

Research Methodology and Creativity

Siba K Udgata

School of Computer and Information Sciences,
University of Hyderabad, Hyderabad

Research Defined and Described

“Research is the systematic approach to obtaining and confirming new and reliable knowledge”

- Systematic and orderly (following a series of steps)
- Purpose is new knowledge, which must be reliable

This is a general definition which applies to all disciplines

Notice that:

“... truth was not used in the definition of research”

“This concept of truth is outside of the productive realm of thinking by researchers”

Research is not

Accidental discovery :

1. Accidental discovery may occur in structured research process
2. Usually takes the form of a phenomenon not previously noticed
3. May lead to a structured research process to verify or understand the observation

Research is not ... cont.

Data Collection

- an intermediate step to gain reliable knowledge
- collecting reliable data is part of the research process

Research is not ... cont.

Searching out published research results in libraries (or the internet)

- This is an important early step of research
- The research process always includes synthesis and analysis
- But, just reviewing of literature is not research

Research is...

1. Searching for explanation of events, phenomena, relationships and causes
 - What, how and why things occur
 - Are there interactions?
2. A process
 - Planned and managed – to make the information generated credible
 - The process is creative
 - It is **circular** – always leads to more questions

- All well designed and conducted research has potential application.
- Failure to see applications can be due to:
 - Users not trained or experienced in the specialized methods of economic research and reasoning
 - Researchers often do not provide adequate interpretations and guidance on applications of the research
- Researchers are responsible to help users understand research implications
(How?)

Public good

- Public research is a public good
 - May be more rigorous and objective because it is subject to more scrutiny
- Private research may also be rigorous
 - But research on a company's product may be questioned as biased.

Classification of Research

- Before classification, we must first **define** types of research
- Different criteria are used to classify research types

(All of these are somewhat arbitrary and artificial)

Basic vs Applied Research

- Basic – to determine or establish fundamental facts and relationships within a discipline or field of study. Develop theories ... (examples in economics, physics?)
- Applied – undertaken specifically for the purpose of obtaining information to help resolve a particular problem
- The distinction between them is in the application
 - Basic has little application to real world policy and management but could be done to guide applied research

Disciplinary, Subject-matter, and Problem-solving Research (Johnson, 1986)

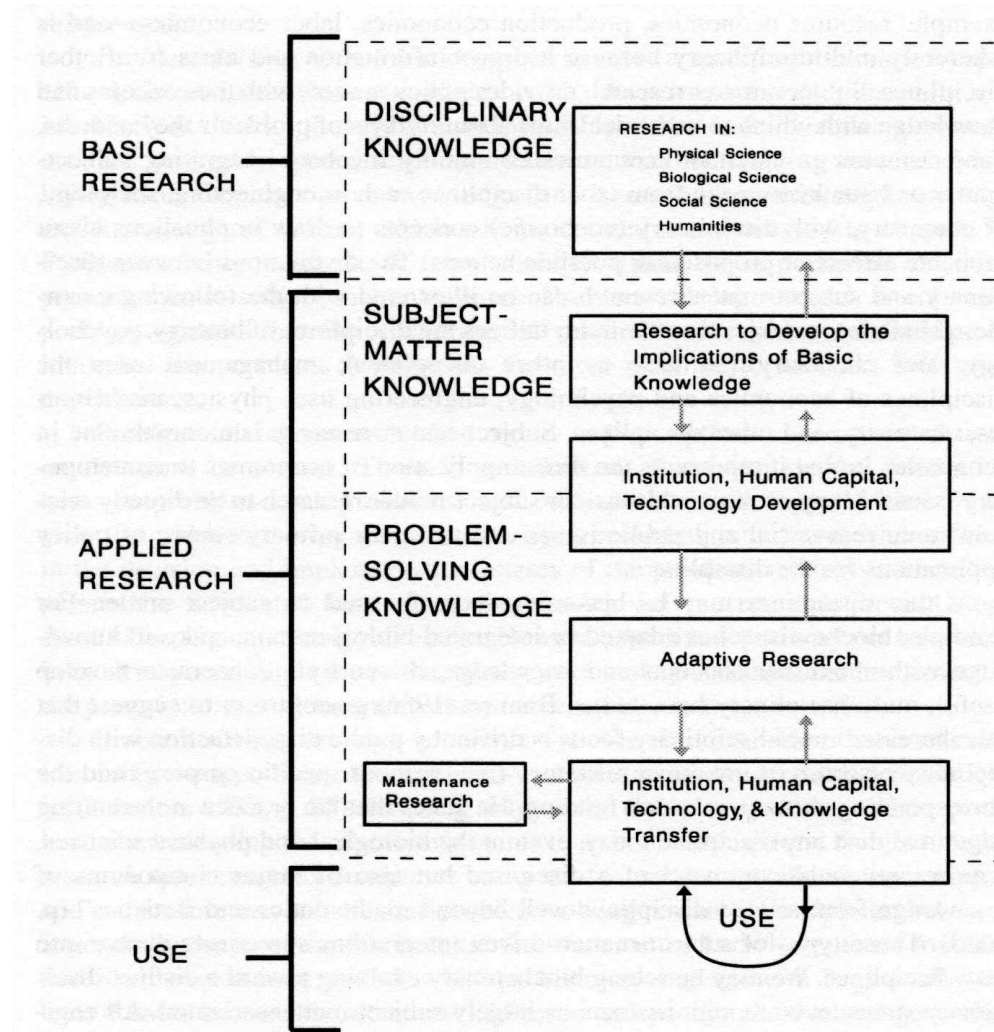


Figure 2.1. Relationship among research, knowledge, and use (Bonnen, 1986).

Disciplinary

- designed to improve a discipline
- dwells on theories, fundamental relationships and analytical procedures and techniques
- In economics, the intended users are other economists
- Provides the conceptual and analytical base for other economic research
- It is synergistic and complementary with subject matter and problem-solving research

Disciplinary... cont.

- Provides the foundations for applied research
- Circular as applied research reveals the shortcomings of disciplinary research
- Examples of some economic theories?
(supply & demand, price elasticity, consumer utility ...)

Subject-matter research

- *“research on a subject of interest to a set of decision makers “ (p 22)*
- Tends to follow subject-matter boundaries within a discipline (eg. resource economics, production economics, labor economics)
- Inherently multidisciplinary, drawing information from many disciplines
 - eg. consumer economic draws from psychology, natural resource economics from biology, economic policy from political science

Subject-matter research ... cont.

- Provides policy makers with general knowledge to make decisions about various problems.
- A primary source of policy applications for economics
- Subject-matter research is a cornerstone in economics – it involves direct application of economics to contemporary issues.

Problem-solving research

- Designed to solve a specific problem for a specific decision maker
- Often results in recommendations on decisions or actions
- Problem-solving research is holistic – uses all information relevant to the specific problem (while disciplinary research tends to be reductionist)
- Disciplinary research is generally the most “durable” (long lasting); problem-solving research the least durable

Analytic vs Descriptive Research

- Descriptive Research – the attempt to determine, describe, or identify something
 - The intent is often synthesis, which pulls knowledge or information together
- Analytic – the attempt to establish why something occurs or how it came to be
- All disciplines generally engage in both

Methodology Defined & Described

Methodology and Method are often (incorrectly) used interchangeable

- Methodology – the study of the general approach to inquiry in a given field
- Method – the specific techniques, tools or procedures applied to achieve a given objective
 - Research methods in social sciences include regression analysis, mathematical analysis, operations research, surveys, data gathering, etc.

The Process of Research

- The process is initiated with a question or problem (**step 1**)
- Next, goals and objectives are formulated to deal with the question or problem (**step 2**)
- Then the research design is developed to achieve the objectives (**step 3**)
- Results are generated by conducting the research (**step 4**)
- Interpretation and analysis of results follow (**step 5**)

The Process of Research

Research Process

- Empathize
- Analyze
- Solution
- Test and Use

Buddha Preaching

- Duhkha
- Samudaya
- Nirodha
- Marg

The Process of Research

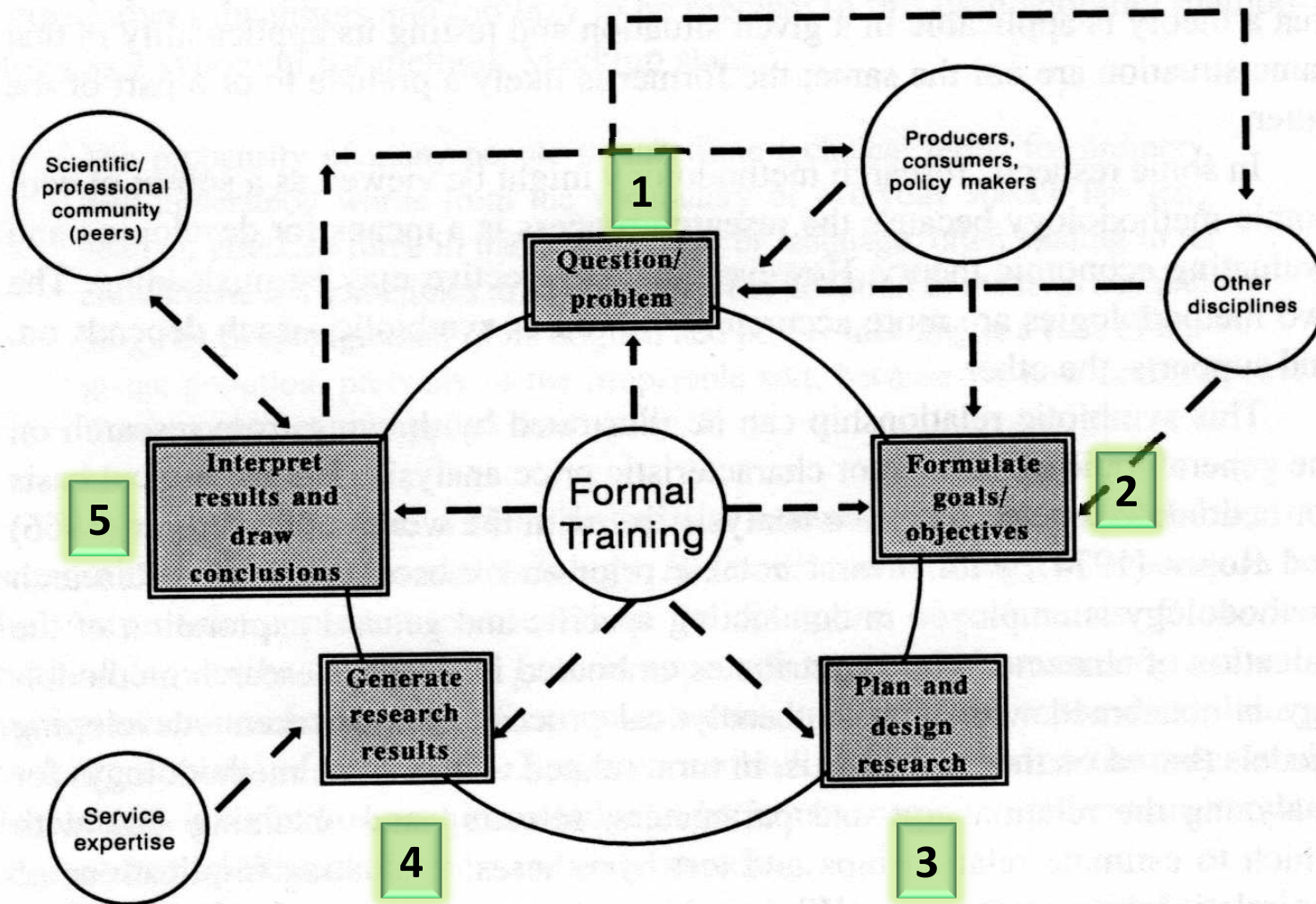


Figure 2.2. Schematic of research process.

Creativity in the Research Process

- Research is a creative process
- *“...research includes far more than mere logic ... It includes insight, genius, groping, pondering – ‘sense’ ... The logic we can teach; the art we cannot”*
- Research requires (or at least works best) with imagination, initiative, intuition, and curiosity.
- There are different types of creativity, characteristic of different situations – “applied” and “theoretical” most closely associate with economic research

Fostering Creativity (Ladd 1987)

- A. Gather and use previously developed *knowledge*
- B. Exchange ideas
- C. Apply deductive logic
- D. Look at things alternate ways
- E. Question or challenge assumptions
- F. Search for patterns or relationships
- G. Take risks
- H. Cultivate tolerance for uncertainty

Fostering Creativity ... cont.

- I. Allow curiosity to grow
- J. Set problems aside ... and come back to them
- K. Write down your thoughts
 - “... frequently I don't know what I think until I write it”
- L. Freedom from distraction ... some time to think.

Creativity may provide the difference between satisfactory and outstanding research.

Creativity Can Be Learned

“Inventing is a skill that some people have and some don’t. But you can learn how to invent. You have to have the will not to jump at the first solution because the elegant solution might be around the corner. An inventor is someone who says, ‘Yes, that’s one way to do it but it doesn’t seem to be an optimum solution.’ Then he keeps on thinking”.

Ray Dolby, inventor

“Problems cannot be solved
by thinking within the
framework within which the
problems were
created”

Albert Einstein

Ways of Enhancing Personal Creativity

1. Accept there's no right answer
2. Don't follow the rules
3. Be foolish
4. Ask 'What if?'
5. Think outside your area
6. Go for ambiguity
7. Believe in yourself

1. No Right Answer

- The best way to get a good idea is to get a lot of ideas
- Change your question (eg IBM should have thought in terms of solutions to problems, not computing hardware)
- Avoid workplaces with a culture of uniformity

2. Don't Follow The Rules

- We make rules based on reasons that make sense
- We follow these rules
- Time passes, things change
- The original reasons for the rules no longer exist, but because the rules are still in place, we continue to follow them

Don't Follow The Rules : Example

Q W E R T Y U I O P

Examples of Rule-Breaking Creativity

Who	How?
Columbus	Broke the rule that to travel East you cannot go West
Copernicus	Broke the rule that the universe is anthropocentric
Einstein	Broke the rules of Newtonian physics by equating mass and energy as different forms of the same phenomenon
General Motors	Broke Ford's rule of any colour, as long as it's black
Butterfly Stroke	Broke the rules of 'arm recovery' in breaststroke
Henry VIII	Broke the rule that the Pope should hold sway in England
Bell Labs	Broke the rule that electrons need to travel in a vacuum for signal processing

3. Be Fool-ish: Examples

Think against the conventional flow, like the fool in Shakespearean times

Case	Area
19th century physician Edward Jenner in looking for a small pox cure, looked not at those <u>with</u> small pox, but those <u>without</u>	Small pox vaccinations
Alfred Sloan and his disapproval of “groupthink”, retabled motions where everyone agreed	Car industry
1334 siege of Hocharterwitz castle in Austria	Survival

4. Ask “What If?”

- Ask “what if” someone else were solving your problem for you, eg
— ----
- **exercise : ‘What if’ someone else were running this session on creativity. How would they organise/structure and give examples on it?**

5. Think outside your area: Examples

Who?	How?
World War I military designers	Borrowed ideas from cubist art to create more efficient camouflage patterns for tanks and guns
John von Neumann (Mathematician)	Used knowledge from poker playing to develop the “game theory” model of economics
Japanese industry	Collaborations between entirely unconnected industries actively encouraged to make R&D breakthroughs

Think Outside Your Area :

Suggestions

1. Read fiction and stimulate your imagination
2. Go to places you wouldn't normally go (eg a junk yard, a fairground)
3. Develop the explorer's attitude : the outlook that wherever you go, there are ideas out there
- (4. When you hit on an idea, write it down)

6. Go For Ambiguity

“If you tell people where to go, but not how to get there, you’ll be amazed at the results”

George S Patton (American General)

Ambiguity As Found In The Workplace

- Non hierarchical organisation
- Tolerance (or even encouragement) of different approaches
- Broad goals defined, but little else

Believe in Yourself

**Lack of creativity is a self-fulfilling prophecy
(as substantiated by research!)**