

EEE6480

EEE660X

COM6910

Research techniques & thesis preparation

- **Risk assessment**
- **Interim report**
- **Literature review**

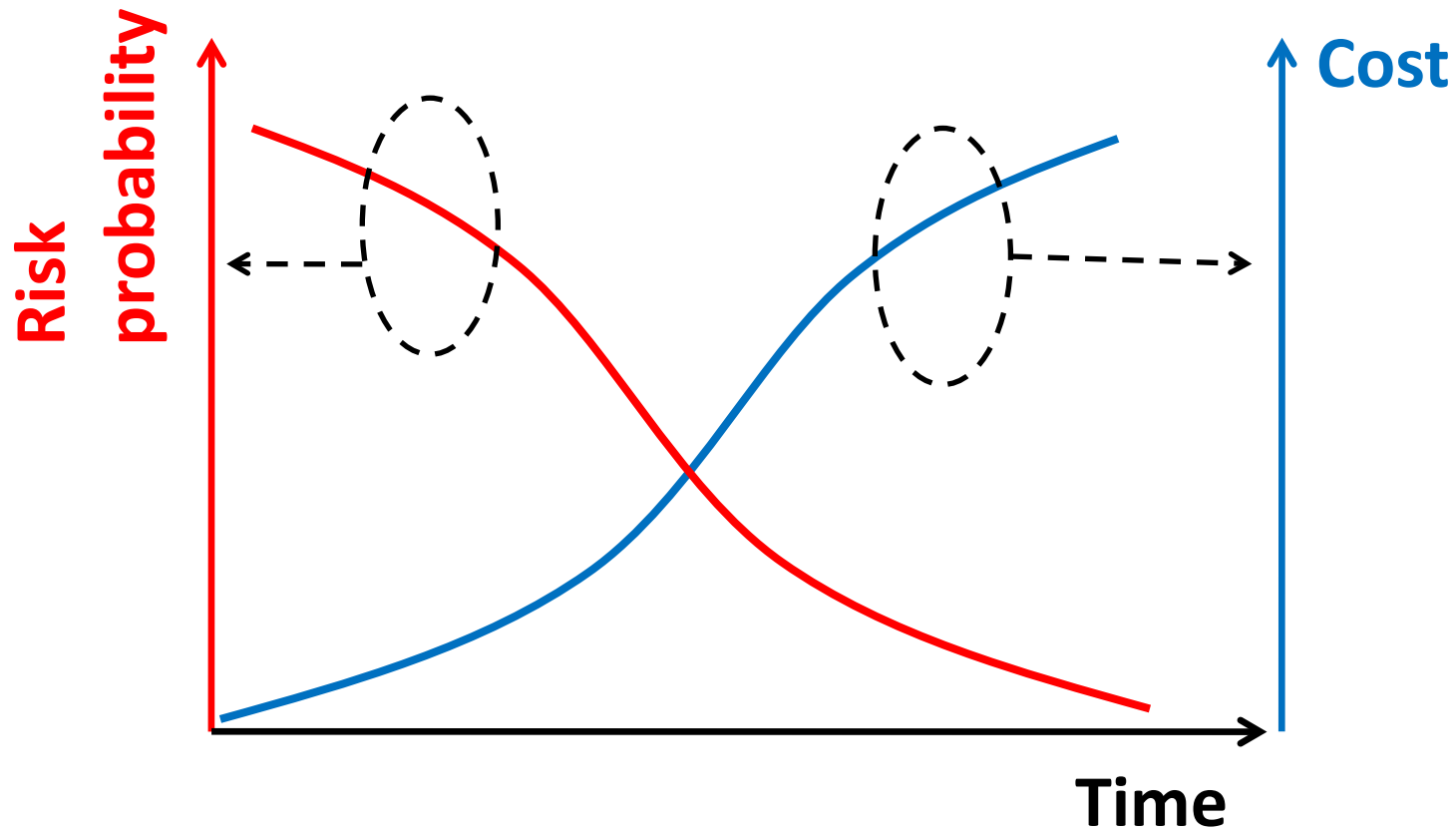
Content

1. Risk assessment
2. Structure of interim report
3. The literature review
4. Demonstration of ISI Web of Knowledge and University Library holdings

Risk

- Impact on cost, schedule, quality
- Malfunction, change in technical requirements
- Can be
 - anticipated (e.g. slippage)
 - beyond anticipation (breakage)
- Recognise and manage potential and unforeseen trouble spots.
- List risks, chances of events occurring, when they may occur, contingency plans for each risk event.

Risk event



Risk Management

Risk ID – identify sources of risk



Risk assessment – severity, likelihood, controllability



Risk response – how to reduce possible damage, contingency plans



Risk response control – implement risk strategy, monitor/adjust plan

Risk ID

- Design – does design depend on unrealistic or optimistic assumptions?
- Testing – will testing equipment be available when needed?
- Schedule – is schedule dependent on completion of other tasks?
- Development – is development process supported by a set of procedures, methods, tools?

Risk assessment

- Scenario analysis - evaluate (tabulate) for each task on a scale of 1 to 5.
 - Probability of event
 - Impact of event
 - Detection
 - When?

FMEA – Failure mode and effects analysis

Impact x probability x detection = Risk value

Risk mitigation

- 1) Reduce likelihood that event will occur.
- 2) Reduce impact that event would have on project.

Structure of interim report

NB. Assume the reader is a well educated graduate engineer, but not an expert on the subject of the project

Maximum 20 pages long

1. **Abstract** – 2 to 3 paragraphs. Summary of aims & obj., approaches taken, achievements so far
2. **Intro** – Scope. Outline topic area, aims & obj. in detail, purpose, brief description of remaining sections, findings.

1. Background (literature review) – Review general field, set scene, technique, set-ups, approaches, set / understand the wider context. Why is the work needed? What are it's applications?

- Outline structure of literature review
- Be focused, concise
- Demonstrate good understanding of background theory
- Organise in a useful way (not random collection of refs.)
- Use up to date literature
- Describe and criticise (justify)
- Design based projects: explore existing design options (pros and cons)

Literature review

Research based –

- Why is the work being done?
- Critical review of state of the art
- How did ideas evolve to where they are now?
- Key players and their opinions

Design based –

- Why is design necessary?
- Critical review of existing design approaches

Structure of interim report

4. Research methods –

- What the project involves
- Project plan (& discussion) and evaluation plan.
 - *Is the plan realistic? Is scope reasonable or is too much being attempted? Is sufficient time included for write-up?*
- May need to apply new methodology (technique, experiment, design methodology, programming)
- Agree with supervisor what needs to be investigated

Structure of interim report

- Project planning (last week)
 - Aims & objectives – how going to achieve?
 - What are your deliverables? How will you evaluate these?
 - Gantt chart
 - Risks and possible remedies (risk register)

5. Conclusions

6. References

4a. Research based –

- theory (but don't repeat from textbooks), measurements, methods – sufficient to enable continuation or comparison

4b. Design based –

- creation of specification
- creative thinking
- options available in terms of cost, complexity tradeoffs
- risks and alternative strategies
- design choices and justification
- use of simulation or prototypes
- evaluation of performance

Literature search

- Science is not conducted in a vacuum
- Impossible to read everything – be selective
- Aim of lit. search:
 - Increase knowledge of a topic
 - Identify useful articles/books
 - Critical appraisal – identify valid studies, dominant consensus
- Summarise and discuss literature

Literature search

- Which sources to use?
 1. **Formally peer reviewed sources:** books, academic journals, most conference articles, review articles.
 2. **Non-peer-reviewed sources:** Technical reports, white papers, talks, tutorials, newspaper/magazine articles
 3. Beware of the internet

Peer review – editor selects 2-3 independent reviewers to assess correctness, novelty, importance

Conference papers given shorter review (novelty, importance)

- Peer review is not foolproof –
 - Reviewer not always expert in field (only 2-3)
 - Quality of conference proceeding varies greatly
 - Vested interest, incompetence, media can influence review
 - Publication doesn't imply reproducibility, support of community
 - Compare evidence for established and new hypotheses

- Determine quality of an article –
 - Quality of publication (impact factor, conf. ranking, authors standing in field)
 - How cited?

Impact factor – average number of citations per article per year

- Subject specific (compare within disciplines)
- View in ISI WoK impact over last 5 years.
- Conference proceedings don't usually have impact factor

Process

- University resources (later)
- Google scholar (mixes peer-reviewed and non-peer reviewed. Difficult to find relevant articles)
- Search engine – useful for finding articles or reviews with references
- Researcher webpages (usually archive pubs, presentations, posters, articles)

Process

- Don't read complete paper unless you have to
 - Abstract ~ 1min
 - Intro ~ 5mins
 - Conclusion/discussion ~10mins
 - Figures/captions ~10mins
 - Whole paper ~ hours

Process

- Find recent review articles (hard work done for you!)
- Understand chronology of the topic
- Check researcher's webpages for unpublished works, papers, talks with most recent literature reviewed
- Identify most recent articles
- Skim each and prepare brief summary. Assess for strengths/weaknesses, exp setup, method, procedures, data and analysis.

Organising references

- e.g. endnote in MS Word – allows to rearrange text and auto order refs, cross reference
- Summary sheet – authors, title, journal, year
 - Statement of problem
 - Hypothesis
 - Theories/assumptions
 - Research methods
 - Tools/procedures
 - Research design
 - Methods
 - Interpretation
 - Conclusions

References

- References are cited to give due credit to originator and to guide the reader to detailed information.
- Provide references wherever required. Properly references material is a sign of a good report.

Referencing

- **Journal paper –**

Author(s), title, name of journal, volume, pages or article number, year

- **Book –**

Author(s), title, edition, publisher and year of publication.
Number of chapter or page.

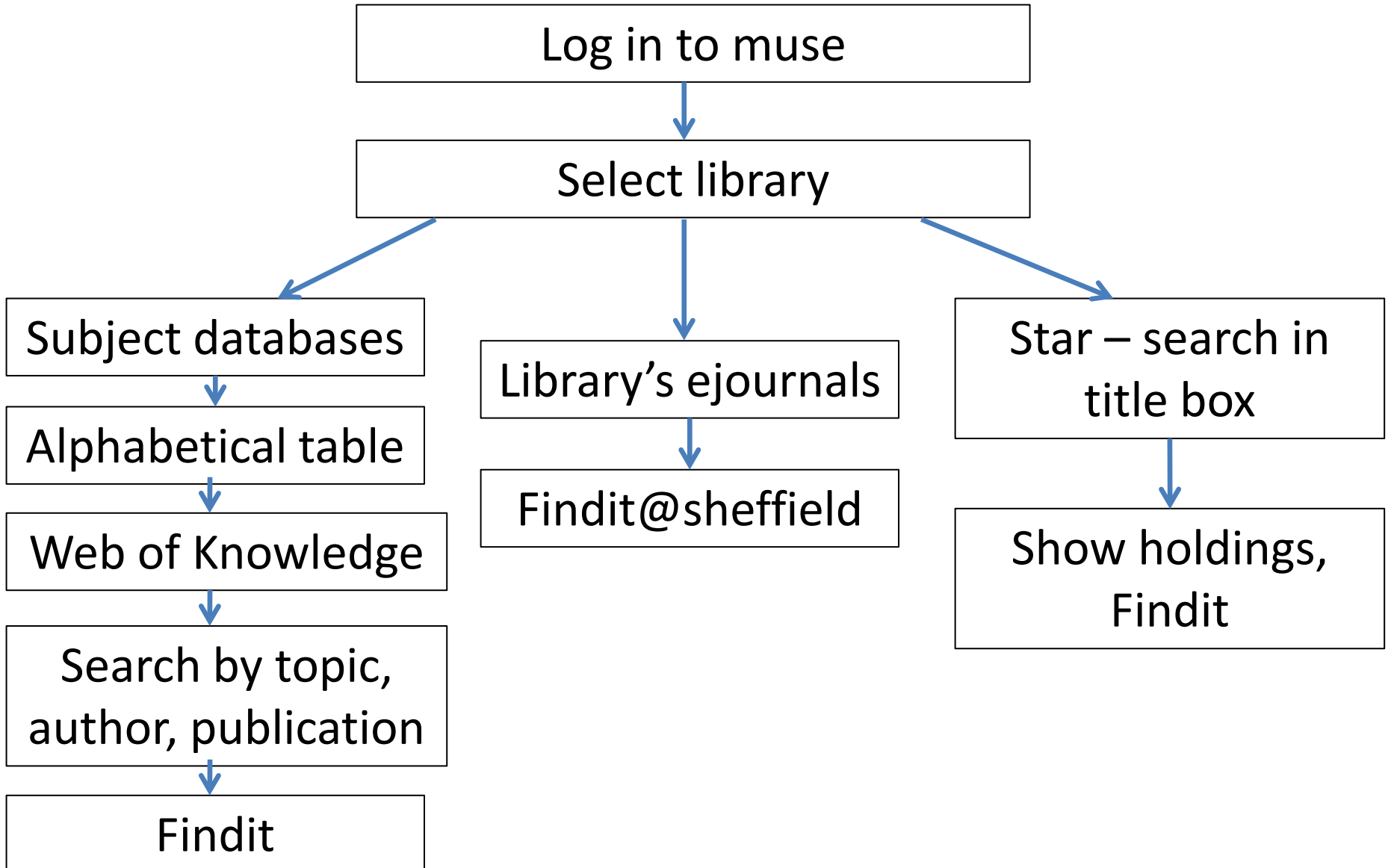
- **Data sheet, application notes, technical reports –**

Company, title, edition, date.

- **Web page –**

Authors(s) or organisation, title, full URL and date of viewing

Journal search



Final thoughts

- Supervisor
 - will give scientific/technical guidance, advice on planning, read/comment on work
 - will not tell you exactly what to do, exactly what to read, micro-manage your project
- Include write-up time in Gantt chart
 - but how long?
 - base it on how long it takes interim report write up and scale accordingly
 - Good scientific writing / good figures take a long time
 - Useful to factor in feedback

Examples of University library resources

– demonstration given in seminar

The screenshot displays the MUSE library website. At the top, a browser window shows the URL 'Welcome to MUSE' and a password prompt for 'shef.ac.uk'. The website header includes the University of Sheffield logo, the 'MUSE' name, and navigation links for MOLE, myEmail, myCalendar, uSpace, groups, logout, and help. A welcome message for 'Kristian Groom' is visible, along with a 'Customise Layout' link. The main navigation bar includes links for Home, Using MUSE, Library, Staff Applications, Careers, and Student Services, with the date 'February 18, 2011' on the right.

The 'myLibrary Account' section features a 'Library Account Summary' table:

Library Account Summary	
Charge Summary	£ 0.00
Reservations	0
Active Document Supply Items	0
Loans	2
Overdue Loans	0
Loans ready for Renewal	0

Below the table are links: [Manage My Account and Renew My Items](#), [Get Library PIN](#), and [Show/Hide full account details](#).

The 'myInterLibrary Requests' section includes the text: 'Request items which are not in the Library's collection'.

The 'Library eResources' section provides links for 'What's new with eResources?', 'Access the Library's ebooks collection', 'Access the Library's subject databases', 'Access to the Library's ejournals collection', 'eResources feedback', and 'eResources service status'. It also mentions 'View scheduled maintenance, at risk periods & temporary unavailability.'

The 'Search White Rose Research Online' section features a Google Custom Search bar with a 'Search' button and a link to 'Create your own Custom Search Engine'.

The bottom of the page shows a 'Done' status, a 'Secure Search' indicator, and a McAfee security logo.

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1. Title: [Recombination and loss mechanisms in low-threshold InAs/GaAs 1.3 \$\mu\$ m quantum dot lasers](#)
 Author(s): Marko, IP; Adams, AR; Sweeney, SJ, et al.
 Conference Information: 19th IEEE International Semiconductor Laser Conference, Date: SEP 21-25, 2004 Matsue JAPAN
 Source: 2004 IEEE 19TH INTERNATIONAL SEMICONDUCTOR LASER CONFERENCE, CONFERENCE DIGEST Pages: 57-58 Published: 2004
 Times Cited: 0
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2. Title: [1.3 \$\mu\$ m InAs/GaAs multilayer quantum-dot laser with extremely low room-temperature threshold current density](#)
 Author(s): Sellers, IR; Liu, HY; Groom, KM, et al.
 Source: ELECTRONICS LETTERS Volume: 40 Issue: 22 Pages: 1412-1413 Published: OCT 28 2004
 Times Cited: 52
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3. Title: [Influences of the spacer layer growth temperature on multilayer InAs/GaAs quantum dot structures](#)
 Author(s): Liu, HY; Sellers, IR; Gutierrez, M, et al.
 Source: JOURNAL OF APPLIED PHYSICS Volume: 96 Issue: 4 Pages: 1988-1992 Published: AUG 15 2004
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4. Title: [Improved performance of 1.3 \$\mu\$ m multilayer InAs quantum-dot lasers using a high-growth-temperature GaAs spacer layer](#)
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 Source: APPLIED PHYSICS LETTERS Volume: 85 Issue: 5 Pages: 704-706 Published: AUG 2 2004
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Source: APPLIED PHYSICS LETTERS Volume: 85 Issue: 5 Pages: 704-706 Published: AUG 2 2004

Times Cited: 134 References: 8 [Citation Map](#)

Abstract: The use of a high-growth-temperature GaAs spacer layer is demonstrated to significantly improve the performance of 1.3 μm multilayer self-assembled InAs/InGaAs dot-in-a-well lasers. The high-growth-temperature spacer layer inhibits threading dislocation formation, resulting in enhanced electrical and optical characteristics. Incorporation of these spacer layers allows the fabrication of multilayer quantum-dot devices emitting above 1.3 μm , with extremely low room-temperature threshold current densities and with operation up to 105degreesC. (C) 2004 American Institute of Physics.

Document Type: Article

Language: English

Reprint Address: Mowbray, DJ (reprint author), Univ Sheffield, Dept Phys & Astron, Sheffield S3 7RH, S Yorkshire England

Cited by: 134

This article has been cited 134 times (from Web of Science).

Park J, Kim NJ, Jang YD, et al. Gain dynamics of an InAs/InGaAsP quantum dot semiconductor optical amplifier operating at 1.5 μm APPLIED PHYSICS LETTERS 98 1 JAN 3 2011

O'Driscoll I, Hutchings M, Smowton PM, et al. Random population of InAs-GaAs quantum dots NOVEL IN-PLANE SEMICONDUCTOR LASERS IX 7616 - 2010

Hasbullah NF, Hopkinson M, Alexander RR, et al. Electroluminescence Studies of Modulation p-Doped Quantum Dot Laser Structures IEEE JOURNAL OF QUANTUM ELECTRONICS 46 12 1847-1853 DEC



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