Hyperiondev

TASK

Define your Product

Visit our website

Introduction

WELCOME TO THE DEFINE YOUR PRODUCT TASK!

Before you start your final Capstone Project, there is one more area that needs your attention: defining your software product. It makes sense that, before you code a software solution, you should know exactly what the system is meant to do. Up to now, you have been focusing primarily on gaining the coding skills you need in order to be able to create a web application. There is more to it than that though. This task will equip you with some other skills you need to become a professional web developer.

Get in touch

Connect for support

Remember that with our courses, you're not alone! You can contact an expert code reviewer to get support on any aspect of your course.

The best way to get help is to login to Discord at **https://discord.com/invite/hyperdev** where our specialist team is ready to support you.

Our team is happy to offer you support that is tailored to your individual career or education needs. Do not hesitate to ask a question or for additional support!

WEB DEVELOPMENT SKILLS

A full-stack web developer needs to see the bigger picture. They need to be able to understand, amongst other things, who will be using the system, how these users will be using the system, the goals and requirements of the system, and the environment that the system will be running on. As you can see, a full stack web developer must be more than just a skilled coder. This task helps you to understand some of the non-coding skills that a full stack web developer needs: gathering, understanding, and communicating the requirements associated with a web application.

REQUIREMENTS AND THE SOFTWARE DEVELOPMENT PROCESS

It is worth noting at this point, that the manner in which you go about gathering and documenting requirements, may be influenced by the software process (see the task: Introduction to Agile Development Process) you and your team choose to use.

No matter what software process you use though, there are two general tasks that need to be considered before you start programming:

- Understand the problem/requirements.
- Plan and design the solution.

The principles regarding what type of information you need to consider when analysing the problem and understanding the requirements of a system are the same for any software process. The process you use to translate those requirements into software and documentation is different though. This task highlights the requirements and information you need to consider when developing a system. It 1) highlights some traditional ways of documenting this information, and 2) shows how the requirements collected are used for agile development.

UNDERSTAND THE REQUIREMENTS

The concept of requirements is fairly self-explanatory: they are what we need a system to be able to do. For example, if we want a system to organise our files on our computer, the system's activities will include reading file names, sorting them (e.g. in alphabetical order), and putting them in neat folders (A-E, F-J, etc.). Part of

the requirements is also looking at the system's constraints — what it must not do. For example, we may only want to sort our Word documents, not program files.

There are two categories of requirements:

1. **User requirements:** What the user finds important. These are broad ideas of what the program needs to accomplish. They are written in simple language for anyone to understand.
2. **System requirements:** These are the detailed versions of the user requirements. Here, technical jargon is used so that the developers understand the exact functions and constraints of the system because it is the starting point of system design. These requirements are broken down further:
    a. **Functional requirements:** The activities that are required of the program.
    b. **Non-functional requirements:** Characteristics of the system as a whole, including its constraints, but excluding the activities covered in the functional requirements.

FUNCTIONAL REQUIREMENTS

These requirements depend on the type of software being developed, the expected users of the software, and the approach taken by the organisation when writing requirements. For example, if you are developing a payroll system, the required business uses might include functions such as *generate electronic fund transfers, calculate commission amounts, calculate payroll taxes*, and *maintain employee-dependent information*. The new system must handle all of these functions.

Functional requirements are based on the procedures and rules that the organisation uses to run its business. They are sometimes well documented and easy to identify and describe, however, this is not always the case. Some business rules can be more obtuse or difficult to find.

NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are requirements that are not directly concerned with the specific activities a system must perform or support. They are often more critical than individual functional requirements, however. System users can usually find ways to work around a system function that doesn't really meet their needs.

It is not always easy to distinguish between functional and non-functional requirements, but there is a framework you can use for identifying and classifying requirements. The most widely used framework is called FURPS+. FURPS is an acronym that stands for **F**unctionality, **U**sability, **R**eliability, **P**erformance, and **S**ecurity. Functionality refers to functional requirements, while the remaining categories describe non-functional requirements:

- **Usability:** These requirements describe operational characteristics related to users, such as the user interface, related work procedures, online help, and documentation.

- **Reliability:** These requirements describe the dependability of a system. In other words, reliability is to do with how a system detects and recovers from such behaviours as service outages and incorrect processing.

- **Performance:** These requirements describe operational characteristics related to measures of workload, such as throughput and response time.

- **Security:** These requirements describe how access to the application will be controlled and how data will be protected during storage and transmission.

FURPS+ is an extension of FURPS that adds additional categories — all of which are summarised by the plus sign. Below is a short description of each additional category:

- **Design constraints:** These describe restrictions to which the hardware and software must adhere.

- **Implementation requirements:** These describe constraints such as required programming languages and tools, documentation methods and level of detail, and a specific communication protocol for distributed components.

- **Interface requirements:** These describe interactions among systems.

- **Physical requirements:** These describe the characteristics of the hardware such as size, weight, power consumption, and operating conditions.

- **Supportability requirements:** These describe how a system is installed, configured, monitored, and updated.

SOFTWARE REQUIREMENTS DOCUMENT

Once the user and system requirements have been determined, they are written up in an official requirements document during the requirements specification process (discussed below). This is a universal document that everyone from the users to the system developers will see. Therefore, it is vital that the document is written to cater for all stakeholders — it needs to be general enough for the user to understand, but detailed enough for the developers to use as a springboard for development. This is why the user requirements will take the form of the introduction, and the system requirements based on that will become the body of the text. The IEEE (1998, as cited in Sommerville, 2016, p. 128) outlines the structure of a standard requirements document:

Chapter	Description
Preface	Defines who you expect to read the document and describes its version history, which should include the reason for creating the new version and a summary of the changes made in each version.
Introduction	Describes why the system is needed. It also describes the system's functions and explains how it will work with other systems. Describes how the system fits into the business overall or the strategic objectives of the organisation that commissioned the software.
Glossary	Defines the technical terms used in the document.
User requirements definition	The services provided for the user are defined here. The non-functional requirements are described. Product and process standards that must be followed must be specified.

System architecture	Presents a high-level overview of the system's anticipated architecture by showing the distribution of functions across system modules. Highlights any architectural components that are reused.
System requirements specification	Describes the functional and nonfunctional requirements in more detail. Interfaces to other systems can also be defined.
System models	Might include graphical system models that show the relationship between system components, the system, and its environment. Some examples of models are object models, data-flow models and semantic data models.
System evolution	Describes the fundamental assumptions which the system is based on. Describes any anticipated changes due to hardware evolution, changing user needs, etc.
Appendices	Provide detailed, specific information that is related to the application that is being developed. For example, hardware and database descriptions.
Index	Several indexes might be included. This might include a normal alphabetic index, an index of diagrams, an index of functions, etc.

The information that is included in a requirements document depends on the type of software being developed and the approach to development that will be used.

REQUIREMENTS ENGINEERING PROCESS

Requirements engineering is the process of finding, analysing, documenting, and checking the requirements of a system (Chemuturi, 2013). This means that it would be up to the Requirements Engineers to oversee the process from start to finish, beginning with the feasibility study. This, as the name suggests, consists of analysing the market, the user requirements, the system requirements and the possible constraints to determine if creating this system is a worthwhile venture.

Once it has been decided that the system is worth developing, the engineering process follows three broad steps, according to Sommerville's (2016) model:

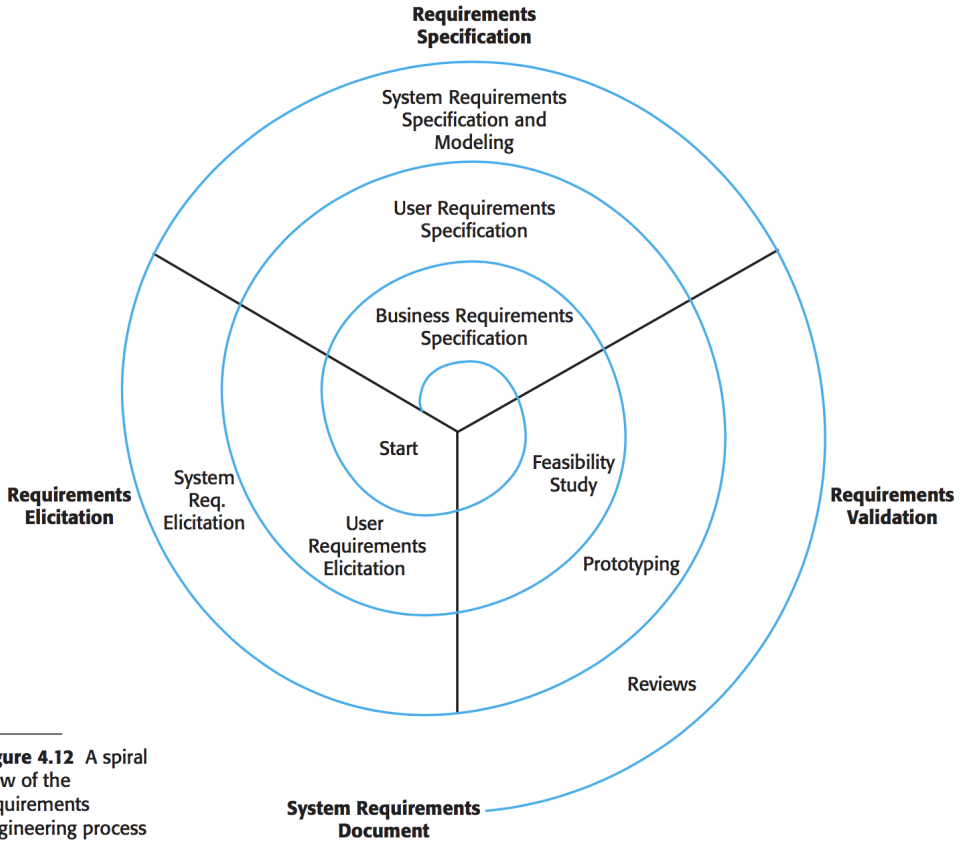


Figure 4.12 A spiral view of the requirements engineering process

A spiral view of the requirements engineering process (Sommerville, 2016, p. 112)

The process begins in the bottom left third in Requirements Elicitation and works its way round in a clockwise direction. Each section is discussed in more detail below:

1. **Requirements elicitation:** Determine how the system will be used by the business by interviewing those who will be using the system. Scenarios are also discussed to get a better idea of what the system is required to do and how it will work. This is generally where user requirements are determined.

2. **Requirements specification:** Write the requirements determined from elicitation into the requirements document described above. Use cases (discussed below) through a UML diagram are also used in this step to illustrate how a user might interact with a system.

3. **Requirements validation:** Determine that the requirements documented contain everything that the user wants it to do. This is a vital step as sorting out miscommunications before the development process saves both time and money.

Note how the process moves in a spiral through the thirds in an outward direction. This shows the iterative nature of the process — we start by looking at the general user requirements, then we continue going around the spiral to look at the more specific system requirements. This process continues until all stakeholders are happy with the requirements specified.

SPOT CHECK 1

Let's see what you can remember from this section.

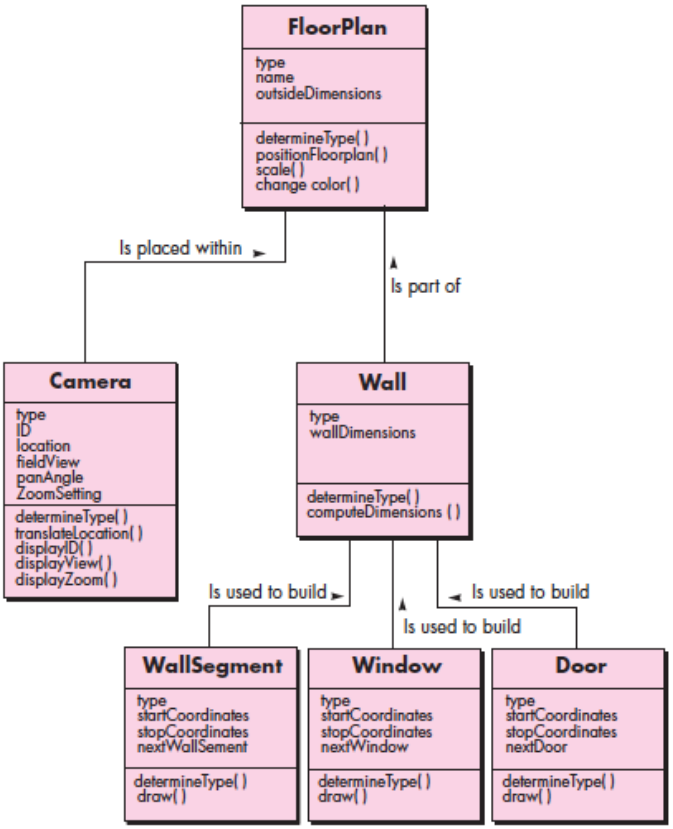
1. What is the difference between a user requirement and a system requirement?
2. What does FURPS stand for?
3. Describe requirements elicitation, requirements specification, and requirements validation.

DESIGN THE SOLUTION

The software process that you choose to use will once again affect the extent of the activities that you carry out here. You may choose to follow an approach where your anticipated software solution is extensively designed and the designs are documented in detail. Agile development, on the other hand, advocates a keep it simple (KIS) approach to design since the system is developed in increments instead of designing the whole system and all its functionality at once. In each iteration of the design phase, the design should give guidance for the implementation of a story. No matter what software process you choose to adhere to, the design phase will likely include the activities discussed in this section.

CRC modelling

Class-Responsibility-Collaborator modelling is a tool that is often used in the agile development of web applications. An example of a CRC diagram is shown below.



CRC modelling is used for the design of object-oriented programs. Basically, CRC models give information about:

- All **classes** that will make up a system. Remember what you have learned about OOP? A class is a blueprint for an object. Wall, Window, Door, etc. in the diagram above are all examples of classes.

- **Responsibilities**: Remember that all classes consist of attributes and methods. These attributes and methods are known as responsibilities. Responsibilities are, therefore, everything that a class knows or does.

- **Collaborators**: Collaborators are classes that need to provide information for another class to be able to carry out a responsibility. Collaborators show the interaction between classes.

USE CASES

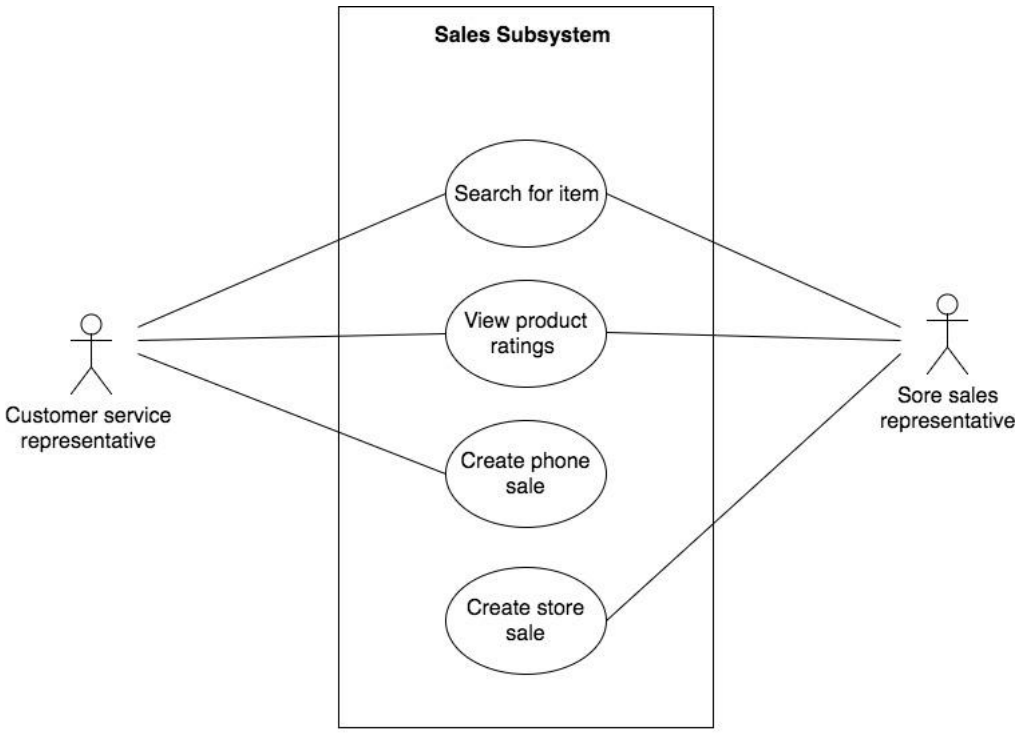
A use case is an activity that the system performs, usually in response to a request by a user. It identifies the actors (people or groups, external to the system, that interact with the system by supplying or receiving data) involved in an interaction

and names the type of interaction. The set of use cases represents all of the possible interactions described in the system requirements.

Each use case should be documented with a brief description that can then be used to create other UML models. The table below shows some examples of brief use case descriptions:

Use case	Brief use case description
Create customer account	The actor enters new customer account data and the system assigns the customer an account number, creates a customer record, and creates an account record.
Look up customer	The actor enters the customer's account number and the system retrieves and displays customer and account data.
Process account adjustment	The actor enters an order number and the system retrieves customer and order data. The actor enters the adjustment amount, and the system creates a transaction record for the adjustment.

Use cases are documented using a use case diagram. Actors in the process, who may be human or other systems, are represented as stick figures and the use case itself is represented by an oval with the name of the use case inside. Lines link the actors with the interaction or use case. The following diagram is an example of a use case diagram:



There is no clear distinction between scenarios and use cases. Some people consider that each use case is a single scenario, while others encapsulate a set of scenarios in a single use case. Scenarios and use cases are effective techniques for eliciting requirements from stakeholders who interact directly with the system. Each type of interaction can be represented as a use case. They are not as effective for determining constraints for high-level business and nonfunctional requirements or for discovering domain requirements, as they focus mainly on interactions with the system.

PROTOTYPING

A prototype is essentially a quickly-built stripped down version of a system. Its purpose is to be able to show stakeholders a basic mock-up of the system so they can see if development is heading in the right direction. The prototype is developed quickly and cost-effectively so that it does not waste resources, but it needs to be developed enough to use for design experiments and for stakeholders to check if all their requirements for the system are being met. If not, the prototype is developed early enough in the process that it is not overly expensive or time-consuming to change something if need be. Prototyping is an important part of user interface design.

USER INTERFACE DESIGN

One particular non-functional requirement is knowing how the user will interact with the system — the user interface (UI). If you think of using Google Maps on your phone, you don't really care about the inner workings of the app, you just want to know how to get from A to B. That's the user interface — where the user and the system interact. Because most users of a system are not well-experienced in the inner workings of software and technology, it is very important that the system is intuitively designed and easy to use. The designing of this involves anticipating what a user might try to do in order to achieve a specific outcome. For example, will they swipe right if they want the menu? What might they do if they want to cancel their current journey? Would the user be confused if the "start" button were red instead of green? All of these types of questions need to be answered and accounted for to make a system usable.

ELEMENTS OF UI DESIGN

If we go to Google Maps, let us see what UI elements are present (Garrett, 2011):

1. **Input controls:** this is how the user provides information. For example:
    a. Dropdown list that pops up when you start typing
    b. Checkboxes to select what map view you want to see
    c. Button to look at directions
2. **Navigational components:** this helps us navigate through the program
    a. Search field to search for a location
    b. Icons to show restaurants, attractions, etc.
    c. Image carousel of nearby places to explore
3. **Informational components:** these provide output from the system
    a. Notifications of potential traffic delays
    b. Progress bar when traffic information is being updated

BEST PRACTICE FOR UI DESIGN

The best programs are designed in such a way that we don't have to learn how to use them. Most of the following may seem obvious when you read it, but they can be what make or break a program's usability:

1. **Keep it simple.** Don't add a whole lot of unnecessary things just to take up space — it can get confusing for the user.
2. **Use common UI elements consistently.** Where would you normally go to close a window on your computer? It's never in the centre of the screen, right? That is because having the close button in one of the top corners of the screen is a common UI element we have all become accustomed to. Having these elements and keeping them consistent means that the user can apply prior experience to your program rather than learning something completely new.
3. **Use colours, textures and typography purposefully.** Remember when you first discovered WordArt in Microsoft Word and proceeded to have rainbow headings with a drop shadow for everything? With good UI, we want to use colours and textures to convey a message — green to start, red to stop, etc. Typography can be useful when showing different levels of hierarchy, e.g. a big heading is the main heading, and smaller headings will be subheadings of that.
4. **Communicate.** There is nothing scarier than making an online payment and having the webpage suddenly freeze. Users feel calm when they know what's going on, so convey the problem to them in a notification.

USER INTERFACE VS USER EXPERIENCE

You may have heard the term "user experience" (UX) before — it is often in a context where it seems interchangeable with "user interface" (UI). While the two do work closely together, they are actually two distinct design processes with different priorities. Put simply, UI deals specifically with the design elements used in the interface — colour, typography, spacing, text boxes, search bars, etc. On the other hand, UX is more abstract: it deals with the *feel* of using the system — its flow.

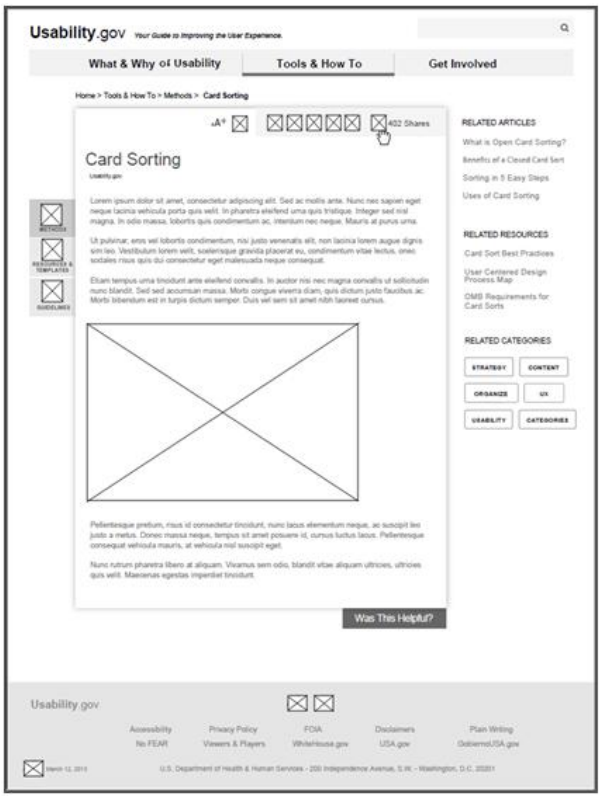
As elegantly put by Dain Miller (Web Developer):

"UI is the saddle, the stirrups, and the reins. UX is the feeling you get being able to ride the horse."

WIREFRAMING

Wireframes are tools that are used extensively for the design of UIs for web applications. Wireframes are simply a "blueprint" of a web application. It is a two-dimensional illustration of a webpage's interface that focuses specifically on space allocation and prioritisation of content, functionalities available and intended behaviours. Wireframes typically do not include any styling, colour, or graphics for these reasons.

Wireframes are guides to where the major navigation and content elements of your site are going to appear on the page. Keep it simple as the goal of the illustrations is not to depict visual design. You should not use colours. If you need to use colours to distinguish items, use various grey tones instead. You should also not use images since they tend to distract from the task at hand. You can use a rectangular box sized to dimension, with an "x" through it to indicate the placement and size of an image. Finally, you should only use one generic font. Typography should not be a part of the wireframing discussion however, you can still resize the font to indicate various headers and changes in the hierarchy of the text on the page. Below is an example of a wireframe:



It is important to remember that wireframes don't do well with showing interactive features of the interface as they are two-dimensional.

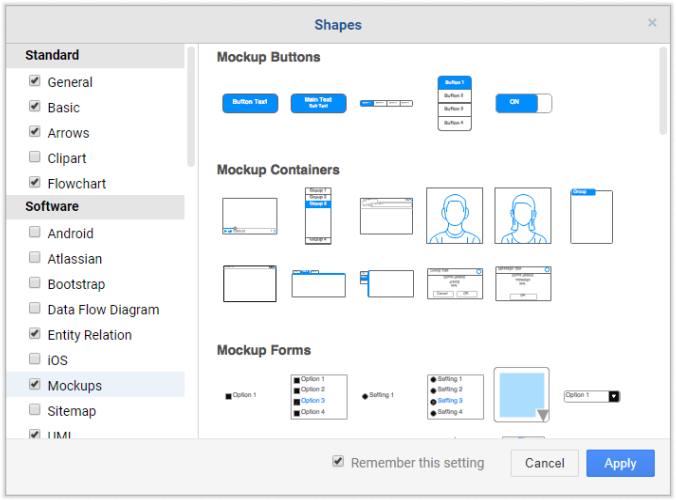
The following is a list of elements that are often included as standard elements on wireframes. However, wireframes tend to differ from site to site.

- Logo
- Search field
- Breadcrumbs (chain of links used on websites with hierarchical navigation)
- Headers, including page title
- Navigation systems, including global navigation and local navigation
- Body content
- Share buttons
- Contact information
- Footer

Take note:

There are various tools that can be used to create wireframes. One such tool is found **here**. To use draw.io to create wireframes, make sure that you add the shapes used to create "Mockups". To do this:

- Open **https://www.draw.io/**
- When a blank, untitled diagram is opened, click on the "More Shapes" button at the bottom left-hand corner of the screen.
- From the dialogue that appears select "Mockups" (in the "Software" category)



SPOT CHECK 2

Let's see what you can remember from this section.

1. What is a use case?
2. What is a prototype and what is it for?
3. What are the 3 main types of components used in UI design?
4. What is a wireframe?

Compulsory Task 1

Follow these steps:

- Imagine that you are required to create a Task Management web app. Your web app should be designed to allow a user to:
    - Sign in
    - Add tasks
    - Assign tasks to themselves or other users
    - Delete tasks
    - Edit existing tasks
    - Mark tasks as complete
    - Filter tasks by:
        - Completed tasks
        - Tasks that must still be completed
        - Deadline
        - Tasks that are overdue

- For this task, you are required to design and plan your Task Management web app. In order to do this:
    - Analyse some existing web applications that do something similar to what you want to accomplish. e.g. Asana
    - Submit:
        - A document that lists the functional and non-functional requirements of your web application.
        - A wireframe showing the UI of your website.
        - At least 5 user stories.

- A document that briefly describes how you are going to make your website (software product) stand out from those of your competitors.

If you are having any difficulties, please feel free to contact our specialist team **on Discord** for support.

Completed the task(s)?

Ask an expert to review your work!

Review work

Rate us

Share your thoughts

HyperionDev strives to provide internationally-excellent course content that helps you achieve your learning outcomes.

Think that the content of this task, or this course as a whole, can be improved, or think we've done a good job?

Click here to share your thoughts anonymously.

References:

Chemuturi, M. (2013). *Requirements engineering and management for software development projects*. New York: Springer Science & Business Media.

Garrett, J. (2011). *The elements of user experience*. Berkeley: New Riders.

Sommerville, I. (2016). *Software Engineering* (10th ed., pp. 101-137). Essex: Pearson Education Limited.

SPOT CHECK 1 ANSWERS

1. User requirements are broad ideas of what the program needs to accomplish. They are written in simple language for anyone to understand. System requirements are the detailed versions of the user requirements. Here, technical jargon is used so that the developers understand the exact functions and constraints of the system because it is the starting point of system design.

2. **F**unctionality, **U**sability, **R**eliability, **P**erformance, and **S**ecurity

3.
    a. **Requirements elicitation:** Determine how the system will be used by the business by interviewing those who will be using the system. Scenarios are also discussed to get a better idea of what the system is required to do and how it will work. This is generally where user requirements are determined.

    b. **Requirements specification:** Write the requirements determined from elicitation into the requirements document described above. Use cases (discussed below) through a UML diagram are also used in this step to illustrate how a user might interact with a system.

    c. **Requirements validation:** Determine that the requirements documented contain everything that the user wants it to do. This is a vital step as sorting out miscommunications before the development process saves both time and money.

SPOT CHECK 2 ANSWERS

1. A use case is an activity that the system performs, usually in response to a request by a user. It identifies the actors involved in an interaction and names the type of interaction. The set of use cases represents all of the possible interactions described in the system requirements.

2. A prototype is essentially a quickly-built stripped down version of a system. Its purpose is to be able to show stakeholders a basic mock-up of the system so they can see if development is heading in the right direction. The prototype is developed quickly and cost-effectively so that it does not waste resources, but it needs to be developed enough to use for design experiments and for stakeholders to check if all their requirements for the system are being met.

3. Input controls, navigational components and informational components.

4. A wireframe is a two-dimensional illustration of a webpage's interface that focuses specifically on space allocation and prioritisation of content, functionalities available and intended behaviours. Wireframes typically do not include any styling, colour or graphics for these reasons. They are guides to where the major navigation and content elements of your site are going to appear on the page.