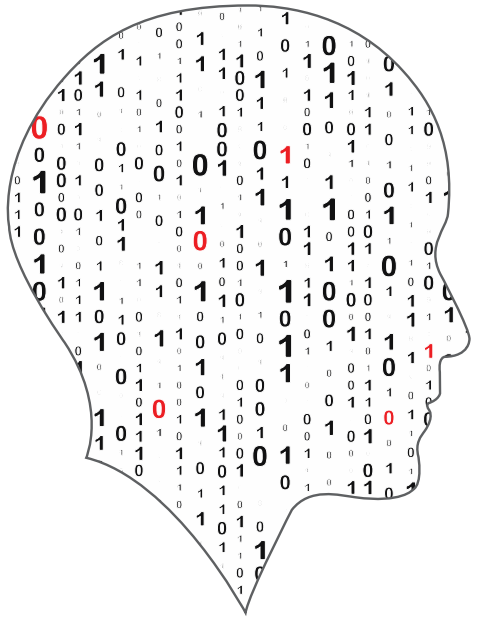
PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

An Roinn Oideachais agus Scileanna
Department of Education and Skills

National Workshop 4



LEAVING CERTIFICATE
COMPUTER SCIENCE

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Session 3/3

ALT 3: Design

Overview of the Session

Section 1	Recap on day 1 - ALT 3 and the LCCS specification + Ideas from breakout
Section 2	The Design Process
Section 3	Stretch break
Section 4	Group activity: Design one potential idea for ALT 3
Section 5	Reporting (on ALTs and CWA)

By the end of this session participants will have:

- reflected on the design process and **potential ideas** for ALT 3 (modelling & simulation)
- worked in groups to **design one** potential solution for ALT 3
- **given and received feedback** on potential ALT 3 designs
- enhanced their understanding of the reporting requirements with regard to the coursework assessment (CWA)

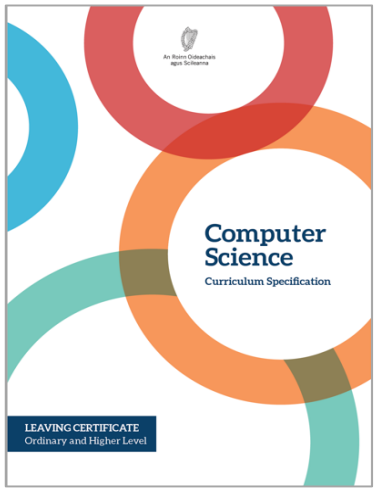
PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Applied Learning Task 3: Modelling & Simulation

Applied Learning Task 3

Modelling, programming and coding require careful ***analysis of patterns and relationships*** *to solve problems.*

Students will engage with a ***problem that is difficult to solve analytically****, but that is amenable to a solution using simulation or modelling.*



Students will develop a computer system that simulates or models the problem. Engaging with a problem in this way will ***heighten students' awareness and understanding of how algorithms can be used*** *across a wide range of disciplines and subjects.*

LCCS Specification: p22

ALT 3: Learning Outcomes

3.8 develop a model that will allow different scenarios to be tested

3.9 analyse and interpret the outcome of simulations **both before and after modifications have been made**

3.10 **explain the benefits of using agent-based modelling and how it can be used to demonstrate emergent behaviours**

LCCS Specification: p23

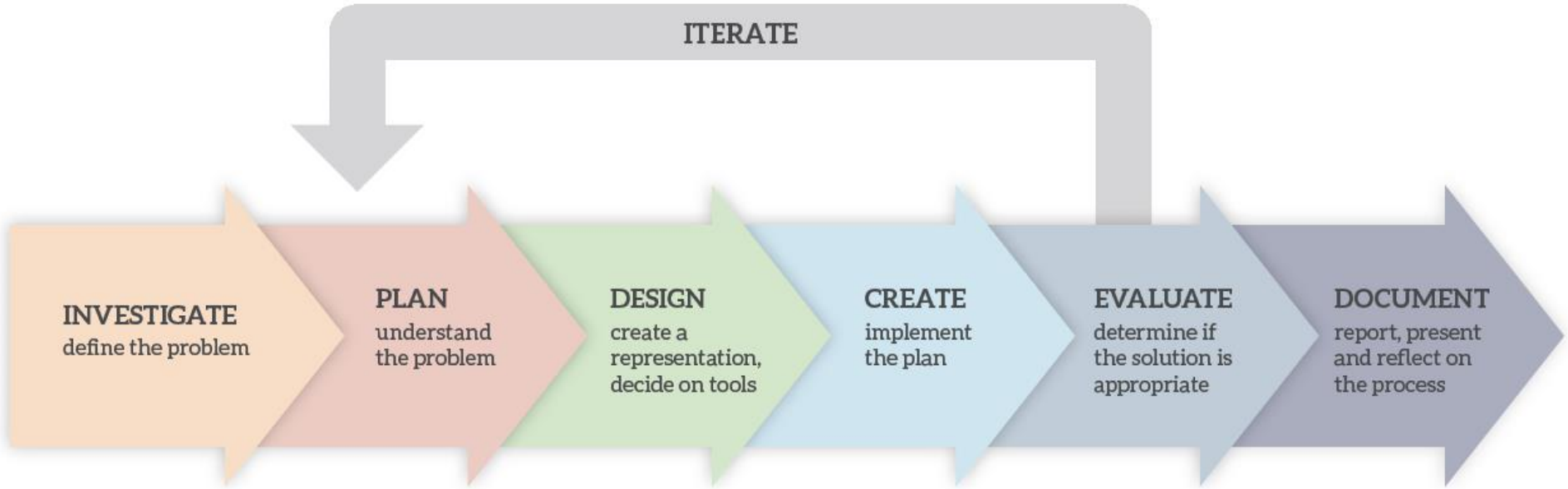
Features/characteristics of Models

"All models are wrong but some are useful" – George Box

- Future – forecasting/predicting
- Messy
- Real-life
- Not easily solved by other means

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

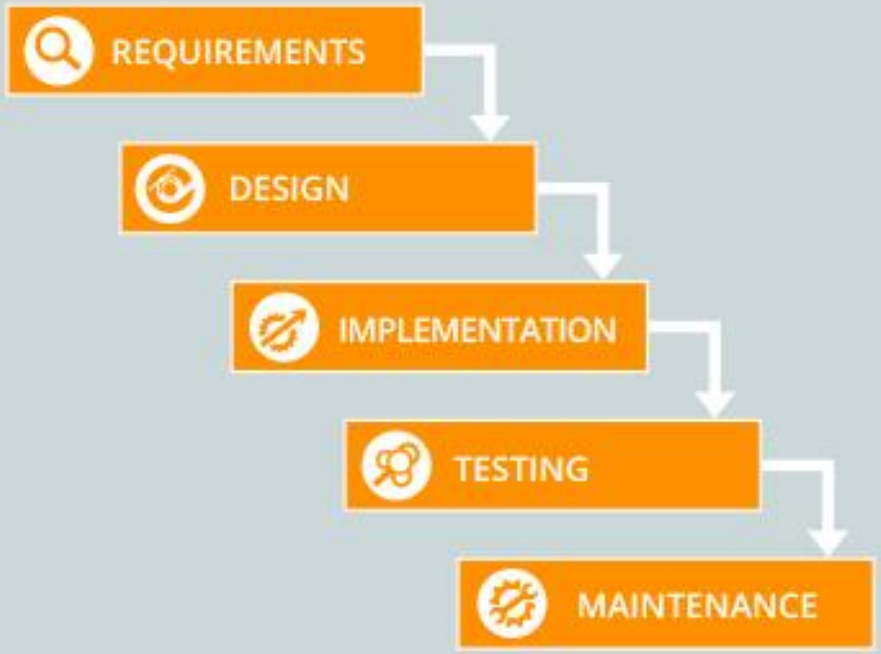
Software Methodologies
Design Processes
Design Tools

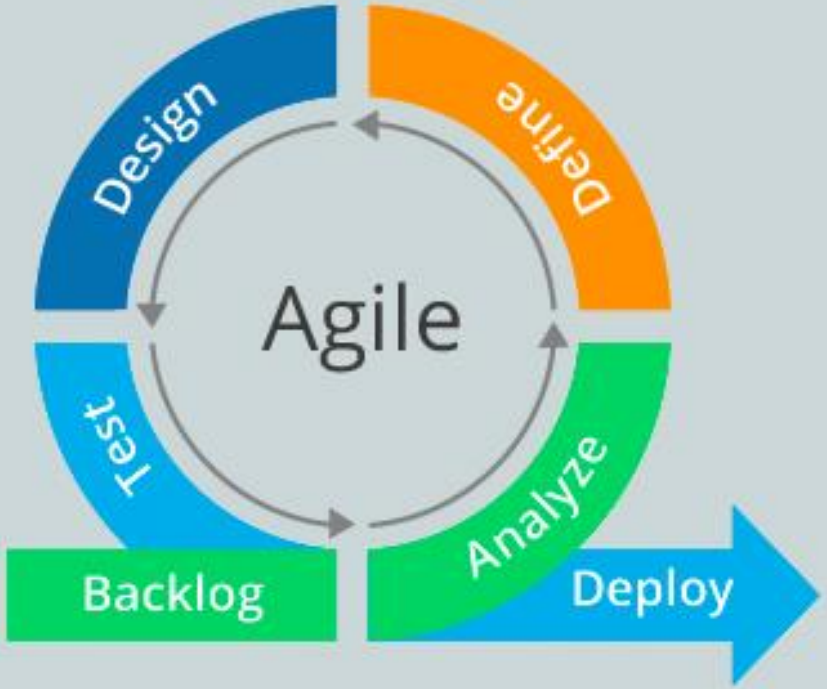


The Design Process

LCCS Specification: p11

Waterfall vs. Agile





Design Methodologies

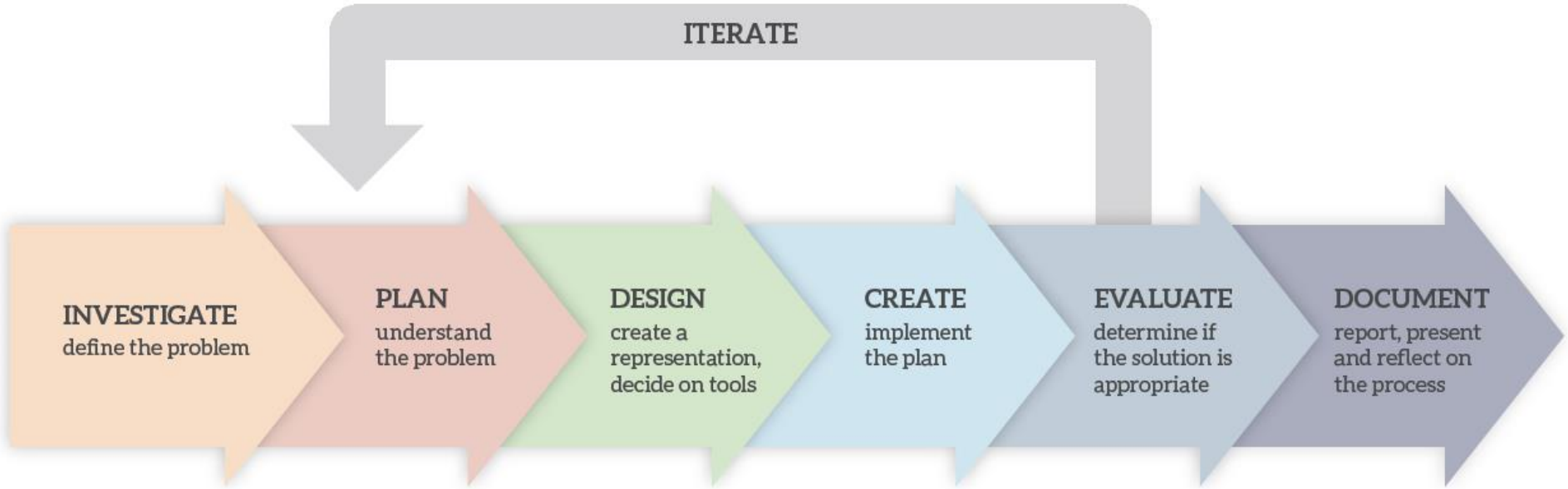
Descriptive / Prescriptive: Languages / Tennis

Other Models – (Staged v Iterative/ V-Shaped / Test-Driven Development)

Infographics

Traditional (Waterfall) vs Agile (eg Scrum)

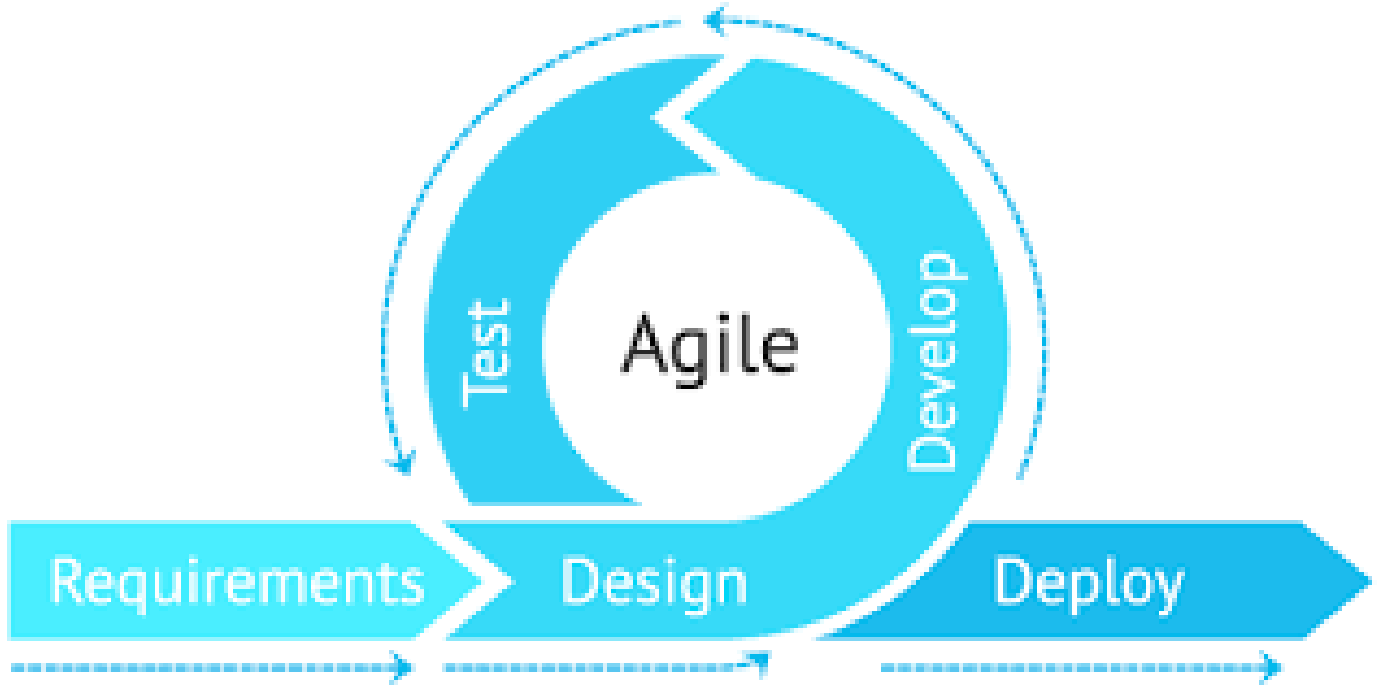
Specification (HKBKF) ALTs, Design and Developing (5 LOs), ***Testing*** (4 LOs)…



The Design Process

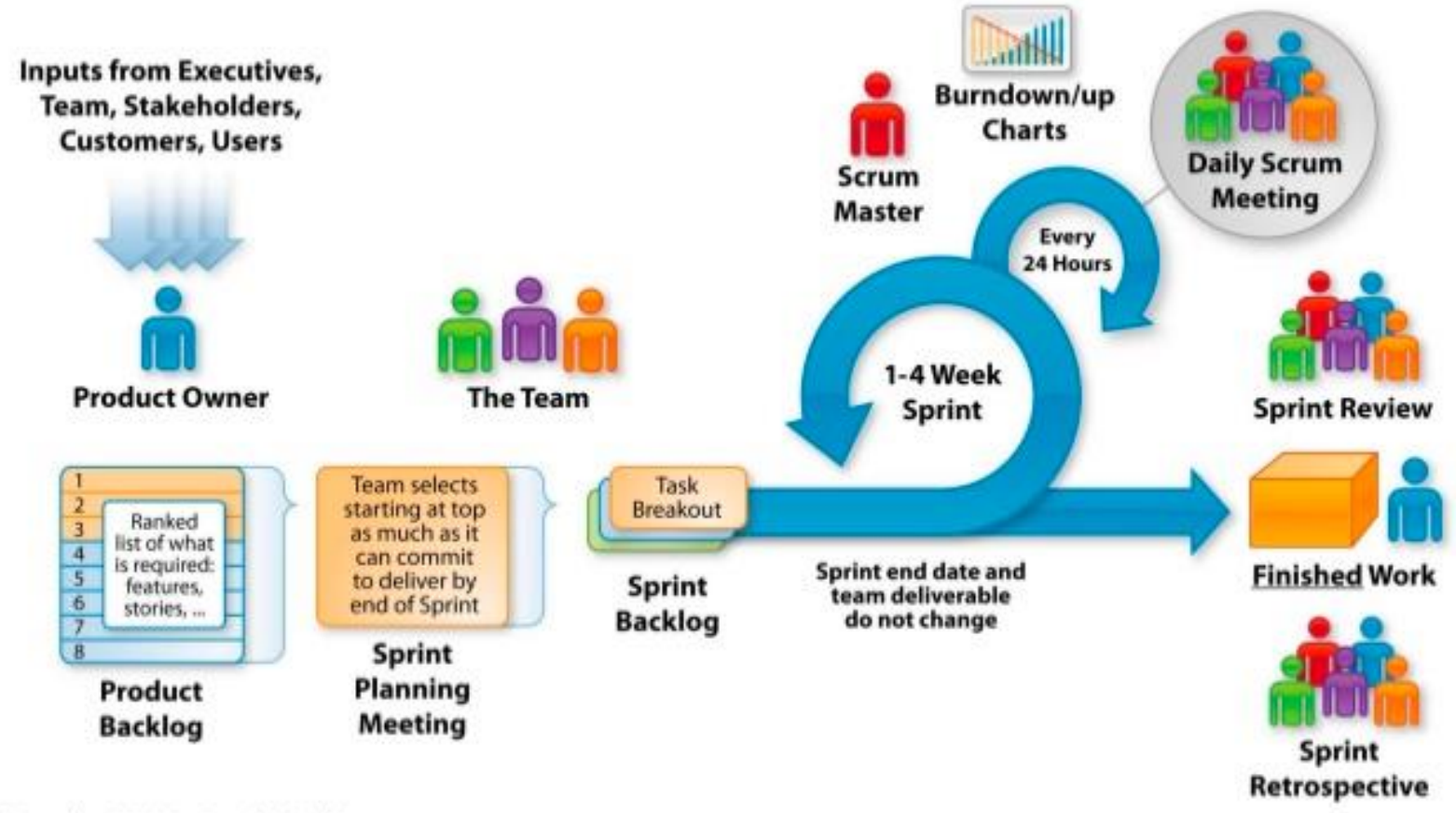
LCCS Specification: p11

Agile Software Development



Scrum

Agile: Scrum Framework

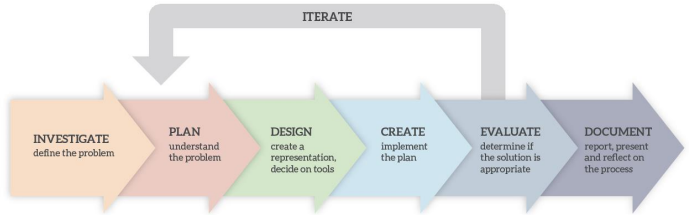


Source: Neon Rain Interactive – Agile For All

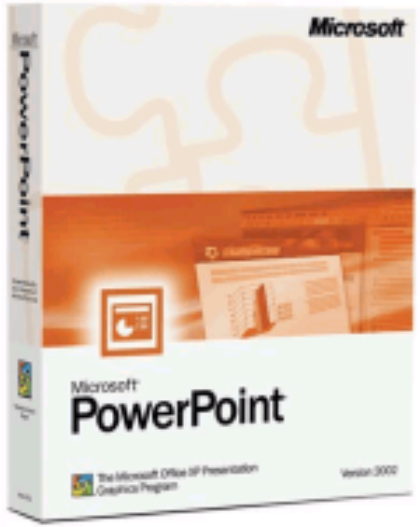
Scrum Process

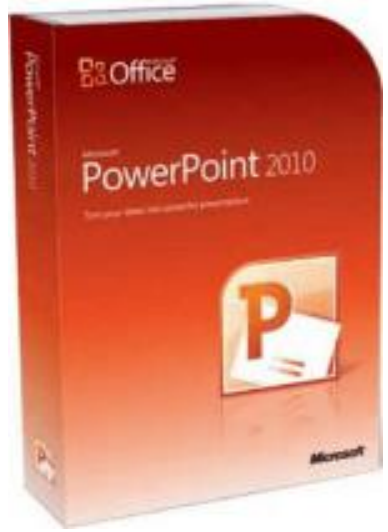
Scrum (Agile)

Waterfall Example – MS Powerpoint

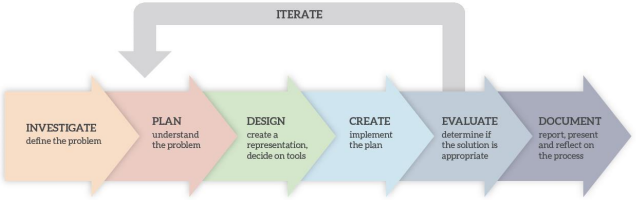


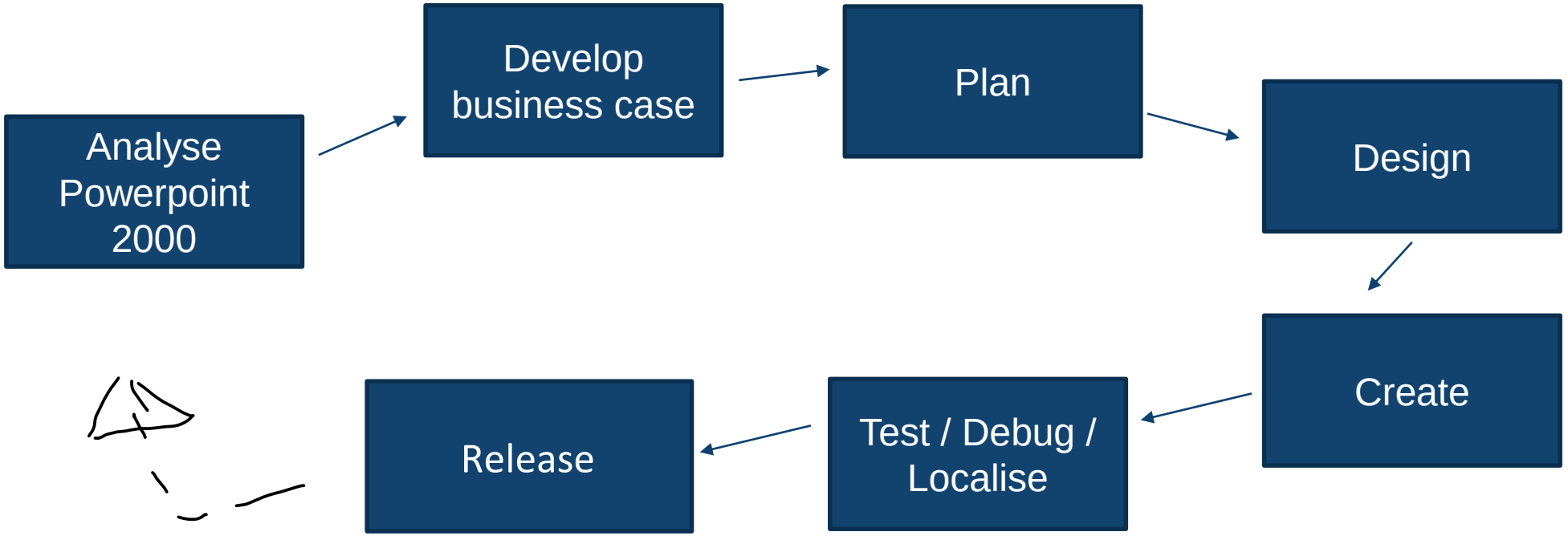
Versions of Microsoft
Powerpoint





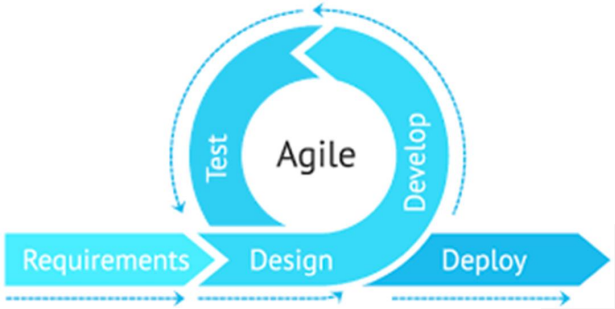
Microsoft *Powerpoint* 2002 – 2 years

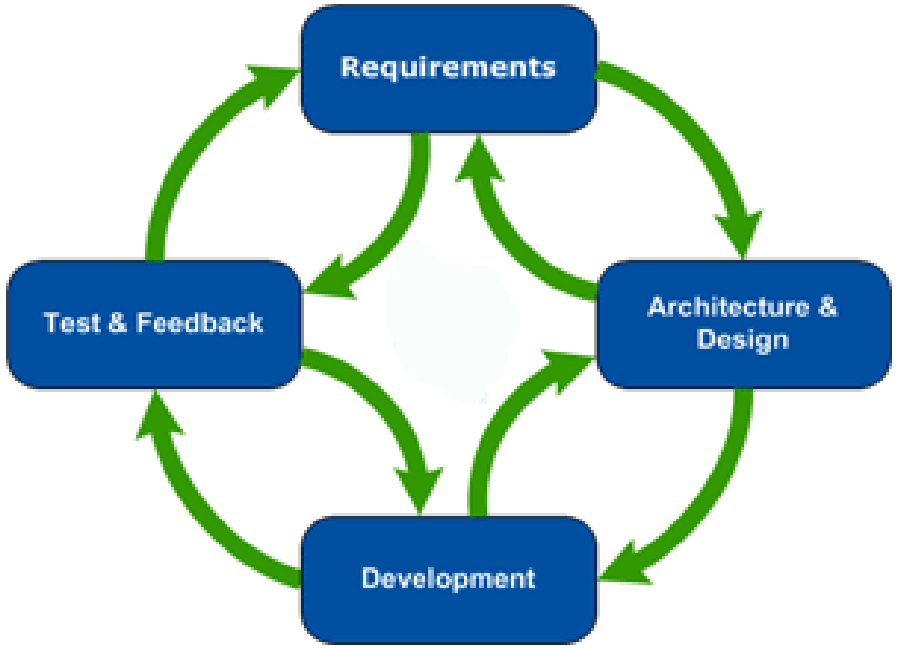




Agile Example – Moodle

Introducing Moodle in a College





Part Implementation – almost from Day one

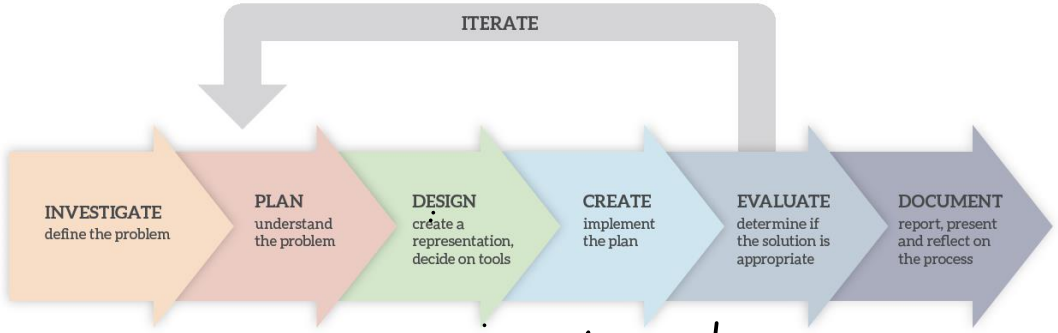
Regular Reprioritising (eg email function / database of student details / access course materials / submitting assignments…)

Numerous meetings which can change project direction

Retesting required at regular intervals

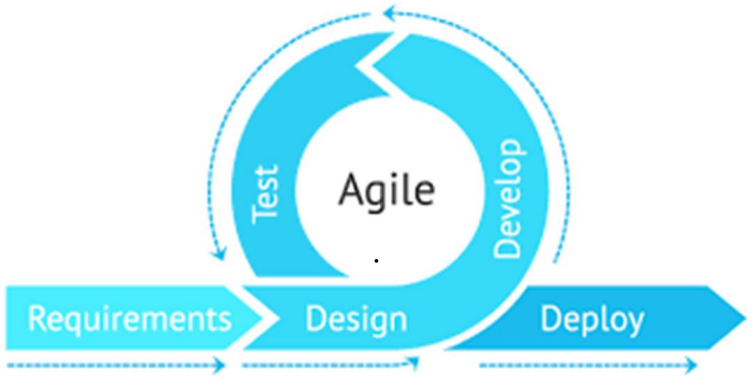
Agile and ALT3

Projects too small to analyse?
Always Waterfall / Traditional?
Could have traditional / agile characteristics?



traditional

Waterfall



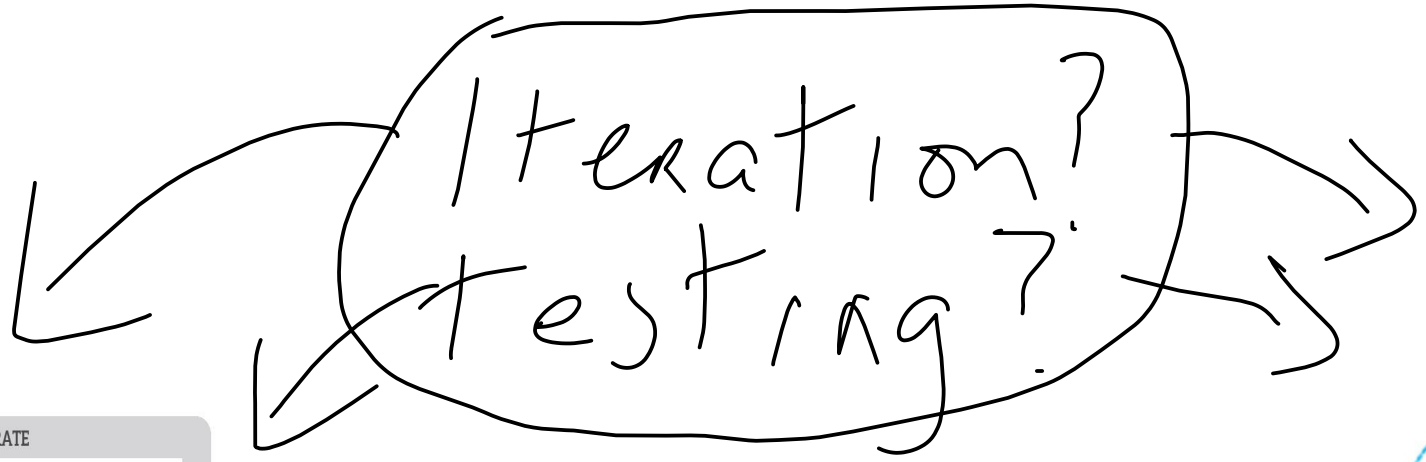
Agile

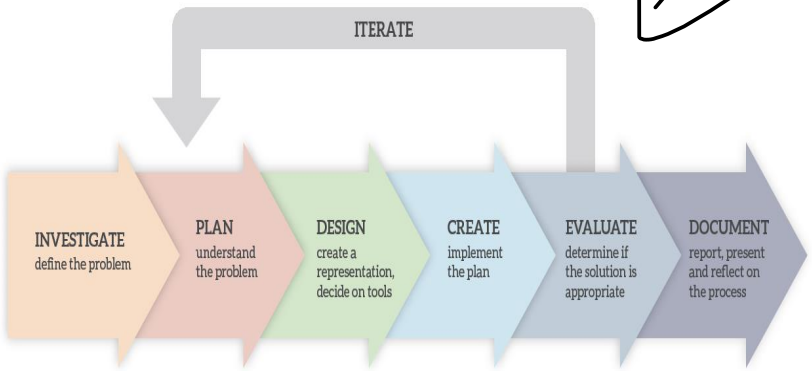
SCRUM,

XP

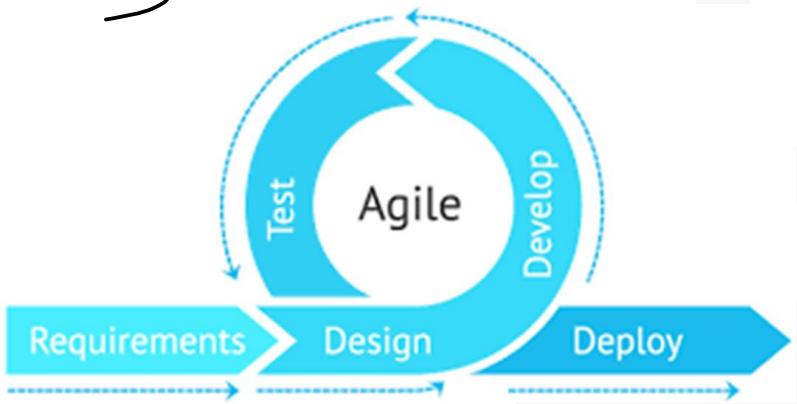
Waterfall vs Agile: Iteration / Testing

Traditional





Agile



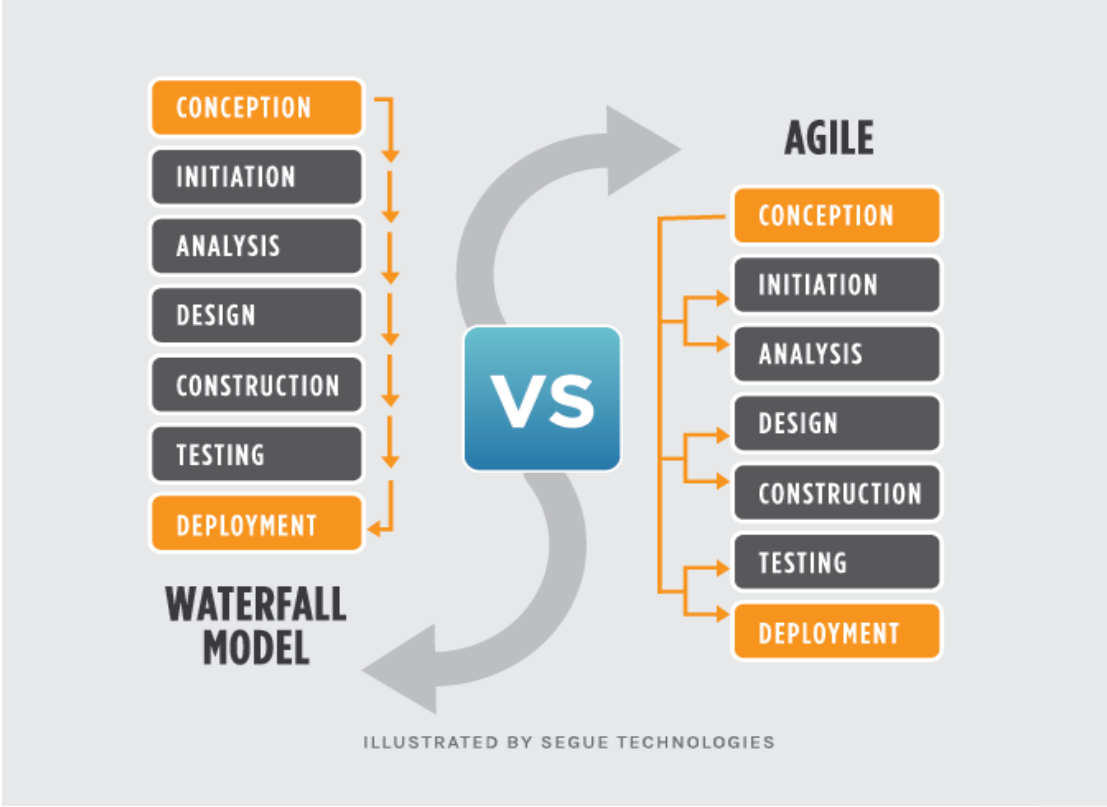
Waterfall vs Agile

Advantages / Disadvantages

Real-life? Mixture?

Give one or two advantages / disadvantages of Waterfall vs Agile development

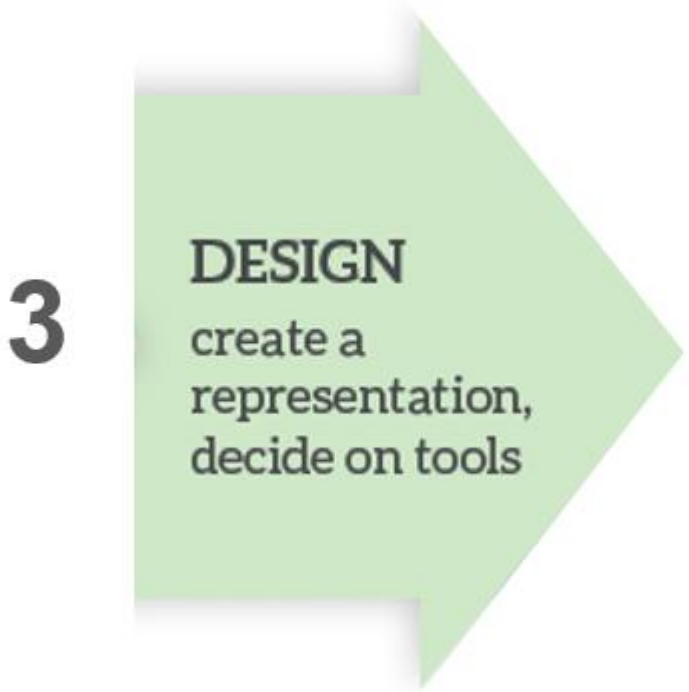
(Menti 9108 1001)



3

DESIGN

create a representation, decide on tools



Input: A functional specification (requirements document)

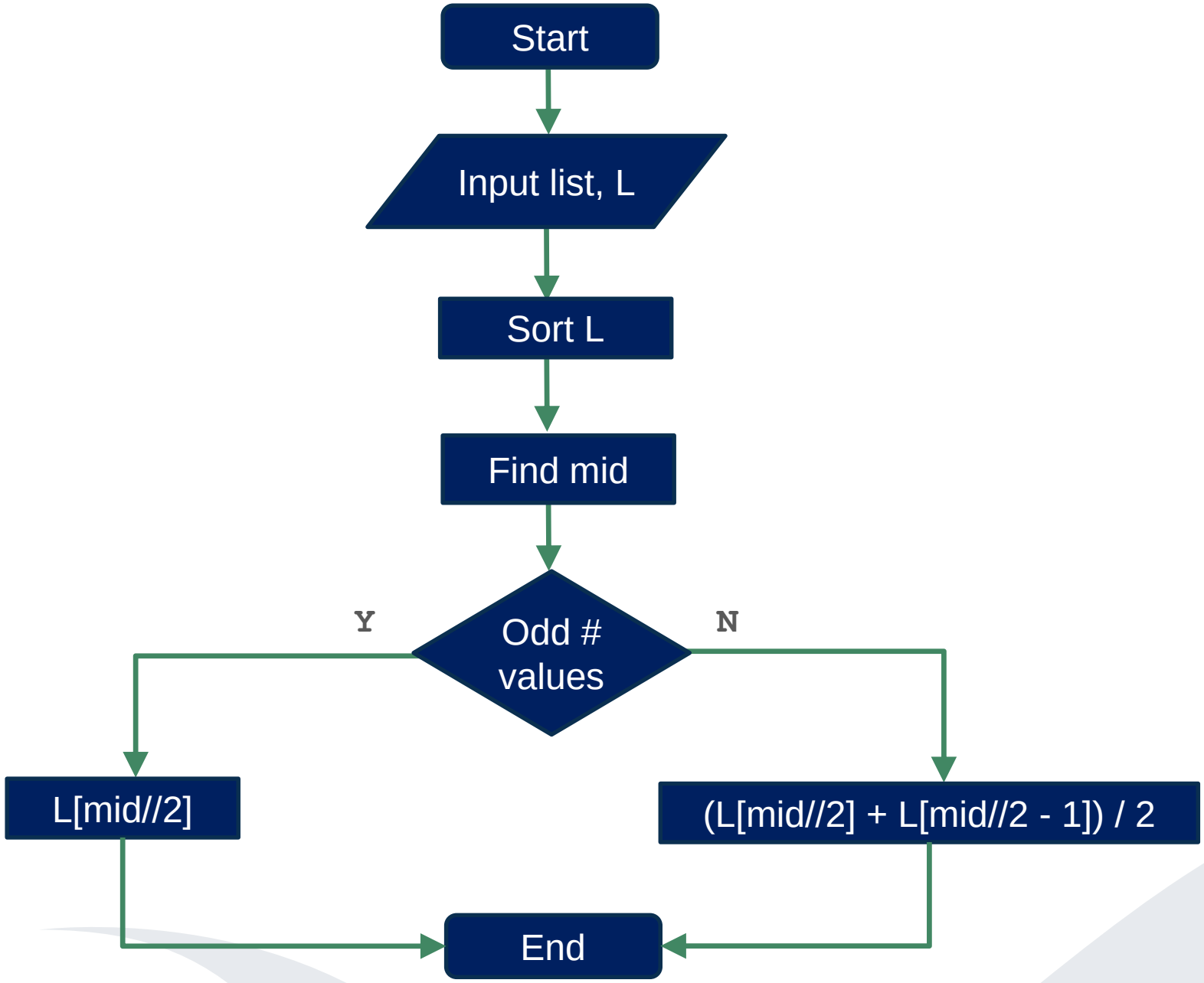
- How is the system realised?
- What is the overall design (system architecture)?
- Are there sub-systems?
- How do the sub-systems relate to one another?
- How is the data represented?
- How is the data captured and validated?
- Data flow diagrams.
- Algorithm design … flow charts, pseudo-code
- Test cases
- Milestones and timelines?

Output: A representation of the system

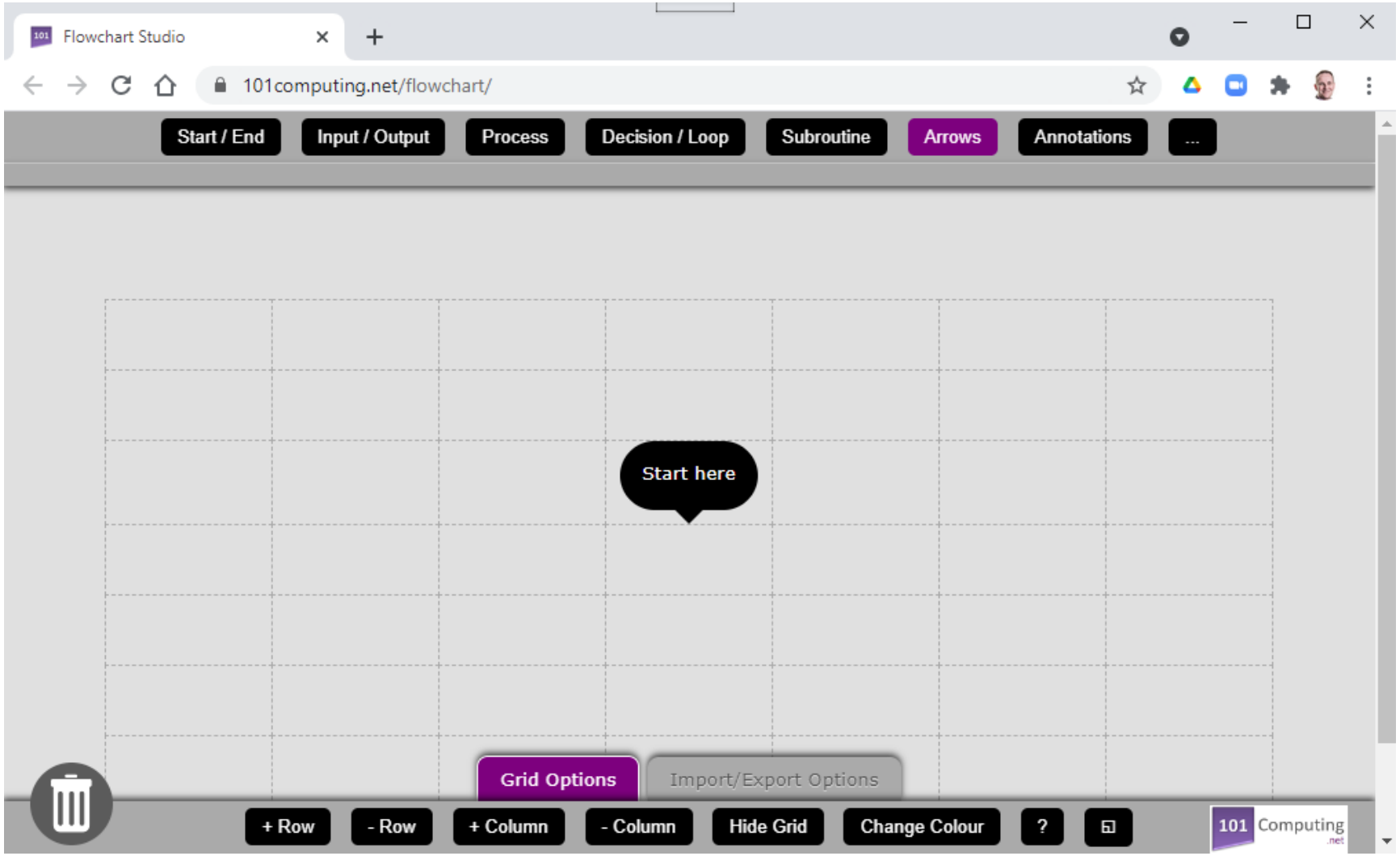
Flow charts

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A diamond indicates a decision

Median


Start
Input list, L
Sort L
Find mid
Odd # values
Y
N
L[mid//2]
(L[mid//2] + L[mid//2 - 1]) / 2
End

Online flowcharting

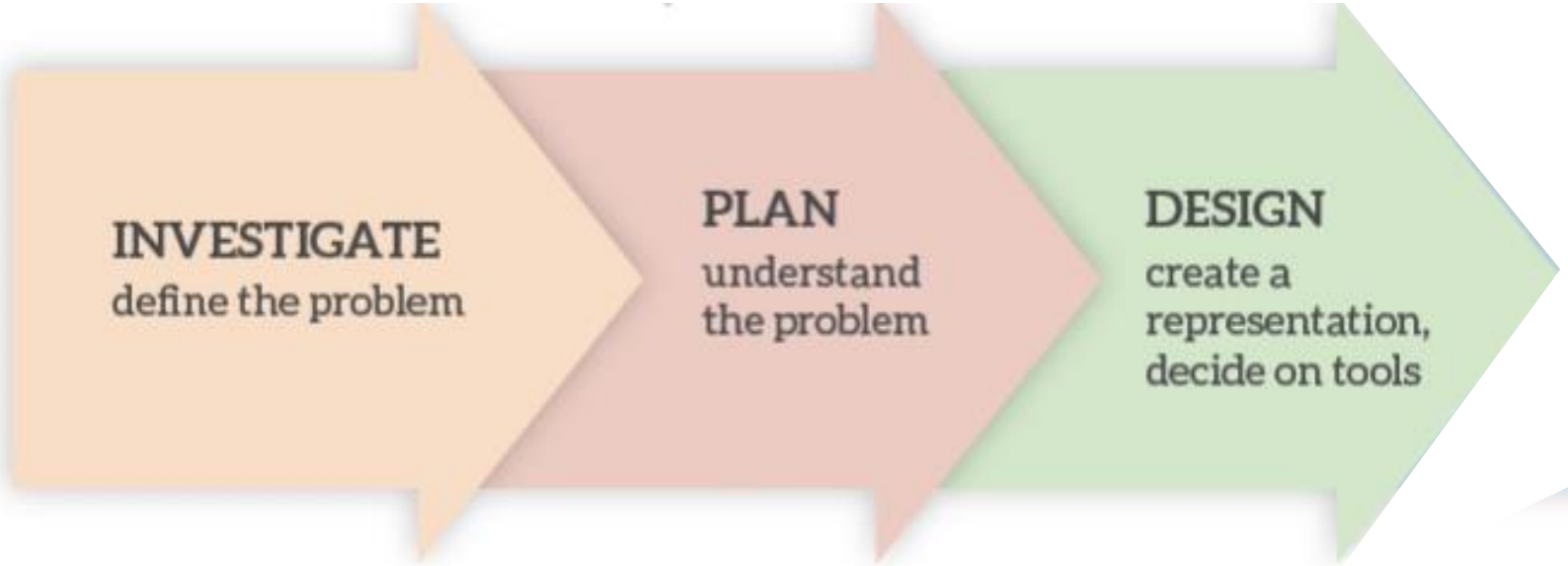


https://www.101computing.net/flowchart/

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

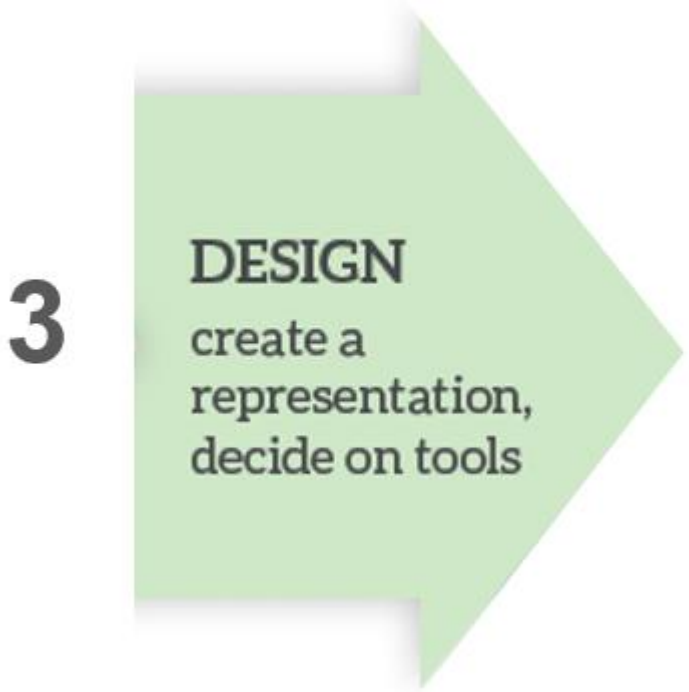
Group Activity: ALT 3 Design

A look back at Investigate/Plan from Day 1


INVESTIGATE
define the problem
PLAN
understand
the problem
DESIGN
create a
representation,
decide on tools

Group Activity / Breakout

Design Questions



Input: A functional specification (requirements document)

- How is the system realised?
- What is the overall design (system architecture)?
- Are there sub-systems?
- How do the sub-systems relate to one another?
- How is the data represented?
- How is the data captured and validated?
- Data flow diagrams.
- Algorithm design … flow charts, pseudo-code
- Test cases
- Milestones and timelines?

Output: A representation of the system

Group Activity ALT 3: Design

1. Read the ‘plans’ carefully - these were developed in NW4 Day 1.

2. Choose **one** plan and develop a design

20-30 minutes

5 minute movement break

Presentation & Debrief

Why?

What steps?

Any areas of disagreement?

Did you consider alternatives?

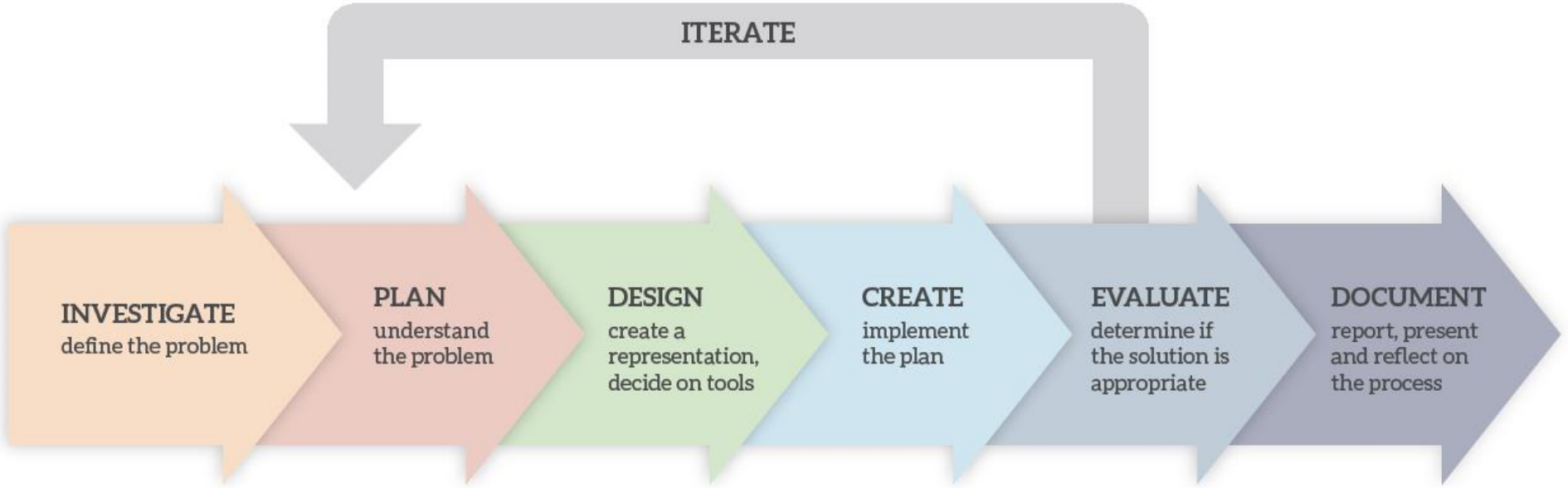
How could you improve?

How?

How did you feel about having to come up with a design based on someone else's plan?

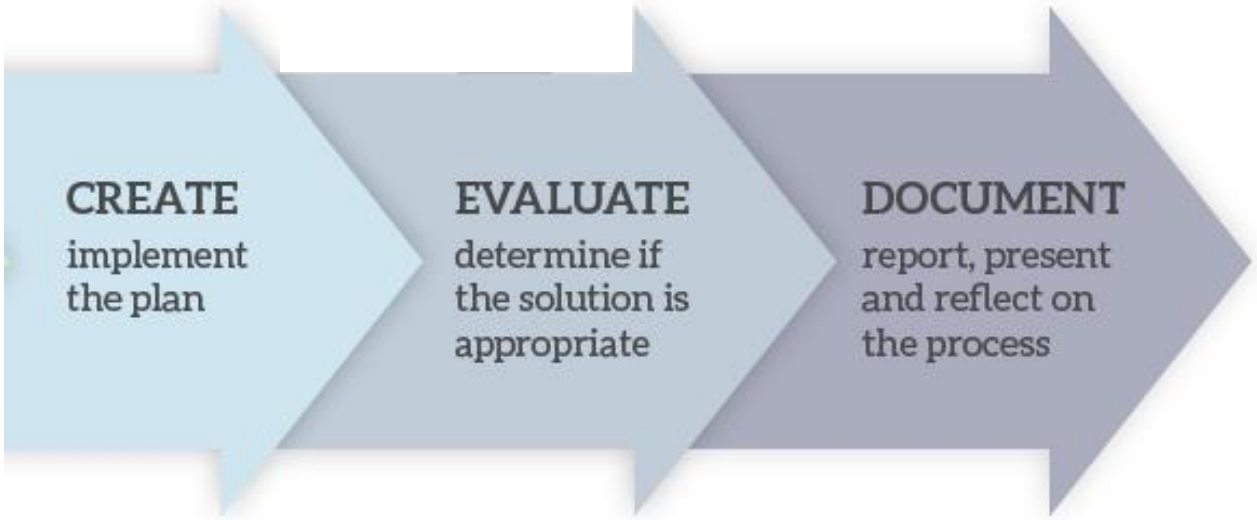
PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Reporting

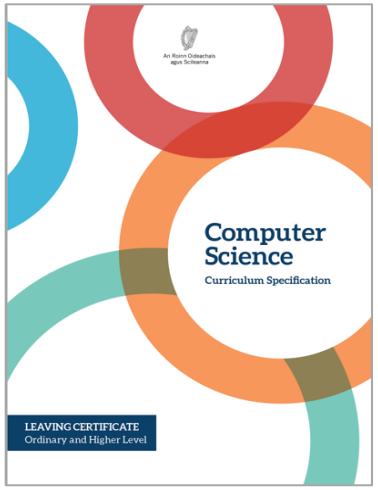


The Design Process

LCCS Specification: p11


CREATE
implement the plan
EVALUATE
determine if the solution is appropriate
DOCUMENT
report, present and reflect on the process

Reporting - ALTs



The output from each task is a computational artefact and a concise individual report outlining its development. In the report, students outline where and how the core concepts were employed. The structure of the reports should reflect the design process shown above in Figure 3. Initial reports could be in the form of structured presentations to the whole class. As students progress, reports should become detailed and individual. Reports are collected in a digital portfolio along with the computational artefact and must be verified as completed by both the teacher and the student. The (separate) externally-assessed coursework will be based on all learning outcomes, with those of strand 3 being particularly relevant.

LCCS Specification: p11

They (students) will develop skills in communication by collaborating to generate reports and present them to their peers. The strand 3 tasks will enable students to take an active role in their own learning by setting goals, developing action plans, and receiving and responding to assessment feedback.

LCCS Specification: p15

S1: Designing and developing	
Design process	1.19 identify features of both staged and iterative design and development processes
Working in a team, assigning roles and responsibilities	1.20 collaborate and assign roles and responsibilities within a team to tackle a computing task
Communication and reporting	1.21 identify alternative perspectives, considering different disciplines, stakeholders and end users
	1.22 read, write, test, and modify computer programs
Software development and management	1.23 reflect and communicate on the design and development process

LCCS Specification: p19

An Roinn Oideachais
Department of Education