POSTGRADUATE RESEARCH METHODOLOGY COURSE

Sept, 2016
POSTGRADUATE STUDIES
UNDERGRAD

WELL THIS ISN'T TOO BAD

GRADUATE HERE

STUDY

EXAM

LABS

GRADUATE STUDIES

GRADUATE HERE. MAYBE?

UNCERTAINTY

LITERATURE REVIEW

FUNDING?

EXPERIMENTAL CLIFF OF MAYHEM

SCOPE

ERR...
My PhD Journey

Your plan

Reality
My thesis is written in

Blood
Sweat
Tears
and COFFEE.
Motivation for doing a PhD

GraphJam.com

Grad Student Motivation Level

YEAR

Masters 1st 2nd 3rd 4th 5th 6th 7th 8th 9th

Blissful Optimism

Advisor lures with visions of greatness

Realize Quals are unavoidable

Friend from undergrad who didn't go to grad school shows off his/her new BMW

PhD Defense

Think about how many people will actually read thesis

Phd Defense

realize weakness of job outlook

Start writing dissertation

I will be an agent of change!

Get used to being "average"

Absorb Cynicism of Lates

The "post-quals slump"

"I've been here five years?"

Advisor runs out of funding

A curse! A curse on the lot of you!

Jorge Cham @ The Stanford Daily
✓ Timeline

✓ Graduation Requirements
KEEP CALM AND GRADUATE ON TIME

HOW TO GRADUATE ON TIME

WHY IS IT SO HARD TO GRADUATE ON TIME?
GANTT CHART

2016/2017 session
A good beginning makes a good end.

Masters (Course work)
Masters (Mixed-mode)
Masters (Research)
Mphil
PhD (Research)
Course Description

This course is designed to support postgraduate students in developing their research project and to assist them in defining their mode of enquiry. It will give students a general introduction to postgraduate research, its methodologies, its challenges and its organisation. Students will be introduced to a range of research tools and will be equipped to plan and organise their research, as well as to communicate their findings.

Learning Outcomes

On successful completion of the course, students will be able to:

• plan and manage a programme of MSc/Mphil/PhD research
• make use of and evaluate a variety of research tools and methodologies
• address issues of copyright, confidentiality, data protection and other ethical issues
• articulate, reflect on and critically evaluate their chosen subject of research and its methods
• communicate with colleagues in the same and other disciplines about their research
• pursue specific research methods in detail
Selected topics:

- Postgrads regulations
- Graduate on time (GoT)
- Roles of PG students
- Relationship with supervisor(s)
- Preparation/Writing of Research Proposal
- Philosophy of Research Methodology & Literature Review
- Research/Experimental Design
- Sampling, Statistical Analysis & Interpretation of Data
- *Viva-voce*
- DISSERTATION/THESIS WRITING
PHILOSOPHY OF RESEARCH METHOD & LITERATURE REVIEW

Sept, 2016
Outline

- Introduction
- Research process
- Literature review
- Issues
What is “research”?

- Studious inquiry or examination aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws.

- The collection of information about a particular subject.

- The process of finding solutions to a problem ..... 

- A systematic process of inquiry...

- A voyage of discovery..

- An art of scientific investigation
If we knew what it was we were doing, it would not be called research, would it?

(Albert Einstein)
Types of Research

- Basic / Fundamental Research
- Applied Research
- Academic Research
- Industrial Research

Types of Research

1. Experimental Methods
2. Naturalistic Observation
3. Case study
4. Survey
5. Correlational Studies
6. Testing
**Academic research**
- Basic research designed to answer scientific questions
- Involves hypothesis driven research
- Begins with basic observations and then bases a hypothesis on these observations
- Designs experiments to test hypothesis
  - Most of the effort in academic research is spent on designing these experiments

**Private Research**
- Ultimate purpose is to generate profit
- Usually takes advantage of existing technology or advances to generate a product
  - Effort can be focused on utilizing the advances of academic research to engineer a product
  - Effort focused on selecting advances that are viable adaptations of academic research
  - Effort focused on marketing of product
Types of Research

• Primary Research
  generating original information

• Secondary Research
  gathering information that has already been generated
Why research?

- Qualifications
- Immortality
- Altruism
- Status / prestige
- Utility
- Economy
- Fun / excitement
- Collaboration
WHY RESEARCH?

a To get a degree (e.g. BSc, MSc, PhD…)

a To solve a problem

a To get respectability

a To face a challenge

a To get intellectual joy

a To serve society

a An activity caused by instinct of inquisitiveness …
The purpose of this research is to ... 

- Explore 
- Determine 
- Establish 
- Explain 
- Describe 
- Portray 
- Understand 
- Assess 
- Evaluate 
- Create 
- etc
The Research Approach

Deductive:
- Theory
- Hypotheses
- Data
- Confirmation

Inductive:
- Theory
- Tentative Hypotheses
- Patterns
- Data

Deductive approach: **testing** theory
Inductive approach: **building** theory
Who Does Research?

- **Graduate Students**
  - Masters Degree
  - Ph.D. Degree
- **Researchers at universities**
  - Post-Doctoral students
  - Faculty members
- **Researchers in industry**
  - Research scientists
  - Many other technical workers
- **Undergraduate students**
- **Others**
QUALITIES OF GOOD RESEARCH

- Systematic
- Clearly defined purposes/objectives
- Carefully planned design
- Appropriate and adequate method(s)
- Adequate analysis of data
- Valid and reliable data (i.e. Replicable)
- Honest, Competent, High integrity
THE RESEARCH PROCESS

The research process is similar to undertaking a journey. For a research journey there are two important decisions to make:

1) *What you want to find out about* or what research questions (problems) you want to find answers to;

2) *How to go about finding their answers.*
RESEARCH PROCESS

1. Identifying the research question or problem area
2. Initial review of literature
3. Distilling the question to a specific research problem
4. Continued review of literature
5. Formulation of hypotheses
6. Determining the basic research approach
7. Identifying the population and sample
8. Designing data collection plan
9. Selecting or developing specific data collection instruments or procedures
10. Choosing the method of data analysis
11. Implementing the research plan
12. Preparing the research report
Steps in Research Process:

1. Formulating the Research Problem

2. Extensive Literature Review

3. Developing the objectives

4. Preparing the Research Design including Sample Design

5. Collecting the Data

6. Analysis of Data

7. Generalisation and Interpretation

8. Preparation of the Report or Presentation of Results-
   Formal write ups of conclusions reached.
Carrying out a research project

- Research Design
- Method Selection
- Literature Review
- Data Collection
- Data Analysis
- Writing Up
Searching for scientific problem
Review of literature
Hypothesis
Aims of research
Methods
Plan of research
Research
Results

Researcher’s work in graphic form

Aztec Pyramide
Searching for scientific problem
Review of literature
Hypothesis
Aims of research
Methods
Plan of research
Research
Results
Researcher’s work in graphic form
RESEARCH

Planning

Implimentation

Reporting
POSTGRADUATE RESEARCH

- Literature Review
- Research Proposal

- Data Collection
- Data Analysis & Interpretation

- Thesis writing
- Thesis defence (viva voce)
POSTGRADUATE DEGREE / PROGRAM

- PhD (Research)
- MPhil (Research)
- Masters (Research)
- Masters (Coursework) / Masters (mixed-mode)
- Postgraduate Diploma
Defining MSc and PhD

- UG: One is ready to learn
- MSc: One is ready to explore
- PhD: One is ready to create
# Malaysian Qualifications Framework: Qualifications and Levels

<table>
<thead>
<tr>
<th>MQF Levels</th>
<th>Skills</th>
<th>Vocational and Technical</th>
<th>Higher Education</th>
<th>Lifelong Learning</th>
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<tr>
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<td>Doctoral Degree</td>
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<td>7</td>
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<td>Masters Degree</td>
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<td></td>
<td>Postgraduate Certificate &amp; Diploma</td>
<td>Accreditation of Prior Experiential Learning (APEL)</td>
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<td>6</td>
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<td></td>
<td>Bachelors Degree</td>
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<td>5</td>
<td>Advanced Diploma</td>
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<td>Diploma</td>
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<td>3</td>
<td>Skills Certificate 3</td>
<td>Vocational and Technical Certificate</td>
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<tr>
<td>Bachelor</td>
<td>Report</td>
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<tr>
<td>Masters (coursework)</td>
<td>Report / Mini Project</td>
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<tr>
<td>Masters (mixed-mode)</td>
<td>Dissertation</td>
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<tr>
<td>Masters (research)</td>
<td>Thesis</td>
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<td>Mphil (research)</td>
<td>Thesis</td>
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<tr>
<td>PhD (coursework)</td>
<td>Report / Mini Project</td>
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<td>PhD (Research)</td>
<td>Thesis</td>
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</table>
Upon completion of the programme, graduates should be able to:

**PLO 1**: Demonstrate mastery of knowledge in the relevant field;

**PLO 2**: Apply practical skills in the relevant field;

**PLO 3**: Relate ideas to societal issues in the relevant field;

**PLO 4**: Conduct research with minimal supervision and adhere to legal, ethical and professional codes of practice;

**PLO 5**: Demonstrate leadership qualities through communicating and working effectively with peers and stakeholders;

**PLO 6**: Generate solutions to problems using scientific and critical thinking skills;

**PLO 7**: Manage information for lifelong learning.
Upon completion of the programme, graduates should be able to:

**PLO 1**: Synthesize knowledge and contribute to original research that broadens the frontier of knowledge in the relevant field;

**PLO 2**: Adapt practical skills leading to innovative ideas in the relevant field;

**PLO 3**: Provide expert advice to society in the relevant field;

**PLO 4**: Conduct research independently and adhere to legal, ethical and professional codes of practice;

**PLO 5**: Display leadership qualities through communicating and working effectively with peers and stakeholders;

**PLO 6**: Appraise problems in the relevant field critically using scientific skills;

**PLO 7**: Integrate information for lifelong learning.

**PLO 8**: Synthesize empirical data and contextualize result ……
BACHELOR: Focus on gaining broad competencies.

MASTER: Move beyond basic research skills; Focus is on developing critical thinking in a subject area.

PhD: Focus is on identifying a “gap” in knowledge and addressing it, hence advancing knowledge in the field of study.

i.e. Difference in significance and level of discovery.
A master's thesis must demonstrate that the student knows the background and principal works of the research area, and can produce significant scholarly work. It should contain some original contribution whenever possible.

A doctoral thesis must contain a substantial contribution of new knowledge to the field of study. It presents the results and an analysis of original research, and should be significant enough to be published.
Learning Outcomes (LO)

LO ↔ Knowledge/Academic skill
    Generic / Soft skills

DOMAINS

Cognitive  Affective

Psychomotor
The Ph.D. Program

Raw talent and intellect

nurturing CSD environment

courses directed research thesis proposal

thesis

well-educated researchers and future leaders in Computer Science
POSTGRADUATE RESEARCH

• Research Topic
• Literature Review
• Research Proposal
• Data Collection
• Data Analysis & Interpretation
• Thesis writing
• Thesis defence (viva voce)
RESEARCH AREA

RESEARCH TOPIC

RESEARCH TITLE
Factors to consider in the choice of a research topic

1. Novel - When considering a research topic, the researcher has to focus on one which has not been investigated before. In the event that the problem has been studied before, he has to inject originality in it by coming up with another research design, using a different data-gathering tool or a different scheme for analyzing the research data.

2. Interesting - The researcher needs to consider his interest in the choice of a research problem. Interest counts a lot in the conduct of a study. If a researcher is not interested in the topic, it will be difficult on his part to put his heart and soul in it.
Factors to consider in the choice of a research topic

3. Relevant - The results of the study on a given problem should be of practical value to the researcher and the significant others in the field.

This means that once the study had been completed, its findings, its conclusions and recommendations can be used in improving practices or solving an identified difficulty.

- Will the results add knowledge to information already available in the field?
Factors to consider in the choice of a research topic

4. **Feasible** - This means that a problem that an investigator is going to work on can be completed without undue amount of time, money or effort. Feasibility of research also means that the researcher has the necessary competence or expertise to conduct the study on the chosen problem.

- Is the topic too broad? (e.g. the effects of TV violence on children)
- Can the problem really be investigated? (e.g. availability of information)
- What costs and time are involved in the analysis?
Factors to consider in the choice of a research topic

5. **Researchable** - Data can be collected to answer the problem posed by the researcher.
   - Can the data be analyzed? (Can the data be measured?)

6. **Ethical** - A problem is said to be ethical when it does not involve physical or psychological harm or damage to human beings or organizations. In other words, a study on a particular topic should not put people or institutions in a bad light.

**CONCISE**: Gives a general sense of what is being investigated.
Focus on areas you are interested in within the topic.
selection of a topic

is the research feasible? NO
YES

will the research have sufficient value? NO
YES

is/are the research question(s) symmetrical? NO
YES

will the research have sufficient scope? NO
YES

likely to be a suitable topic; next, discuss with your supervisor
What is a Research Proposal?

Clear, concise, well-organised document that spells out what it is you propose to do and why you are proposing to do it.
What is a Research Proposal?

- A proposal provides clear justification of the need for the study.

- It details how the study will be completed in order to achieve the aims and objectives and address the research questions or problems.
Figure 8.1: Questions to be addressed by research proposals

- How are you going to do it?
- What is the subject of the proposal?
- Why do you want to do it?
- For whom is the proposal intended?
- What do you plan to accomplish?
- What do you want to do?
A TITLE that clearly conveys the theme of your research project.

The main RESEARCH QUESTION that will be the focus of your research.

The EXPLANATION of why your research topic is important.

A brief LITERATURE REVIEW showing that you possess relevant knowledge to answer the research question.

A proposed METHODOLOGY for answering your research question.

TIME SCHEDULE for your research project.
Research Proposal Writing

- Title
- Abstract
- Rationale
- Research Question(s)
- Methodology
- Analysis
- Schedule
INTRODUCTION

Provides a clear statement of the:

- Research problem
- Significance of the project;

-What is the problem/issue/question and why is it important?

@ Context and Relevance of Study

The justifications need to be supported by relevant REFERENCES
OBJECTIVES

Specific proposed outcome(s) and/or product(s) of the Research

@ What will be known after the project was completed

Need to be clear & definite, specific, measurable and achievable in a specific time period

Comparatively, GOALS are conceptual and more abstract, and usually are not measurable.
SMART Objectives

- Specific
- Measurable
- Agreed
- Realistic
- Time bound
METHODOLOGY

a Defined by the OBJECTIVES

a A clear, systematic & detail description on HOW the study will be conducted, including the materials to be used and methods/experimental procedures to be carried out

[Supported by REFERENCES]
METHODOLOGY

Describes clearly and systematically how the study was conducted, including materials and methods used or carried out

Should provide sufficient information about the experiments:

- **WHEN & WHERE** the study was carried out,
- **WHAT** materials, techniques, samples, approaches were used
- **HOW** the study was carried out
- **WHAT** procedures were used

Techniques that are thoroughly described elsewhere in the literature should be briefly summarized and appropriately referenced
METHODOLOGY

EXPERIMENTAL PROCEDURES / DESIGNS

PARAMETERS / VARIABLES

MEASUREMENTS / ANALYSIS

QUALITY ASSURANCE / QUALITY CONTROL

STATISTICAL CONSIDERATIONS
METHODOLOGY
Experimental Work/Research Design

DATA

OBJECTIVES
3MINUTE THESIS COMPETITION

3:00

3 min
YOUR THESIS IN 3 MINUTES:

WHY YOU’RE DOING IT
("MY SUPERVISOR TOLD ME TO DO IT" DOESN’T COUNT)

HOW YOU’RE DOING IT
(ASSUMING YOU KNOW)

HOW IT RELATES TO THE REAL WORLD
(UHM... PAUSE!)

EXPLAIN YOUR THESIS IN 3 MINUTES

1. WHY YOU'RE DOING IT
2. HOW YOU'RE DOING IT
3. HOW IT RELATES TO THE REAL WORLD
WHY RESEARCH PROPOSAL FAILS ???

• Aims and objectives are unclear or vague.
• There is a mismatch between the approach being adopted and the issues to be addressed.
• The overall plan is too ambitious and difficult to achieve in the timescale.
• The researcher does not seem to have conducted enough in-depth background research.

(LITERATURE REVIEW)
Literature Review
LITERATURE REVIEW
What is literature review?

The terms literature search, literature review and literature survey are one and the same and these are used interchangeably.

It means, in simple words, going through what is already said (published) about the topic/aspect you have chosen to research.
Why review the literature?

“...without it you will not acquire an understanding of your topic, of what has already been done on it, how it has been researched, and what the key issues are.”
A literature review surveys scholarly articles, books and other sources (e.g. dissertations, conference proceedings) relevant to a particular issue, area of research, or theory, providing a description, summary, and critical evaluation of each work.

The purpose is to offer an overview of significant literature published on a topic.

The review should demonstrate to the reader why the writer’s research is useful, necessary, important, and valid.
Components of literature review

Literature review requires four stages:

- **Problem formulation**—which topic or field is being examined and what are its component issues?

- **Literature search**—finding materials relevant to the subject being explored

- **Data evaluation**—determining which literature makes a significant contribution to the understanding of the topic

- **Analysis and interpretation**—discussing the findings and conclusions of pertinent literature
Expectations

• What is expected of a literature review at undergraduate level
  – Familiarity with a topic
  – Skills to be able to carry out a search on the subject
  – Knowledge on appropriate referencing style and an ability to create accurate bibliography
  – The ability to summarise key ideas and some critical awareness
The expectations at **Masters level**

- An increase in the scope, breadth and depth of the literature search
- Application of relevant literature from across other disciplines
- Competence in reading research
A Good Literature Review is:

- **Focused** - The topic should be narrow. You should only present ideas and only report on studies that are closely related to topic.
- **Concise** - Ideas should be presented economically. Don’t take any more space than you need to present your ideas.
- **Logical** - The flow within and among paragraphs should be a smooth, logical progression from one idea to the next.
- **Developed** - Don’t leave the story half told.
- **Integrative** - Your paper should stress how the ideas in the studies are related. Focus on the big picture. What commonality do all the studies share? How are some studies different than others? Your paper should stress how all the studies reviewed contribute to your topic.
- **Current** - Your review should focus on work being done on the cutting edge of your topic.
What distinguishes a good quality literature review?

- Appropriate **breadth and depth**
- Rigour and consistency
- Clarity and brevity
- **Effective analysis** and **synthesis**
- Use of the literature to justify:
  - The particular approach to the topic
  - The selection of methods
  - That your research contributes something new
Overall Structure

Broad Topic

Specialist sub-area

Relevant Primary research

Your research question
How to structure a literature review

- Generally use the inverted pyramid

Broad introduction to topic

At the end of your literature review the reader must have only one thought in their heads…….

That this research question must be answered!
You need a good literature review because it:

demonstrates that you know the field.

This means more than reporting what you've read and understood. Instead, you need to read it critically and to write in such a way that shows you have a feel for the area;

You know what the most important issues are and their relevance to your work, you know the controversies, you know what's neglected, you have the anticipation of where it's being taken. All this would allow you to map the field and position your research within the context.
You need a good literature review because it:

justifies the reason for your research.

This is closely connected with demonstrating that you know the field. It is the knowledge of your field which allows you to identify the gap which your research could fill. However, it is not enough to find a gap. You have also to be able to convince your reader that what you are doing is important and needs to be done.
A literature review usually combines both **summary** and **synthesis** of the sources.

A summary is a recap of the important information of the source;

A synthesis is a re-organization, or a reshuffling, of that information.

The Review is supposed to lead to your own proposed research project and its justification.
Besides enlarging your knowledge about the topic, writing a literature review lets you gain and demonstrate skills in two areas:

- **Information seeking:**
  the ability to scan the literature efficiently, using manual or computerized methods, to identify a set of useful articles and books.

- **Critical appraisal:**
  the ability to apply principles of analysis to identify unbiased and valid studies.
Research Problem

ANALYSIS

Knowing what Scholars have concluded

What are the scholars saying

Identify themes or issues

Integrate the literature so that it tells a story in its own right

Continuous critiquing of conceptual framework

SYNTHESIS

Identifying issues and themes

LITERATURE REVIEW

Generate a conceptual framework of the literature

Discover relationships between themes/ issues

Compare what the authors are saying

Reading the literature

Start here
WORKING WITH THE LITERATURE

FIND IT!
- Knowing the literature types
- Using available resources
- Honing your search skills

MANAGE IT!
- Reading efficiently
- Keeping track of references
- Writing relevant annotations

USE IT!
- Choosing your Research topic
- Developing your question
- Arguing your rationale
- Designing method

REVIEW IT!
- Understand the Purpose of lit. rev
- Ensuring adequate coverage
- Write purposefully
- Working on style and tone
How to write LR?

Source ↓
Search ↓
Sort & Select ↓
Summarise & Synthesise
RESPONSIBLE CONDUCT IN RESEARCH

Research Integrity and Misconduct
Responsible Research Conduct

- **Research Integrity** is “adherence to rules, regulations, guidelines, and commonly accepted professional codes or norms.

- **Research integrity** is essential to ensure the reliability of research results and to preserve public support for research.
RESEARCH MISCONDUCTS

“Fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results”

- **Fabrication** is making up data or results and recording or reporting them.

- **Falsification** is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.

- **Plagiarism** is the appropriation of another person’s ideas, processes, results, or words without giving appropriate credit.
ETHICS OF RESEARCH

- Plagiarism
- Claiming credit for results of others
- Misreporting sources
- Invent results
- Data with questionable accuracy

“Or our scientists say it would be a public health hazard, but market research shows it would sell like hot cakes. What do you think?”
Ethical Norms of Research

HONESTY
Strive for honesty in all scientific communications. Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent data. Do not deceive colleagues, granting agencies, or the public.

OBJECTIVITY
Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research where objectivity is expected or required. Avoid or minimize bias or self-deception. Disclose personal or financial interests that may affect research.

INTEGRITY
Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.
Ethical Norms of Research

CAREFULNESS
Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities, such as data collection, research design, and correspondence with agencies or journals.

OPENNESS
Share data, results, ideas, tools, resources. Be open to criticism and new ideas.

RESPECT FOR THE INTELECTUAL PROPERTY
Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give credit where credit is due. Give proper acknowledgement or credit for all contributions to research. Never plagiarize.

CONFIDENTIALITY
Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.
Ethical Norms in Research

**Responsible Publication**
Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.

**Responsible Mentoring**
Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.

**Respect for colleagues**
Respect your colleagues and treat them fairly.

**Social Responsibility**
Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

**Non-Discrimination**
Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors that are not related to their scientific competence and integrity.
Ethical Norms of Research

**Competence**
Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science as a whole.

**Legality**
Know and obey relevant laws and institutional and governmental policies.

**Animal Care**
Show proper respect and care for animals when using them in research. Do not conduct unnecessary or poorly designed animal experiments.

**Human Subjects Protection**
When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy; take special precautions with vulnerable populations; and strive to distribute the benefits and burdens of research fairly.

Cloning, Stem Cell Research and the Hwang Woo-Suk Case: The Problem of Research Misconduct

CELAB: Perfect Copy? Comparative and Interdisciplinary Approaches to Reproductive Cloning and Stem Cell Research
Budapest, CEU, 2007 March 1-2.

Kakuk Péter
research assistant at University of Debrecen, Department of Behavioural Sciences
research associate at Central European University, Center for Ethics and Law in Biomedicine
PLAGIARISM

Using other peoples’ ideas, text (exact or rephrased), tables or figures in our writing or presentations without giving reference to the source.

Unauthorized use or close imitation of the language and thoughts of another author and the representation of them as one's own original work.

The act of stating or implying *that another person's work is your own*. It can range from submitting a paper you didn't write to omitting key citations.
Plagiarism

No credit given
"Stealing of published material"
Small modifications made
Plagiarism:
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Network Economics for the Internet

Hans W. Göttinger
STRATEC, Munich, Germany
Email: hwp@stratec.de

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Abstract

Most studies of resource allocation mechanisms have used a performance model of the resource, where the very concept of the resource is defined in terms of measurable qualities of the service such as utilization, throughput, response time (delay) and so on. Optimization of resource allocation is defined in terms of these measurable qualities. One novelty introduced by the economic approach is to design a system which takes into account the diverse Quality of Service (QoS) requirements of users, and therefore use multiobjective (utilities) optimization techniques to characterize and compute optimum allocations. Economic (mechanism design) modelling of computer and communication resource sharing uses a unified paradigm described by two level modelling: QoS requirements as inputs into a performance model that is subject to economic optimization. In this step, one transforms QoS requirements to a performance (example, queuing service model). This model enables quantifiable parameters of resource allocation. For example, average delay QoS requirement when based on a FIFO queuing model is a function of resources, bandwidth and buffer and user traffic demands. These parameters are then used to establish an economic optimization model. The question of whether the resource is a piece of hardware, a network link, a software resource such as a database or a server, or a virtual network entity such as a TCP connection is of primary importance. The first step in the optimization process eliminates the details and captures the relevant behaviors and the optimization parameters. We consider a centralized model of network and service economics, where we show efficient QoS provisioning and Pareto allocation of resources (network and server resources) among agents and suppliers, which are either network nodes or servers (content providers). We show how prices for resources are set by the suppliers based on the QoS demands from the agents.

Keywords: Internet, Network Economy, Mechanism Design, Distributed Economic System, Economic Agents

1. Introduction

With advances in computer and networking technology, numerous heterogeneous computers can be interconnected to provide a large collection of computing and communication resources. These systems are used by a growing and increasingly heterogeneous set of users which are identified with the present Internet. A macroscopic view of distributed computer systems reveals the complexity of the organization and management of the resources and services they provide. The complexity arises from the system size (e.g. no. of systems, no. of users, etc.). A multimedia server application requires I/O bandwidth to remove content, CPU time to execute server logic and protocols, and networking bandwidth to deliver the content to clients. The performance of applications may also be altered by trading resources. For example, a multimedia server application may perform better by releasing memory and acquiring higher CPU priority, resulting in smaller buffers for I/O and networking but improving the performance of the communication protocol execution.

Finally, in a large distributed system, the set of systems, users and applications is continuously changing. In most of the cases, the network and the services are at different points in the application execution, and the traffic of interest is not known a priori. This results in the need of a system capable of adapting to changes in the environment and the application. In this paper, we assume that the system is influenced by changes in the environment and the application.
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- Open mind
- Curiosity
- Patience
- Persistence
- Positive Attitude
- Discipline and focus

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2. Approved Proposal Crest
3. Data Collection and Analysis Trough
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My thesis is written in

Blood
Sweat
Tears
and COFFEE.

THE LIGHT AT THE END OF THE THESIS.
CAN YOU SEE IT?
Yes, I did it!
I will do it
I can do it
I'll try to do it
How do I do it?
I want to do it
I can't do it
I won't do it

Which step have you reached today?
Thank You