# Writing of technical report and thesis

Research Methodology (UNIM 513)

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# Introduction

# Getting Started:

Structure A : Begin work immediately after registration.

Structure B: 1 semester to confirm projects

Structure C: 2 semesters to confirm projects

# Supervisors

| Programme | Supervisor | Co-Supervisor |
|---|---|---|
| Structure A – PhD *(thesis)* | • PhD in the domain, and<br>• Co-supervised and graduated 1 Structure A Masters or 2 Structure B Masters preferred | • PhD in the domain, or<br>• Masters as a supporting domain expert |
| Structure A – Masters *(thesis)* | • PhD in the domain, or<br>• Masters, and co-supervised and graduated at least 1 Structure A Masters, or<br>• Masters, and have a PhD Co-Supervisor, as well as co-supervised and graduated at least 1 Structure B Masters | • PhD, or<br>• Masters in the domain |
| Structure B – Masters *(dissertation)* | • PhD in the domain, or<br>• Masters, and co-supervised and graduated at least 2 Structure B Masters | • PhD, or<br>• Masters in the domain |
| Structure C – Masters *(project)* | • PhD, or<br>• Masters in the domain | • Not encouraged |

# Confirming Title

| Programme | Duration | Form |
|---|---|---|
| Structure A – PhD *(thesis)*<br><br>Structure A – Masters *(thesis)*<br><br>Structure B – Masters *(dissertation)* | Topic and supervisor must be confirmed within two months of registration | COGS11A |
| Structure C – Masters *(project)* | Topic and supervisor must be confirmed before the end of the semester prior to the semester of commencing the project. | COGS11A and COGS11A01 |

# Submission (Structure B)

Students have to submit their dissertations to COGS usually 1 month before the end of the final semester set for the project.

An unbound copy of the thesis shall first be submitted to Programme Coordinator via form COGS 16A to be checked for conformity to the format stipulated in the Thesis Guideline before it can be allowed to be submitted for examination.

Once deemed to conform, 4 softbound copies must be submitted via form COGS 17.

# Submission (Structure C)

Students have to submit their dissertations on a fixed date set by COGS usually 1 month before the end of the final semester set for the project.

2 copies of Project Report must be submitted to the Programme Coordinator.

# Panel of examiners

| Programme | Panel of Examiners | Additional Rules |
|---|---|---|
| **Structure A – PhD** ***(thesis)*** | • Chairman<br>• 2 External Examiners<br>• 1 Internal Examiner<br>• Supervisor & Co-supervisor | • 1 Panel per thesis<br>• Chairman must a Professor in the university<br>• Internal Examiner must be present<br>• At least 1 External Examiner must be present at the viva |
| **Structure A – Masters** ***(thesis)*** | • Chairman<br>• 1 External Examiner<br>• 1 Internal Examiner<br>• Supervisor & Co-supervisor | • 1 Panel per thesis<br>• Chairman must be a PhD holder in the university<br>• External Examiner must be present<br>• Internal Examiner must be present |
| **Structure B – Masters** ***(dissertation)*** | • Chairman<br>• 1 External Moderator<br>• 1 Internal Examiner<br>• Supervisor & Co-supervisor | • 1 Panel for all dissertations in one batch except<br>Internal Examiner is per dissertation |
| **Structure C – Masters** ***(project)*** | • Chairman<br>• 1 Internal Examiner<br>• Programme Coordinator<br>• Supervisors | • 1 Panel for all projects in one batch except<br>• Internal Examiner is per dissertation |

# Assessment (Structure A and B)

| Programme | Presentation | Q&A | Maximum |
|---|---|---|---|
| **Structure A – PhD** ***(thesis)*** | 20 minutes | 90 minutes | 3 hours |
| **Structure A – Masters** ***(thesis)*** | 20 minutes | 70 minutes | 2.5 hours |
| **Structure B – Masters** ***(dissertation)*** | 20 minutes | 40 minutes | 1.5 hours |

# Assessment (Structure A and B)

1 – Accepted

2 – Accepted with minor modifications

3 – Accepted with major modifications

4 – Resubmission

5 - Rejected

# Assessment (StructureC)

| Grade | Grade Point | Description |
|---|---|---|
| A+ | 4.00 | Distinction |
| A | 4.00 | Distinction |
| A- | 3.67 | Very Good |
| B+ | 3.33 | Good |
| B | 3.00 | Pass |
| B- | 2.67 | Marginal Pass |
| C+ | 2.33 | Marginal Pass |
| C | 2.00 | Marginal Pass |
| C- | 1.67 | Marginal Pass |
| D | 1.00 | Marginal Pass |
| E | 0.00 | Fail |

# The SPAM method

# Types of writing:

1. Proposal
2. Progress Report
3. Conference Paper
4. Thesis

# What do you need in your technical writing?

1. Introduction
2. Literature Review
3. Methodology
4. Results
5. Discussion
6. Conclusion
7. References

# How long for each section?

1. Introduction: 3% - 10%
2. Literature Review: 8% - 30%
3. Methodology: 8% - 20%
4. Results: 15% - 60%
5. Discussion: 10%
6. Conclusion: 1%
7. References: 20%

# SYSTEM

The scope of system under study

# PROBLEM

The problems to solve

# SPAM

# ACHIEVEMENT

The results/achievements

# METHODOLOGY

The methods used

# The SPAM method

## S System

- Define system under study
- Defend why study is important.

## P Problem

- Define problems to be solved within the system
- Defend that existing solutions have weaknesses

## A Achievement

- Define the achievements (results) i.e what PP and DP used
- Defend that the results are correct and that they solve/reduce the problems

## M Methodology

- Define the methods used in obtaining the results
- Defend that the methods are correct, acceptable and practical

# The SPAM method: To score for your examination via group study

## S System

- Define system under study: Examination
- Defend why study is important: To assess understanding of students

## P Problem

- Define problems to be solved within the system: To score/get good marks
- Defend that existing solutions have weaknesses: Study alone; less understanding and boring

## A Achievement

- Define the achievements (results) i.e what PP and DP used: Better CGPA
- Defend that the results are correct and that they solve/reduce the problems: Show graph/statistics

## M Methodology

- Define the methods used in obtaining the results: Group study
- Defend that the methods are correct, acceptable and practical: Validation

# Title from SPAM

# Title from SPAM

- State each point of SPAM in one or two words, and join them into a sentence
- **Highlight on System **(S)** and Problems **(P)****
- Methodology **(M)** is encouraged to be included
- Results/achievements **(A)** can be included if they are very significant

# Title from the SPAM method

| | |
|---|---|
| **S** | System: Examination |
| **P** | Problem: To get good marks |
| **A** | Achievement : Better CGPA |
| **M** | Methodology: Group study |
| **Title** | Achieving better CGPA in examination using group study |

# Title from the SPAM method

| | |
|---|---|
| **S** | System: Pizza |
| **P** | Problem: Delay in delivering pizza |
| **A** | Achievement : Deliver pizza within 30 minutes |
| **M** | Methodology: Drones |
| **Title** | An enhancement technique in delivering pizza within 30 minutes by using drones. |

# SPAM: Crack phone problem

| | |
|---|---|
| **S** | System: |
| **P** | Problem: |
| **A** | Achievement : |
| **M** | Methodology: |
| **Title** | |

# SPAM: Overheating car engine problem

| | |
|---|---|
| **S** | System: |
| **P** | Problem: |
| **A** | Achievement : |
| **M** | Methodology: |
| **Title** | |

# THINGS TO AVOID IN TITLES

## Complex compound nouns

- Excess water weight remover → Desiccator

## Acronyms

- Try to avoid using too many abbreviations or acronyms, particularly uncommon ones

# THINGS TO AVOID IN TITLES

## Question marks

- Example:
  - “Guess Who's Not Coming to Dinner? Evaluating Online Restaurant Reservations for Disease Surveillance.” J Med Internet Res. (2014)
- Why ask a question in a title when you can just make a declarative statement instead?

# THINGS TO AVOID IN TITLES

## Puns

- Examples:
  - "Holey Sheets - Pfaffians and Subdeterminants as D-brane Operators in Large N Gauge Theories.” High Energy Physics – Theory (2002)
  - "Smells Like Clean Spirit: Nonconscious Effects of Scent on Cognition and Behavior." Psychological Science 16.9 (2005): 689-693.
- Often backfires

# Abstract from SPAM

# Abstract

How long? 200 – 300 or half a page

Elaborate each of **SPAM** in 1 or 2 sentences, join them into a paragraph

Highlight main achievements (**A**) only (normally in the last sentence). May compare achievements with previous results.

A single paragraph; no references

# Abstract

Pizza delivery is a service in which a pizza chain delivers a pizza to a customer. It gains more attention these past years due to the convenience of getting food being delivered straight in front of your door. However, due to the hectic traffic especially during peak hour, complains have been coming in from the customers in delay of delivering the pizzas. Not only this leads to unsatisfactory customer, but also in additional cost as the pizza chain needs to provide extra coupon to customers as compensation. Hence in this thesis, we utilize the usage of drone to deliver the pizza straight to the customer's house. With this method, it is proven that the pizza is able to be delivered within 30 minutes. This increases the customers' satisfactory index as high as 30% and saves 10% in terms of the pizza chain's revenue.

# Introduction from SPAM

# Introduction

- **BACKGROUND REVIEW (40%-50%)**
  - Define/elaborate the **S**ystem and scope under study **(S)**
  - Defend/elaborate the importance of studying the system
- **CRITICAL REVIEW (40%-50%)**
  - Define the Problems **(P)**
  - Defend that the existing solutions have weaknesses/limitations
- **PROPOSAL (10%)**
  - The methodology (in brief) **(M)**
  - The achievements (main results only) **(A)**
- A short overview of the whole sequence of the paper may be required

| | |
|---|---|
| 1 | state the general topic and give some background |
| 2 | provide a review of the literature related to the topic |
| 3 | define the terms and scope of the topic |
| 4 | outline the current situation |
| 5 | evaluate the current situation (advantages/ disadvantages) and identify the gap |
| 6 | identify the importance of the proposed research |
| 7 | state the research problem/ questions |
| 8 | state the research aims and/or research objectives |
| 9 | state the hypotheses |
| 10 | outline the order of information in the thesis |
| 11 | outline the methodology |

Establish your territory (say what the topic is all about)

Establish a niche (show why there need to be further research on your topic)

Introduce the current research

# Sample Introduction

Optical spectrum code-division multiple-access (OSCDMA) is a multiplexing technique adapted from the successful implementation in wireless networks. Hence, this modifies its spectrum appearance, in a way recognizable only by the in-tended receiver. Otherwise, only noise-like bursts are observed [1],[2].The advantages of OSCDMA technique over other multiplexing techniques such as time-division multiple-access and frequency-division multiple-access are numerous [3],[8].Many codes have been proposed for OSCDMA such as optical orthogonal codes (OOCs) [4],prime codes, and modified frequency-hopping (MFH) codes [5].However, these codes suffer from various limitations one way or another. The codes' constructions are either complicated (e.g., OOC and MFH codes), the cross-correlation are not ideal (e.g., Hadamard and Prim codes), or the code length is too long (e.g., OOC and Prime code). Long code lengths are considered disadvantageous in its implementation since either very wide band sources or very narrow filter bandwidths are required. For example, if the chip width (filter bandwidth) of 0.5 nm is used, the OOC code will require a spectrum width of 182 nm and prime code will require 480.5 nm, whereas, modified double weight (MDW) only requires 45 nm. It will be shown that the transmission performance of MDW codes is significantly better than that of Hadamard and MFH codes. This is achieved through theoretical calculation and software simulation.

# Introduction

**MUST HAVE:**

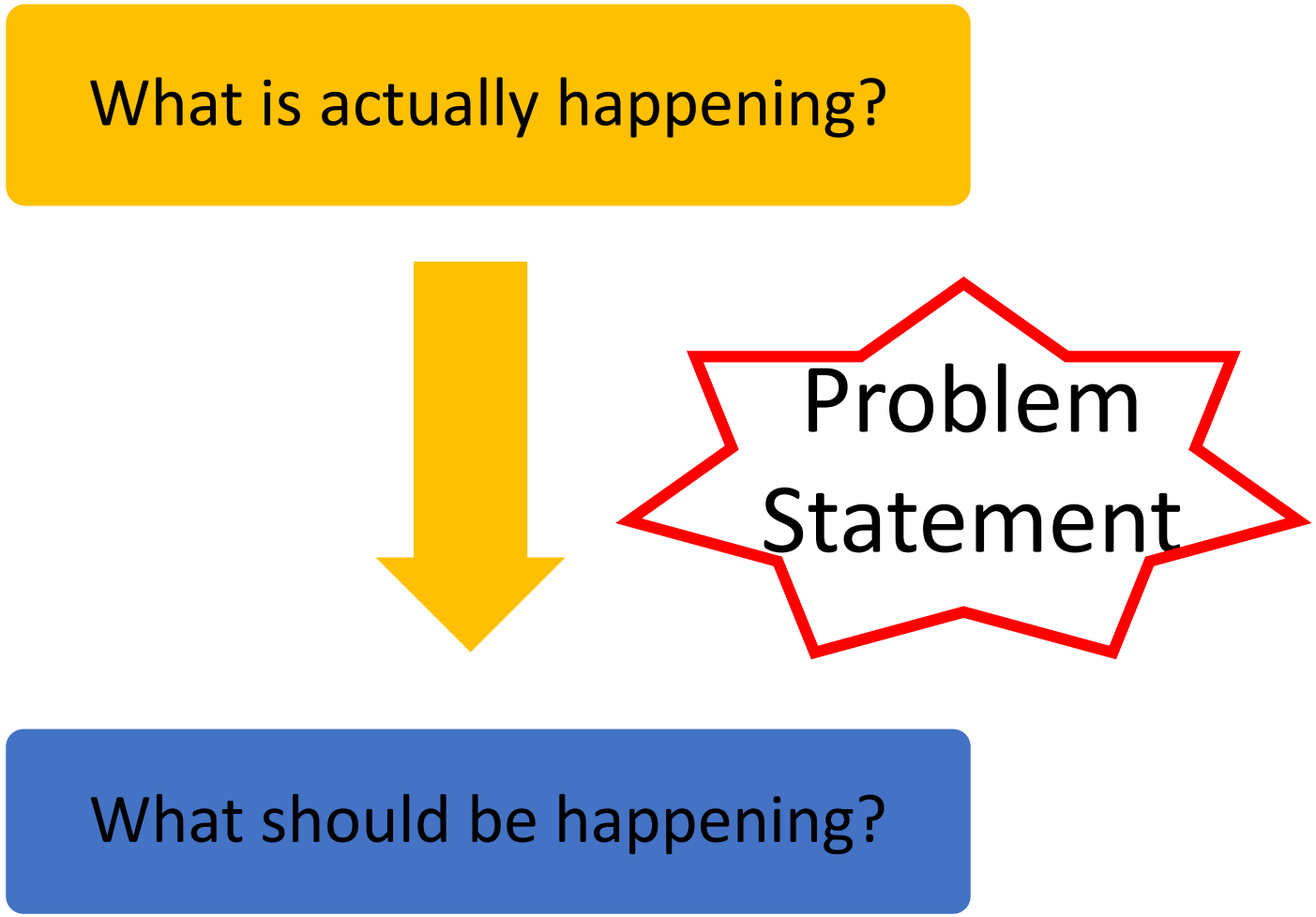
1)Problem Statement

2)Research Objectives

3)Scope of Work

4)Thesis Outline

# Problem statement




- Stress important keywords
- Exaggerate your tone
- Make it sounds like, without your research, it will be somewhat like the end of the world

# Problem statement

**Pizza Delivery Times:**

Pizza delivery times at the Westside location have been averaging 38 minutes on Friday and Saturday nights (*high volume periods*). As a result, 20% of the pizzas are being delivered late (past 30 minutes). Delivering pizzas in less than 30 minutes is crucial to increase revenue and customer satisfaction.


Where is the problem?

What is the Problem

Why is it important?

Magnitude of the problem

# Research Objectives and Contributions

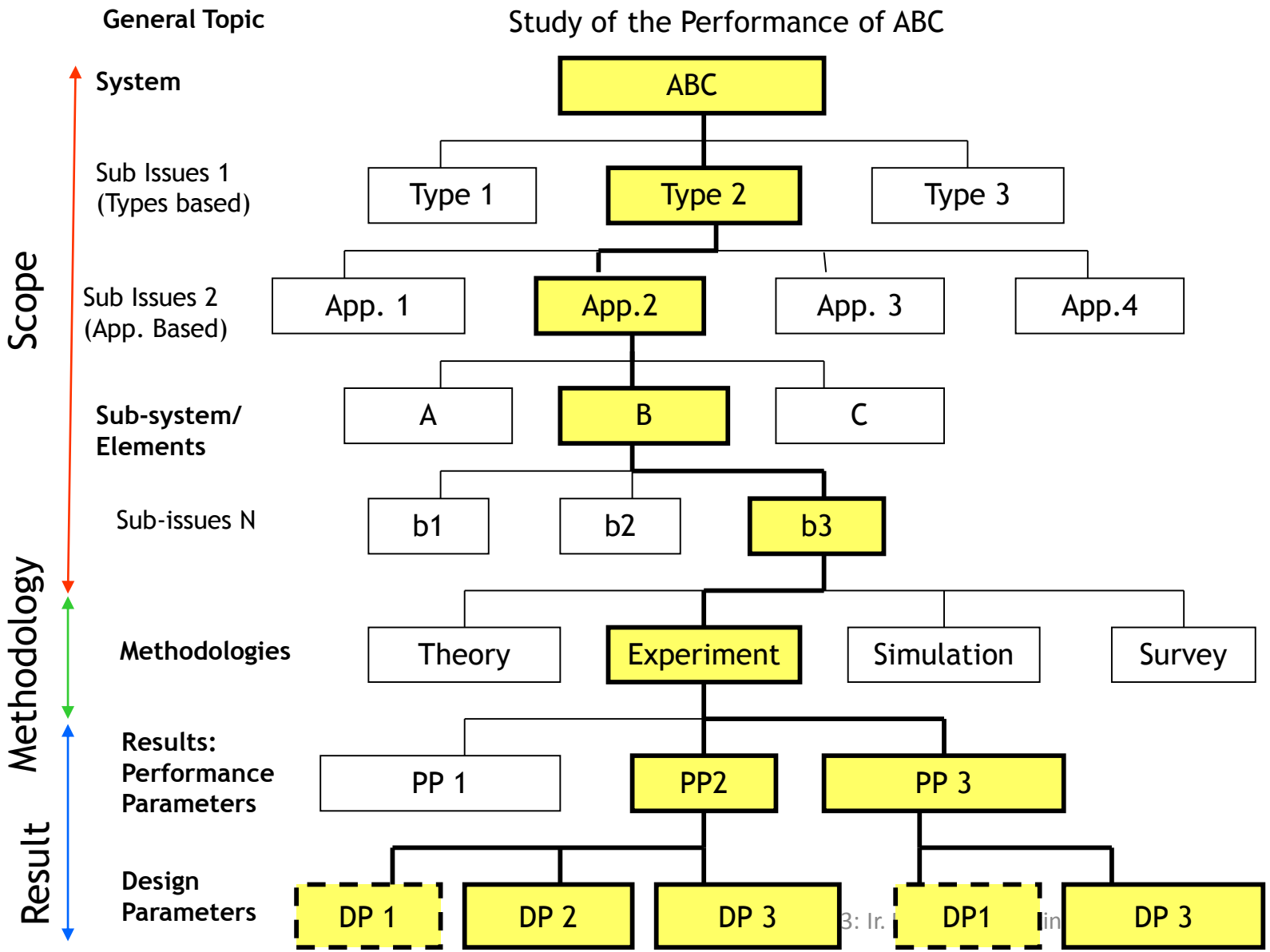
- Personally, I always stick with “Rules of three”
- Thomas Jefferson in Declaration of Independence → “life, liberty and the pursuit of happiness”
- Jobs introduced the iPad 2 as “thinner, lighter, and faster”
- Three is reasonable
- Beyond three, audience is not able to capture your points

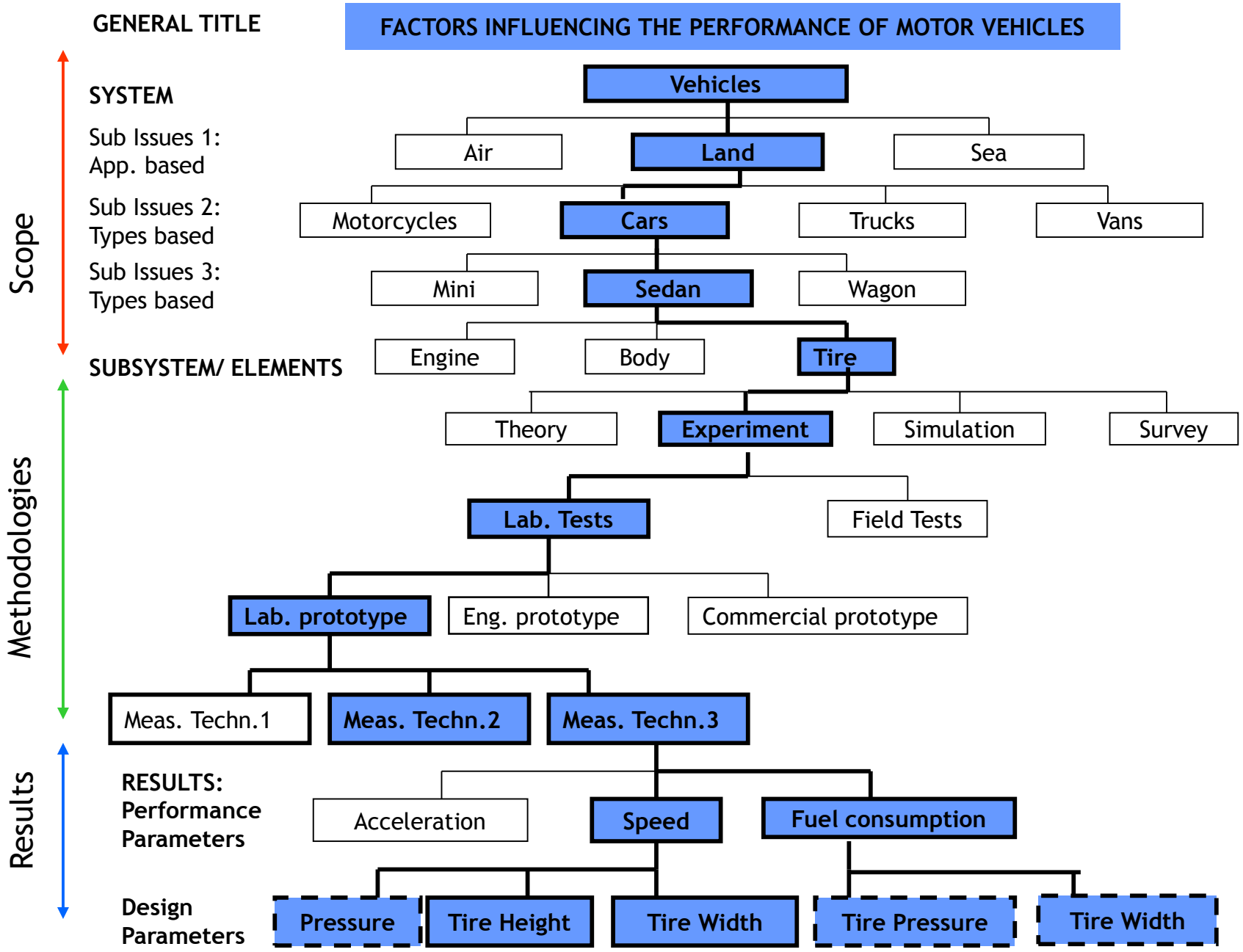
# Research Objectives

1. To characterize the factors causing delay in delivering the pizzas
2. To develop a new method of delivering pizzas in less than 30 minutes
3. To validate the new method proposed with the current method

Solution: Deliver pizzas in less than 30 minutes

# Scope of work

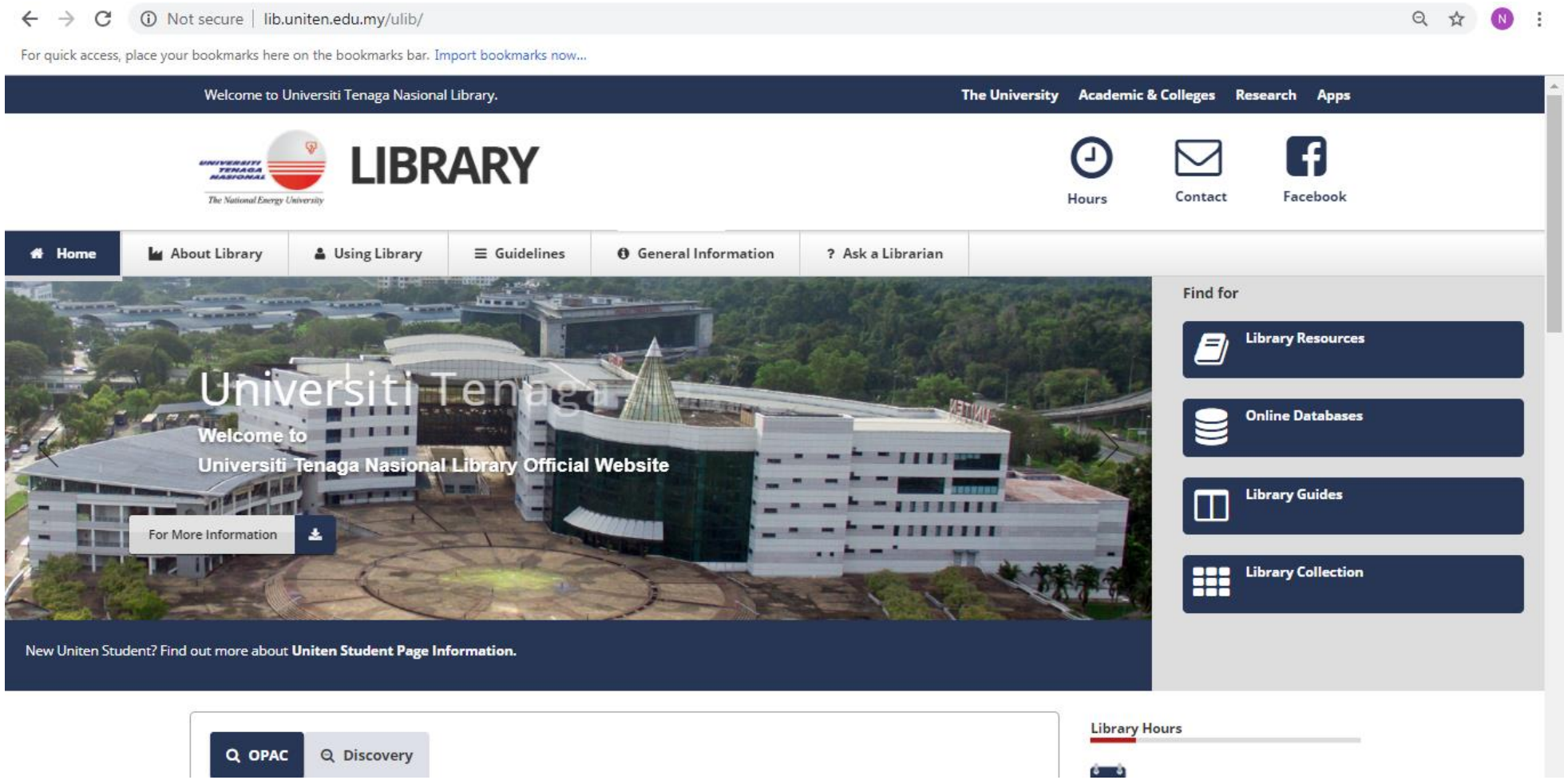



GENERAL TITLE
FACTORS INFLUENCING THE PERFORMANCE OF MOTOR VEHICLES
Scope
SYSTEM
Sub Issues 1: App. based
Sub Issues 2: Types based
Sub Issues 3: Types based
SUBSYSTEM/ ELEMENTS
Methodologies
Results
Vehicles
Air
Land
Sea
Motorcycles
Cars
Trucks
Vans
Mini
Sedan
Wagon
Engine
Body
Tire
Theory
Experiment
Simulation
Survey
Lab. Tests
Field Tests
Lab. prototype
Eng. prototype
Commercial prototype
Meas. Techn.1
Meas. Techn.2
Meas. Techn.3
RESULTS: Performance Parameters
Acceleration
Speed
Fuel consumption
Design Parameters
Pressure
Tire Height
Tire Width
Tire Pressure
Tire Width

# Literature Review

# Literature Review/Research Background

## lib.uniten.edu.my/ulib

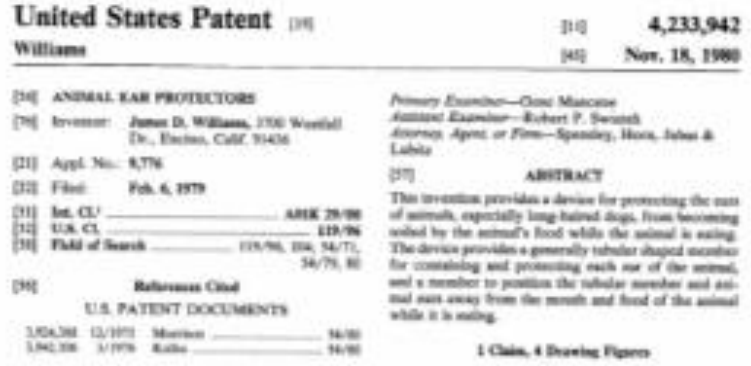


# Literature Review/Research Background

- **ACM Digital Library**
- **ASCE American Society of Civil Engineers**
- **ASME American Society of Mechanical Engineers**
- **BLIS Bernama Library and Infolink Services**
- **CCH Malaysia Online**
- **Emerald Insight**
- **IEEE Xplore**
- **ScienceDirect**
- **Scopus**
- **Springer Link**
- **Taylor & Francis Online**
- **Wiley Online Library**

# Literature Review/Research Background

Patent search: http://patft.uspto.gov/



United States Patent [19]
Williams

[11] 4,233,942
[45] Nov. 18, 1980

[54] ANIMAL EAR PROTECTORS

[76] Inventor: James D. Williams, 3700 Westhill Dr., Encino, Calif. 91436

[21] Appl. No.: 9,776

[22] Filed: Feb. 6, 1979

[51] Int. Cl.[3] ..... A01K 29/00
[52] U.S. Cl. ..... 119/96
[58] Field of Search ..... 119/96, 104, 54/71, 54/79, 80

[56] References Cited
U.S. PATENT DOCUMENTS

3,924,388 12/1975 Morrison ..... 54/80
3,942,308 3/1976 Kolbo ..... 54/80

Primary Examiner—Gene Mancene
Assistant Examiner—Robert P. Swiatek
Attorney, Agent, or Firm—Spensley, Horn, Jubas & Lubitz

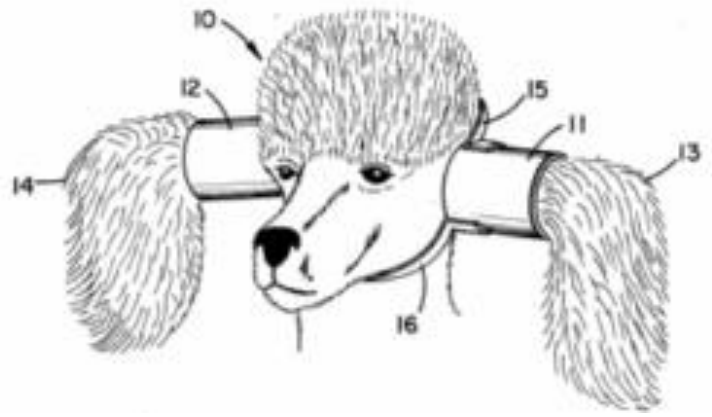
[57] ABSTRACT

This invention provides a device for protecting the ears of animals, especially long-haired dogs, from becoming soiled by the animal's food while the animal is eating. The device provides a generally tubular shaped member for containing and protecting each ear of the animal, and a member to position the tubular member and animal ears away from the mouth and food of the animal while it is eating.

1 Claim, 4 Drawing Figures

Intellectual property

To prove your invention is able to be commercialized



# Literature Review

| ***Questions*** | ***Sample answers*** |
|---|---|
| **What is it?** | An evaluation of previous research on your topic. |
| **What is its purpose?** | 1. "provides background information needed to understand your study<br>2. assures your readers that you are familiar with the important research that has been carried out in your area<br>3. establishes your study as one link in a chain of research that is developing and enlarging knowledge in your field" (Weissberg & Buker 1990, p.41) |
| **What do I need to include?** | **Minimum:** well-established research in the field; most recent relevant research. |

# Literature Review

| ***Questions*** | ***Sample answers*** |
|---|---|
| **How do I organise it?** | Some POSSIBLE approaches, which can be combined (there are others):<br>1. Organised around key themes or debates<br>2. From distant to close; from less specific to more specific<br>3. Generic knowledge<br>* conceptual framework<br>* understanding of specific context<br>* applying theory to context<br>4. A methodological approach, following the different methods used in your field. |
| **What referencing system should I use?** | The REFERENCE system you follow will be that of one of the leading journals in your field: check with your supervisor. |

# Literature Review

| ***Questions*** | ***Sample answers*** |
| --- | --- |
| **How do I refer to other authors?** | How you refer to authors will depend on whether you want to focus:<br>• on the information: use name/number in parentheses.<br>e.g.: **It was demonstrated [2]**<br>or **It was demonstrated (Williams, 2003)**<br>• or on the author: use acknowledging phrases e.g. **Williams (2003) demonstrated that**... or **Williams [2] demonstrated that...** |

# Literature Review

## 2 parts:

- Research Background
- Literature Review

## Cover past and latest references

## Organize and summarize literature review

# Literature Review

| Author | References | Summary | Advantage | Disadvantage/ Difference |
|---|---|---|---|---|
| | | | | |
| | | | | |

# Examples of Literature Review

- Look at the following examples and see how can you summarise a number of studies and contrast differing findings. Also notice the use of evaluative language to show the student's evaluation of the previous research.

**KEY**

- Summarizing Language **IN RED**
- Contrast Language *IN* **BLUE**
- Evaluative Language <u>UNDERLINED</u>

# Examples of Literature Review

**EXAMPLE 1**

"**Several studies [5, 6, 7] have reported** the benefits of using boron solid sources over other types of boron diffusion source. … **On the contrary**, Warabisako et al [9] demonstrated that obtaining high efficiencies with boron solid source was no easy task. They reported severe degradation of bulk minority carrier lifetime after boron solid source diffusion" (Chen, 2003, pp.2-14-2-15).

# Examples of Literature Review

**Example 2**

"On evaluation of **the studies performed thus far,** genotype 1b rdrp proteins have been studied extensively **while** rdrp proteins from other genotypes have been somewhat ignored. Kim et al. Was **the only group** to have published a 3a rdrp paper, **although** their focus was on the template requirement for the ns5b gene **as opposed to** polymerase activity" (Tan, 2004, pp.15-16).

# Examples of Literature Review

**Example 2**

"On evaluation of **the studies performed thus far,** genotype 1b rdrp proteins have been studied extensively **while** rdrp proteins from other genotypes have been somewhat ignored. Kim et al. Was **the only group** to have published a 3a rdrp paper, **although** their focus was on the template requirement for the ns5b gene **as opposed to** polymerase activity" (Tan, 2004, pp.15-16).

# Methodology from SPAM

# Methodology

**How to elaborate the M?**

- Define/describe the methods of Process /Production used
- Define/describe the methods in Generating/Verifying data
- Define/describe the methods in Analyzing data
- Defend that each of the methods is correct and advantageous

# Research Methodology

Method of data analysis

Procedure / experimental setup

# Research Methodology

## How detail?

- It needs to contain enough detail for another specialist in your field to repeat your experiments and replicate your results

## All methods must be justified

## Be transparent in how you employ your methods

# Research Methodology

Validation

Comparison

# Extracts from Methodology

**Thesis A: Test on the proposed equation**

Different set of hydraulics and sediment data was used to validate the robustness of the proposed equation and the validity of the various dimensional parameters relating to the movement of sediments.

**Thesis B: Model testing**

Model testing was conducted to determine the various parameters relating to the formation of midland point bars in sand bed river. It involved measurements of the flow and sediment matrices as well as the geometrical analysis of the bars under different matrices.

## Thesis C: Viral RNA Extraction

RNA was extracted from sera using the QIAmp Viral RNA extraction kit (Qiagen, Hilden, Germany) according to the manufacturer's instructions. A negative extraction control was included which consisted of water in place of serum. Its purpose was to confirm any positive result and rule out ant contamination. The 60ml of eluted RNA was stored at -800C (Oon 2005, p.13).

## Thesis D: BN Solid Source Preparation

Twelve in-situ p-type planar, boron nitride (BN) solid source slices were purchased for this thesis. The BN solid sources used in the experiments were PDS Products boron nitride wafers Grade BN-1250, purchased from Sainst Gobain Advance Ceramics (see Appendix A). The composition of the BN solid sources was 40% BN and 60% SiO2. The BN solid source slices were divided into two sets of six and only one set was used in the initial experiments (that set of BN solid slices broke later in the thesis after too much abuse, and the remaining set of six was prepared to continue the experiments). The other set of six BN solid source slices were stored in a clean N2 bo (Chen, p.3-5).

# Results and Discussions from SPAM

# Results/Discussion

**How to elaborate the A?**

- Define and Present Data (e.g Relationship, Comparative, Optimization curves)
- Discuss Data ( Analysis of trend, Analysis of reason)

(defend that the results solve the problems under research)

# Results/Discussion

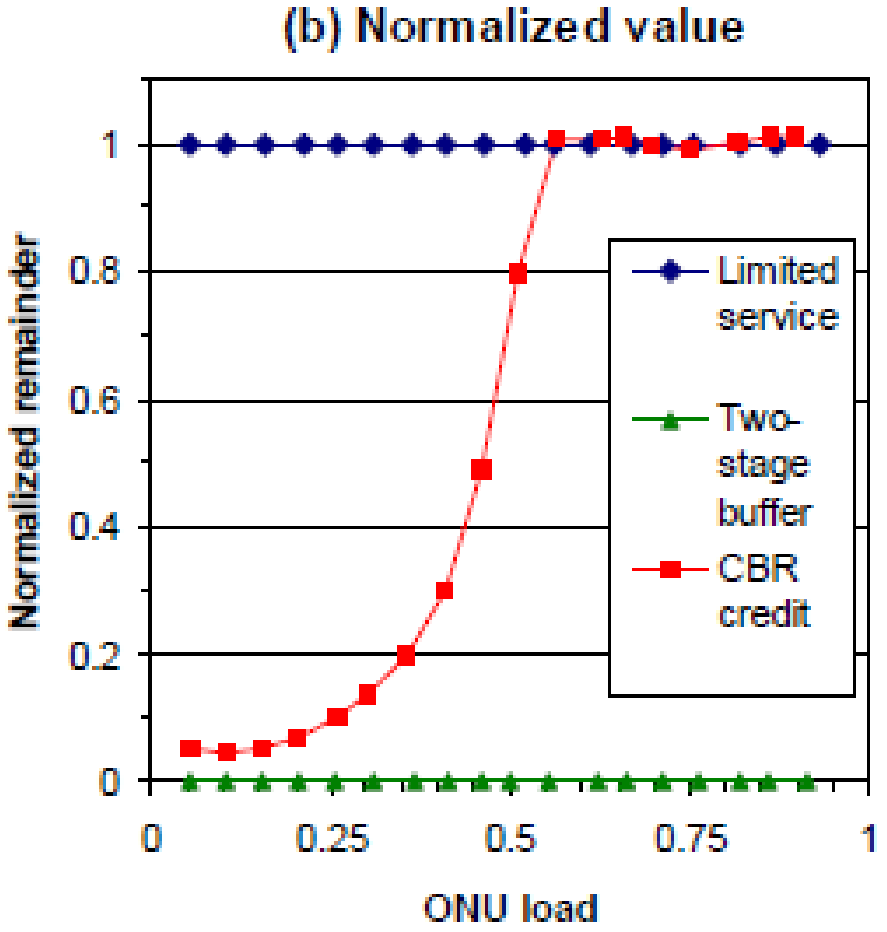



Figure 13(b) shows that, starting at a load of 0.6, the average unused remainders in limited service and CBR credit schemes are the same [and have an absolute value of approximately 555 Bytes as predicted by Eq. (2)]. This is expected, since, at high loads, the ONUs request windows larger than *W*MAX Bytes. According to Eq. (6), the OLT will grant them a *W*MAX-Byte slot, ignoring the credit value. Therefore the CBR credit scheme's performance at high loads is the same as in the limited service scheme.

# Results/Discussion

**How to arrange the order of results?**

- **From most important to least important**

  (from largest measurable differences to smallest; from statistically most significant to least significant)

- **As a logical response to the research questions or problems you are trying to answer or solve.**

  This may involve presenting one set of results that answers your first research question, followed by the next set of results that answers your second research question

- If you are using **a range of methods** or a number of **experimental elements**, group the method/procedure together with the relevant results.

# Results/Discussion

1. **What does your discussion section do?**
    - Explains what the results mean;
    - interprets the data;
    - compares it with other research;
    - evaluates its importance;
    - points out the limitations of your research;
    - raises questions for future directions.

# Results/Discussion

**2. What information does the reader expect to find?**

- How your research relates to your aims;
- how it confirms your aims;
- an explanation of your results;
- how your research relates to theory or previous research;
- the significance of your research;
- limitations or improvements that could be made to your research.

# Results/Discussion

**3. What information will you include?**

- A summary of the key findings;
- how these relate to your aims;
- confirmation of your aims;
- comparison with theory/previous research;
- explanation of unexpected results;
- significance;
- limitations/future directions.

# Results/Discussion

**4. What information will you leave out?**

- Anything that is not in the results section;
- results that are less significant:
- results that do not relate directly to or confirm your aims/hypotheses;

# Results/Discussion

**5. How will you organise your information?**

- 1) ONE way is to respond to the aims/hypothesis in the order that they are stated in your Introduction.
- 2) ANOTHER way is to start with the most significant results, comment on them and work your way down to the least significant.
- 3) A THIRD way is to follow the pattern outlined in sections 2 or 3 above.

# Preliminary results

Define and Present Data (e.g Relationship, Comparative, Optimization curves)

Discuss Data ( Analysis of trend, Analysis of reason)

Defend that the results solve the problems under research

## Example 1. (School of Bio-Molecular Sciences)

- **Genetic mechanisms and dissemination of antibiotic resistance**
  PCR-screening for integrons in the multiple-antibiotic resistant and extended-spectrum β-lactamase (ESBL) producing collections of bacteria **revealed** that 41% and 79% of strains in the multi-resistant and ESBL collections respectively, carried at least one integron. The proportion of strains in the multiple-antibiotic resistant collection of bacteria carrying integrons **is comparable to other studies**. For example, 49% of 120 urinary isolates of Enterobacteriaceaein Sydney were found to carry integrons (White et al., 2001) whilst 52% of clinical isolates of E. coli in Taiwan were found to harbour class 1 integrons (Chang et al., 2000). These high levels of integrons in clinical isolates **emphasise the potential** of these elements in the development of multiple-antibiotic resistant strains of bacteria by capturing antibiotic resistance gene cassettes and collecting them in arrays. (Jones 2003, p.62)

## Example 2. (School of Civil Engineering)

- **Permeable Treatment Walls**
  There are **several important points to note** about the results presented for the case of a single gate permeable treatment wall. The first of these points involves the **validity of the assumptions** made about the properties of the aquifer, gate and walls. **Clearly** the use of the design chart **is limited** to cases where the parameters of the system are the same or very homogeneous. **This assumption** will **only**hold in **a very small amount** of real cases. **The other assumption** that **may be difficult to fulfil** is the one metre width of the wall and gate. This value **would be realistic** for slurry walls but in the case of sheet piles **may be less accurate.**
  (Dasey 1996 p.39)

## Example 3 (School of Computer Science & Engineering)

- **The Steiner Tree Problem**
  Table 5.3.3 shows the comparison on the number of S-points generated. The number of S-points generated **might not be** a good metric on the quality of the solutions. Smith et al. [1981] conjectured that increasing the number of S-points will increase the reduction over the MST. **This is reasonable** since every addition of S-point into the tree is meant to reduce the total cost. **However**, in some applications **it is more desirable** to reduce the number of S-points. For example, in the case of building roads connecting cities, there **might be some costs** involved with every road intersection.
  (Fu, 1993 p.53)

# Conclusion from SPAM

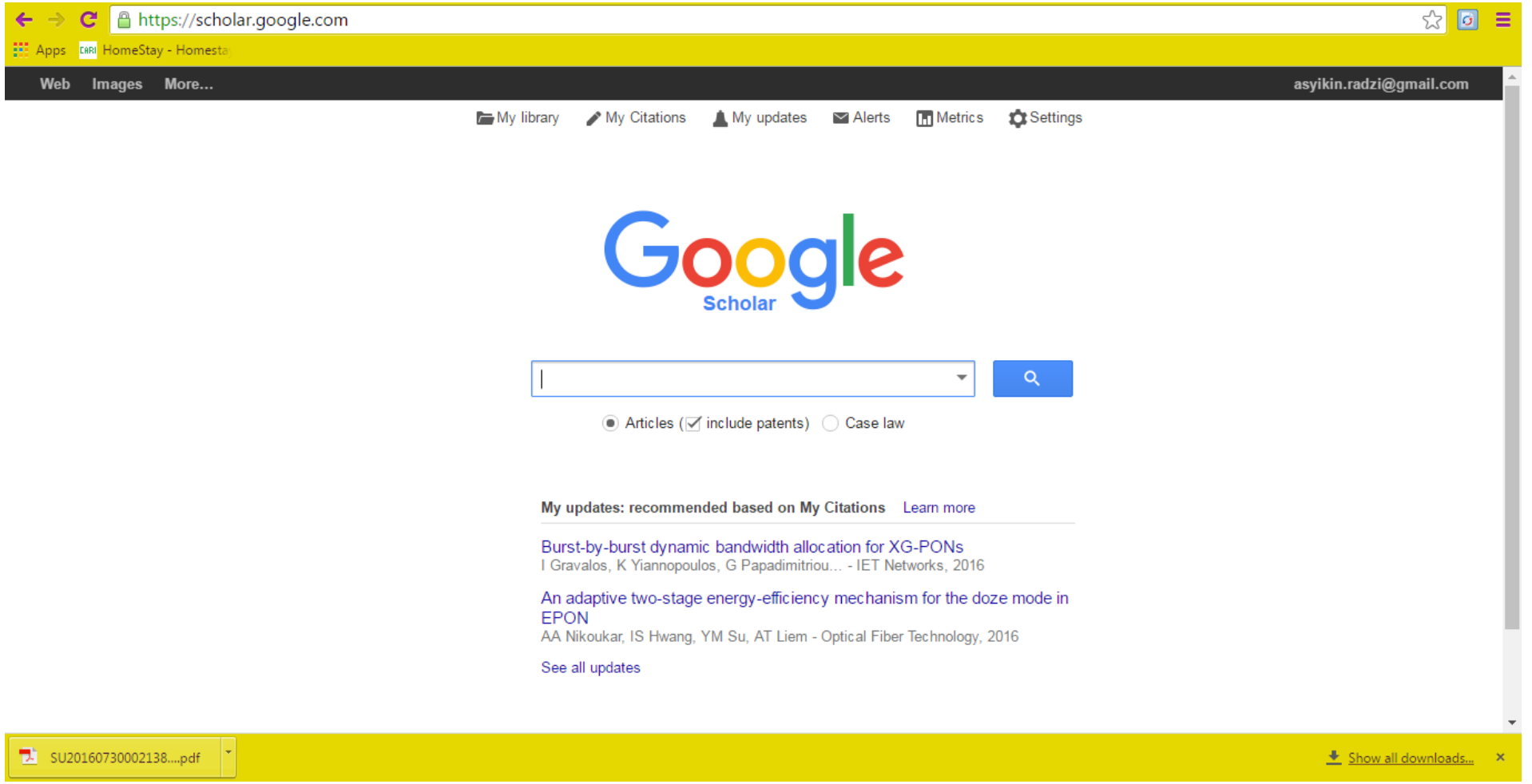
# Conclusion

- Repeat SPAM focusing more on Achievements (**A**) and Methods (**M**)
- Longer than Abstract, shorter than Introduction
- Achievement (**A**) - 50% highlighting the advantages
- Methods (**M**) – 30%
- System (**S**) – 10% on the Background Review i.e the importance of system under study
- Problems (**P**) – 10% on the Critical Review
- A single paragraph; no references

# References

- Quote all references in the main paper
- Most references are in Introduction and Literature Review
- All conclusive statements must be substantiated by own results and/or references, unless the statements are obvious

# Google Scholar



# Specific database

- Scopus.com
- Science Direct
- IEEE
- OSA
- Hindawi
- **If not open source, must subscribe

# Other sources

- Research gate
- Facebook: Research Articles, Books and Literature

# Common errors with thesis

| | |
|---|---|
| No introduction | Make sure you have an introduction |
| Disjointed structure | Plan each section (summarise what you are going to say), decide on the sequence of information. Check for logical flow. |
| Incorrect use of references | Always state your sources, reference images, always note the source as you are reading it. |
| Citation errors in references | Always check the spelling of your references; making sure you include all appropriate bibliographical data. |
| Too many nested sub-sections in the TOCs | Make sure that your TOCs is no more than two pages. |

# Common errors with thesis

| | |
|---|---|
| No error analysis | Don't be afraid of finding errors in your methods or results. State clearly and honestly if there was some problem. |
| Assumptions not being made explicit | Check that what you have said can be understood by someone else. |
| Missing/incomplete explanations | Always do a comprehension check of your work: is an explanation needed? Have you included all relevant details? |
| Diagrams/figures too small | Always use 12 point font as a minimum size. |
| Undefined symbols, symbols changing, using two symbols for one item | Proof read your work carefully; check for inconsistency in use of symbols; if you change a symbol, explain this to the reader |

# General pointers

- Specific Figures , Equations, Tables are Proper nouns (Figure 1, Eqn 4.2, Table 2)
- Always begin a section with texts; never begins with a figure
- Always accompany a figure, table with text description
- All conclusions must be substantiated either by your own resultsor by references
- Titles should not have periods
- Always mention why a section is important for your study; how is it relevant to your study.
- Avoid long sentences
- Put quotation marks clearly, else you may be mis-understood for plagiarism
- Good to keep your completed paper for sometime, and review it again before submitting it for publication
- Criticize your paper thoroughly before the reviewers do it for you

# THANK YOU

# References

[1] COGS Supervision And Viva Regulation 2018

[2] Journal Writing Structure SPAM Approach – The Only SPAM You Desire, Prof. Khazani

[3] Workshop on Guide on Good Practices In Research Planning , Development & Commercialization “ How To Series”

[4] Overview of K Chart a Tool for Research Planning and Management, Prof. Khazani

[5] Discussion On Research Report & Thesis Writing, Prof. Junaidah Ariffin

[6] Nature Masterclass – Scientific Writing and Publishing