CHAPTER III

THE PROBLEM, PILOT WORK AND THE PLAN
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1. **INTRODUCTION:**

Each research has typical stages, still each has its own peculiarities. The research process in psychology has a sequence of activities that is approximated in most of the studies. This sequence is followed to pursue scientific research. The scientific research is ordered in such a way that investigators can have critical confidence in research outcomes. Scientific investigation is empirical, which means that the investigator must put his belief to a test outside himself. He must be aware of his own critical points and his subjective belief must be checked against objective reality. The scientific researcher enjoys his experience and finds the process a self-exhilarating event. This research also follows a systematic process as presumed.

2. **THE RESEARCH PROBLEM:**

All researches start with a problem— a question to be answered, a difficulty to be solved or an obstacle to be removed. According to ANDREWS (1968), "Numerous problems originate from past researches, field observations and from investigated data. Practical problems are the problems of applied psychology and are tested in field conditions."

It is known that Indian technocrats are well trained and a few of them prove to be genius to earn popularity in national and international spheres. But it is also evident and can be

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1. ANDREWS (1968) - The Experimental Psychology, P. 197.
easily observed that majority of these similarly trained technocrats do not prove sufficiently productive to to a national/international or individual prestigious level. Why the similarly trained technocrats cannot reach to an equal status from the point of view of their own satisfaction or the satisfaction of the society in a broader sense? This question inspired this investigator to pose a problem 'How far the Indian technocrats are creative and what makes them different in creativity?'

The cause of the inspiration to work on this problem was not a single one. As already has been mentioned in the first chapter there were other reasons also to make choice for this work. An additional dimension of the investigator's interest in this topic was that being in constant association of a technocrat life partner, the researcher got many chances to observe technocrats very closely. And to get indications that many technocrats either do not have sufficient inspiration and aspiration to be creative or do not get exposure to a creative atmosphere, or do not have enough creative potential to be at par with engineers of other developed countries equipped with advanced technology so that the import of technology and dependence on other countries for this purpose may be totally avoided. Thus there were many channels passing through which this problem took a shape, and the final problem for this investigation emerged as the Indian technocrats are not as creative as they are required to be.
The problems are usually very wide and they are to be narrowed logically to make the research feasible. The investigator of this research delimited the problem through selecting a few important and established related dimensions of age, intelligence and personality with reference to two groups of technocrats' creativity.

Everyone knows that the engineering profession is a field of creativity. Still all the technocrats do not prove to be creative in a real sense. It is very natural to find individual differences in all human behaviour in general, but when the group is homogenous from the point of view of selection, training and profession, vast differences in a particular relevant performance seem at least worth investigation even if it is not considered surprising. This was one of the reasons to take up this problem to be solved by the present investigator. The problem is focussed only on 'creativity' through narrowing down the measurable productivity as a whole in the field of engineering.

3. **The Research Plan, The Pilot Study And The Design:**

**A vital step of any genuine research is to prepare a research design.** Research design is a mapping strategy which is fundamentally based upon the objectives of the study. It is a planning of research which is usually made logically visualizing its practicability. KERLINGER, F.N., (1964) asserts that "Research designs are invented to enable the researcher to
answer research questions as validly, objectively, accurately and economically as possible". 1

After having identified a specific problem that appears appropriate and interesting, the investigator outlined the research plan in detail and made it final after the pilot study.

A preliminary trial of research measures and techniques is essential to the development of a sound research plan even if the research has some theoretical background. This preliminary trial is usually enlarged first into a pilot-study and then into a full fledged study on a specific topic.

The present investigator selected the final research design after the pilot work on the topic. The pilot work was done on 54 technocrats of a single concern. The pilot work conducted keeping under consideration the earlier studies on creativity in general. Some work on creativity is available through which the scholars have tried to relate it with the age of the persons. The examples are the studies conducted by BJORKSTEN (1946) LEHMAN (1953), D. WECHSLER (1958), Terman (1964), and J.E. BIRREN et al. (1979). A few of the earlier studies on creativity as related with age were conducted through introspective/restrospective materials. The examples of such studies are the works done by W.A. MOZART (1799), P.I. TCHAIKOUSKY (1878), H. POINCARE (1924) and S. SPENDER (1946). Keeping

in view these studies, the present investigator did not start her work with any intentions to replicate the studies and correlating creativity with the age. The same was the situation when the earlier studies on personality and creativity were reviewed. The creativity has been correlated with personality by many scholars. The empirical studies conducted by D.W. MACKINNON (1962), and R.B. CATTELL and H.J. BUTCHER (1968) are the most outstanding ones in this area. MACKINNON mentioned 15 items as characteristics of creative architects, and CATTELL et-al measured 16 P.F. of 144 eminent researchers. Such correlations are established again and again, and therefore the present investigator neither intended nor found the correlational design fit for the objectives of this study.

An interactional design did not seem to be very appropriate for this study. It is evident that a number of orietic and non-orenic variables interact for creativity. The variables of personality types, intelligence levels and age-ranges which were selected for this study, interact significantly (.01 or .05 levels) for creativity, as is known previously and also confirmed in a very preliminary work during the process of planning of this research through a few 3 (personality type values) × 3 (age-ranges) × 2 (intelligence levels) interactional designs. The investigator felt that such a design would not help adequately in comparing two sections (Commercial and Technical) of technocrats taking all the above mentioned variables

under consideration, and also knowing that the 4 personality types (according to the 16 P.F.) are not mutually exclusive, and therefore include replications of the same cases.

All the above mentioned 'trial and error' led to the final decision, fitting suitably to the objectives of the research, for selecting a causal comparative design of ex-post-facto nature for this research. Such a design is useful for identifying possible antecedents or consequences of variations in behaviour patterns of groups made on the basis of criterion/criteria. The basic structure of comparison in this study was decided to be two sections of technocrats according to their assignments i.e. Commercial duties and technical duties. Other infrastructure variables were age and intelligence, which have been taken into consideration in all comparisons. On this paradigm a number of the under-mentioned inter/intra group comparisons for creativity were planned which can be mentioned broadly as under:

**ITEMS OF COMPARISONS**

1) Commercial section and Technical section.
2) Three age-ranges in total.
3) Three age-ranges sectionwise.
4) Two intelligence levels in total.
5) Two intelligence levels sectionwise.
6) Four personality factors in view of their values and creativity.
7) Four personality factors with their values sectionwise.
8) Four personality factors with their values age-wise.

Selection of the variables in the present comparative design was done according to the results of the pilot work. The age-range variations in three rubrics was justified more than the fixed age variations. The results of the pilot work
showed that the technocrats generally enter in the profession at the age of 23 or 24 and adjust themselves in the circumstances within 6 or 7 years. This adjustment is an essential aspect for all sorts of learning and creation. It is also known that after the age of 39 years creativity does not show positive trends. Keeping in view these facts the present investigator decided to include three age-ranges i.e. 23 to 30 years, 30 to 39 years and above 39 (upto 55 years of age) years. The technocrats above 55 years of age were not included. Keeping in view the general tendency of indifference towards the job in the period close to the retirement.

The technocrats of the pilot study belonged to two intelligence levels which was very reasonable on account of their specific selection and training procedures. The planning of the main study was also based only on two levels of intelligence.

Thus this research planning is partially based on theory and partially on the pilot work indications.

4. HYPOTHESES FORMULATION:

The preferred research is always with clear theoretical implications. The process of narrowing down of the problem leads to certain specific questions or hunches to make the research and its results communicable. "Hypothesis is a testable proposition that may be the solution of a problem" (Mc GUIGAN 1968). The following hypotheses are formulated in the present research on the basis of review of the literature and observation :-
1. The technocrats of technical section are more creative than that of commercial section.

2. Younger technocrats are more creative than the older technocrats.

3. More intelligent technocrats prove to be more creative.

4. High anxious technocrats are low in creativity.

5. Introvert technocrats are more creative in comparison to other technocrats having other values on Introversion versus extraversion factor of personality.

6. Tender-minded emotional technocrats are high in creativity than the technocrats having other values on 'Tender-minded versus alert-poise' factor of personality.

7. Independent technocrats are higher in creativity than the technocrats having other values on 'subdued versus independent' factor of personality.

5. VARIABLES:

The constructs or properties used in a psychological research are called variables. Numerals or values are assigned to a variable. The values or numerals can be continuous or discrete according to the nature of the variable. In general a 'variable' has some effect or exerts an influence during the observation or measurement of some phenomenon. The variables can be classified into many types according to their functions in a piece of research. The variable which is manipulated or
changed by the investigator in some systematic way in the 'independent/antecedent variable.' A measure that changes because of this manipulation is seen as dependent upon it and is called the 'dependent/consequent variable.' There is a third broad category of variables which are controlled if considered relevant in a particular investigation.

The variables can be classified again in two types (JOHN GALIUNG 1967). The first type is a 'public variable' which means a variable where its' values are known and known to be known by others. Another type is a 'private variable,' which means a variable where the individual values certainly may be known, but others have to legitimate claim on knowing the values.

In the present research four variables are treated as antecedent variables and manipulated selectively on the bases either of numerals or observable measurable factors. These antecedent variables of this research are as follows:-

a) THE VARIABLE OF TECHNOCRATS' PROFESSIONAL ASSIGNMENTS :-

This research is based fundamentally on the variable of professional assignments of the Indian Technocrats. The technocrats belonging to Commercial Section do different duties from those who belong to Technical Section. Though none of the above mentioned sections are totally deprived of creative opportunities but it is hypothesized that more exposure to practical activities provide more chances to be creative in one's behaviours and inculcate the urge to be creative. This
presumption helped in the natural manipulation of this variable through selecting technocrats from the two populations.

b) **THE VARIABLE OF AGE:**

Though the variable of age is a 'public variable', still it has to be made clear how the present investigator created variations in age of technocrats for this particular study. The pilot work showed that the variation of age will be more suitable if the idea of age-range is taken into account. Review of literature shows that age is correlated with the emergence, peak and decline of creativity in a person, and for that reason the variable age is varied in the form of three age ranges as given below:

1. Young Group of Technocrats YG of 23 to 30 years of age.
2. Middle Group of technocrats NG of 30+ to 39 years of age.
3. Elderly Group of technocrats EG of 39+ to 55 years of age.

No technocrat of 55+ years of age was included in the sample because of the self evident psychological phenomenon of becoming somewhat disinterested in the job being closer to the retirement.

c) **THE VARIABLE OF INTELLIGENCE:**

The variable of intelligence is varied selectively on the basis of the scores obtained by the technocrat in ALEXANDER PASS ALONG TEST. Only two values of the variable could be
included as no technocrat either can be or actually located below average intelligence. The intelligence measured by this test is called Practical Ability Quotient. The values of P.A.Q. were as follows:

1. Average P.I.Q. : Those obtaining scores up to 110.

d) THE VARIABLE OF PERSONALITY :-

In the present study the concept of personality is included as defined by CATTELL. Therefore the personality is varied selectively as mentioned below:

<table>
<thead>
<tr>
<th>PERSONALITY VARIABLES</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ANXIOUS Vs ADJUSTMENT</td>
<td>1. High 2. Average 3. Low</td>
</tr>
<tr>
<td>2. SUBDUED Vs INDEPENDENT</td>
<td></td>
</tr>
<tr>
<td>3. INTOVERSION Vs EXTROVERSION</td>
<td></td>
</tr>
<tr>
<td>4. TENDER MINDED EMOTIONALITY Vs ALERT POISED</td>
<td></td>
</tr>
</tbody>
</table>

The above mentioned four factors of the variable of personality are the second order factors as conceived by CATTELL : -
<table>
<thead>
<tr>
<th>FACTORS</th>
<th>DIRECTION</th>
<th>ACCUMULATION STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ANXIETY Vs. ADJUSTMENT</td>
<td>High Scores</td>
<td>L + O + Q4 - C - H - Q3</td>
</tr>
<tr>
<td>2. SUBLONGED Vs. INDEPENDENT</td>
<td>Low Scores</td>
<td>E + M + Q1 + Q2 - A - G</td>
</tr>
<tr>
<td>3. INTROVERSION Vs. EXTROVERSION</td>
<td>High Scores</td>
<td>A + E + F + M - Q2</td>
</tr>
<tr>
<td>4. TENDERMINDED EMOTIONALITY Vs. ALERT</td>
<td>Low Scores</td>
<td>C + E + F + N + A - 1 - H</td>
</tr>
</tbody>
</table>

5) THE VARIABLE OF CREATIVITY:

'Creativity' is treated as the consequent variable in the present study. This variable is measured through stanine scores converted from the raw scores. The total sample of this study was divided into five categories as follows:

1. Creative genius obtaining 8 and above stanine scores.
2. Very superior creatives obtaining 7 stanine scores.
3. Superior creatives obtaining 6 stanine score.
4. Average creatives obtaining 5 stanine score.
5. Below average creatives obtaining 4 and below stanine scores.

6) THE VARIABLES WHICH WERE TREATED AS CONSTANTS:

A few variables, on which the sample of technocrats was made homogenous, were treated as constants. Evidently no measuring tool was needed to equate these attributes in
connection with the technocrats included in the present investigation. These variables were as follows:--

THE VARIABLES TO MAKE THE SAMPLE HOMOGENEOUS:--

5. No. THE VARIABLE

1. PROFESSION

   ALL WERE TECHNOCRATS IN CONCERNS/INSTITUTIONS OF HIGH STATUS.

2. EMPLOYMENT

   ALL WERE EmployED FOR THE MINIMUM PERIOD OF ONE YEAR.

3. SOCIO ECONOMIC STATUS

   THEIR SOCIO-ECONOMIC STATUS WAS SIMILAR TO A GREAT EXTENT.

4. MARITAL STATUS

   ALL OF THEM WERE MARRIED.

6. SELECTION OF THE SUBJECTS:--

The most decisive factor of a research is the selection of units. Units can be human or other living organisms or objects and events. The most important thing in the selection of units for a researcher is that they belong to a set or subsets. The importance of such a procedure is nicely narrated by JOHAN GALTUNG (1967) in his statement "... a unit may be seen, judged, measured not only in absolute terms but also relative to other units of the same kind belonging to the same set. Thus the unit may have it's individual existence, but also can belong to a category or a sub-category."

The units comprise the sample. The sampling involves the selection of a portion of a population as representative of that population. The population of the present investigation was located from three big industrial towns of Uttar Pradesh. The population bifurcated according to the research design was as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>BIFURCATIONS</th>
<th>CODE</th>
<th>AGE-RANGE</th>
<th>POPULATION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>YOUNG GROUP</td>
<td>YG</td>
<td>23 to 30</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>MIDDLE GROUP</td>
<td>MG</td>
<td>31 to 39</td>
<td>814</td>
<td>2496</td>
</tr>
<tr>
<td>3.</td>
<td>ELDERLY GROUP</td>
<td>EG</td>
<td>39+ to 55</td>
<td>922</td>
<td></td>
</tr>
</tbody>
</table>

It is seldom possible for a researcher to draw a representative sample from a target population. Therefore the accessible population is preferred in most of the researches like the present one. To know the degree to which the results can be generalized to the target population from the accessible population, the random sampling proves to be a great asset. Therefore the method of random sampling (with the help of the table of random numbers - TABLE-A - PSYCHOLOGICAL RESEARCH - SCOTT AND WERTHEIMER) was used in the present investigation. In connection with the commercial technocrats, but with the technical technocrats it could not be possible on account of their small number. Therefore availability of the technocrats of this particular section was the only alternative left in their selection. The sample size in the present research consist of 300 technocrats. The lists of the technocrats belonging to two sections of assignments i.e. Commercial Section and technical section were obtained from each concern. Then with the help of random number table the required number of 204 technocrats was taken.
These 300 technocrats belonged to the two sections according to their assignments inside the organisation. Their inclusion in the sample is displayed in the following table:

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>AGE-RANGE</th>
<th>COMMERCIAL POPULATION</th>
<th>TECHNICAL SECT. COMMERICAL</th>
<th>TECHNICAL SECT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. YOUNG GROUP</td>
<td>23-30</td>
<td>760</td>
<td>45</td>
<td>715</td>
</tr>
<tr>
<td>YG</td>
<td></td>
<td></td>
<td></td>
<td>89</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
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<tr>
<td></td>
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<td></td>
<td>58</td>
</tr>
<tr>
<td>2. MIDDLE GROUP</td>
<td>30-39</td>
<td>814</td>
<td>40</td>
<td>774</td>
</tr>
<tr>
<td>MG</td>
<td></td>
<td></td>
<td></td>
<td>96</td>
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<tr>
<td></td>
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<td></td>
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<td>30</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>3. ELDERLY GROUP</td>
<td>30-55</td>
<td>922</td>
<td>42</td>
<td>880</td>
</tr>
<tr>
<td>EG</td>
<td></td>
<td></td>
<td></td>
<td>115</td>
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<tr>
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<td></td>
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<td>35</td>
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<td>80</td>
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<td>2496</td>
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<td>187</td>
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<td>2369</td>
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<td>300</td>
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<td></td>
<td>96</td>
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<tr>
<td></td>
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<td>204</td>
</tr>
</tbody>
</table>

As the above table shows the population of Commercial technocrats is comprised relatively a small part of the total population. In fact, each concern employs, in addition to technocrats, a number of ministerial staffs who do not possess any technical qualifications. Therefore the unequal number of fractions of technocrats is on account of availability. The reader understands that where comparison of groups/sections is put together, the unequal number does not create any comparatively large number of technical technocrats.
provided a better intra-section comparisons of the group which is hypothesized as relatively more creative.

The technocrats' population in 3 big industrial towns of Uttar Pradesh was concentrated as shown in the following table :-

<table>
<thead>
<tr>
<th>Types of Engineers</th>
<th>Units in Towns</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textile, Mechanical</td>
<td>TOWN-1 - 12 units</td>
<td>500</td>
</tr>
<tr>
<td>Electronic, Electrical</td>
<td>TOWN-2 - 2 units</td>
<td>1100</td>
</tr>
<tr>
<td>Chemical, Auto Engineers</td>
<td>TOWN-3 - 7 units</td>
<td>896</td>
</tr>
</tbody>
</table>

2496