Effective Research Questions, Research Planning & Skills Analysis

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Definition of Research

Research is creative work undertaken on a systematic basis.

It contributes to the stock of human knowledge; gives meaning to isolated facts; applies knowledge through problem-solving; and transforms and extends our knowledge.

It must be published, disseminated or made publicly available in the form of assessable research outputs.

(Approved DIT, 07 February 2013)
Definition of Research

It includes

• work of relevance to commerce, industry, public, voluntary sectors

• generation of images, performances, artefacts, design, leading to new insights

• use of existing knowledge to produce materials, devices, products, pedagogical practices, and processes.

(Approved DIT, 07 February 2013)
Definition of Research

It excludes

• routine testing and routine analysis of materials, components and processes such as for the maintenance of national standards

• routine development of teaching materials and CPD/training.

(Approved DIT, 07 February 2013)
Model of Research

Research Area → Research Topic → Research Question → Methods → Data Collection → Data Analysis → Answers

- Environment & Health
- Information & Media
- Materials & Technologies
- Society, Culture, Enterprise

lit

- literature
- ethics

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www.dit.ie/graduateresearchschool
Model of Research

Research Area -> Research Topic -> Research Question -> Hypothesis -> Methods -> Data Collection -> Data Analysis -> Answers

- literature
- ethics

Environment & Health
Information & Media
Materials & Technologies
Society, Culture, Enterprise
Research Hypothesis

Not mandatory

Use only if appropriate

For each narrow research question, can you predict what is likely to be found?

If Yes, can the prediction be tested and explained by a theory from which the hypothesis follows?
Model of Research

- Research Area
- Research Topic
- Broad Research Question
- Narrow Research Question
- Data Collection

Most Abstract
Most Specific
Research Area

• Helps identify the appropriate literature

• 1-2 words

• Examples.
  • Toxicology
  • Youth Suicide
Research Topic

• Helps identify the methodology

• 4-5 words

• Examples
  • Cytotoxicity of nanomaterials
  • Factors associated with incidence of youth suicide
Research Question

What is a research question?

A research question is

clear, focused, complex, feasible, significant, ethical

and answers something

new.
Clarity

Clear: How are online users experiencing or addressing privacy issues on social networking sites such as MySpace and Facebook?

Unclear: Why are social networking sites harmful? which social networking sites? what kind of harm? can “harm” be proven?
Clear questions tend to be

• short
• conceptually straightforward
• jargon-free
• and have limited variables and clauses
Unfocused: *What is the effect on the environment of global warming?*
- Cannot look at all of the environment.
- Cannot look at all of global warming

Focused: *How is glacial melting affecting penguins in Antarctica?*
- Specific cause (glacial melting)
- Specific place (Antarctica),
- Specific group affected (penguins).
Complexity

**Appropriately Complex:** What are common traits of those suffering from diabetes in America, and how can these commonalities be used to aid the medical community in prevention of the disease?

**Too simple:** How are doctors addressing diabetes in the U.S.?

Does not require research, Can be looked up online
Complexity

As a general rule of thumb

If Google can answer the question, it’s not a very good question
Feasibility
A good research question is answerable

Ask yourself

Do you have the resources to sufficiently answer your question?
Do you have the appropriate background to carry out the research?
Are there ethical constraints?
Can you obtain the cooperation from all the necessary individuals etc?
How long will the research take to carry out?

It’s a PhD, Not a Nobel Prize

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Significance

A good research question must be significant. Its answer(s) must advance knowledge in the field; improve a practice; help human beings.

Replications, by themselves, are not good enough.

Be careful with ‘hobby-horses’ and ‘soap-boxes’

Be objective. It is important to you, but is it important to humankind?

Be careful with advocacy.
Novelty

The answer to the question must add to the stock of human knowledge.

New knowledge for the world, not just new to you or the university or Ireland/Lithuania.
Research Question

Research Questions help focus research by providing a pathway through the project.

Specificity helps avoid ‘the write all you know’ approach and work towards a specific arguable thesis.
Research Question

Empirical Criterion

If your research question does not give clear indications of the data needed to lead to an answer, then you will not know how to proceed.

Use — when, where, why, how many, how often, how do?

Do Not Use — should?

Needs a value judgement and it is not clear what data is needed
Research Question

Broad Research Question

general, abstract and not directly answerable

Narrow Research Question

specific and answerable since it points to the data needed

Is it clear what data is needed to answer the question?

No – the question is too broad, redraft

Yes – proceed to experimental design
Strong Research Question

Do I know the field and its literature well?
What are the important research questions in my field?
What areas need further exploration?
Could my study fill a gap? Lead to greater understanding?
Has a great deal of research already been conducted in this area?
Has this study been done before?
If so, is there room for improvement?
Strong Research Question

Is the timing right for this question to be answered?
Is it a hot topic, or is it becoming obsolete?
Would funding sources be interested?
If you are proposing a service program, is the target community interested?
Most importantly, will my study have a significant impact on the field?

Environment & Health
Information & Media
Materials & Technologies
Society, Culture, Enterprise
Hourglass Model

Broad Research Question
Narrow RG
Data
Data Analysis
Answer Research Question
Research Plan

What is the research question?
What is the current state-of-the-art?
What are the work-packages and timelines?
How will results be disseminated?
What is the thesis format?

Review the Plan Annually

Template at: http://www.dit.ie/researchandenterprise/graduateresearchschool/currentresearchstudents/forms/#d.en.22465
Work-Package

What are the objectives within each work-package?
What skills are needed to complete the work-package?
Caroline’s Research Plan

Work-package 1  November 2013 – June 2014

1. Literature Survey
   Objective – Determine current knowledge

2. MTT Assay
   Objective – Use MCF 7 and A549 cell lines
   Expose to CDEnFA, MTX, CDEnFA:MTX
   Calculate IC$_{50}$

3. Dissemination
   Annual evaluation May 2014
Caroline’s Research Plan

1. MCF-7 - Knock out FR and RFC
2. Flow Cytometry + rtPCR - Measure levels of FR and RFC and apoptosis
3. Repeat MTT on all MCF-7 lines
Annual Evaluation May 2016 and Complete papers 1 & 2

Work-package 3 July 2016 – June 2017
1. Galleria and Mouse Studies
Skills

• Discipline Skills – Needed to complete the experimental

• Transferrable Skills – Personal skills particularly valued by employers
  • Personal Effectiveness
  • Communication
  • Team-working