two important roles to be filled:

- there should be a chairperson, who is responsible for controlling the review, and
- a business analyst, who is responsible for providing information about the requirements document or possibly presenting it to the review meeting.

Where the requirements have been well-organized, for example, grouped by business area or use case, it is possible to conduct a set of shorter review meetings. The requirements document is confirmed as a satisfactory statement of the business requirements.

The outcome of the review should be an agreement that the entire requirements document is complete, consistent, conformant and a true reflection of what the business requires to be delivered.

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10. AGILE APPROACH TO REQUIREMENTS

The Requirements Engineering (RE) approach described above ensures that the project has understood and incorporated all business needs and user requirements before the solution is designed for implementation.

The traceability features allow all changes to the requirements, for whatever reason, to be incorporated in the document with no loss of quality, and the reasons for those changes recorded in case of query or conflict further down the line. However, the RE approach can be time-consuming and make demands on resources; many organizations need to produce new systems in a shorter timespan than this allows so have adopted an Agile approach to development. The key differences between defining requirements when using an incremental or waterfall approach and the Agile philosophy, is in the level and type of documentation that is produced.

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10. AGILE APPROACH TO REQUIREMENTS

If RE is employed in an incremental or waterfall-style project, the aim is to produce a baselined set of good, complete, relevant well-formed requirements before a solution is specified and designed; this ensures that the development is driven by business requirements, and not by the technology.

Despite the less detailed nature of the requirements definitions, it is still important to use the RE framework to ensure that the requirements are clear and meet the quality criteria described earlier.

The details of the requirements evolve during the development process and, if desired, the detailed definition of the requirements is completed once the development has been completed.

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10. AGILE APPROACH TO REQUIREMENTS

The outcome of the workshop should be the scope, a set of high-level requirements, a priority for implementing the requirements and some way of representing which actors need to interact with the system. Each use case represents a piece of functionality that is needed to meet an actor's needs, and may contain a number of requirements to satisfy them; these requirements need not be defined absolutely until just before they are due to be built. The developer, using a prototyping approach and technology, sits with the business user and business analyst, to elaborate on the requirements that will deliver the user story and meet its defined goal.

CONCLUSION

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In the journey of problem-solving and decision-making, the "Establishing the Requirements" chapter plays a pivotal role in shaping the path forward. This chapter is dedicated to the crucial process of defining and understanding the specific requirements and needs that a solution must meet. As we conclude this chapter, we reflect on its key takeaways and the importance of its learning objectives. **Defining Stakeholder Needs; Gathering Requirements; Analyzing and Prioritizing Requirements; Documenting Requirements; Validation and Verification; Managing Changes; Communicating Requirements.** In the broader context of problem-solving, the ability to establish requirements serves as the compass that points us in the right direction. It ensures that our solutions are not only effective but also aligned with the needs and expectations of those they serve.

REFERENCES

- **Required Reference:**

Debra Paul and James Cadle, et al, (2020). "Business Analysis". BCS, 4th Edition. ISBN:978-1-78017-5102

- **Recommended Reading**

James Cadle, Debra Paul, Jonathan Hunsley, Adrian Reed, David Beckham, Paul Turner (2021). "Business Analysis Techniques" 3rd Edition, BCS. ISBN: 978-1-78017-5690

The End of Lecture

Thank You

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