G.C.E. O/L Grade 11 ICT · Lesson 2

2.2 System Development Life Cycle (SDLC): Waterfall and Iterative Models

Syllabus 11.2. A new information system is not built in one day. It goes through a set of steps called the **Systems Development Life Cycle (SDLC)**: requirements identification, design, implementation, testing, deployment and maintenance. In this note we follow **one case study** – a new **school library management system** for a Sri Lankan school – through every phase. You will also compare the **phased (waterfall)** and **iterative incremental** life cycles and see what changed in 2026.

1. The six phases of the SDLC

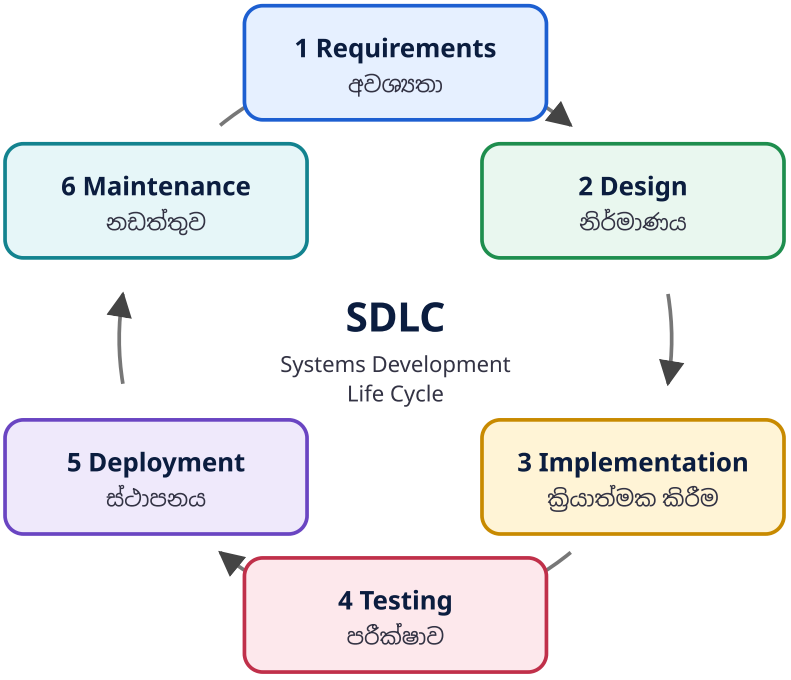


Figure 2.4 – The SDLC: six phases that repeat as the system grows.

💡 Think of building a house. First you ask the family what they need (requirements), an architect draws the plan (design), masons build it (implementation), you check the taps and wires (testing), the family moves in (deployment) and later you repair and extend it (maintenance).

Phase	Case study: school library system
1. Requirements identification	Interview the librarian, give questionnaires to students, observe the issue desk, read the old book cards; feasibility study.

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

2. Design	Design the Book and Member tables, the issue screen, the overdue report and the barcode input.
3. Implementation	Programmers write the code and build the database.
4. Testing	Test issuing and returning books with normal, boundary and invalid data.
5. Deployment	Install it in the library, enter all books, train the staff, change over from the cards.
6. Maintenance	Fix a fine-calculation bug, add SMS reminders, make the search faster.

2. Phase 1 – Requirements identification

The analyst finds out **what the users need** and the problems of the present system. In our school, the librarian says book cards get lost, fines are worked out wrongly and no one knows which books are overdue. First a **feasibility study** checks whether the project is worth doing.

Feasibility	Question
Technical	Do we have the computers, network and skills?
Economic	Is the benefit worth the cost?
Operational	Will the librarian and students use it?
Legal	Does it follow the law, e.g. the PDPA 2022?
Schedule	Can it be finished in time, e.g. before the new school year?

Fact finding – four ways to collect the requirements:

Method	Library example	Good point
Interview	Talk to the librarian and the principal	Detailed answers; can ask more questions
Questionnaire	Give a form to 200 students	Many people quickly and cheaply
Observation	Watch the issue desk at the interval	See what really happens
Document review	Read old book cards, registers and fine receipts	Shows the real data used

3. Phase 2 – Design

Design plans **how** the new system will work, before any code is written.

Input design
ආදාන නිර්මාණය

Output design
ප්‍රතිදාන නිර්මාණය

Database design
දත්ත සමුදාය නිර්මාණය

Interface design
අතුරුමුහුණත් නිර්මාණය

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

4. Phase 3 – Implementation (coding)

Programmers turn the design into a working program: they create the database tables and write the code for issuing, returning and reports. They write comments and keep the code in version control (e.g. Git) so changes are not lost.

> NEW 2026 **2026 – AI-assisted development:** tools such as GitHub Copilot or ChatGPT can suggest code. Use them responsibly: understand and test every line, never paste real student data into an AI tool, check licences, and say when AI helped.

5. Phase 4 – Testing

Testing finds errors **before** the users do. It is done at four levels, from small parts to the whole system:

Level	What is tested	Library example
Unit testing	One module on its own	The fine calculation function
Integration testing	Modules working together	Issue screen saves into the Loans table
System testing	The whole system, incl. speed and security	100 loans at once; wrong password blocked
User acceptance testing	Real users check it meets their needs	The librarian tries a normal school day

Test data for the field “Mark (0–100)” – choose all three kinds:

Kind	Example values	Expected result
Normal	45, 72	Accepted
Boundary	0, 100	Accepted
Invalid	-5, 105, abc	Rejected with an error message

- **Normal** – ordinary values inside the range.
- **Boundary** – values at the edges of the range (0 and 100).
- **Invalid** – values that must be rejected (−5, 105, “abc”).

> NEW 2026 **2026 – security testing:** test for weak passwords, check that one student cannot see another student’s records, and keep personal data safe as the **PDPA 2022** requires.

6. Phase 5 – Deployment

The system is installed, the old data (all book cards) is entered, users are trained and a user guide is given. Moving from the old system to the new one is called **changeover**. There are four

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

methods:

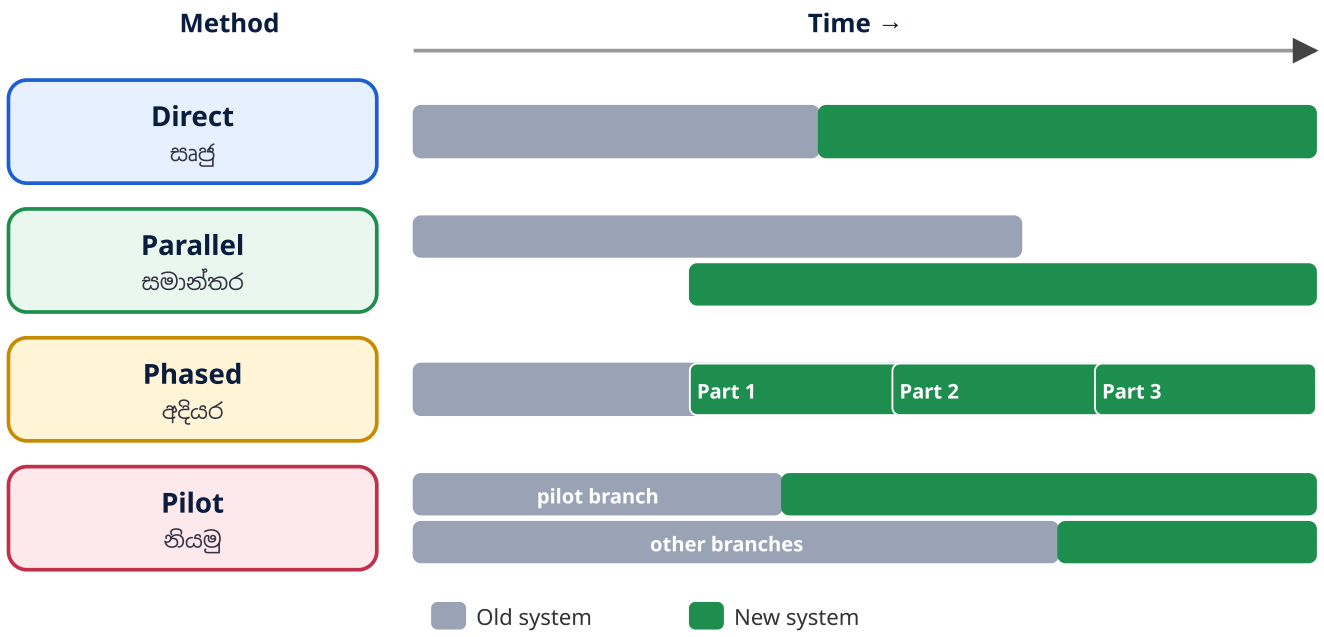


Figure 2.5 – The four changeover methods on a timeline (grey = old system, green = new system).

Method	How	Advantage	Disadvantage
Direct	Old system stops, new starts the same day.	Cheap and quick	High risk if the new system fails
Parallel	Old and new run together for a time.	Safest – old system is a backup	Double work and cost
Phased	New system is brought in one part at a time.	Problems are small and easy to fix	Takes a long time
Pilot	New system is tried in one place first, then everywhere.	Tested in real use with little risk	Other places wait

NEW 2026 **2026 – cloud deployment and app updates:** many systems now run in the **cloud**, so the school needs no server – users open it in a browser. Mobile apps are updated through Google Play / App Store, often every few weeks.

7. Phase 6 – Maintenance

Type	Meaning	Library example
Corrective	Fixing errors (bugs) found after deployment.	Fine shown as Rs. 50 instead of Rs. 5 per day is fixed.
Adaptive	Changing the system to suit a new environment or rule.	Updating the app for a new Android version or the PDPA rules.
Perfective	Improving the system or adding features users ask for.	Adding SMS reminders and a faster search.

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

8. Phased (waterfall) and iterative incremental life cycles

In the **phased (waterfall)** life cycle each phase is finished before the next begins, like water falling down steps. In the **iterative incremental** life cycle the system is built in small parts (**increments**); each cycle plans, builds and tests one part, and users try a working version after every cycle.

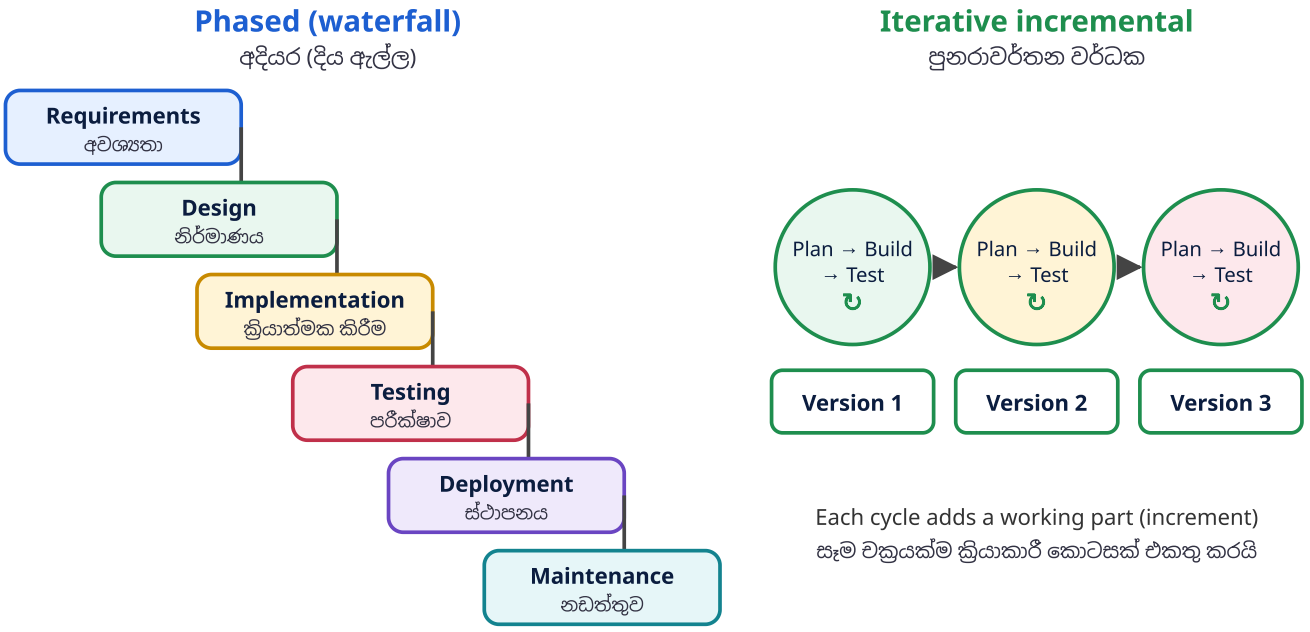


Figure 2.6 – Waterfall steps (left) and iterative incremental loops (right).

Point	Phased (waterfall)	Iterative incremental
Order	Phases run once, one after another	Phases repeat in small cycles
Working version	Only at the end	After every increment
Changing requirements	Hard and costly	Easy – next cycle
User feedback	Mostly at the end	Often, after each increment
Risk	High – problems found late	Lower – problems found early
Best for	Small, clear, fixed projects	Large or changing projects, apps

Library example: with **iterative** development, version 1 only issues and returns books, version 2 adds fines, version 3 adds SMS reminders and reports. The librarian gives feedback after each version.

> NEW 2026 **Extra (beyond the syllabus) – Agile / Scrum:** a popular iterative method in 2026. Work is done in short **sprints** (1–4 weeks); a **product owner** keeps a list of features (**backlog**), and the team meets for a short **daily stand-up**. You do not need Scrum words for the O/L exam.

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

Key Words

SDLC – Systems Development Life Cycle – the phases used to build a system.

Feasibility study – Checks if a project is possible and worth doing.

Fact finding – Collecting requirements by interview, questionnaire, observation and document review.

Design – Planning inputs, outputs, database and interface.

Implementation – Writing the code and building the system.

Unit testing – Testing one module on its own.

User acceptance testing – Real users check the system meets their needs.

Boundary data – Test values at the edges of a valid range.

Changeover – Moving from the old system to the new one.

Parallel changeover – Old and new systems run together for a time.

Adaptive maintenance – Changing a system to suit a new environment or rule.

Iterative incremental – Building a system in small repeated cycles, one part at a time.

Sample Q&A

1. What does SDLC stand for?

> **Answer:** Systems Development Life Cycle.

2. List the six phases of the SDLC in order.

> **Answer:** Requirements identification, design, implementation, testing, deployment, maintenance.

3. Name four fact-finding methods.

> **Answer:** Interview, questionnaire, observation and document review.

4. For a mark field 0–100, give one normal, one boundary and one invalid test value.

> **Answer:** Normal 45; boundary 0 or 100; invalid −5, 105 or “abc”.

5. Which changeover method is safest and why?

> **Answer:** Parallel – the old system still runs, so it is a backup if the new one fails.

6. Give one difference between the waterfall and iterative incremental life cycles.

> **Answer:** Waterfall does each phase once and gives a working system only at the end; iterative repeats cycles and gives a working version after each increment.

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

MCQ

1. The first phase of the SDLC is…

A. testing
B. requirements identification
C. deployment
D. maintenance

2. Which phase comes straight after design?

A. Requirements identification
B. Maintenance
C. Deployment
D. Implementation

3. Checking whether a project is worth its cost is… feasibility.

A. economic
B. schedule
C. technical
D. legal

4. Watching the librarian at the issue desk is the fact-finding method called…

A. document review
B. observation
C. interview
D. questionnaire

5. The best way to collect views from 200 students quickly is…

A. a questionnaire
B. unit testing
C. an interview with each one
D. observation

6. Planning the Books, Members and Loans tables is part of…

A. observation
B. corrective maintenance
C. database design
D. deployment

7. Testing the fine calculation function on its own is…

A. unit testing
B. user acceptance testing
C. system testing
D. integration testing

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

8. The librarian trying the new system on a normal day is…

A. integration testing
B. unit testing
C. document review
D. user acceptance testing

9. For a mark field that accepts 0 to 100, which value is boundary data?

A. 105
B. 100
C. abc
D. 72

10. For the same field, “abc” is…

A. invalid data
B. boundary data
C. a data store
D. normal data

11. Old and new systems running together for a time is… changeover.

A. phased
B. pilot
C. parallel
D. direct

12. Trying the new system in one branch first is… changeover.

A. corrective
B. parallel
C. pilot
D. direct

13. Updating the library app for a new Android version is… maintenance.

A. parallel
B. adaptive
C. corrective
D. perfective

14. In the waterfall life cycle, a working system is usually ready…

A. before requirements
B. after every sprint
C. after each increment
D. only at the end

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

15. A responsible way to use an AI coding assistant is to…

A. paste real student data into it
B. submit its code without reading
C. understand and test the code it suggests
D. skip testing

Structured Questions

1. List the six phases of the SDLC in order and give one library example for any two of them. (6 marks) *(6 marks)*

> Requirements identification, design, implementation, testing, deployment, maintenance (4 for all six in order). Examples, e.g. requirements – interview the librarian; maintenance – fix the fine bug (1 each, 2).

2. Name two fact-finding methods and give one advantage of each for the school canteen ordering system. (4 marks) *(4 marks)*

> Questionnaire (1) – collects views of many students quickly (1). Observation (1) – shows the real queue at the interval (1). (Interview / document review also accepted.)

3. A field accepts a student's age from 10 to 19. Give one normal, two boundary and one invalid test value. (4 marks) *(4 marks)*

> Normal, e.g. 15 (1); boundary 10 and 19 (2); invalid, e.g. 25, −1 or "ten" (1).

4. (i) Describe direct and parallel changeover. (2 marks)
(ii) Which would you choose for the O/L results system? Give a reason. (2 marks) *(4 marks)*

> (i) Direct – the old system stops and the new starts at once (1); parallel – both run together for a time (1). (ii) Parallel (1) – results are very important, so the old system is a backup if the new one fails (1).

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

5. Compare the waterfall and iterative incremental life cycles under two headings, and name the three types of maintenance. (5 marks) *(5 marks)*

E.g. order – waterfall phases once in sequence, iterative repeats cycles (1); changing requirements – hard in waterfall, easy in iterative (1). Corrective, adaptive, perfective (1 each, 3).

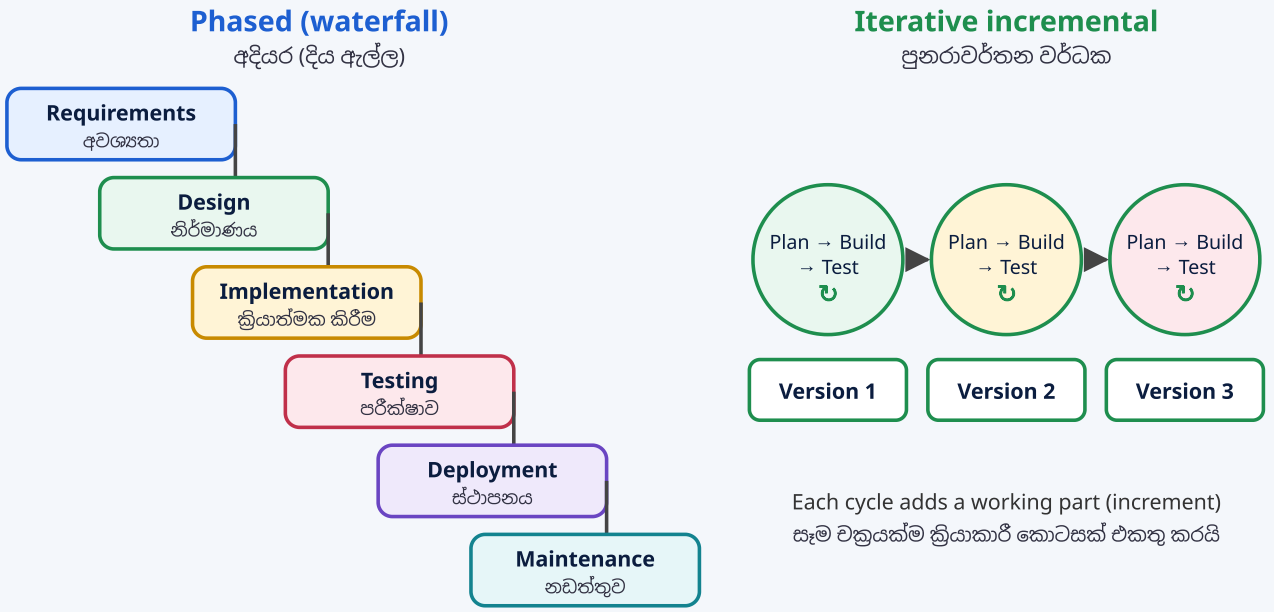


Figure 2.6 – Waterfall and iterative.

Summary

- SDLC: requirements → design → implementation → testing → deployment → maintenance.
- Feasibility: technical, economic, operational, legal, schedule.
- Fact finding: interview, questionnaire, observation, document review.
- Design: input, output, database, interface.
- Testing: unit → integration → system → user acceptance.
- Test data: normal, boundary, invalid.
- Changeover: direct, parallel, phased, pilot; maintenance: corrective, adaptive, perfective.
- Waterfall = once in order; iterative = small repeated cycles.

MCQ answer key – 2.2

1. **B** – Find the needs first.
2. **D** – Design → implementation (coding).
3. **A** – Cost vs benefit.
4. **B** – You watch.
5. **A** – Many people, cheaply.
6. **C** – Design phase.
7. **A** – One module = unit.

© 2026 schoolict.net (Ruwan Mangala Suraweera) · All rights reserved

8. **D** – Real users accept it.
9. **B** – At the edge of the range.
10. **A** – Must be rejected.
11. **C** – Both together.
12. **C** – One place first.
13. **B** – New environment.
14. **D** – Phases run once in order.
15. **C** – Understand, test, protect data.

© 2026 schoolict.net (Ruwan Mangala Suraweera). All rights reserved.