Computing Research Project

Literature searching and literature reviews

UNIVERSITY *of* GREENWICH

Alliance with FPT Education

Pearson BTEC

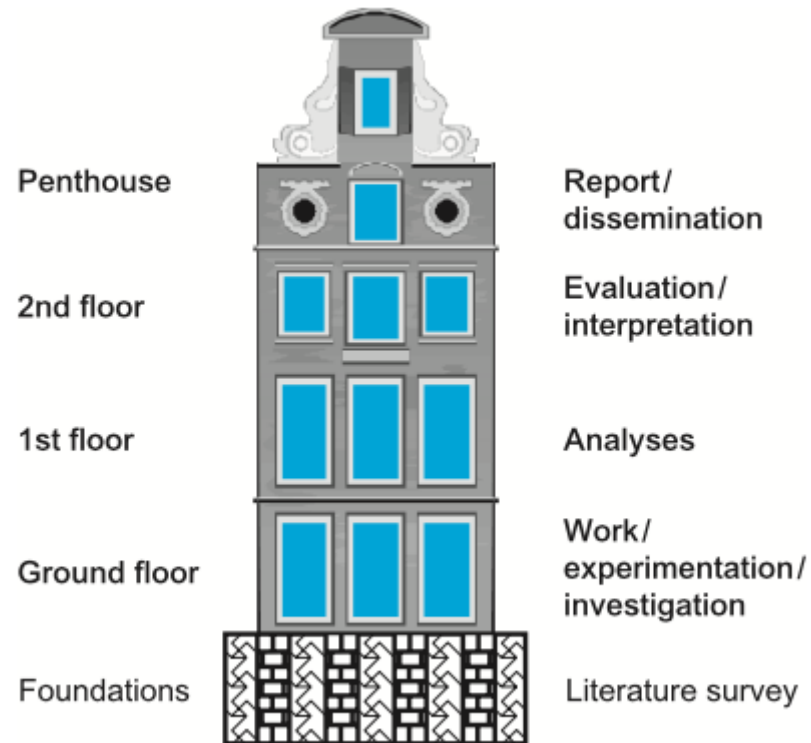- To introduce the skills needed to undertake literature surveys

- Understand the process of literature surveys
- Define and conduct a literature search
- Manage information obtained during a literature search
- Understand how to conduct critical evaluation
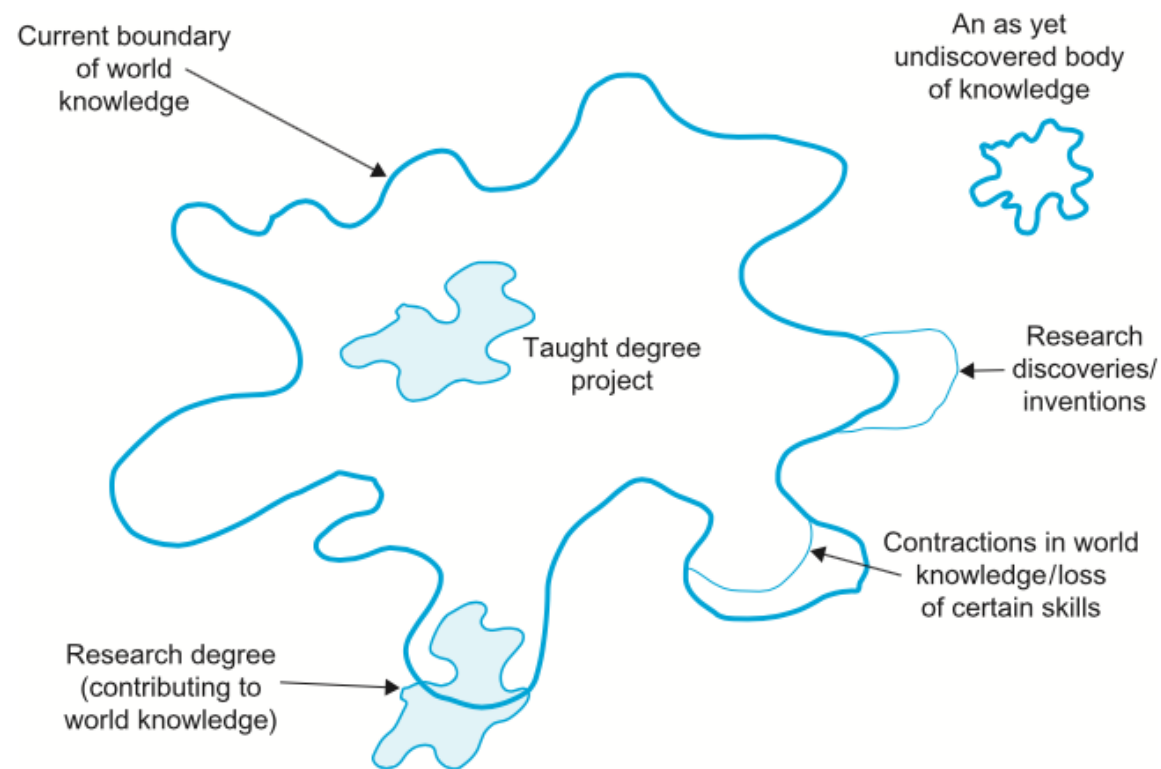- Write a literature review

- One of the main section of your final report is the literature review
  - Even for the practically-based programming projects with a piece of software as the main component
- Literature survey includes
  - Literature search and Literature review
- Literature search
  - Represents mechanics of looking for, sorting, managing and digesting the available materials
- Literature review
  - Represents your written understanding, critical evaluation, conceptualization and presentation of the material you have obtained
  - The important closely related skill is referencing (will be discussed later)
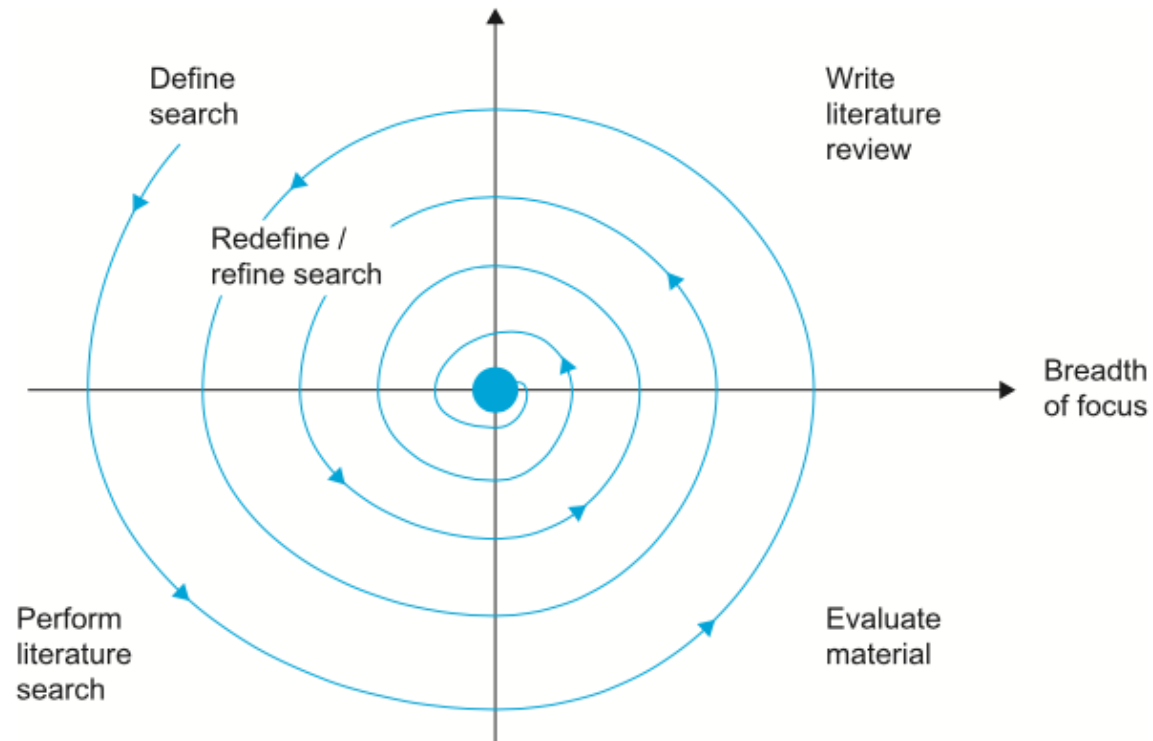
- ## It justifies your project
  - Your project is worth doing; the area is recognized and meaningful
- ## It sets your project within context
  - By discussing and critically evaluating past and current research in this area
- ## It provides others with starting point to understand your project
  - Other researcher can read this to understand your project and can continue from where you left off

Penthouse		Report/dissemination
2nd floor		Evaluation/interpretation
1st floor		Analyses
Ground floor		Work/experimentation/investigation
Foundations		Literature survey

Current boundary of world knowledge

An as yet undiscovered body of knowledge

Taught degree project

Research discoveries/ inventions

Contractions in world knowledge/loss of certain skills

Research degree (contributing to world knowledge)

The 'spiralling in' effect means you will get more focus to the main topic

LITERATURE SEARCHING

- A literature search is "*systematic* gathering of *published* information related to a subject"
- Systematic
  - You should progress and then identify boundaries and when to stop
- Published/recognized
  - Assessed (tested, proved to be worth) by experts in the field
  - Using material from Internet (e.g., Wikipedia) only will lower your grade
- Two golden rules to follow
  - Allow plenty of time (so should start as soon as possible)
  - Ensure that you make note of the full reference of any material you obtain

- Assessing books
  - Begin with the title
  - Move to contents listing
  - Scan the index for keywords that are important for you
  - Check if the author is well recognized in this field
  - Is the book up-to-date
- Assessing articles
  - Begin with title
  - Check if it is up-to-date (or may be overtaken by other publications?)
  - Read the abstract and keywords
  - Look at the list of references at the back (are key works cited?)
  - Read the introduction
  - Read the summary/conclusions
  - Assess its level (technical, readable, review, introductory, etc)

- Books
  - Provide starting point for your literature survey with good grounding and overview of the field
- Journals
  - Discussing up-to-date issues in the field, quite specific and deep, but daunting to read, so should read books first to build your ground
- Conference proceedings
  - May bring latest findings (more up-to-date ideas or even preliminary results)
- CDs and DVDs
  - They normally present information from other sources for better accessibility

- Company reports
  - These can provide valuable information for case studies
  - Care should be taken since these could be biased or not allowed to public
- Theses
  - They also provide a useful source of relevant references
- Manuals
  - Within technical computing projects, manuals may prove to be a valuable source of information
  - However, you should not use these as foundations for academic discussion
- Software
  - Any software needed for your project should be obtained as soon as possible

- The Internet
  - An valuable source of information but must be treated with caution
  - May waste time, unqualified, un-refereed opinion, modified regularly
- Points to consider while evaluating materials from the Internet
  - What is the purpose of the site (e.g., to sell a product?)
  - When was the site updated?
  - Is the site part of an official organization?
  - Are there any copyright issues associated with the materials?
  - Is there an author for the material? If yes, check if the author is qualified?
  - Is the site recognized from other sources?
  - Is the material biased?

- Internet
  - This is valuable tool for tracing articles and information
  - You can start with some search engines (google)
  - Wikipedia is a good starting point, however, it's not academically refereed
- OPAC (Online Pubic Access Circulation)
  - Most institutions have an OPAC helps to search for material held in Library

- Note interesting quotes and their full references while you go along
- Use review articles and books to help your search
- Reference correctly from the start
- Know when to stop
- Have a system to organize and catalogue the material you read
- Read recognized leaders and original theorists in your field
- Start with a broad search before you focus (easy first, complex later)

MANAGING INFORMATION

Managing information

- In many cases, you may find yourself swamped under materials
  - There should be some means to manage these
- Arrange your materials
  - Follow clustering techniques (RTM, relevance tree, or spider diagram)
  - Identify topics and classify your materials based on these
- Use software to manage references, examples
  - Use Ms. Word to keep records of references
  - Use Reference Manager (http://www.refman.com)
- While reading
  - Highlight key points
  - Make notes

CRITICAL EVALUATION

- To criticize?
  - It's not just about finding fault with the object in question
  - This means far more than looking for faults

- What kind of article is this
  - Review paper, evaluative paper, theory paper, practical paper, case study, etc.
- What can you gain from the article
  - Ideas, techniques, useful quotes?
- Is the author well recognized?
- What contribution is the article making?
  - Can this contribute to your project?
  - If yes, how?
- How does the article fit within context?
  - Can it support your project?
  - How important is the article in its field and your own?

- Do conclusions follow logically from the work that has been presented?
  - Are the arguments logical?
  - Do they follow one another?
  - Do they support or contradict the works from others?
- Can you differentiate fact from unsubstantiated opinion?
  - If there are opinions, do you agree with them?
  - Are these opinions supported by logical arguments or other authors?
- What do you feel about what has been written?
  - Do you agree with the statements that are made?
  - Are there any counter-arguments?
- Does the article contradict other viewpoints or support the status quo?
  - How does the article relate to other literature in the field?

- What references does it use?
  - Are these references appropriate, relevant and up-to-date?
  - Which references can you use?
  - Is the article referenced by other authors?
- Are there limits to what the author is suggesting?
  - Is his/her argument applicable only in certain cases?
- Can you use the results from the article in your own work?
  - How do these results contribute and fit into their field and your own?

- Rudestam and Newton suggested some additional points
- These are broken into
  - Conceptualization
  - Theoretical Framework and Hypotheses
  - Research Design
  - Results and Discussion
  - Summary

- What is the major problem or issue being investigated?
- How clearly are the major concepts defined/explained?
- Is there a clear research question/hypothesis?
  - Can they that be, and is, tested?
- What type of research design/methodology is employed?
  - Is it suitable and reliable?
- Have algorithms and statistical techniques been used appropriately?
  - Can you apply them in your own work?
  - What are the limitations of these techniques?

- Is the choice of measures, sample sizes and data appropriate?
    - Have extraneous factors/variables been considered?
- Can generalizations be made from these results?
    - What are the limitations of these generalizations?
- Are the implications of the results be discussed?
- What is your overall assessment of the study
    - In terms of its adequacy for explaining the research problem and the contribution it is making?

Critical reading

- Goes beyond mere description by offering opinions, and making personal response, to what has been written
- Relates different writings to each others
- Does not take what is written at face value
- Views research writing as a contested terrain, within which alternative views and positions may be taken up
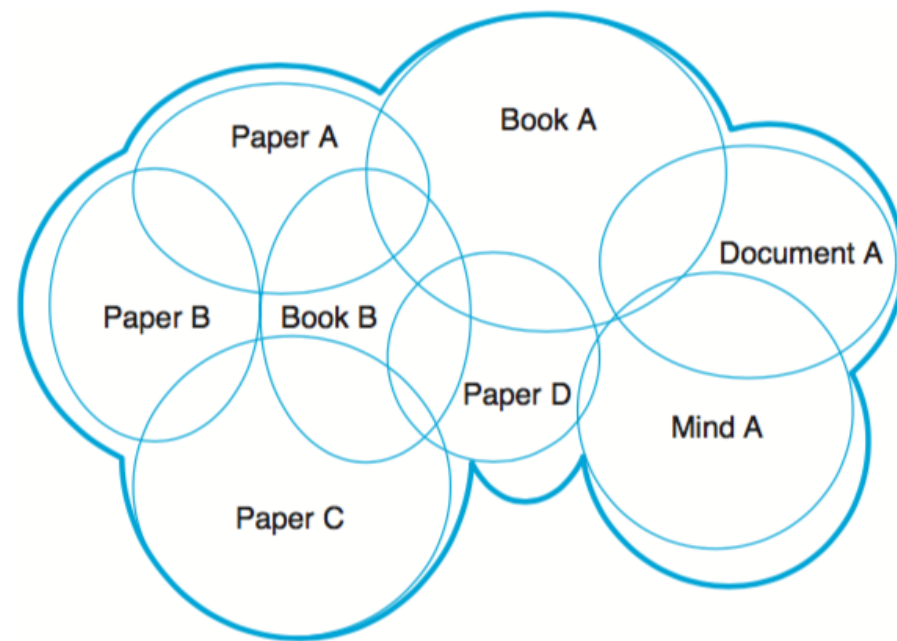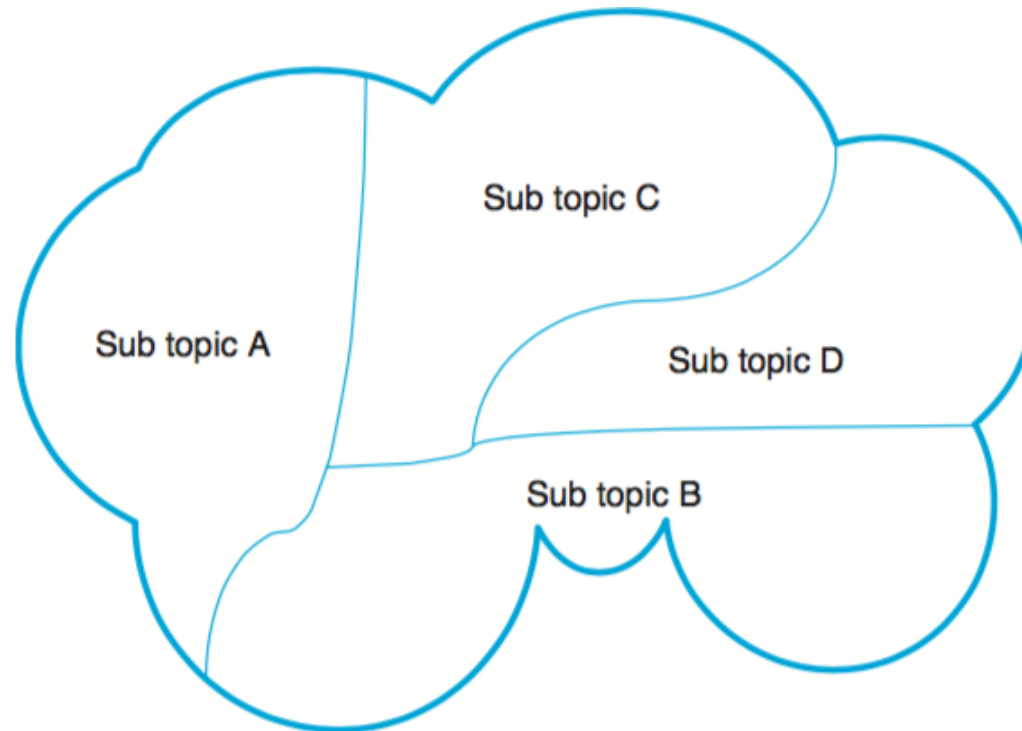
WRITING LITERATURE REVIEWS

- To refine your research question and objectives
- To highlight research possibilities that have either been explicitly identified by other authors or have possibly been overlooked in the past
- To avoid repeating the work of others
- To identify research methods and strategies that may be usefully applied in your own research

Way 1: A research field made up of a number of articles, books, documents,

Book A: Covers …,
Book B: Discusses …,
Book C: Introduces…,

Way 2: View the field as series of inter-related sub topics

Sub topic C

Sub topic A

Sub topic D

Sub topic B

Person A: Thinks…, and so on

- As a single chapter
- As a series of chapters
- Subsumed within the report as various issues are tackled

- It is not a report that lists all the papers and books you have read whether they are relevant or not
  - You must be selective about that to which you refer
- It must not dedicate a page or paragraph to each article in turn merely reporting on their content

Example – An artificial neural network approach to rainfall-runoff modelling

The United Nations General Assembly declared the 1990s the International Decade for Natural Disaster Reduction with the specific intent to disseminate existing and new information related to measures for the assessment, prediction, prevention and mitigation of natural disasters (WMO, 1992). A prominent element within this programme has been the development of operational flood forecasting systems. These systems have evolved through advances in mathematical modelling (Wood and O'Connell, 1985; O'Connell, 1991; Lamberti and Pilati, 1996), the installation of telemetry and field monitoring equipment at critical sites in drainage networks (Alexander, 1991), through satellite and radar sensing of extreme rainfalls (Collier, 1991), and through the coupling of precipitation and runoff models (Georgakakos and Foufoula-Georgiou, 1991; Franchini *et al.*, 1996). However, in practice, successful real-time flood forecasting often depends on the efficient integration of all these separate activities (Douglas and Dobson, 1987). Under the auspices of the World Meteorological Organisation (1992) a series of projects were implemented to compare the characteristics and performance of various operational models and their updating procedures. A major conclusion of the most recent intercomparison exercise was the need for robust simulation models in order to achieve consistently better results for longer lead times even when accompanied by an efficient updating procedure.

The attractiveness of Artificial Neural Networks (ANNs) to flood forecasting is three-fold. First, ANNs can represent any arbitrary non-linear function given sufficient complexity of the trained network. Second, ANNs can find relationships between different input samples and, if necessary, can group samples in analogous fashion to cluster analysis. Finally, and perhaps most importantly, ANNs are able to generalise a relationship from small subsets of data while remaining relatively robust in the presence of noisy or missing inputs, and can adapt or learn in response to changing environments. However, despite these potential

Example (continued)

advantages, ANNs have found rather limited application in hydrology and related disciplines. For example, French *et al.* (1992) used a neural network to forecast rainfall intensity fields in space and time, while Raman and Sunilkumar (1995) used an ANN to synthesise reservoir inflow series for two sites in the Bharathapuzha basin, S. India.

The use of artificial neural networks for flood forecasting is an area which has yet to be fully explored. Up until now the majority of work in this area has been mainly theoretical; concentrating on neural network performance with artificially generated rainfall-runoff data; for example Minns and Hall (1996). However, these theoretical approaches tend to overlook the difficulty in converting and applying actual data to artificial neural network topologies. Hall and Minns (1993) go some way to address this criticism by applying neural networks to a small urban catchment area. However, their discussion is limited to the performance of a neural network on a small number of events.

This paper goes one stage further by discussing how artificial neural networks may be developed and used on 'real' hydrological data. It discusses the problems that need to be addressed when applying neural networks to rainfall-runoff modelling and demonstrates the effectiveness of artificial neural networks in this particular domain. By applying a neural network to flood simulation in two UK catchments, the prospects for the use of ANNs in real-time flood forecasting are evaluated. Finally, suggestions are made concerning necessary refinements to the existing ANN prior to transfer to operational use.

(Reproduced in part from Dawson and Wilby, 1998)

1. Arrange relevant literature in the field

2. Critically evaluate the past and current research in the field

3. Identify your project within a wider context

4. Justify the existence of your project by identifying a gap in the field and showing your project will fill that gap (applicable for research degree level)

- A literature survey will help to place your project within a wider context and justify its presence within a particular field of study
- Main components of literature survey
  - Literature search: and manage information
  - Literature review: requires critical understanding

References

Dawson, C. W. (2009). *Projects in Computing and Information Systems A Student's Guide* (2nd Edition ed.). Pearson Education.