

## EDITORIAL

# MARWAT'S LOGICAL TRAJECTORY OF RESEARCH PROCESS: AN OVERVIEW

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Research may be defined on the basis of why or how.

Why we do research? Logical definition? Its objectives/ benefits?

We do research to solve a problem.

How we do research? Operational definition? What physical steps we take to conduct research?

Research is a 4-steps systematic process. Systematic means step by step; where activity and output of each step is known beforehand. Process means a never ending activity.

1. Topic Selection & Formulation. Formulation of topic gives us proposal.
2. Data Collection. It gives us unorganized facts & figures; not usable for the end-user.
3. Data Analysis. It gives us organized facts & figures called information; usable for the end-user.
4. Report Writing. It gives us thesis/ dissertation, article or book.

The above noted trajectory belongs to the late Prof. Dr. Allah Nawaz from Department of Public Administration, Gomal University, D.I.Khan, Pakistan.

I have devised a new flow of eight logical steps to conduct a research project, known as "Marwat's Logical Trajectory of Research Process". Steps 1-5 are related to the 'Why' of the research project or 'Introduction' of the research problem. Steps 6-8 are related to the 'How' of the research project or 'Methods' to get the answer for the research question.

1. Research Problem (RP)

2. Knowledge Gap (KG)
3. Research Question (RQ)
4. Research Objective (RO)
5. Research (Null) Hypothesis (RH)
6. Data Collection (DC)
7. Data Analysis (DA)
8. Data Interpretation (DI)

Let us have short overview of each step. Here we describe it for one research problem. Multiple problems may be adjusted as required.

**1. Research Problem (RP):** It is unawareness of certain piece of information regarding any one or more of the following events.

- i. Prevalence of a disease or a health related event in a specified population
  - ii. Distribution of a disease or a health related event in a specified population by person, place or time
  - iii. Determinants (causes/ risk factors) of a disease in a specified population
  - iv. Treatment of a disease in a specified population
- i-iii are epidemiological problems and could be solved through epidemiological study designs, while iv<sup>th</sup> one is a clinical problem and could be solved through interventional/ clinical study designs.

**RP:** We are unaware of the prevalence of diabetes mellitus in adult population of district D.I.Khan, Pakistan.

**KEY WORDS:** Research; Data Collection; Data Analysis; Prevalence; Risk Factors; Population; Adult; Pakistan; Marwat's Logical Trajectory of Research Process.

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**2. Knowledge Gap (KG):** We go for literature search. If we found the required information regarding our RP, we would withdraw from this project. If we could not find the required information; we would confirm the gap and will go ahead to fill this gap.

**KG:** We could not find the recent data for the prevalence of diabetes mellitus in adult population of district D.I.Khan, Pakistan, hence KG was confirmed.

**3. Research Question (RQ):** The RP is transformed into the format of a question.

**RQ:** What is the prevalence of diabetes mellitus in adult population of district D.I.Khan, Pakistan?

**4. Research Objective (RO):** The RQ is narrated in positive form.

**RO:** The objective of this study was to determine the prevalence of diabetes mellitus in adult population of district D.I.Khan, Pakistan.

**5. Research (Null) Hypothesis (H<sub>0</sub>):** It is a tentative answer to our RQ, collected from literature regarding our population of interest.

**H<sub>0</sub>:** The observed prevalence of diabetes mellitus is same as expected in adult population of district D.I.Khan, Pakistan.

**6. Data Collection (DC):** Data is value for a variable. Data is collected for variable of interest as per RO. Variable and its attributes are identified. Scale of measurement/ data type is given (nominal/ ordinal/ interval/ ratio).

**DC:** Presence of diabetes mellitus was a research variable. It had two attributes of yes and no. Data type was nominal.

#### 7. Data Analysis (DA)

**I. Descriptive Statistics:** Statistics means index of the sample. Data is described for the sample.

**II. Inferential Statistics:** Sample data is inferred to the population from which it was drawn.

**i. Estimation of Parameter:** Parameter means index of the population. Population parameter is inferred from the sample statistics as confidence interval for proportion or mean at certain confidence level.

**ii. Hypothesis Testing:** It is verified through certain/ specified test of statistical significance at certain alpha level. It will verify the null hypothesis of no difference to see if it is true or false? If the result of the test shows no significant difference ( $p > .05$ ), then it is matched to the null hypothesis; we say that null hypothesis was true and hence accepted (could not be rejected). If the result of the test shows significant difference ( $p \leq .05$ ), then it is not matched to the null hypothesis; we say that null hypothesis was false and hence rejected.

**8. Data Interpretation (DI):** In data analysis, we present data in numbers or charts. Then we describe the meaning of these numbers in Text, so that a person not conversant with statistical computations may understand the meaning of these numbers.

**DI:** The prevalence of diabetes mellitus was 13% (95% CI 11.5-14.5) in adult population of district D.I.Khan, Pakistan. The observed prevalence of diabetes mellitus was higher (13%) than expected (10%) in adult population of district D.I.Khan, Pakistan.

Following thirty-one research articles are published fully adopting this trajectory in different designs (cross-sectional, experimental), different number of populations (one, two, three) and different data types (nominal, ordinal, interval, ratio).

1. Epidemiological- Cross-sectional- Single population- Nominal data<sup>1-17</sup>
2. Epidemiological- Cross-sectional- Two populations- Nominal data<sup>18</sup>
3. Clinical Sciences- RCT- Two populations- Nominal data<sup>19-24</sup>
4. Basic Sciences- Cross-sectional- Single population- Ratio data<sup>25</sup>
5. Basic Sciences- Cross-sectional- Two populations- Ratio data<sup>26</sup>
6. Basic Sciences- Cross-sectional- Three populations- Ratio data<sup>27-29</sup>
7. Medical Education- Cross-sectional- Single population- Interval data<sup>30-31</sup>

Other than the above 31 articles, 14 published articles have partially adapted this trajectory.

1. Epidemiological- Cross-sectional- Single population- Nominal data<sup>32-39</sup>
2. Clinical Sciences- RCT- Two populations- Nominal data<sup>40-41</sup>
3. Clinical Sciences- RCT- Single population- Ratio data<sup>42</sup>
4. Basic Sciences- Cross-sectional- Two populations- Ratio data<sup>43,44</sup>
5. Medical Education- Cross-sectional- Single population- Interval data<sup>45</sup>

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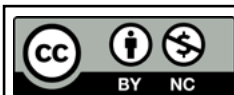
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CONFLICT OF INTEREST  
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