
Creating an MLE

Gathering requirements

- Identifying stakeholders
- Deciding procedures
- Constructing models
- Trawling for information
- Creating a specification
- Gathering requirements: Summary and checklist

4. Gathering Requirements

Who should read this:

The main text is intended to brief senior managers and academics and to provide a route into detailed requirements gathering methodologies for the MLE design and development team.

Outcomes:

If you follow this process you will create a requirements specification based on a systematic identification of stakeholder needs drawn from established good practice in systems design.

Approach:

In the section '[Why might you want an MLE?](#)' you will have established a shared understanding of what an MLE is and a rationale for implementation for your organisation. The section '[Understanding your organisation](#)' will have helped you understand your organisation, how it works and where the MLE will impact. This section will now help you to develop a far more detailed understanding of what you actually want your MLE to be able to do; thus enabling a detailed model to be developed which will form the basis of the design process which will be discussed in a later section.

The design of an effective Managed Learning Environment crucially depends on catering for the needs of all the stakeholders that will interact with it. These needs will be different for different stakeholder groups and there is the potential for conflicting requirements. A key process, therefore, in the design of an MLE, is to understand the needs of all the stakeholders and to create a solution that satisfies the varied requirements.

The intention is to present each aspect of the process in a practical way without using specialist language. However, there are links to resources that will allow you to research each area in more depth should you need or wish to do so. A glossary of terms is included at the end of the section.

There are six topics in this section which deal with different aspects of the requirements gathering activity, but which are also intended to provide you with a pathway through the whole process. The topic titles and their descriptors are as follows:

1. **Identifying Stakeholders:** this is pre-requisite to determining needs. Typically done through functional groupings, the group definitions and representatives chosen to articulate the group needs will affect the mix and priority of requirements. This topic links with the other sections in this infoKit which also use stakeholder information.
2. **Deciding Procedures:** it is generally accepted that formal structured requirements gathering procedures are the best way to arrive at a consistent, comprehensive and workable solution. This topic will introduce such procedures and give examples of their use.
3. **Constructing Models:** the design and functionality of MLEs will not be well understood by many of the stakeholders. In order to facilitate the discussions needed to capture the information necessary to identify requirements, models (or prototypes) of the intended MLE may be used.
4. **Trawling for Information:** a range of data gathering techniques, such as structured focus group meetings, may be carried out with all the key stakeholders in order to identify their needs. Although this might appear a complex process, educational institutions will have similar stakeholder profiles with similar needs. This will enable rapid prototyping and scenario building activities to be employed.
5. **Generating a Requirements Specification:** covering the drafting of individual requirement specifications from the needs and viewpoints gathered from the information trawl. It is at this

stage that conflict resolution will take place and only achievable requirements allowed to proceed to final draft.

6. **Summary and Checklist:** the section concludes with a summary of the key activities to be undertaken in drawing up a requirements specification and a checklist of stages the design process needs to go through. The terminology of systems design is used throughout the section and a glossary is provided here for clarification.

As MLE implementation becomes more commonplace, the range of needs of each of the stakeholder groups will become much better understood and the process of specifying requirements much more efficient. This section, as with the infoKit as a whole, will be regularly updated to pick up on good practice.

4.1. Identifying Stakeholders

After you have decided to implement an MLE in your organisation, you need to consider how you will cater for the needs of all potential stakeholders in the design of that MLE. Here techniques for the systematic identification of users and stakeholders are presented, prior to you determining their requirements.

Stakeholder Identification is part of the well established process of requirements gathering and general systems analysis and is covered in the [Project Management infoKit](#). Although the discussion here will be in the context of MLE stakeholders, and a number of typical individuals and groups will be named, it is the process that is the focus and the stakeholders named are not intended to be seen as an exhaustive group. A number of key resources will be identified as typical of the tools available to the MLE design team. At the end of the section a broader variety of resources and links are provided for readers who wish to develop a deeper understanding of the subject.

The process here concentrates mainly on User–Centred Requirements Analysis which emphasises the importance of obtaining a complete understanding of user needs, and validating the emerging requirements against potential real world scenarios.

This approach provides a broad framework for requirements gathering which goes beyond the identification of MLE functional requirements to include key non–functional requirements such as efficiency, reliability, usability and portability; which you will want to consider when designing an MLE.

Users and Stakeholders

The first stage in the process of identification is typically to carry out a User Context Analysis. This is a process of information gathering which often begins by distinguishing between user groups; those who use the MLE directly, and other stakeholders; those who are affected by the MLE but do not directly use it. User characteristics and the user environment (as in the section '[Understanding your Organisation](#)'). Although you will see differences in the way stakeholders are described and listed both in this infoKit and in the resources, they are all largely equivalent and all emphasise the need for a systematic approach to the process. Follow this link to the [Project Management infoKit](#) for a basic introduction to stakeholder information and analysis.

An excellent resource which charts this process and provides on–line resources is the User–Centred Requirements Handbook. This is one of a number of reports and resources emerging from the European–funded Respect programme which are recommended for you to consider, as they also provides tools for needs identification and requirements gathering.

Having listed the stakeholders and identified their agendas and relationship to the MLE project we can go a step further by specifying their main task goals as shown in the example below.

Form 1: Users and Main Task Goals	
System Name: Managed Learning Environment	
Users	Main Task Goals
Learners	To receive an effective, efficient and enjoyable learning experience To complete learning activities and assessment exercises
Academic Tutors	To develop, deliver and manage an effective and efficient learning delivery programme
Admin Support Staff	To have access to a range of effective admin support tools To provide admin support for staff, students and management
Technical Support Staff	To deliver an easily maintainable, reliable and robust ICT support system for staff and students
Learning Resources Staff	To provide learning resources for staff and students To ensure that clearance has been obtained for all materials made available on-line
e-Learning Development Team	To provide instructional design, technical design and web programming services for academic staff
etc	

Form 2: Stakeholders and Main Task Goals	
System Name: Managed Learning Environment	
Stakeholder	Main Task Goals
Finance	To provide budgetary management and information services
Student Support	To provide advice, guidance and personal support services for students
Registry	To manage all student data records To provide academic quality assurance systems
MIS	To provide a high quality management information service
etc	

Similar templates can be used to document the user/stakeholder characteristics and the user/stakeholder operating environment. In carrying out this analysis you will not only be identifying the users and stakeholders, you will also be starting the process of documenting their capabilities and constraints in preparation for a needs analysis and subsequent staff development plan.

The identification of the user and stakeholder groups and their characterisation can be carried out by your MLE design team using an appropriate range of methods. The section '[Understanding your Organisation](#)' covered such methods in the topic '[finding and using information](#)'.

These are just a sample of the types of information gathering activities available to the design team. A comprehensive description of techniques, which will form the basis of the next section, has been written by Kirakowski and is recommended reading.

There are also excellent examples of how stakeholders have been identified and their requirements documented as part of the MLE design process. A good example is the [De Montfort University MLE project](#) and a visit to their web site will provide you with a valuable range of resources.

[Follow this link](#) for key resources for this section (these open in a new window)

4.2. Deciding Procedures

Introduction

A Managed Learning Environment is a human activity system and hence the use of formal systems design procedures makes sense for any institution wishing to create an MLE. Systems analysis and design involves well established and proven techniques and tools.

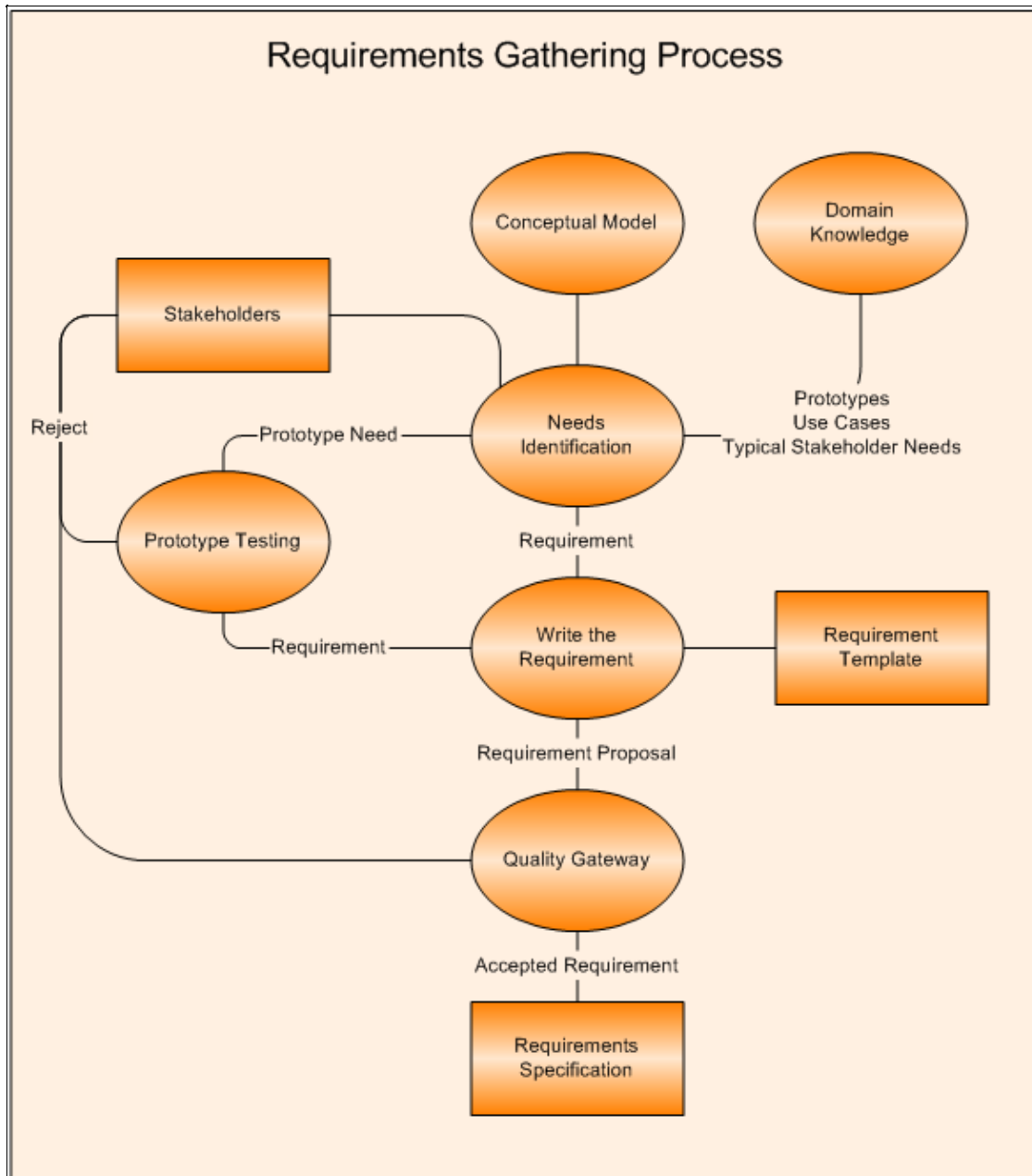
'The special contribution of Systems Design is that it offers a complete set of techniques, guiding design from gathering data about what matters to make, to defining the system function and structure that works for the customer.' (Beyer, H. and Holtzblatt, K., (1998) *Contextual Design*. Morgan Kaufmann. P425.)

'When the concern is the contribution of several institutional parts to one enterprise, as in the case of large scale projects, the VSM [a particular systems analytical method] offers the possibility to study and design flexible structures and, as a consequence, reduce the chances of costly errors.' (Espejo, R. (1989) *A Cybernetic Method to Study Organisations*. In *The Viable System Model*. Ed: Espejo and Harnden. Wiley. P361)

This section will outline a range of systems design techniques that you can use to create a comprehensive and accurate definition of MLE stakeholder requirements.

Requirements Specification Procedures

A typical representation of the requirements gathering process is shown below.



This diagram is an adaption from Robertson but is representative of typical approaches.

Usually, an MLE design project group is formed of key users of the intended system, reporting to senior management. The project group has the responsibility of ensuring that a thorough systems analysis is completed as part of the design process to ensure that the requirements of all users and stakeholders are accommodated by the MLE.

You begin the process by creating a conceptual model of the intended system which defines the main features and functionality. This will be initiated through brainstorming activities with key stakeholders together with experienced practitioners. If such expertise is not available within the institution, then other organisation support such as consultants may be engaged to support the process. The JISC and the Centre for Educational Technology Interoperability Standards ([CETIS](#)) have a role to play here and this infoKit is intended to provide a valuable reference resource.

The purpose of the conceptual model is to provide a vehicle for you and the design team to make the overall purpose and principles of the intended system apparent to all the stakeholders. Having done this, you can engage in dialogue with the stakeholders to begin the process of identifying needs. This is normally done in the context of the technical, physical, social and organisational environment of the stakeholders. The Conceptual Model describes, in general terms, the

anticipated functionality and usage of the MLE. This model or Prototype would then be tested with each stakeholder group for its usability and a positive cost/benefit outcome.

The design team works with the stakeholders in an iterative process that continuously refines and develops the Conceptual Model to accommodate design constraints, task scenarios and new processes as they emerge from the consultation. Example 1. below, illustrates this process.

Example 1

Stakeholder: Institutional Quality Manager

Task Scenario: On–line access to student performance data

Design Constraints: Data security, VLE/MIS data interoperability, data access opportunities

Usability Goal: For internal and external examiners to have on–line access to student performance data

Requirements: Quality user interface, effective and efficient access to specific student data, coordinated and verified student data management system, complete data security

New Processes: Provision of secure on–line access to student data for internal and external examiners. Agreed quality procedures for the updating, verification and accessibility of student data

Throughout the process you will be compiling a User Requirements Document. This document would typically have the following structure:

- General system characteristics
- Organisational structure
- Task scenarios and interactions
- Technical environment
- System functions and features
- User interface design
- Standards and styleguides
- Test and implementation plan

A range of methods can be used to gather stakeholder needs and these are outlined in detail in the section 'Trawling for Information'. In summary, the design team will use:

- Brainstorming
 - ◆ A way of generating many ideas or problem solutions. Ideas should be broad and radical, and produced very fast. It is a lateral thinking process which encourages participants to break out of their normal thinking patterns into new ways of looking at things.
- Focus groups
 - ◆ An informal technique that brings together a group of stakeholders to discuss needs and requirements. It is useful to gather simultaneous reactions and group dynamics. It is important to have a moderator to maintain group focus.
- Group discussions
- Interviews
 - ◆ Usually conducted on one–to–one basis. They tend to be time consuming and as such need to be carefully planned.
- Observation
 - ◆ Again this can be a time consuming process and it is worth remembering the 'Hawthorne Effect' where people often change their behaviour whilst being observed.
- Scenario building

- ◆ Another group technique which is useful when building different views or requirements of a process. The trigger for the collaborative working may be that each person describes the process from their point of view, or a moderator presents a model inviting comments and suggestions.
- Storyboarding
 - ◆ A written or pictorial representation of a process. It is usually used to show a sequence of operations within a process and the interactions with other processes. An excellent technique to use when working with stakeholders who are not familiar with MLE concepts.
- Task analysis
 - ◆ Shows what a user is required to do in order to complete a task. It is used to define the current system and to show the information flows within. When determining the requirements for an MLE, the task analysis could, in addition, highlight duplication and omissions.

These methods are explained in detail by Maguire who also provides a series of templates for documenting the outcomes.

Although the development of e-learning delivery systems is relatively new in education, a number of institutions have been through a systematic process of MLE design and their experience is valuable for others beginning that process.

Jos Boys, for example, describes approaches to MLE development in the context of organisational change and notes that stakeholders have a variety of motivations and degrees of enthusiasm for change. This needs to be accounted for in the methods used to satisfy their requirements.

Sarah Holyfield examined the role of requirements gathering in developing a shared understanding of the managed learning environment, described in terms of functionality required by the stakeholders.

A number of other examples like these are included in the resources for this section.

[Follow this link](#) for key resources for this section (these open in a new window)

4.3. Constructing Models

4.3.1. Introduction

The formal creation of a conceptual model describing the functionality of the intended MLE needs to happen relatively early on in the design process. However, even before this takes place, you are likely to have undertaken several activities which will have informed the modelling team.

It is to be hoped that your institution, having decided to introduce e-learning, will have built this into the strategic plan based on a sound business case for its implementation. The business case would include reference to the creation of an MLE for the delivery of e-learning and therefore an outline conceptual model would already be in existence which describes the basic functionality of the system and the intended users.

This outline model will probably come from knowledge of existing MLEs in other institutions and information from such sources as JISC. It is also likely that the institution will have some experience of the use of key MLE components such as a VLE, although the knowledge and experience may be confined to a few specialist staff. The model at this stage is likely to be aspirational, encompassing all the different planned modes of student engagement with learning

and the levels of support they will be offered. It will, either implicitly or explicitly, be structured to deliver the intended pedagogic approach favoured by the institution.

There are different levels of conceptual modelling in systems design. The MLE design team will create a model which describes the overall system, its components, functionality and features. Additionally, conceptual models of sub-systems will need to be formed to capture the viewpoints of each of the key stakeholders and the job of the design team will be to ensure that these individual models are catered for in the overall design.

4.3.2. Conceptual Modelling

The task for the design team, in creating a formal conceptual model of the MLE, is to develop a comprehensive systems descriptor which defines what it is intended to do and how it does it.

At the most basic level your MLE may consist of a virtual learning environment (VLE) such as Blackboard or WebCT linked to your student records system. A more complex model may envisage integration with other systems such as library, timetabling, assessment and staff records.

Robertson describes a template for a requirements specification which provides a complete description of a product's capabilities. You can adapt this to create a useful framework for specifying a model MLE, classifying the requirements in terms of:

- Functional requirements (what the MLE is intended to do and how it does it)
- Non-functional requirements (look and feel, performance requirements, political and legal requirements etc)
- Characteristics and constraints (the business case for implementing the MLE, the owners, users and customers, the naming conventions, budgetary limits etc)
- Development issues (the project plan and responsibilities, re-use of existing models and MLE components, evaluation of vendor products etc)

The design team will identify the stakeholders and will include in the model a description of the activities and communications that each will undertake with the MLE. This will later be tested with those stakeholders.

Checkland calls these descriptions Root Definitions of a human activity system which capture a particular viewpoint. There are a number of individual conceptual models each of which must be included in the overall model.

Espejo similarly stresses the importance of including all viewpoints, not just the direct users of the system:

'Insightful solutions developed by a group of participants, perhaps through a highly regarded problem-solving process, can often be frustrated by the structural realities of the organisation in which they operate if they are not taken into account.' (Espejo, R. (1989) *A Cybernetic Method to Study Organisations. In The Viable System Model. Ed: Espejo and Harnden. Wiley. P361.*)

The models relating to individual viewpoints are often referred to as prototypes and the developing and testing of prototypes is extensively covered by Maguire (Maguire, M. C., (1998) *User-Centred Requirements Handbook. Deliverable 5.3, Requirements Engineering and Specification in Telematics. Part B, Phase 2, Prototype and User Test.*)

Your design team can use a number of techniques to describe their conceptual model and diagrams are likely to feature strongly in the documentation. A good example of how this has been applied in the design of an MLE can be found on the [De Montfort University Managed Learning Environment Project](#) web site. The MLE Architecture Overview document available on this site summarises their approach.

The use of diagrams in the design of MLEs is also discussed by Holyfield. A number of useful examples are provided in this report, which can be accessed through the key resources for this topic, and their value discussed as well as some potential disadvantages.

At a more advanced level of analysis, design teams will find value in Beer's Viable Systems Modelling methods which are aimed at optimising communications and control capacity in human activity systems. The [CoManTLE Project report 'Research Framework: Modelling the Organisational System'](#) recognises the complexities of introducing an MLE across a large institution and explores the use of formal systems analysis including viable systems modelling.

[Follow this link](#) for key resources for this section (these open in a new window)

4.4. Trawling for Information

4.4.1. Introduction

Having created a model of the intended MLE, identified the key stakeholders and documented the user characteristics, you will be in the position of being able to trawl for information about stakeholder needs. This will be carried out by one or more staff acting as Requirements Analysts. The requirements analyst works with each stakeholder to observe, interpret and record their anticipated interaction with the MLE system to ensure that their needs are met in the most efficient and effective way.

There are some basic issues which need to be recognised and catered for at the outset. The first is that the stakeholders' only experience of an MLE and what it means for them may be the conceptual model created by the design team. They may not be able to express a need because they only have a limited understanding of what it can do for them. Under these circumstances it will be necessary for the analyst to create detailed examples of their practical use (known as use cases), for that stakeholder to reflect on. Similarly, a typical user will be very conscious of some requirements, but others needs will be so engrained in their daily work that they've forgotten they exist. The trawling process must use methods which reveal all the requirements.

4.4.2. A Framework for Identifying Requirements

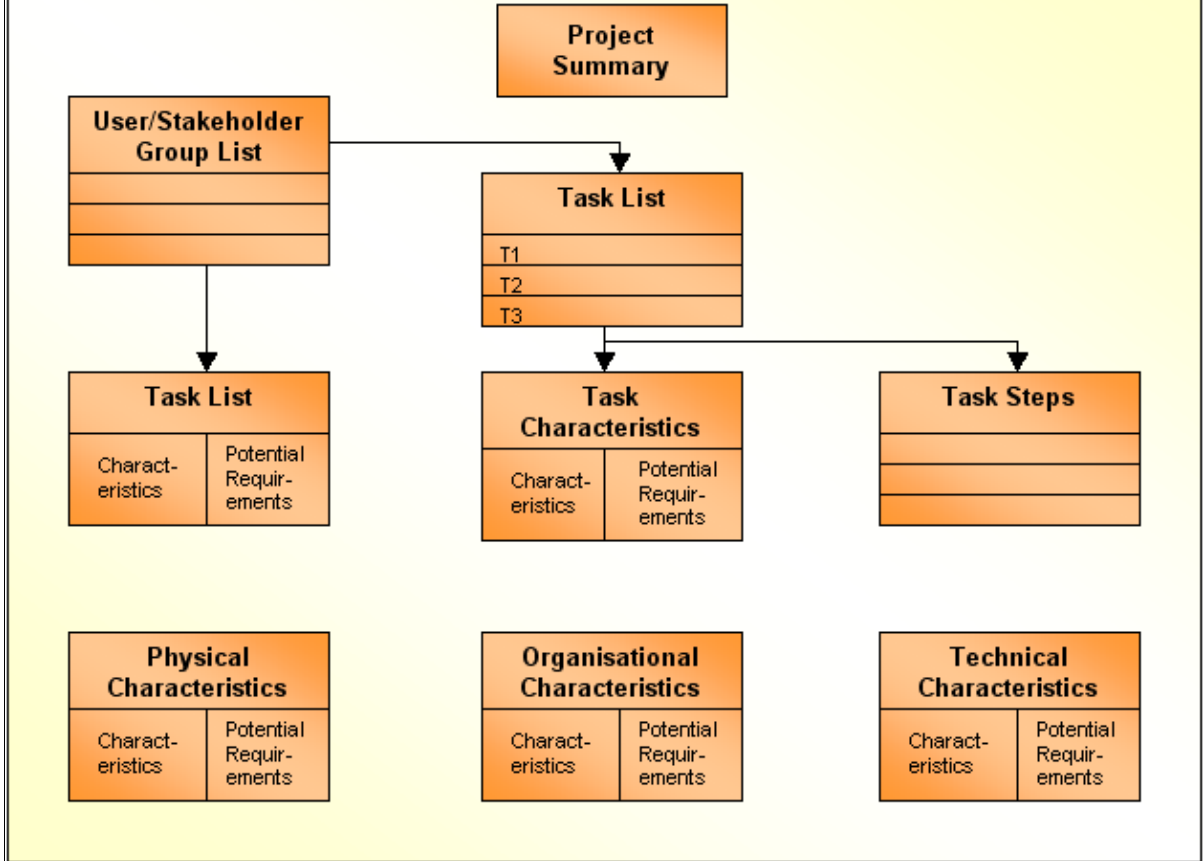
Given the number of stakeholders impacted by an MLE and the varied nature of their requirements a systematic approach to information gathering is essential. One such method is Apprenticing where the requirements analyst sits with the stakeholder to learn the job by observation and asking questions. When asked about their jobs away from work, people tend to respond in generalist terms. However, most people are good at explaining their job whilst they are actually doing it.

Maguire proposes a three stage framework for determining user requirements:

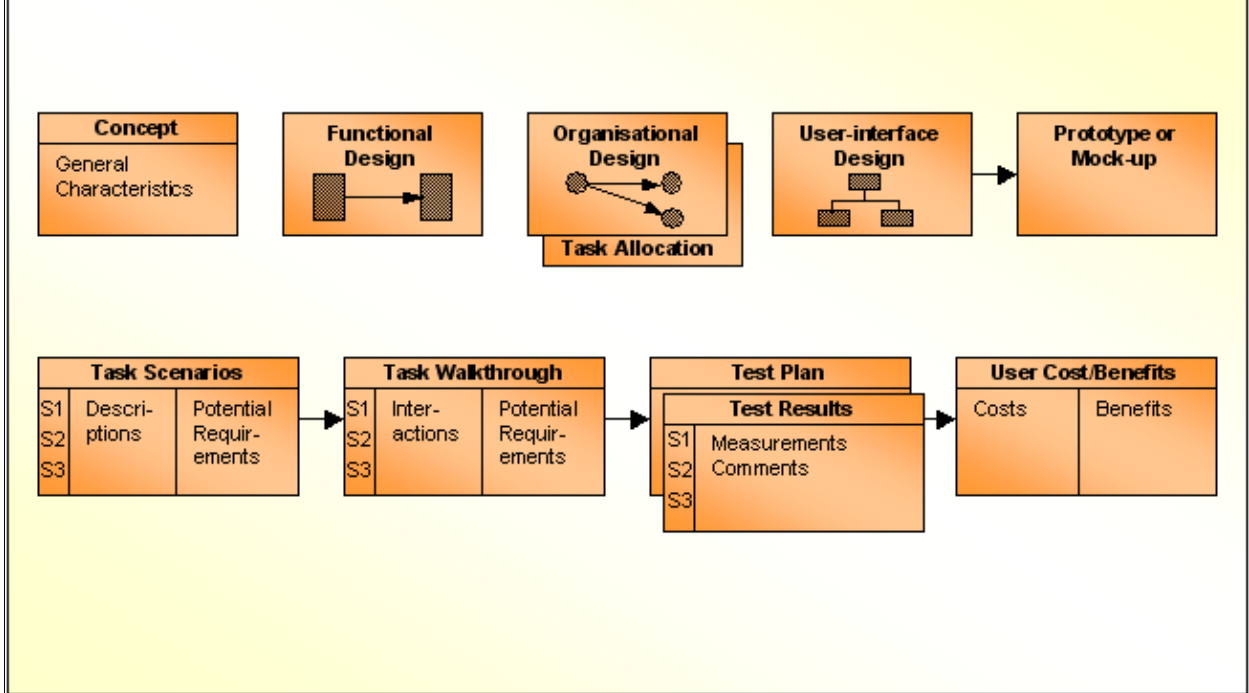
- User Context Analysis
- Feasibility and Prototyping
- User Requirements Synthesis and Validation

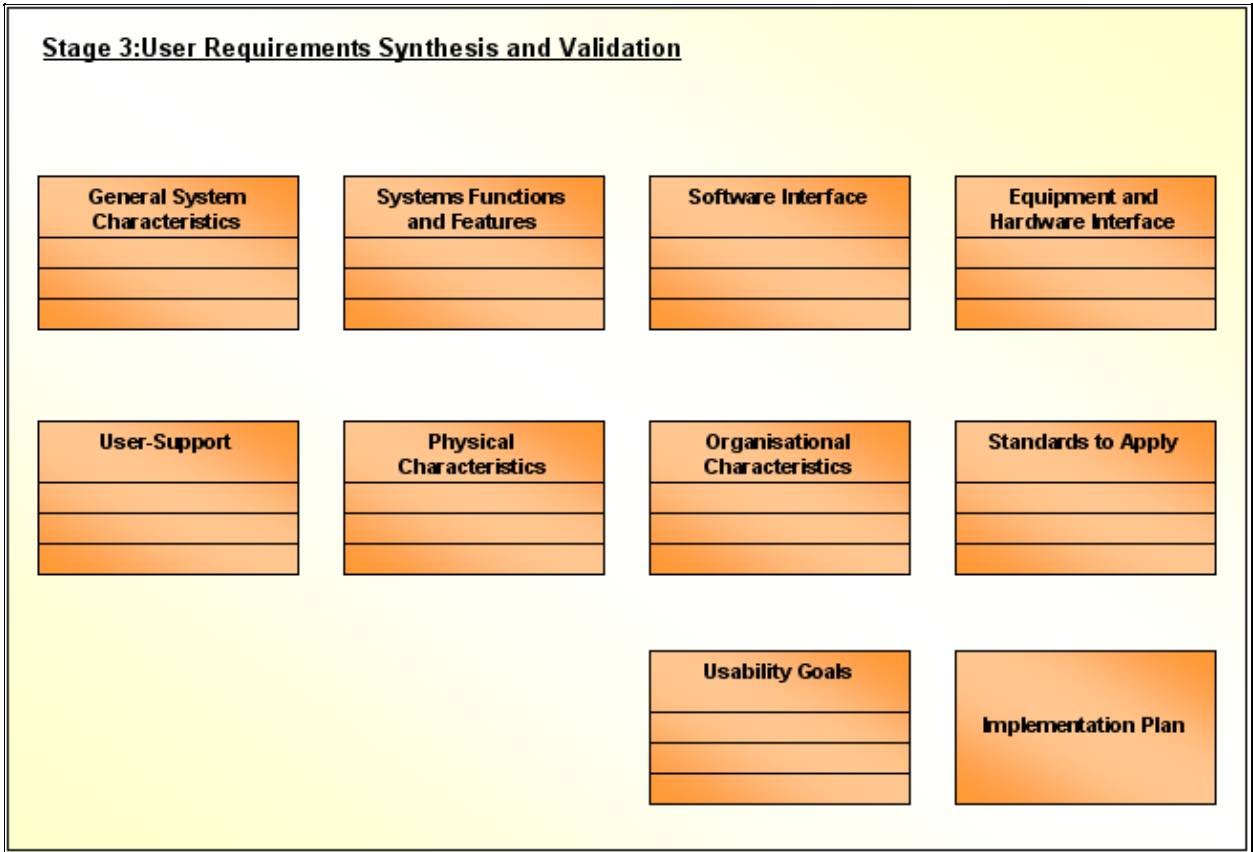
These stages are shown in the diagram below where it can be seen that Stage 1 covers the stakeholder analysis, Stage 2 covers conceptual design, prototype design and trawling for information and Stage 3 covers requirements specification and systems design.

Stage 1: User Context Analysis



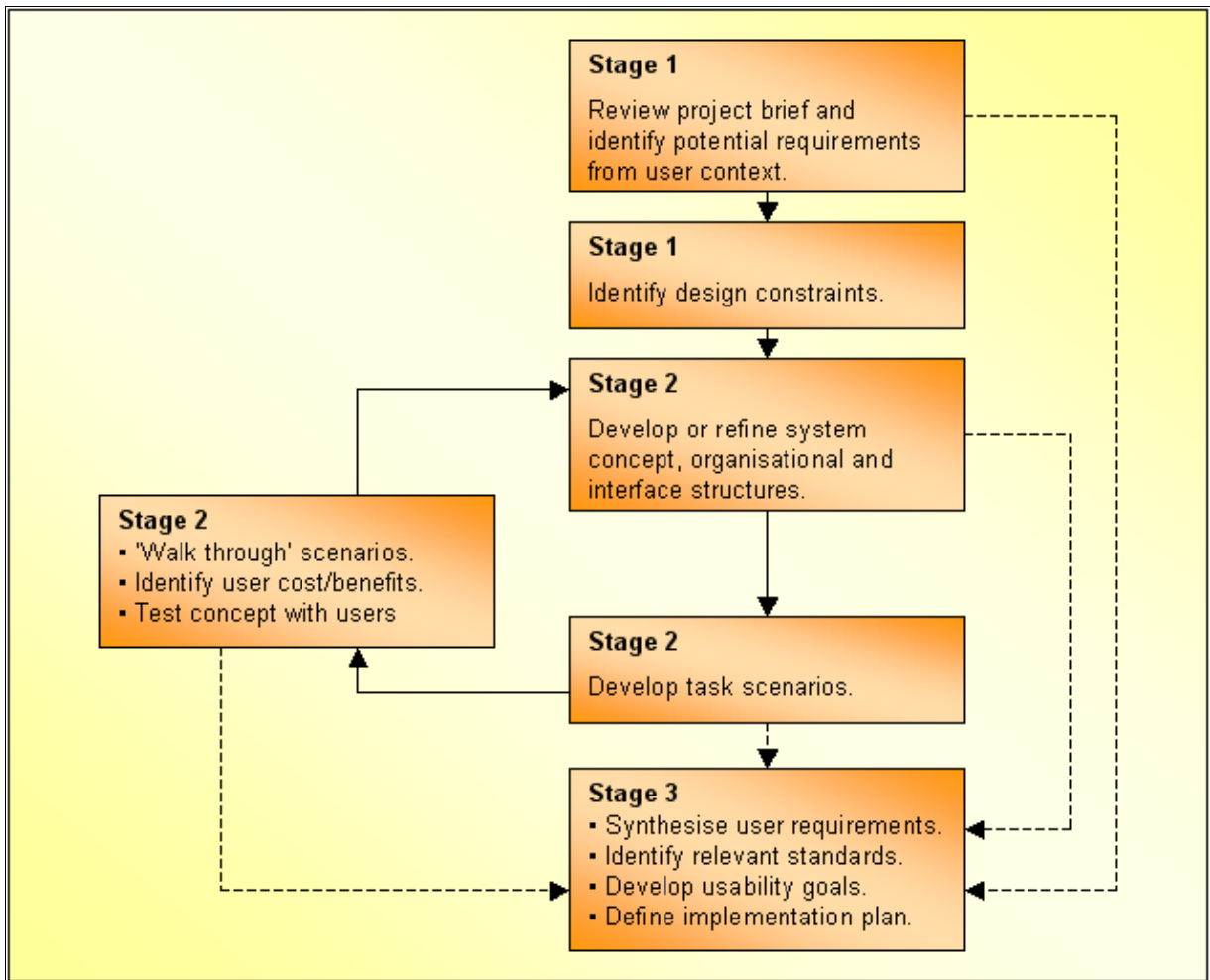
Stage 2: Feasibility and Prototyping





The above set of diagrams show User-requirements Specification Framework (from Maguire, 1998)

Maguire uses diagramming very effectively and the diagram below is a good summary of the basic activities involved in requirements gathering.



User-requirements Specification Activities (from Maguire)

There are different ways in which the requirements gathering process is described by different authors, but the consensus is largely the same. The stage 2 iteration above would include a range of different methods for information trawling. Again, the summary provided by Maguire is as good a representation as any and table 1 below shows part of the much more comprehensive list of methods included in the resources.

Characteristics Applicable to Framework stage:							
	1. User Context and Early Design	2. Prototype and User Test	3. User Requirements Documentation	Time and Effort Required.	Expertise or Skills Required.	Equipment Facilities Required.	Particular Strengths
Methods							
1. Brainstorm		Yes		Low	Group Motivator		Generating Ideas
2. Focus Groups	Yes	Yes		Low	Group Chairing		Discuss Topic In-depth
3. Functionality Matrix		Yes	Yes	Low	System Knowledge	Spreadsheet Software	Refining List of Functions
4. Group Discussion	Yes	Yes	Yes	Low	Group Chairing		Airing Issues

5. Interview	Yes			Low	Neutral Non-leading		Individual Opinions In-depth
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Maguire describes each of the above information gathering methods in some detail and provides a wide range of templates for use during the process. There are many other tools available to help with the requirements process and Robertson provides advice on making an appropriate choice.

In summary, then, the process of trawling for information will involve your requirements analyst working with each stakeholder to construct use cases or work scenarios which describe how the stakeholder will interact with the MLE. The requirements analyst will do this using a descriptive prototype of the MLE which is a specific view of the MLE conceptual model relevant to the stakeholder's role and working environment.

[Follow this link](#) for key resources for this section (these open in a new window)

4.5. Creating a Specification

4.5.1. Introduction

The process of trawling for information was based on the interaction that each of the stakeholders would have with the MLE. We termed each of the specific interactions with a stakeholder a Use Case. The use cases and the information they provide about stakeholder requirements need to be systematically recorded, typically using the type of template referred to earlier.

Whatever form it takes, the record will need to contain some basic information:

- A description of the potential requirement in the form of an action that the MLE must take to satisfy the requirement
- A unique requirement identifier
- The use case(s) this requirement is associated with
- The source/stakeholder associated with the requirement
- The requirement rationale and priority

It is likely, during the process of identifying stakeholder needs, that a number of complex use cases (or work scenarios) will be discussed which may involve a large number of requirements. It is important that these are broken down into single actions that the MLE must perform in order to do the work of the use case. If you want to investigate use case modelling in more detail there is a lot of published information available and a good example is the paper [From Essential Use Cases to Objects](#) included in the resources.

As the requirements emerge you are likely to want to classify them in a logical way. Typically this would be in terms of functional and non-functional requirements, the technical, physical, social and organisational environment and the various user interfaces. For each requirement whoever is carrying out the analysis will specify a fit criterion by which they would know that the MLE can successfully carry out the required action. The analyst will also be looking for dependencies and conflicts which will need to be resolved. During the whole process of defining the specifications, the analyst will be double checking stakeholder satisfaction, relevance, viability and completeness of the requirement.

4.5.2. Functional and Non-functional Requirements

Functional requirements derive from the fundamental purpose of the MLE and the particular mix of actions that it must be capable of to deliver the administrative processes and pedagogic approach favoured by the institution.

The infoKit on [System Selection](#) covers defining functional requirements in some detail and gives examples relating to student administration, human resource management and virtual learning environment (VLEs).

Defining the requirements of an MLE is necessarily more complex than considering a single system as you will be placing a lot of emphasis on how the different systems (particularly student records and VLE) interact. Depending on the scope of your MLE you may also be considering linking in your library system and perhaps systems such as timetabling and staff records. The complexity of all the possible user interactions is one reason why most institutions choose to phase MLE development. As part of the Managed Learning Environment Activity in Further and Higher Education in the UK ([Landscape Survey](#)) which was funded by the JISC and UCISA, a matrix was developed to enable institutions to consider how far along the line of MLE development they were. You may find it interesting to carry out this exercise.

You also need to think about the non-functional requirements which typically include:

- Look and feel (colourful, attractive, professional)
- Usability (easy to use, ergonomic, accessible)
- Performance (speed, accuracy, reliability)
- Maintainability (easy to maintain, doesn't require specialist skills)
- Security (confidentiality, integrity, availability)

The requirement specifications must be drawn up in the context of the product constraints and issues that apply to the MLE (overall budget limits, scope, scalability, build or buy policy, upgrade path, interoperability). However for a successful MLE the design of supporting processes and information flows is critical in ensuring all the elements work together.

4.5.3. Reusing Requirements

When you begin the design process and construct a requirements specification it will not, of course, be the first requirements specification that has been created for an MLE. Moreover, MLE specifications for different institutions will tend to have a great deal of commonality in terms of their features, functions and the way they are used.

Typical use cases, therefore, for most users and key stakeholders will already have been identified and the requirements specifications created. At this early stage of development this information may not be well organised in the public domain, but as time goes on the body of information will increase and the need to create requirements specifications from scratch will reduce.

A good example of a user requirements specification is the 'User Services Assessment' document which can be obtained from the [De Montford University MLE project web site](#). [The Diagramming Report](#) included in the resources also gives an example of drawing up a requirements specification.

The work commissioned by the JISC on MLEs and VLEs provides useful information in this regard and visiting the [JISC MLE web site](#) is a good way of keeping up with developments. It is intended that this infoKit will also disseminate good practice as it emerges.

4.5.4. Prototyping and Testing

Prototyping was mentioned earlier in this section as a means of raising awareness in stakeholders of the functionality of MLEs and the implications for their role in its operation. Prototyping is also used to play out the consequences of specifying requirements in circumstances where the experience of the user is limited or the feasibility of the requirement is unclear.

Low fidelity prototyping and testing is a simple paper-based technique for challenging and

clarifying requirements through brainstorming activity between the requirements analyst and the stakeholder. A simulation of an interface (menus, windows, dialogues and icons) is built from paper and card and this model is used to demonstrate the interface to the stakeholders. This is done by a member of the analysis team playing the role of the computer. Changes to this model can be made very easily and quickly during the demonstration. Once articulated, the requirements are tested by evaluating the effectiveness of the actions they would require of the MLE in facilitating the use cases that generated them.

[Follow this link](#) for key resources for this section (these open in a new window)

4.6. Summary and Checklist

This section has shown that establishing the requirements of stakeholders as part of the design of an MLE is readily achieved by using well established systems design methodologies.

We have looked at examples of procedures and tools to identify the key users and stakeholders in your planned MLE. We have also shown how the construction of a conceptual model of the intended system is essential, both for explaining the uses and benefits of the MLE to stakeholders and also evaluating their requirements of the system to successfully carry out their role.

You will have seen that there are many different ways in which information can be gathered about the needs of the intended users and stakeholders of your MLE. The full range of techniques looks daunting, but in fact only a few will have to be used to get the information you need, the choice being determined by the constraints of the working patterns of stakeholders in your organisation.

The other characteristic of the process that you will have noticed is that it is iterative and yields an increasingly refined definition, not only of user requirements, but of the conceptual model from which the requirements are derived. As you develop a richer picture of the form and functionality of your MLE, greater detail will emerge of how individual components can be optimised to satisfy the requirements.

As each requirement specification is articulated it is tested with the initiating stakeholder and the particular activity it is intended to support. You will be looking to ensure that the action in the MLE it triggers reliably satisfies the stakeholder need without conflicting with any other activity and is optimal, in terms of efficiency and effectiveness, compared with alternative solutions.

In the latter part of this process you will be constructing prototypes of system components and use cases of their application in order to test their effectiveness with stakeholders. This will lead directly into the design phase of the project.

We conclude this section with a checklist of the key activities involved in the construction of a comprehensive MLE requirements specification.

Checklist

Activity	Action Required
Deciding the Requirements Gathering Methodology	Agree, with the MLE design team, the preferred systems design methodology to be used. Decide the extent of the requirements gathering activity dictated by the chosen? methodology. Create a requirements gathering plan, resource specification and budget.
Identifying the Key Stakeholders	Identify, with the MLE design team, the main users of the MLE and other stakeholders who are affected by the system. Set limits to the boundaries of the stakeholder group. Continuously review these limits as the MLE specification is refined.

Constructing a Conceptual Model of the MLE	Construct, with the MLE design team, a descriptive model of the intended system that would enable each of the stakeholders to understand its overall purpose and functionality. Ensure that each stakeholder is clear about their interaction with the MLE and can specify their requirements of such a system.
Gathering Stakeholder Needs Information	Employ an appropriate mix of information gathering methods to identify potential stakeholder requirements. Create a plan for this activity which will generate the required information within a workable timescale. Provide an appropriate budget and resources.
Creating a Requirements Specification	Use the stakeholder needs information and their intended use/interaction with the MLE to create draft requirements specifications. Document use cases for all stakeholder functions.
Testing and verifying the Requirements Specification	Apply prototyping techniques with the use cases for each stakeholder to test the effectiveness of each requirement in meeting the identified need. Confirm validity and viability of each requirement.

Conclusion

This section has provided a set of procedures designed to help you specify the user requirements in the design of your MLE. Each procedure is derived from established systems analysis and design techniques which have been shown to lead to consistent and optimal outcomes. A range of references and resources have been cited which will provide further detail in each aspect of the process should you want to look at them in more depth.

A number of terms have been used in this section which will be familiar to those who are involved with systems design. For the non-specialist, clarification of these terms might be helpful and we conclude here with a brief glossary.

Glossary

Term	Meaning
Systems analysis	A methodology for developing a management plan for a project. Systems analysis techniques provide a structured route through the specification, design, development and implementation process.
Conceptual model	A description of the intended system. The conceptual model would describe the purpose and functionality of the system without, initially, specifying the means of achieving this. As the development progresses, the practical implementation and the role of each stakeholder will become defined.
Stakeholder	All people who interface with the system, either as users or as people who affect or are affected by its operation.
Prototype	A sub-set of the conceptual model which describes the viewpoint of a particular stakeholder and their interaction with the system.
Use case	A description of a particular work scenario involving the stakeholder and the system which identifies a specific need and leads to a requirement specification.
Requirement	A function that the system has to perform to satisfy a specific need of a system stakeholder.

Section Editor

Tony Toole is Director of On-line Services at Coleg Sir Gŵr in South Wales and has responsibility for all e-learning developments at the college. He began the development of e-learning in 1997, when Dean of Faculty of Engineering, in response to the training needs of SMEs in rural Wales who could not access conventional provision. The college now has 1500

on–line distance learning students following a range of courses from level 2 Computing to postgraduate Business Studies. The quality of the provision has been recognised through several national awards including the 2001 Beacon Award for e–Learning.

Tony is also partly seconded to the University of Glamorgan to assist with their major e–learning development programme. He has responsibility for managing the Wales–wide partner college network and also the establishment of the Glamorgan On–line Research Unit. He was awarded a University Fellowship in 2000 and a Professorship in 2002.

Tony has been closely involved with the formation of e–learning strategy in Wales and is project director for a number of research and development projects testing the practical implications of implementing that strategy.

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