ICT393
Advanced Business Analysis and Design

Topic 1
Systems Analysis and Design Revisited

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Readings and Resources

- Avison, D. E., & Fitzgerald, G. (2003). Where now for development methodologies? *Communications of the ACM, 46*(1), 78-82.
- Griffin, A. S., & Brandyberry, A. A. (2010). System development methodology usage in industry: a review and analysis. *Journal of Information Systems Applied Research*, 3(19), 1-18.
- Vijayasarathy, L. R. & Butler, C. W. (2016). Choice of software development methodologies. Do organizational, project, and team characteristics matter? *IEEE Software*, 33(5) 86-94.
- REVISION: Any systems analysis and design book that covers object oriented analysis and design. For example:
  - Miles, R. and Hamilton, K. (2006) *Learning UML 2.0*,
  - Fowler, M. (2003) *UML distilled: A brief guide to the standard object modelling language*

Learning Objectives

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After completing this topic you should be able to:

- Describe how approaches to system development differ
- Read the main kinds of model developed as part of system development and know when, and why, they are used
- Have an awareness of how systems development methodologies and techniques have been used in organisations

Some Terms

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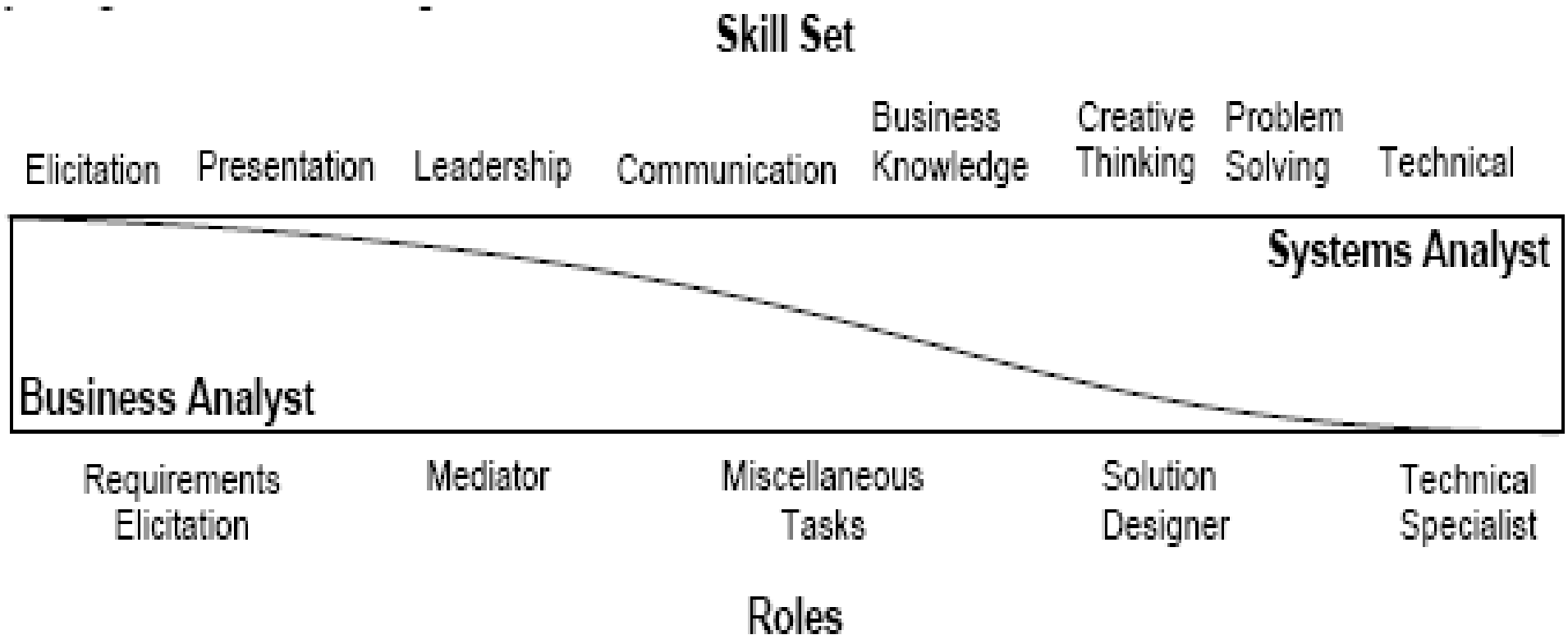
- **Systems analysis** versus **business analysis** – what is the difference if any?

- **Systems analyst** versus **business analyst** – how do these jobs differ?

To Do: Visit www.seek.com.au and look at several systems analyst job advertisements, and several business analyst job advertisements

One view point ...



Vongsavanh & Campbell (2008)

More Terms

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- **What is the system development lifecycle (SDLC)?**

- **What phases does/can the SDLC include?**

More Terms

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- A **system development methodology** is a very formal and precise system development process that defines a set of activities, methods, best practices, deliverables, and automated tools that system developers and project managers are to use to develop information systems.

- **What are some examples of system development methodologies?**

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- **How do approaches to system development differ?**

How Do Approaches Differ?

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Approaches to system development differ in various ways including:

- Whether the focus is on building or buying software solutions
- Whether process is prescriptive or adaptive
- Whether development is sequential or iterative
- Whether development is model driven or product driven (rapid application development)

Approaches (ctd)

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Building or buying software solutions:

- Methodologies may emphasize either building software solutions in-house or buying a commercial software solution. Many of the same analysis and design techniques are applicable in both situations

Prescriptive or adaptive:

- Prescriptive methodologies insist on all steps being followed exactly, whereas adaptive ones allow for change within certain guidelines

Approaches (ctd)

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Sequential or iterative:

- **Sequential –** an approach to systems analysis and design that completes each phase one after another and only once. **Eg: Waterfall development approach**

- **Iterative -** an approach to systems development that completes the entire information system in successive iterations. Each iteration does some analysis, some design, and some construction. Synonyms include incremental and spiral

"Waterfall" Approach to the SDLC

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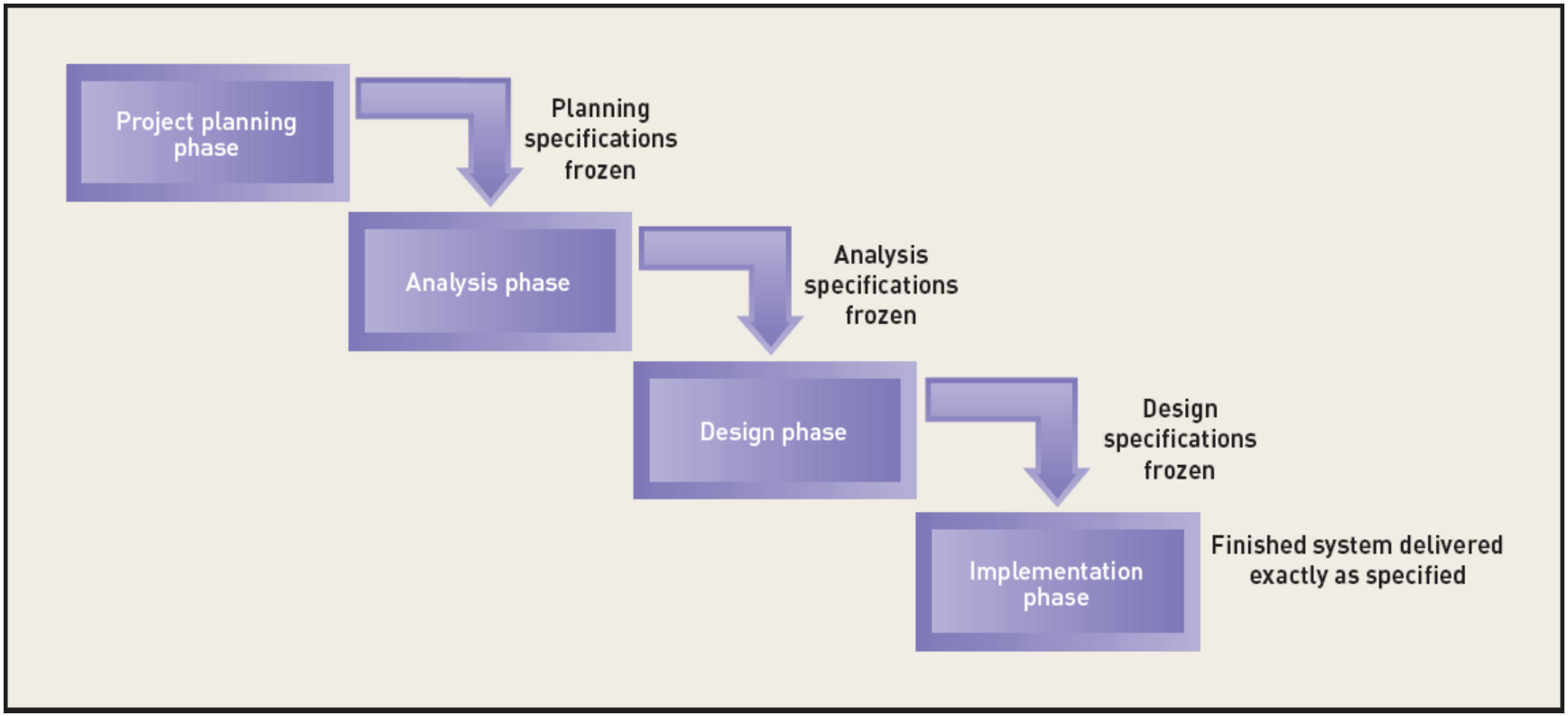

Modified Waterfall Approach with Overlapping Phases

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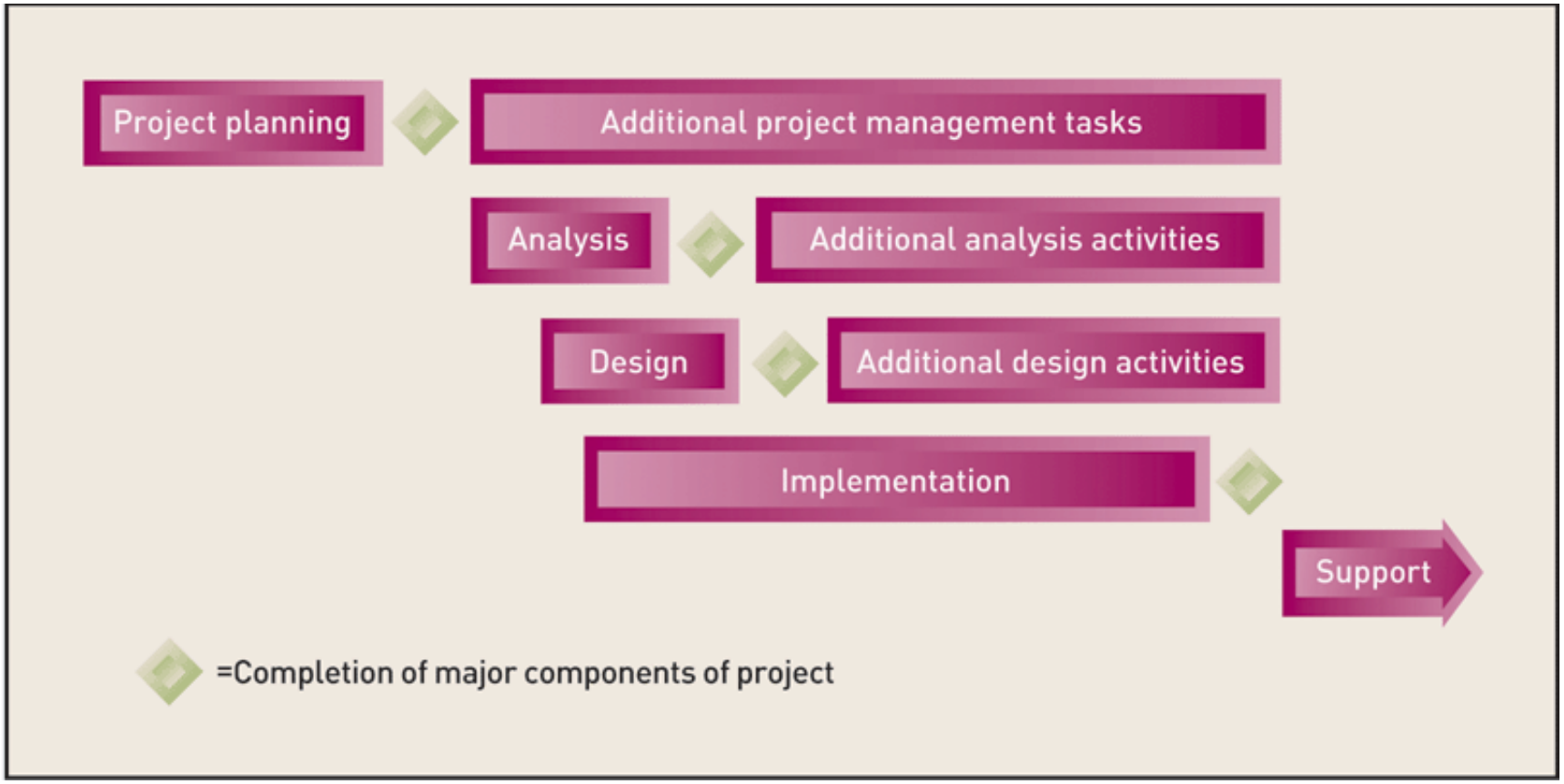
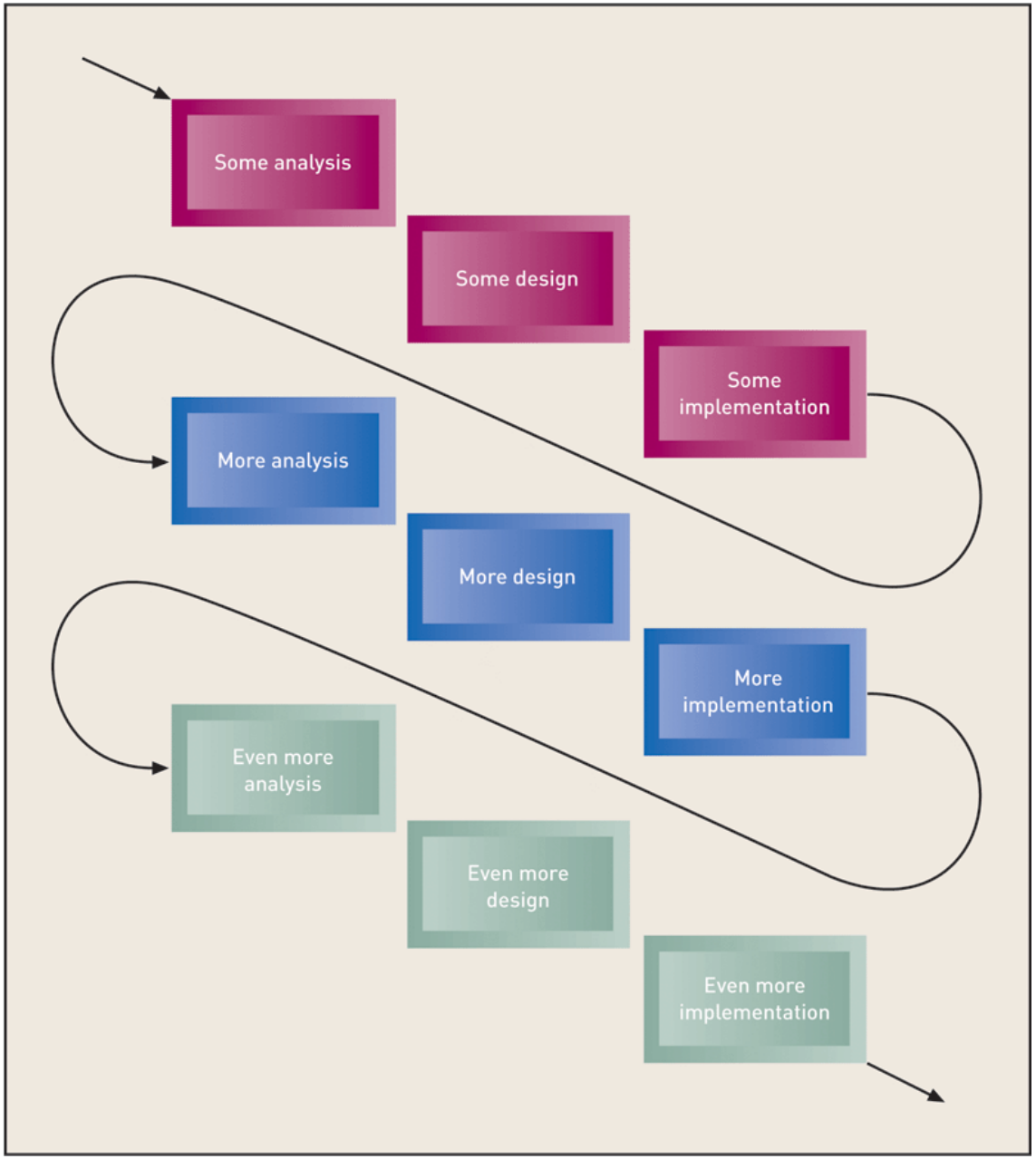
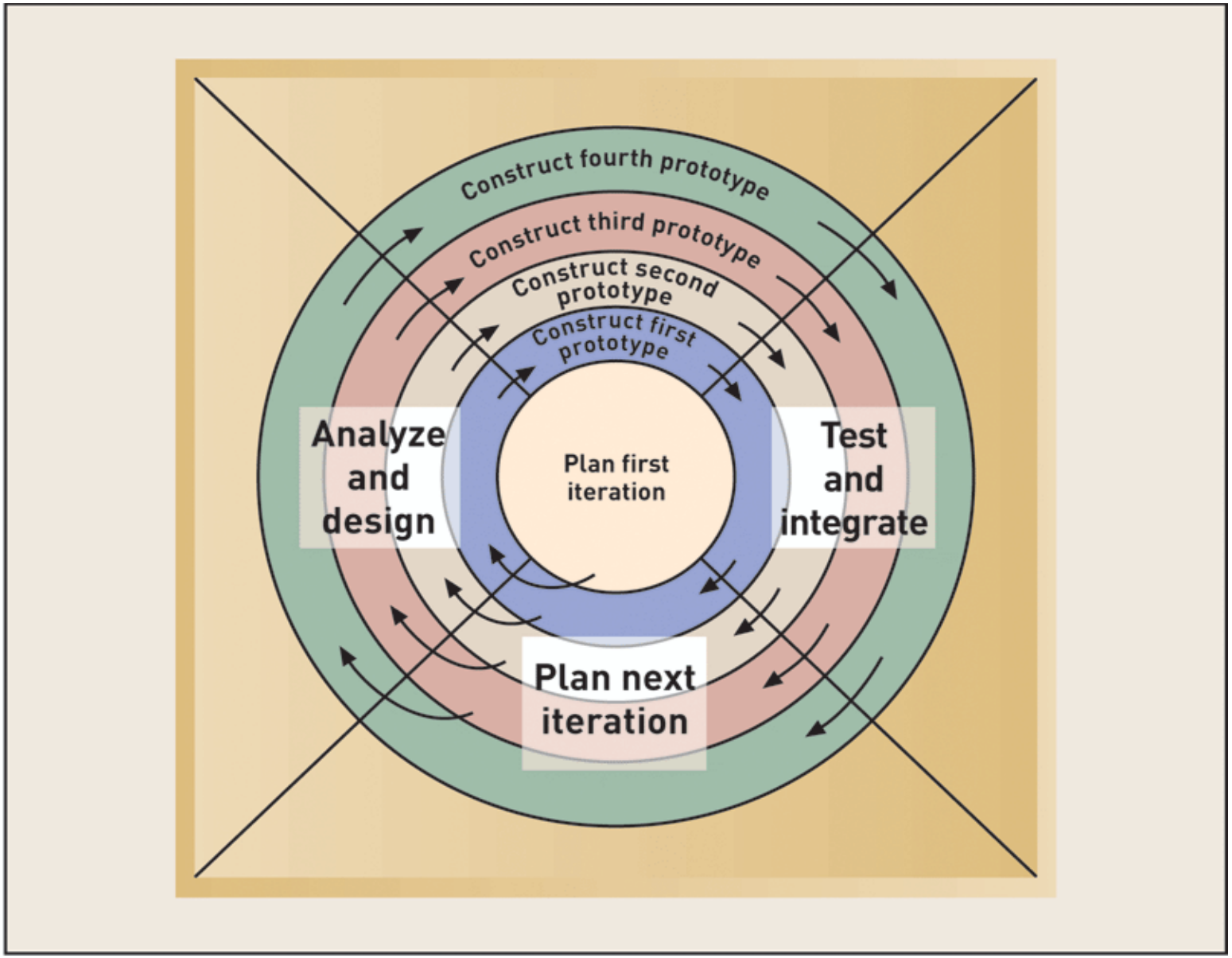


Iterative Approach



Spiral Life Cycle Model



Approaches (ctd)

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Model driven or product driven:

- **Model driven development** techniques emphasise the drawing of models to help visualise and analyse problems, define requirements, and design systems
  - Process modelling
  - Data modelling
  - Object modelling
- **Product driven** techniques tend to emphasize extensive user involvement in rapid prototyping of a system (rapid application development) or emphasize writing code as soon as possible (e.g. eXtreme Programming)

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- **What are the advantages and disadvantages of model driven approaches?**

- **What are the advantages and disadvantages of product driven approaches?**

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- **How have approaches to system development changed over time?**

History of Methodologies

Avison and Fitzgerald (2003) provide a timeline for how they believe system development methodologies have changed over time:

1. Pre-methodology era - 1960s & 70s
2. Early methodology era - late 70s, 1980s
3. Methodology era – late 1980s, 1990s
4. Post-methodology era – late 1990s on

Pre-methodology era

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- Systems were developed without the use of an explicit or formalised development methodology
- Emphasis on coding and solving technical problems
- Little focus on users

- **What problems arose?**

Early methodology era

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- Focus on phases and stages - eg Waterfall model
- Focus on well defined deliverables
- Approaches tended to be sequential and very prescriptive

- **What problems arose?**

Methodology era

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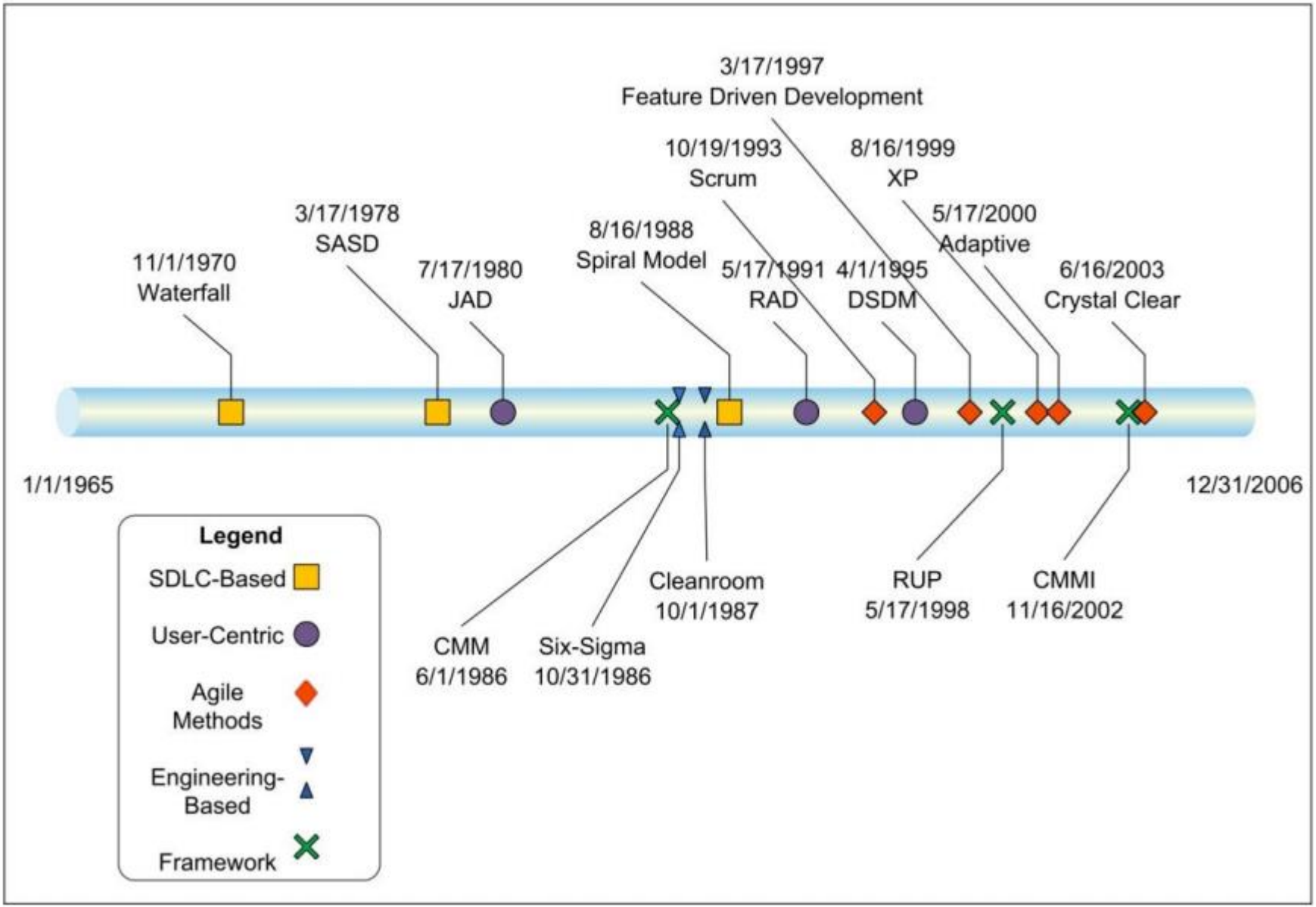
- Many new approaches emerged in response to problems with existing methodologies
- Approaches included:
  - Structured
  - Data oriented
  - Prototyping
  - Object oriented
  - Participative
  - Strategic
  - Systems

System Development Methodology Timeline



Post-methodology era

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- Reappraisal of usefulness of earlier methodologies
  Why?
- "We argue that the traditional IS development methodologies are treated primarily as a necessary fiction to present an image of control" Nandhakumar & Avison (1999)
- "People think you can come up with one universal … solution that solves a whole bunch of problems. [Those people] are wrong" Cooper (2001)

Post-methodology era

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- Some organisations turned to newer approaches, some stopped using formal methodologies (particularly for web applications)

- New approaches included:
  - Agile approaches
  - More focus on commercially developed packages
  - Outsourcing of development

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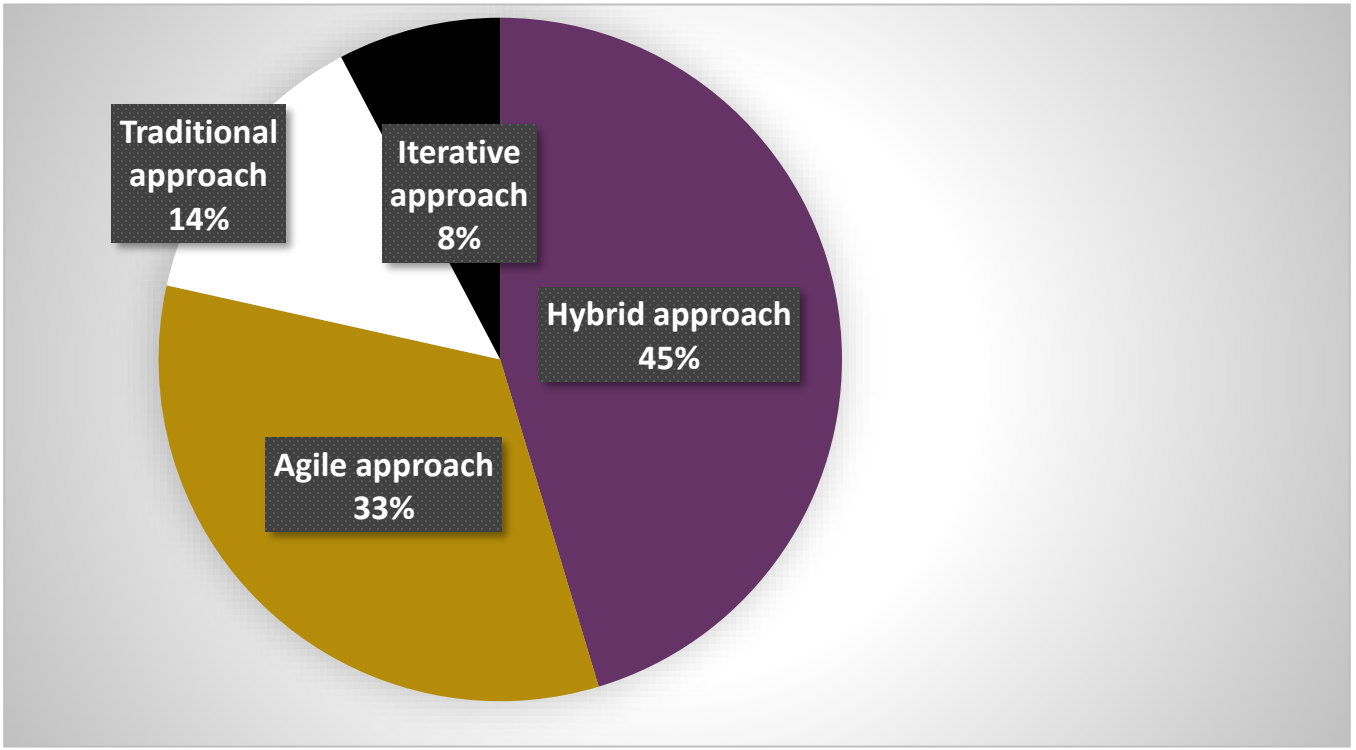
- **What is the difference between SAD modelling techniques and methodologies?**

Studies of Methodology Use

A 2016 study in the US (Vijayasarathy & Butler, 2016) found that organisations were using a wide range of development approaches:



Studies of Methodology Use

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Vijayasarathy and Butler (2016) also found:

- 32.0% used a Waterfall methodology
- 28.1% used Agile Unified Process
- 20.3% used Scrum
- 8.5% used Extreme Programming

What factors do you think might influence whether a organisation uses a formal development methodology?

Studies of Methodology Use

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Lang & Vukovac (2010) studied approaches used for web development and found:

- 40% used hybrid or customised in-house approach
- 24% object oriented development approaches
- 24% rapid or agile approaches - eg RAD, eXtreme programming
- 18% traditional development approaches – eg SSADM
- 15% incremental or evolutionary methods – eg RUP

In-house methods usually blended phases of classical waterfall model with aspects of newer agile approaches

- **What do these sorts of studies tell us?**

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- **How are SA & D techniques used in organisations?**

Studies of technique use

Early studies found that a wide variety of techniques are used in practice - including flowcharts and entity relationship diagrams, as well as UML diagrams. UML is gradually becoming the default

UML use

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Dobing and Parsons (2006/2008) reported the most frequently used UML components:

- Class diagram - 73% used in at least 2/3 projects
- Use case diagram - 53% used in at least 2/3 projects
- Sequence diagram – 52% used in at least 2/3 projects
- Use case narrative – 44% used in at least 2/3 projects
- Activity diagram – 32% used in at least 2/3 projects
- State chart (machine) diagram – 30% used in at least 2/3 projects

UML use

They also investigated what the components are used for

Which UML components are most useful for communication with clients? Why?

Component	Client verification	Clarifying tech understanding	Programmer specs	Maintenance doc
Use case narrative	87%	74%	79%	68%
Activity diagram	77%	80%	81%	73%
Use case diagram	74%	66%	62%	61%
Class diagram	57%	93%	89%	92%
Sequence diagram	62%	91%	84%	71%

UML use

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A similar study (Fitsilis et al., 2013) reported the most frequently used UML components as:

- Class diagram – used by 83%
- Use case diagram - used by 75%
- Activity diagram – used by 70%
- Sequence diagram – used by 61%
- Collaboration or communication diagram – used by 57%
- State chart (machine) diagram – used by 29%

Learning objectives revisited

- How do approaches to system development differ?
- Can you read the main kinds of model developed as part of system development and do you know when, and why, they are used?
- To what extent and how have systems development methodologies and techniques been used in organisations?

Additional References

- Cooper, M. (2001) Everyone is wrong: Q & A with Martin Copper. *Technology Review*. June.
- Dobing, B., & Parsons, J. (2006). How UML is used. *Communications of the ACM, 49*(5), 109-113.
- Fitsilis, P., Gerogiannis, V., & Anthopoulos, L. (2013). The role of UML in software development in Greece-Results from an exploratory study. *The Journal of Engineering (IET)*, 1-11.
- Lang, M., & Vukovac, D. P. (2010). Web-based systems development: analysis and comparison of practices in Croatia and Ireland. In *Information Systems Development* (pp. 91-100).
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- Vongsavanh, A., & Campbell, B. (2008). The role and skill sets of systems versus business analysts. In A. Mills & S. Huff (Eds.), *Proceedings of the 19th Australasian Conference on Information Systems*.