PROFESSIONAL ISSUES: CONSULTING SKILLS

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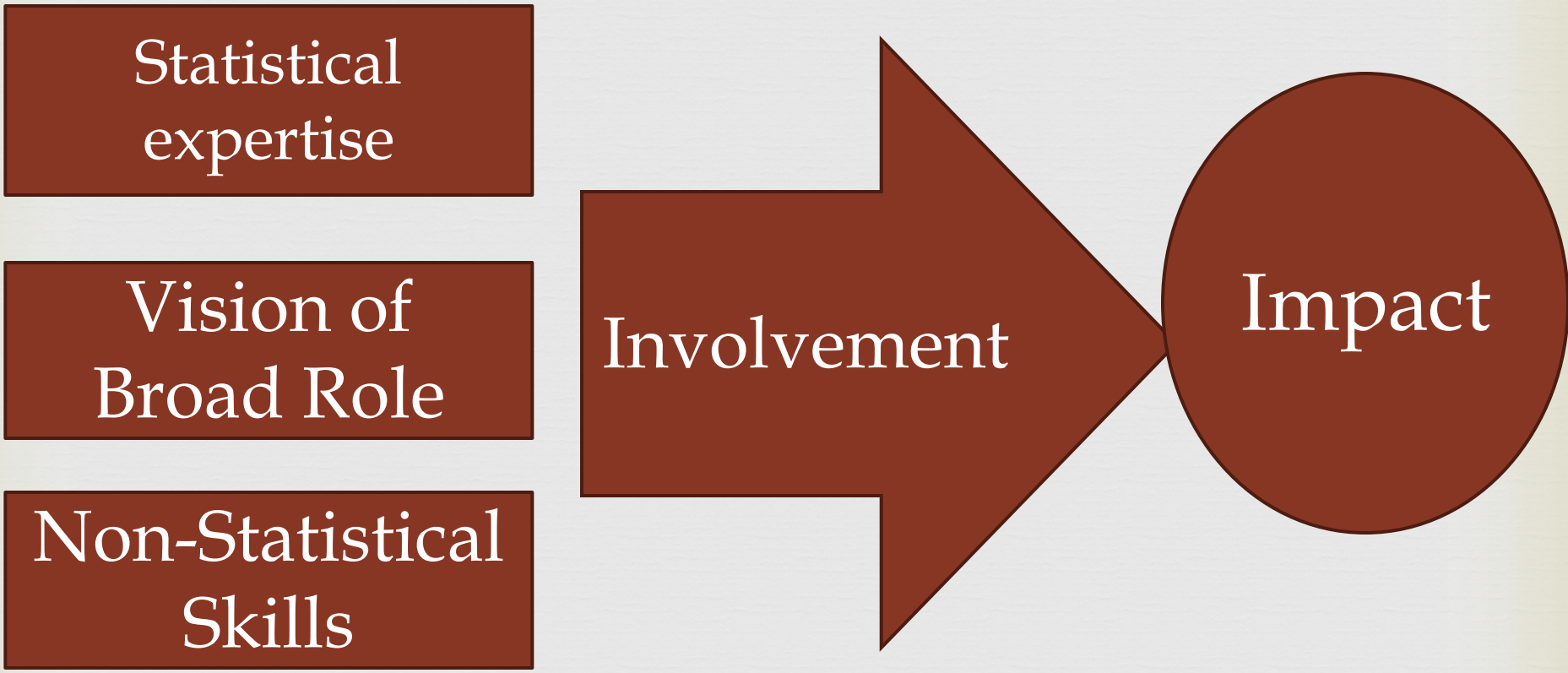
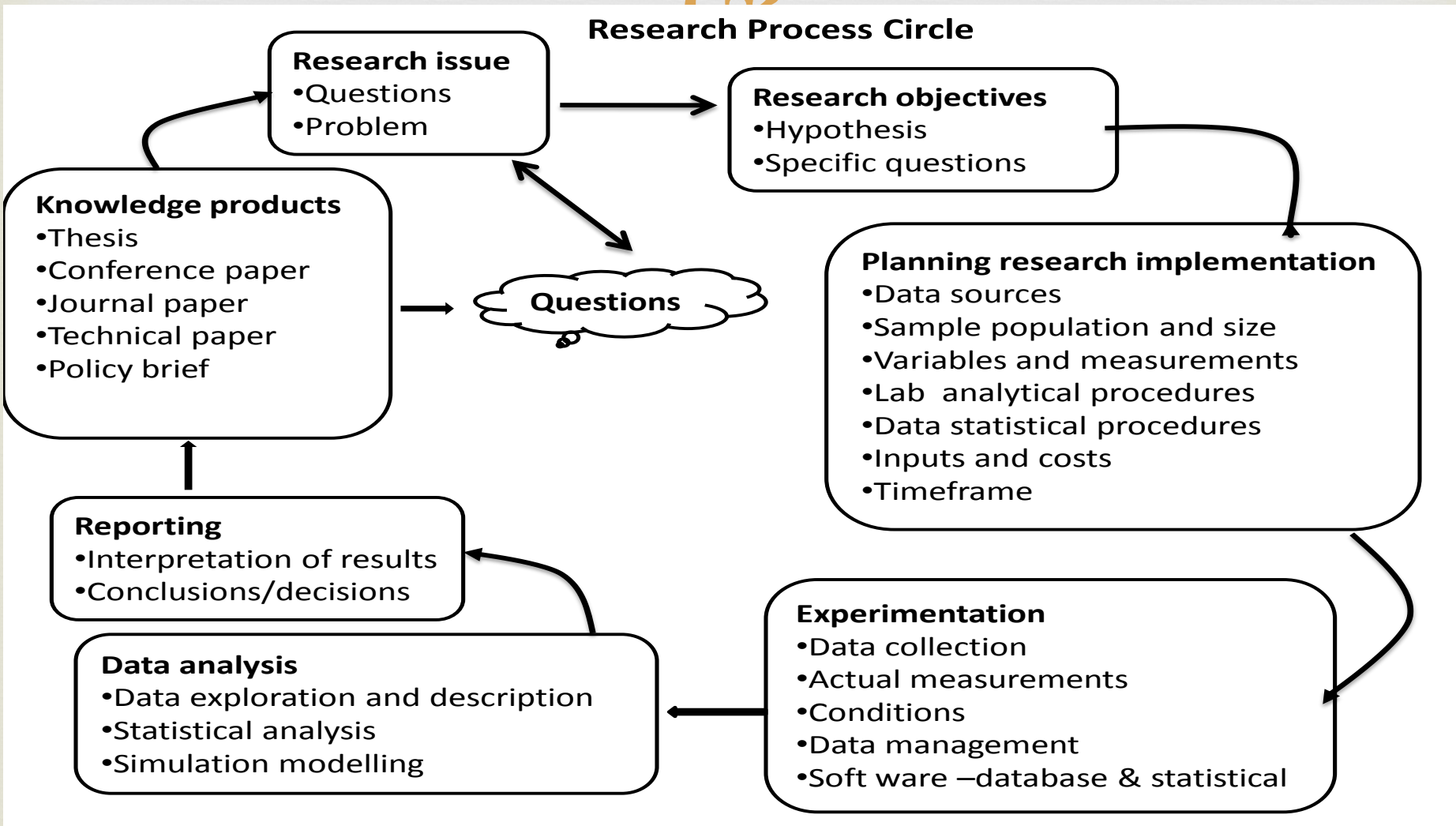
Why consulting skills?

- Essential element of statistical training
- Address some of the challenges students have to face:
  - listening to the client;
  - the integration and differentiation of the problem;
  - tailoring a solution to the client's level;
  - the need to take one's time;
  - the need to determine whether the client has an active or passive role;
  - the negotiation of authorship; and
  - acknowledgement.

What are professional useful skills needed in a multi-disciplinary setting?



Statistical expertise: research cycle



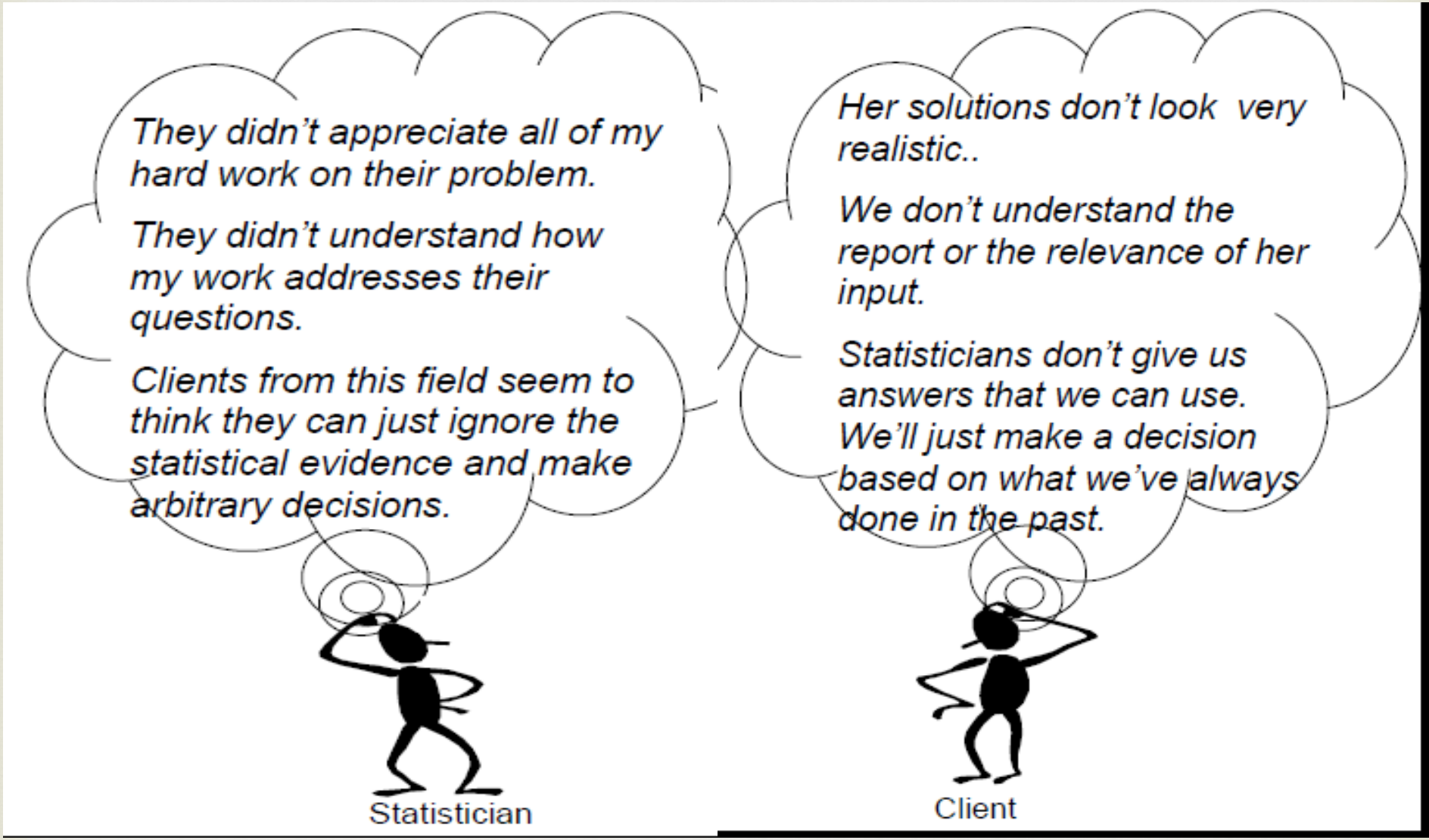
Key areas to attend on consulting

- Formulation of SMART Objectives
- Formulation of Research Hypothesis and Questions
- Study Methodology (designs, measurements, data management, data analysis, interpretation and reporting)
- Developing Monitoring and Evaluation framework
- Capacity building
- Project Management skills

What happens when role of statistical expert is too narrow?

- **Example**
- An investigator came to my office asking for sample size requirements;
- I could never get a clear picture of the overall situation;
- She put my questions aside, all she wanted was “the number”;
- After I finally coughed up a number for her she never got back to me;
- I admit I did not try very hard to follow up with her either;
- My impression is that the number was too large;

When your role is too narrow..



What should be vision of broad role..

- "Helping clients think through their scientific goals, working out details of study design and implementation, and figuring out how to display and interpret results are major tasks.
- In fact, refining a good idea for a research study into concrete specific aims and study design is one of the most challenging parts of doing research, and something with which an experienced statistician can be a great help. help."

- *Kevin Cain, The Statistical Consultant Consultant, Fall, 2006*

What to take note on data management

- Construct spreadsheets in MS-Excel, prior to data entry.
- Spreadsheet should contain all relevant information for efficient analysis of the data.
- Design & organization of computer files to store all relevant information for any one to understand the data for use.
- Carry out checks on the spreadsheet to ensure correct construction of the data.

The Basic Spreadsheet

- To produce high quality, valid results from our trials –must ensure data collected and documented +archived in highest standard.

Spreadsheet for experimental data

❖Has 3 main components-*expt details, design factors & measurement variables.*

a) **Experimental details:**

- Project name & description
- Experiment name, leading scientist PI, collaborators
- Location, design, data collector, entry technician, data checker . Can be recorded in properties of workbook.

Cntd….

b) **Design Factors**:

- design factor columns need to be ***allocated*** and ***labelled***.
- columns that identifies the **rows** (block number, plot number) and the **treatments** applied to them.
- Every row must be ***uniquely identified*** e.g in RBD 2 columns needed 1 showing the block and another showing the plot.
- Block identification will be needed as a separate column for analysis.

Contd…

c) **Measurement Variables**

- These are columns of the measured data.
- Each column has a title section at the top that describes the contents of the column in detail, including the units of measurement.
- All statistical packages read short names for each of the columns.
- Most statistical software requires variable names that are 8 characters or less.
- The worksheet has one row for each unit (**plot, subplot**) that is measured.
- Rows are arranged in field order, **NOT** treatment order.
- The order of the rows is the order data has been collected in the field and logically, the order of data on the raw data collection form.

Basic spreadsheet for exptal data

Experimental details	
Design factors	Measurements variables
Column titles/codes	
Factor levels	observations

Example of poor sheet designs for exptal data

Spreadsheet for survey data

a) **Survey Details** – contains information about the survey as a whole & provides background.

b) **Survey Descriptors** –no design factors like in expts.

- Variables defined by the survey are allocated here.

Can include:

- Sample site details
- Interview ID
- Name of the enumerator
- Date and time of the interview.

Descriptors can not be entered prior to data entry.

Survey data sheet.

Survey details	
Survey descriptors	Measurement variables
Column titles/codes	
Survey defined variables	observations

Handling multiple response data

- Involves questions whose respondents can choose a number of relevant responses.

- For example ‘If you are using an improved fallow on any of your land, please tick from the list below, any reasons that apply to you:

  - ✓ Do not have any land of my own
  - ✓ Do not have any suitable crop for an improved fallow
  - ✓ Cannot afford to buy the seed or plants
  - ✓ Do not have the time or labour

Spreadsheet data entry & checking

Data entry:

- Data entry should be started as soon after collection in the field as possible.
- Spreadsheet should have been designed before data collection to facilitate immed.data entry.
- The observations made in the field and any notes made on the data collection form can still be explained easily.
- A data summary should be given to the supervisor or scientist responsible for the trial .
- Raw data collected should be entered directly into computer –No hand calculations to be carried out.

Data Checking

- Adding calculations and conversions
- Missing Values

Techniques for Data Checking

- ✓Scatter plot
- ✓Case nos
- ✓Double entry
- ✓Validation
- ✓Line plots
- ✓Pivot table

Consulting skills in data analysis

What to Focus

Preparing the data.

- involves choosing the rows and columns of this Matrix and formatting it for use with the statistical software.

Descriptive Analysis

- generates main summaries, tables and graphs that “tell the story” to meet the objectives.
- Exploratory analysis also reveals further & unexpected patterns & relationships

Confirmatory Analysis

- Adding measures of precision
- Improving the estimates of various critical quantities

What to focus…

Interpretation and Use:

- Without interpretation the analysis is pointless.
- Involves the whole job of integrating the new knowledge on the problem.

Reporting

- This involves report of the analysis & presenting the final tables & graphs.
- Along with the report, consider the archive of the data & the analysis methods used which needs careful recording incase anything is questioned or needs repeating.

Important methods to check for continous data

Analysis of variance as a descriptive tool

Source of variation	d.f	ss	Ms	F.pr
treatment	t-1			
blocks	b-1			
Treat.blocks	(t-1)(b-1)			
residual	bt-1			

- Some basic demonstrations!

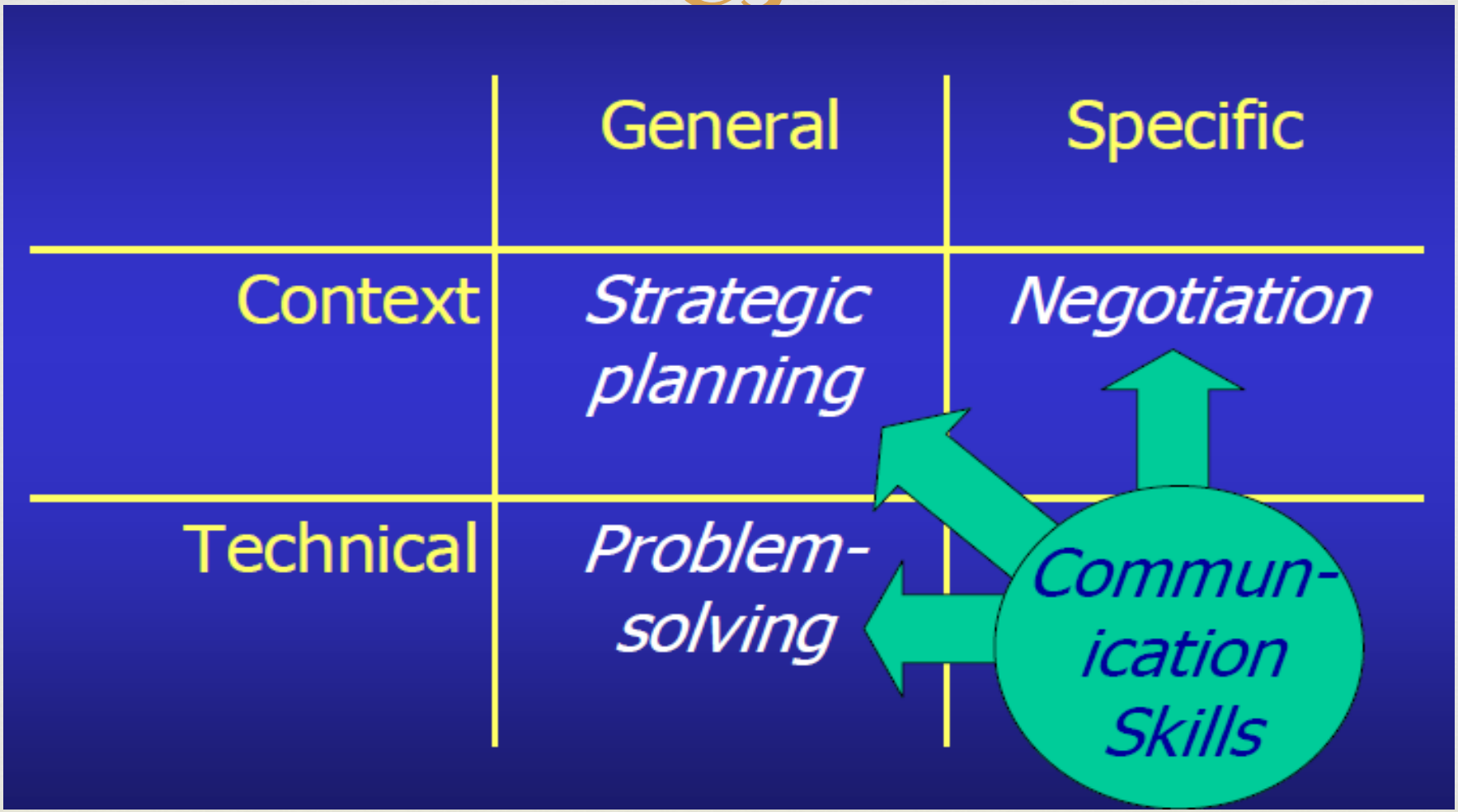
Non-statistical skills

- **Collaborative Research and Statistical Consultancy**
  - Communication
  - Problem solving
  - Maintain good working relationships
  - Informal teaching of clients
  - Familiarize one self with subject matter paradigms
  - Time management

What you need to do!

- Invests time and resources to learn, grow and develop;
- Look for opportunities to learn from mistakes;
- Look for ways to improve performance and efficiency on the job;
- Provide others with tools and approaches to solve problems and improve processes

Getting involved!



THINK OUTSIDE THE BOX!