

Research Methods for IT

Week 1,2

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Switch off mobile phones during lectures, or put them into silent mode

Term Paper



Finalize Group Members and Domain	17-Feb-2023
Search Papers and Sort Selected (At least 15)	24-Feb-2023
Go Through the Abstract and Introduction of Selected Papers	24-Feb-2023
Submit a Summary and Comments on related papers	21-Mar-2023
Submit a complete Survey Report	TBD
Presentation of Survey Report	TBD
Define Your Problem/ Topic	TBD
Submit Initial Draft	TBD
Final Paper Submission	TBD
Final Presentation	TBD

Please note that Every Phase has Marks

Some Topics (from previous batch)

Wireless Security and Threats

A Formal Modeling Approach to Model and Test Aspect Oriented Software Development

Secure Environment Discovery and Resource Sharing in the Android Operating System

A Comparative study of Wi-Fi 3G and Wimax

Comparative Analysis of Cleanroom and Component Based Software Engineering

A Step to Understand Context-Awareness

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Some Topics (from previous batch)

Comparison of VoIP Performance over IEEE802.11Protocol Standards

Formal Methods in Safety Critical Systems

Systematic Solution of Sparseness in an Algorithm for Diversifying Recommendation

Application of Fuzzy Logic in XML Database

Performance Analysis of RIP, OSPF and EIGRP Routing Protocols

An Overview Of Software Quality Assurance And Importance of CMM

Some Topics (from previous batch)

Analysis of Internet Addiction amongst University Level Students

Which is better among Aspect Oriented and Object Oriented?

Comparison of Open Source Softwares (OSS) with other Proprietary Software (PS)

Virtual router monitoring using nagios

Gas Management & Disaster System Using ZigBee

Some Topics (from previous batch)

IEEE 802.11 Family : A Survey

Context-aware security in ubiquitous computing environments

E-Commerce in Pakistan: Growth Potentials & E-Payment Solutions

Analysis of Adhoc network in ubiquitous Computing using Open Source Operating Systems (OpenMoko) for Handheld Devices

Comparison of Software Testing Techniques



Some Topics (from previous batch)

Collaborative Filtering

Remote Access security

A Critical Approach towards Existing Privacy Models in Ubiquitous Systems for Better User-Centered Privacy Evaluation Model

Why Relational Database Model is used in Large Scale Computer Applications

How to learn the research process



Answer is

“There is no way to get experience except through experience.”

remember

“Scientists are rated by what they finish, not by what they attempt”

How to do Research (1)

Research is all about **addressing an issue** or **asking and answering a question** or **solving a problem**, so...

Identify an issue, question, or problem.

- Talk with **people who want or need your study**.

Find out what's already known about it.

- Talk with **experts** and/or **read their reviews** and the **original research** on the topic.

How to do Research (2)

Plan, cost, and do your study accordingly.

Write it up and submit it for assessment.

- Better still, do a good job on it and **submit it for publication.**
- Undergrad projects are sometimes good enough to publish.
- Your work will **benefit more people** if you publish it.
- Rule No. 1 in academia is **publish or perish**

Dissecting the Dimensions of Research

topic: physical–biological–psychological–sociological

novelty: create new vs review published data or info

technology: develop new vs use existing methods

scope: study a single case vs a sample

mode: observe vs intervene

methodology: qualitative vs quantitative (info vs numbers)

ideology: objective vs subjective

politics: neutral vs partisan

utility: pure vs applied

Topic: what are you researching?

Examples

- Clinical: the effect of a herb on performance.
- Psychological: factors affecting work-place satisfaction.
- Behavioral: how can we reduce truancy at this school?
- Economic: characterize the productivity of new immigrants.
- Social: develop risk-management procedures at a gym.

Finding a good question/problem to address can be hard.

- It helps to have a **good supervisor, good colleagues**, and/or **knowledge or practical experience** of and **affinity** for a topic.
- You must **read journal articles** to find out what's already known.
 - Authors also often point out topics for future research.

Novelty: creating new or reviewing published info?

Most research projects are so-called **original investigations**.

- You obtain new data or information about a phenomenon.
- You reach a conclusion and try to publish it.

Some research projects are **reviews of the literature**.

- You use other researchers' published data or info about a phenomenon.
 - A quantitative statistical review is called a **meta-analysis**.
- But a write-up of an original investigation always has to include a short review of literature.

Technology: develop new or use existing method(s)?

Sometimes a legitimate topic for study is methodological.

For example, development or novel investigation of...

- a measuring device
- a protocol for a physical performance test
- a diagnostic test
- a method of analysis

You usually include or focus on a reliability and/or validity study of the measure provided by the method.

- **Validity** = the relationship between observed and true values
- **Reliability** = reproducibility of observed values

Scope: case or sample? (1)

Are you **solving a single case** of something, or is it a sample that will allow you to **generalize to a population**?

In a **case study**...

- You are interested in "**what happened or will happen here**".
- Your finding applies only **locally**: to the case you studied.
- The quest for an answer can be like that in a **court case**.
- You reach an answer by applying **logic** (= common sense?) and **doubt** to your knowledge and to the information you gather.

Scope: case or sample? (2)

In a study of a **sample**...

- You are interested in "**what happens in general**".
- Rarely, "what" is simply descriptive: the frequency, mean value or other **simple statistic** of something in the sample.
- Most often, the "what" is the value of an **effect statistic**: the relationship between the thing of interest (a **dependent variable**, such as health, performance...) and something else (a **predictor variable**, such as training, gender, diet...) in the sample.
 - Examples of effect statistics: difference or change in a mean value; ratio of frequencies (relative risk); correlation coefficient.

Scope: case or sample? (3)

- **Sample size** is a big issue.
 - The smaller the sample, the more the uncertainty.
 - A stronger relationship needs less certainty.
 - So a stronger relationship needs a smaller sample.
 - Unfortunately most relationships are weak or trivial, so **you usually need large samples.**

Methods: quantitative or qualitative? (1)

With **quantitative** methods...

- You gather **data** with an **instrument**, such as a stopwatch, a blood test, a video analysis package, or a structured questionnaire.
- You derive **measures or variables** from the data, then investigate **relationships** among the variables.
 - Some people think you have to do it by **testing hypotheses**.
- **Error of measurement** is an important issue.
 - Almost all measures have **noise** or other errors.
 - Errors affect the **relationship** between measures.
 - You attend to errors via **validity** and **reliability**.
 - A **pilot study** to investigate error can be valuable.

Methods: quantitative or qualitative? (2)

With **qualitative** methods...

- You gather **information** or **themes** from texts, conversations or loosely structured interviews, then **tell a coherent story**.
- The **open-ended** nature of these methods allows for more **flexibility** and **serendipity** in identifying factors and practical strategies than the formal structured quantitative approach.
 - The direction of the research may change mid-stream.
- **Hybrid** or **mixed method**: analyze a **sample of cases qualitatively**, then code information into values of variables to make **inferences about a population quantitatively**.

Politics: neutral or partisan?

Most researchers aim to be politically **neutral** or **impartial** by presenting all sides of an argument.

Sometimes the researcher is overtly **partisan** or **adversarial**.

- In social science such research is known as **critical** or **fundamental**.
- The researcher attempts to raise understanding about **oppression** and to facilitate **collective action** against it.

Utility: pure or applied?

In **pure**, **basic**, **theoretical** or **academic** projects, the aim is to understand the **cause** or **mechanism** of a phenomenon.

Applied or **practical** projects impact directly on **health**, **wealth**, or **culture** (art, recreation...), or on development of a **method**.

Even so, try to **include mechanisms** in an applied project.

- It will help you publish in a **high-impact journal**, because their editors and reviewers can be snooty about pure research.
- Understanding something may give you **ideas** for more projects.

Pure is sometimes **lab-based**, lacking naturalness.

Applied is sometimes **field-based**, lacking control.

Thanks!

