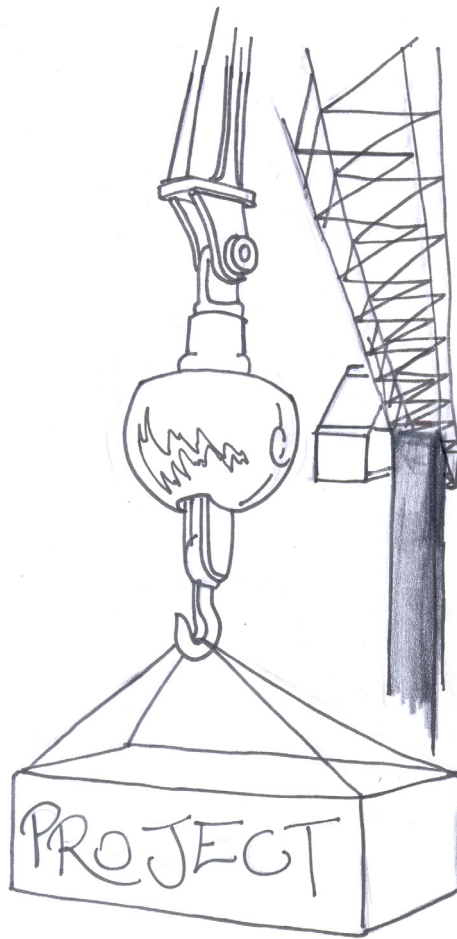


Chapter 4 Structuring Your Research



The resolution of revolutions is selection by conflict within the scientific community of the fittest way to practice future science. The net result of a sequence of such revolutionary selections, separated by periods of normal research, is the wonderfully adapted set of instruments we call modern scientific knowledge.

Thomas S. Kuhn

The Structure of Scientific Revolutions (1962), 171.

The previous chapters had the task to describe the theoretical issues and the concepts behind the research process. This chapter takes a more hands-on approach in describing how best to carry out the research design, what software to use and how to choose which questions are really needed for the study. This is followed by the issues identified during the data gathering process, the data analysis part, the reporting process and how to ensure that ethics are recognised and adhered to.

The final sections revisit the drafting of the aims and objectives and the eventual research questions and review how they fit within the data cycle. Finally, the hypothesis issue is tackled to ensure that all this fits together.

A Datacycle Approach

The Datacycle self-explains its *raison d'être* through its procedural function. Earlier on in the book, it was identified that research requires data; however data gathering is not without its own set of requirements. The process initially entails a clear design of the method that will be undertaken, the choice of the tools to be used and the drafting of a tool called a matrix (discussed later on in this chapter) to help identify which questions are really required. Only when these have been established can the actual data gathering process start, followed by the analysis process with its inherent querying and recording methodologies. Where issues deemed problematic to the process are identified, this loop is flexible enough to allow the research to go back and re-initiate either the whole process or individual elements.

Design

The design process takes up the bulk of the cycle's work. One has to have a clear idea of what is required from the study. This can be ascertained through the drafting of a clear aim, a set of objectives and a set of research questions. The latter will help identify which variables are required.

Assuming that the literature review process has been concluded and that one has chosen which research method will be employed, the next step is to come up with a series of phases that will be undertaken.

Draft a **checklist** which covers the following:

Methodology Issues

- Is the researcher in a position to initiate studies using a particular methodology?
 - a. Will a qualitative approach be taken?
 - b. Will a quantitative approach be taken?
 - c. Will a mixture of the two be taken?
- Has the literature review brought up very specific data requirements?
 - a. If yes, are they available for gathering?
 - b. If not all could be accounted for, have surrogates been considered (for example income data is absent therefore a surrogate could be used that indirectly reflects that variable, such as the number of cars in a household)?
 - c. Does the data have a timestamp before it can be accessed? For example, national data has a 30-year moratorium as per Chapter 477 of the Laws of Malta.
- Will the researcher need to carry out archival research, interviews, and surveys or will s/he use readily accessible distributed data (for example from the net databases)?
 - a. If archival, is the material physical (analogue – hardcopy)? Is it too deteriorated to read? Is it accessible?
 - b. Is it in the country of residence or in another country whence costs have to be factored in?
 - c. If based on surveys, are the methods understood? Does one need to send online emails or physical mail shots with return envelopes? In addition, has a prize been included for respondents and have the necessary permits been acquired?

Operational Issues

- Have costs been factored in?
 - a. Some agencies charge a unit cost for the data.
 - b. Others charge a nominal cost irrespective of the query type.
 - c. Others charge an hourly rate for the time executed during the running of the researcher's query but do not charge for the data.
 - d. Others do not charge at all due to legislative constraints or due to the fact that the queries were already prepared.
- Have the contacts been made?
 - a. Have you allowed enough time to enable the contacts to fit your sessions in their timetable?
 - b. Will communication technology be employed? Will you use internet communication tools such as basic emails, online questionnaires, video conferencing or otherwise? Or will phones be employed?
 - i. Have you ensured that the system works?
 - ii. Have you ensured that you have enough backup power to record the sessions?
 - iii. Have you prepared for a contingency just in case of power failure (whether direct electricity or backup power)?
 - c. Will the sessions be recorded?
 - i. If yes, will permission be requested from the interviewee?
 - ii. How will you record the sessions and how have the ethical issues been accounted for?
 - iii. Have you accounted for enough time to transpose the interviews into text? This transcription method should ensure that the written text is exactly loyal to that in the recorded media.
 - d. How will you store the files? Always keep multiple backups of the digital files and at least one copy of the analogue (hardcopy) material.
 - i. Keep digital copies in a CD/DVD format;
 - ii. If possible keep one in a secure online location; and
 - iii. Ensure that the formats are readable in more than one document format in case of software malfunction.

Technical Issues

- If the files are highly sensitive, how will they be stored?
 - i. Where will the files be kept – is a secure place available, a site that cannot be compromised?
 - ii. How will the names of the persons interviewed be protected? Have you created a system that enables the conversions of those names to codes, and is the code document stored in a separate place?
- Has error checking been given the relative weighting?
 - a. Are errors accounted for especially during the input cycle?
 - b. How will you verify that the data is still sound especially following such exercises as sorting, which tend to be the main sources of data misalignment?
 - c. What types of error checking will be carried out once the data has been inputted? (This could include a number of summation exercises).
- Is the researcher skilled in the use of analytical software?
- What process or language will be used to record the queries based on the variables? (This is highly crucial in that a query carried out at a certain time and the same query carried out at a later stage should deliver the same result). Simple logic, no? However, this is the main source of error generation and the inability for results to be replicated. This may be due to a variety of factors:
 - a. The data may have been edited in the meantime (importance is due to the version being used);
 - b. The data may be sourced from a live database that could be updated on an ongoing basis, inclusive of the archival data. Take dwelling permits as an example: a file may be superseded and the original data referring to the number of units would subsequently be removed. This would cause a change in the variable pertaining to number of units permitted by year.

- Has a lineage system been prepared?
 - a. Will you be able to backtrack should an error be identified late in the study and the researcher needs to go back and rectify that error?
 - b. Have the processes been recorded in detail so that all the successive steps can be taken again?

IS A PLAN B AVAILABLE?

This is one major concern for any researcher! What happens should the topic under study prove to be impossible to research?

There are various issues why this can occur:

- Data is not available;
- Contacts do not cooperate;
- The topic is too sensitive and feedback is limited;
- The topic was superseded by new legislation;
- The topic was overtaken by events;
- The literature review led to a deviation from the aim of the study...

Thus the need for a PLAN B, but what does this signify in reality?

Researchers have to be aware that due to the above, they may have to change their research topic; therefore the best option is to draft an alternative topic early in the proposal drafting stage. This is cumbersome work but it helps ease the trauma of a difficult situation, especially at a moment when time pressure is high.

Note that there is no need to have a plan B that calls for a full topic alternative, but it could be one that changes part of the topic or even the methodology.

An example of a plan B would be a quantitative study that proposed to study migration to and from Malta which data recording was disrupted due to legislative changes and the termination of recording systems. A plan B that would adhere to the topic could propose to conduct a qualitative study on those returned migrants who have been registered as such prior to the termination of recording.

Choosing the correct mining/trawling tools

This section, though covered in Chapters 6 and 9, is best introduced at this point since it will lead to the issue of matrixing. How will one know how to choose the correct data gathering tools? How will one structure the interview/survey/questionnaire forms to enable easy data input? Are specific tools needed?

The answers vary based on the type of study proposed, however this section will focus on the concept behind the need. Let us take a look at the steps one needs to take in order to structure the mining and trawling processes.

<p>Mining: the process taken to gather the data either manually or through initiated processes such as a questionnaire.</p>
<p>Trawling: the automatic process whereby data is gathered by machines or sensors which will review the availability of that data, extract it and store it in a specific location for the researcher's perusal.</p>

Step 1: How will the data be gathered?

- Manually – *in-situ*
- Automatically - remotely

Step 2: What forms will be used?

- Pre-prepared forms
- Open-ended – no formal forms

Step 3: Which tools will be used?

- Analogue – paper/clipboard style – may need maps for *in-situ* analysis
- Digital – using PDAs or a laptop with a scanner or recorder

Step 4: Will the forms have all the variables inserted?

- Yes and includes all the sub-categories
- Partial – allows for the inclusion of new variables and new types of archival input

Example of a checklist matrix:

Target: To gather data on the number of fish caught close to the shore through the use of in-situ measurements and the taking of photographs using open-ended methodology.

	Forms	In-situ	Analogue	Digital	Full Variables	Part Variables
Manual	X	X				
Automatic			X	X		X

Matrixing

Once the process on how to develop the study has been concluded the next phase to be employed should concentrate on creating a matrix that helps the researcher to review if the questions prepared for the data analysis process can be reviewed against the findings from the literature review.

To recap:

- i) The literature review identified a number of relationships that the researcher would like to analyse in a local context;
- ii) Each relationship is transposed into a variable (an element that can be analysed, whether based on keywords, codes and text);
- iii) The variables list is converted to a value-free question if using the interview/questionnaire option or to a spatial variable if using the in-situ survey mode;
- iv) The questions are drafted in sequence to ensure that they flow smoothly and not go back to a previous section. Make sure the number is manageable to reflect the real needs of the study. Extra questions are just baggage and tend to burden a study unnecessarily:
 - i. Initial section – background information (on person/area/location under study);
 - ii. Thematic section - (topic-relevant variables);
 - iii. Feedback section – allows the interviewee to state issues not tackled in the survey. This is not always carried out or even needed since only if the statements are relevant to the topic should they be included in the analysis;
 - iv. If using a pro-forma template (particularly for archival research the variables need to reflect the material being inputted such as background information, the individual variables listed in the particular ledger/book/inventory.

Once this is done, it is time to create a matrix to allow the researcher to form an idea of the eventual relationships that can be investigated within the study.

So..... What is a Matrix?

Forget science fiction movie infiltration and the complex worlds created within such virtual worlds...

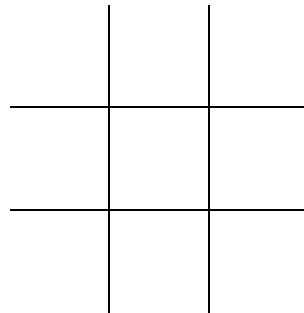
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i h m f a h n f a q t k
t b d a k l p u l g g a m x t z i b f o a g q a
r e w q a a n t o n e i
h a f n
c o n h a q b b d k g q h p n a q
t k g a l q k
g h y e q o i h m f a h n f a a q
q u n g a q t b d a k l u g a a n
h a q u i h a f n
t e p h e n a t p l i h a q b b d k
h g a t k g a l q u h

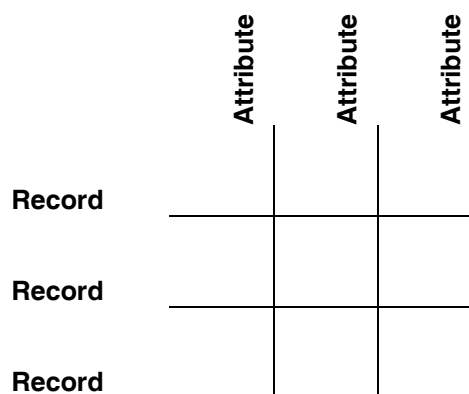
```

A matrix is a collection of cells that serve as an aid to structure data according to set columns and records in what can best be described as a spreadsheet.

Imagine a Tic-Tac-Toe game (also referred to as OXO)



This matrix is empty – let us identify the cells
Columns – attributes
Rows – records



A Tic-Tac-Toe game that has been concluded may look like this:

	Attribute 1	Attribute 2	Attribute 3
Record 1	X	O	O
Record 2		X	O
Record 3	X	X	O

The matrix tells us that the game was won when 3 Os were placed in sequence under attribute 3 which has a relationship with Records 1, 2 and 3.

Creating the matrix in step-by-step sequence

Taking the Tic-Tac-Toe concept further and visualise a questionnaire that has 10 questions.

Sample questions are listed below:

1. Sex

- i) Male
- ii) Female

2. Age: _____

3. Status

- i) Single
- ii) Married
- iii) Legally Separated
- iv) Divorced
- v) Widowed

4. Residence Locality

5. Employment

6. Do you think that the current way of communication (from management to employees) is effective?

- i) Yes
- ii) No

7. What makes a communication system effective?
- i) a cohesive team
 - ii) target-oriented *modus operandi* (goal oriented)
 - iii) mutual understanding between the parties of each other's skills
 - iv) knowledge of information systems that actuate and enhance communication styles
8. Which communication method is the most effective?
- i) Telephone
 - ii) E-mails
 - iii) Meetings
 - iv) Letters
 - v) Notices
9. From your experience in management, do employees perform better when there is effective communication?
- i) Yes
 - ii) No
10. From your past experience when communication maybe was not as effective, did workers perform effectively?
- i) Yes
 - ii) No

Step 1: Create the Matrix shell as shown below

	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Note that the question numbers are reflected on both the top Attribute cells and on the left Record cells. It is essential that the matrix is created in this way, the reason for which is given in the next Steps.

Step 2: Highlight those numbers that correspond to the same question numbers

	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

The diagonal cells show the ones that fall within the same question number within the attributes and records. These variables can be analysed through descriptive statistics as they cannot be clashed against themselves.

Step 3: Fill in all the cells below in grey

	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

This step ensures that any two questions are not analysed against each other twice in the same study. Comparing Question 1 with Question 2 is the same as comparing Question 2 with Question 1. A simple enough process, but one can be surprised how many times such double entries are made!

Step 4: Create a list of those questions which will be compared/cross-analysed.

Example from the questionnaire listed above:

Q1 vs. Q2

Step 5: Mark the corresponding cells with an X

	1	2	3	4	5	6	7	8	9	10
1	X									
2		X								
3			X							
4				X						
5					X					
6						X				
7							X			
8								X		
9									X	
10										X

Add also those for the next 3 comparisons:

Q1 vs. Q5

Q2 vs. Q8

Q6 vs. Q9

	1	2	3	4	5	6	7	8	9	10
1	X				X					
2		X						X		
3			X							
4				X						
5					X					
6						X			X	
7							X			
8								X		
9									X	
10										X

In a real research scenario the matrix would include a significant number of **Xs**. Note that one must not saturate the cells with Xs as that defeats the purpose of the whole exercise. The scope is to ensure that those cells which are relevant to the Research Questions identified in the previous exercises are really and truly included and also to ensure that no extra (potentially unnecessary but definitely time-consuming) comparisons are made. Every research encounter the authors have had with a large number of students and professionals brings up the surprising number of cross-analysis that was included in the analytical chapter/sections but never relevant to the study and not used at all. In some cases, even the relative questions in the questionnaire/interview sheet/input list would have been discarded prior to the launching of the sessions. One might argue that the pilot study would highlight this issue, however pilot studies rarely tackle potential comparisons between the variables, but only concentrate on whether the questions are understood by the interviewee/respondent.

Step 6: Identify the Measurement Scale which will be used (Refer to Chapter 5 for a description of the Scales). In this section the answers have been pre-prepared based on the questionnaire drafted above.

As an ice-breaker, there are four types of measurement scales as used by the matrix, which define the mathematical levels of precision with which the values of a variable are expressed. These are:

- **Nominal Scale**
- **Ordinal Scale**
- **Interval Scale**
- **Ratio Scale**

In the Matrix Model, the NOIR is used: Nominal (N), Ordinal (O), Interval (I) and Ratio Scales (R).

Now, identify under which scales the relative questionnaire categories fall:

Question No.	Measurement Scale
1	N
2	R
3	N
4	N
5	N
6	O
7	N
8	N
9	O
10	O

In order to ease analysis matters, it is best to change the interval to a range which in turn from Nominal becomes an Ordinal. This issue is best explained in terms of age categories. Imagine analysing question 1 and 2 based on the single age replies as listed in the questionnaire. If the ages ranged between 10 and 100, then there is a possibility that for every age-year one could have an input such as 2 males and 3 females. Since it is too cumbersome to analyse, the best method is to translate the single years to cohorts. The best way to do this is to use the basic demographic 5-year age cohorts, which would be classified as follows:

Age Cohorts (years)
0 – 4
5 – 9
10 – 14
15 – 19
20 – 24
...
95 - 99
100+

These groupings are termed cohorts, which have a measurement scale designated as ordinal.

Step 7: Update the Matrix to reflect the Measurement Scales listed in Step 6

		N	R	N	N	N	O	N	N	O	O
		1	2	3	4	5	6	7	8	9	10
N	1					X					
R	2								X		
N	3										
N	4										
N	5										
O	6									X	
N	7										
N	8										
O	9										
O	10										

Step 8: Convert the Interval Scale to Ordinal Scale as per Step 6

		N	O	N	N	N	O	N	N	O	O
		1	2	3	4	5	6	7	8	9	10
N	1					X					
O	2								X		
N	3										
N	4										
N	5										
O	6									X	
N	7										
N	8										
O	9										
O	10										

Step 9: Colour-Code the Cells marked with an X




This step ensures that once the data inputting stage is complete, the analysis phase is carried out in an efficient time-saving manner. The colour-coded cells can be run together by row number which reduces the time taken to run single queries individually.

Should Q1 (where Q1 is a Nominal - N) need to be analysed against another Nominal (Q3), then the statistical test to use is that called Chi Squared (covered in Chapter 11).

If both the row and the column are identified as an Ordinal (O), then the relative test would be based on a correlation (Chapter 11) (such as Q6 vs. Q9). Should the Row be an Ordinal (Q2) and one of the attributes (Column Question) be a Nominal (Q8), the latter enforces the test to the same types as Nominal vs. Nominal i.e. Chi square.

		N	O	N	N	N	O	N	N	O	O
		1	2	3	4	5	6	7	8	9	10
N	1					X					
O	2								X		
N	3										
N	4										
N	5										
O	6									X	
N	7										
N	8										
O	9										
O	10										

Legend

	Nominal vs. Nominal and Nominal vs. Ordinal	Chi squared test	NxN NxO
	Ordinal vs. Ordinal	Correlation: Spearman's test	OxO
	Descriptive Statistics	Frequencies	

The Matrix can be amended as more analysis is carried out and new queries may be required based on new findings. The ready-made MATRIX will allow for such additional work without the requirement for starting from scratch.

Data gathering

Once the Matrix has been prepared, the basic groundwork would have been laid. The next phase would initiate the process for eventual data collection. This is easier said than done, since one has to start by deciding the best way to start one's work.

Remember, the first interview is always heart-throbbing and tests one's nerves, even of those few whose nerves were primed from steel! Once the first hurdle has been overcome, the next research steps should follow smoothly.

If the first step or steps prove problematic, you might wish to confer with a supervisor or a manager on either reviewing the *modus operandi* or even restructuring the process. This can be carried out by first tempting the process with what is called a Pilot Study.

What is a Pilot Study?

Consider this as a testing phase, a launching pad and a necessary evil!

The magic ingredient required to carry out this initial step is called 'human targeting': grab a few friends or colleagues and choose between five and ten if taking the quantitative route and one or two individuals if the qualitative one is chosen.

Distribute the material to the nice persons in front of you and ask then the necessary questions or review them while filling it up: both in terms of time and issues reflecting the understandability/flow of the questionnaire.

If using an interview mode ensure that this simulation will record all the steps that will be replicated in the actual sessions. These include availability of recording materials, notepads, ensuring that posture leads to legible hand-writing (*hen-writing* makes it very difficult to go back and revert to the interviewee with an illegible scribbling)... That's very embarrassing!



It is always surprising how many small items are discovered during this phase, so it must **not** be approached lightly.

Once the devils have been confronted, then the findings can be dissected in a post-mortem:

- i) What could have been carried out better?
- ii) What did not make sense in such a process?
- iii) What needs to be weeded out?
- iv) What needs to be included?
- v) Are the numbers targeted realistic?
- vi) Was the time projected realistic and appropriate or should I restructure the process?
- vii) How will it affect the data collection period identified?

Verify that all these steps have been solved and then start the process to go about your real study.

Start the sampling process and then choose the process to elicit the group of persons who will serve as your target group. Chapter 2 covers the sampling process and how best to choose a sample from available sources.

Different ways to go about doing research

Once the target group has been chosen, one needs to identify the on-the-ground mode of operation.... the basic activity which will allow one to gather data. Unless already decided upon through the literature review process and unless pre-prepared data is available, one has to identify the appropriate mode. This is not a pick-out-of-the-Easter-bunny-hat choice but one that must be stemmed from background studies and review of case-studies.

Once chosen, the method must be adhered to as some can take ages before the necessary information can be gleaned. Refer to Chapter 2 for an explanation of the different ways to go about this process.

Analysis

Having completed the data gathering exercise and inputted the data into an analytical tools (refer to Chapter 9 for details on the diverse tools), it is best to understand what steps should be taken in order to analyse that same data.

There are various options one needs to contemplate prior to the actual analysis:

- Has a decision been taken on what tool will be used?
 - Ensure that the tool is well understood and if one has programming skills, such would help to carry out simple queries. If using such skills it is best to record the process used.
- Has the matrix been completed?
 - Ensure that the matrix described above is complete and allows for the analysis process to flow smoothly.
- Have you drafted a series of keywords if using a qualitative approach?
 - Write down a series of keywords that you will look for in the transcribed text. These will serve to elicit commonalities between the different replies.
 - Examples of keywords for a study on youth and drug use:
 - Youth
 - Recreation
 - Stress
 - Drugs
 - Alcohol...
 - the keywords list will expand as more interviews and transcriptions are carried out, though it would be ideal to compile the list during the literature review stage.
- Does your method include creating a series of catalogue cards which will allow you to remember the keywords (categories) within which they fall?
 - This is a very interesting issue which was used primarily in pre-computer research. A series of cards would be created which would contain themes or keywords. Any information and data would be described under each theme or through a sub-set series of cards. When one requested information for a specific query the cards would be extracted by theme and the contents clashed.
 - Though an interesting way to carry out cross analysis, this method has been superseded by technology, and computer software carry out this role. However, hardcopies should still not be abandoned as they serve both as a backup and as a visual reality: try reading a 100-card graph on a monitor as against all those cards spread on a floor! In reality both can be used, however the researcher's choice is based on ease of use of digital technology or more traditional reliance on solid material options.
- Have you chosen the statistical measures that will be used if you are taking the quantitative route?

- The statistical measures used depend on the outputs of the NOIR Matrix and on the type of relations one is analysing. Chapter 11 gives a description of some of these measures.
- Can your qualitative results be analysed also through the quantitative approach?
 - This is a very challenging issue for those who do not want to consider using quantitative tools! However, the scope of such a question serves the inherent reality that qualitative and quantitative approaches are divided by a very fine line. What is the scope of keywords if not to elicit how many times that same word surfaced in a set number of interviews? Simplistic as it may seem the interviews pile up, so do the specificities that bind them together.

Having come up with answers to the above, one's next step is to look at how best to carry out the analysis. There are important processes to do this based on a simple rule:

Record Every Step You Take!

One of the problems faced in carrying out analysis concerns the issue of back-tracking. Very few researchers record every step they take to carry out an analysis, and when a discrepancy crops up, one is at a loss to backtrack and find out where the whole thing went awry!

To avoid this problem, all one needs to do is to record the steps taken in every query through what is called a Lineage. The Lineage allows one to follow the steps taken and also records what files were generated, how they were stored, the problems encountered and other relevant steps.

The following Lineage examples give overviews of some of the steps taken in order to (i) create a dwelling zone map, and (ii) find how many persons are aged over 70. The actual lineage is over 15 pages long!

Lineage 1	
Project: Creating a dwelling zone map	
User: Saviour Formosa	
Date: 23 June 2005	
Source File Name: lineage creating a dwelling zone map.doc	
Destination Directory: C:\data\landuse\descriptive links\lineage	
Project Description: a number of dwelling by type maps were created to eventually form a single dwelling zone map	
Abbreviations used:	
xls	Excel file
doc	Word file
tab	MapInfo file
mif/mid	MapInfo Export file
dbf	Database format file

Lineage Steps

- 1) Creating a buffer map for each zoning type

Each layer was gathered from the different data sources such as:

- i) land availability database
- ii) planning permits
- iii) address point database

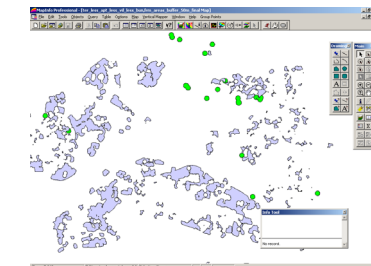
a buffer averaging 30m was given for each area

- 2) each layer was then overlaid on the respective layer in order to remove any overlaps. The base importance used was as follows:

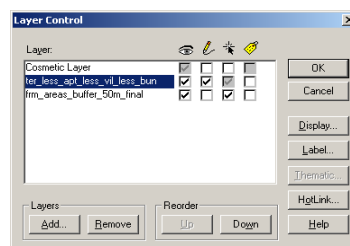
- i) TER - terraced (base)
- ii) APT – apartment (one up)
- iii) VIL – villa (next up)
- iv) BUN – bungalow (next up)
- v) FRM – farmhouse (top)

- 3) an example in the integration was kept as follows:

- i) Open both layers to be overlaid



- ii) Make the bottom layer editable



Comments on difficulties

- a. If buffers were not all at 30m, this may generate a type of inconsistency that should not be a problem since the streets would be covered and any accidental overreach would only be in the region of 3 dwelling plots.

Lineage 1

Project: *Lineage for listing of elderly over 70 years of age*

User: Saviour Formosa

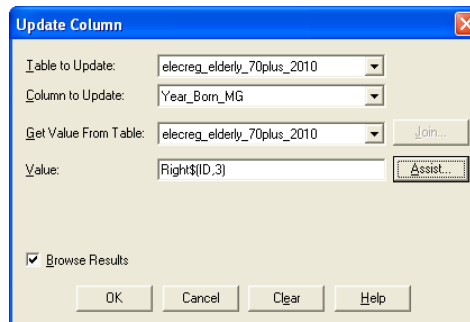
Date: 18 July 2010

Source File Name: *elecereg_elderly_70plus_2010.TAB*

Destination Directory: C:\data\elderly living alone

Steps: Phase I: Eliciting the age of the persons

- i) created a file from elecereg Oct2009
- ii) added a column named YearBorn MG to extract the last 3 digits found in the ID column
 - a. *Right\$(ID,3)*



Update Column

Table to Update: elecereg_elderly_70plus_2010

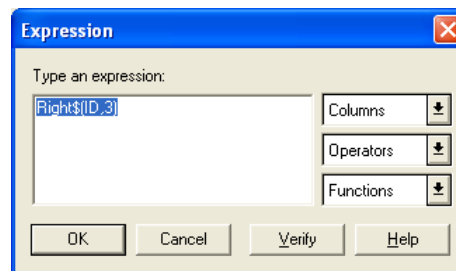
Column to Update: YearBorn_MG

Get Value From Table: elecereg_elderly_70plus_2010

Value: Right\$(ID,3)

Browse Results

OK Cancel Clear Help



Expression

Type an expression:

Right\$(ID,3)

Columns

Operators

Functions

OK Cancel Verify Help

VERY IMPORTANT NOTES

- i) The age resultant in Phase 1 is indicative and can generate some errors as follows:
 - a. The A, P, L categories can generate persons aged over 100. Review each item individually since they may be children: error caused by the **Step iv**. Those who have an M or G category would more likely be Maltese elderly since the M and G categories were discontinued in end 1999/beginning 2000

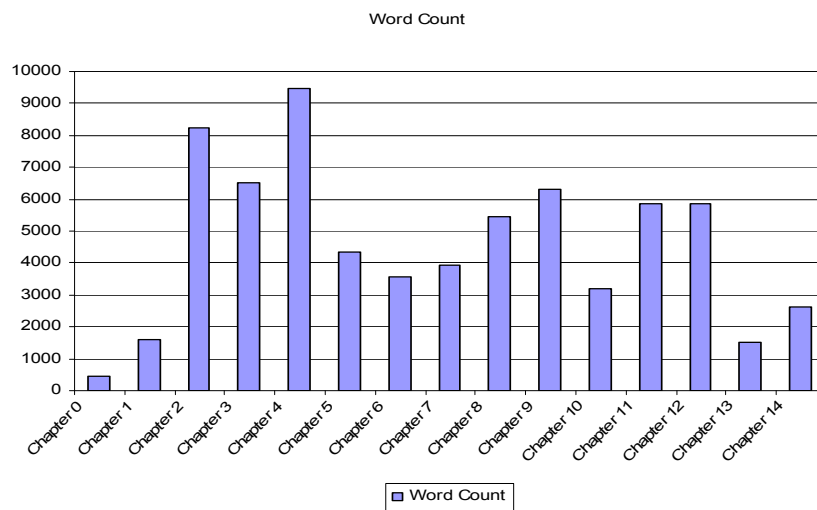
One might be tempted to ignore the lineage process as it appears too time consuming and demanding. It is, but serves its purpose both for cross-checking of data where the results appear too outlying or also to enable re-running that study at a later stage. Do not depend too much on your memory for such processes! Memory deteriorates with time and, once a number of similar but distinct lineages have been drafted, it is difficult to recall which was which.

Analysis

Some rules must exist! Here they come. Keep them in mind at all stages of the analysis.

- Choose the right variables to compare
 - Make sure that you do not complicate matters only to find that the variable has nothing to do with the research question. Do not choose a pollution-related variable to analyse the behaviour of juvenile delinquents.
- Choose simple relationships
 - Do not choose relationships not backed by literature and eventually discover that the relationship between the variables is too complex and difficult to describe.
- Divide complex relationships into smaller simple ones
 - A smaller problem is easier solved. Divide a complex problem into a number of problems that can be solved individually. If still complex, divide some into even smaller ones. Once solved build up the answers towards the whole again.
- Compare different sections together e.g.: demography with transport, etc
 - Ensure that the variables being cross-analysed cover all the themes discussed in the mind map and in the matrix.
- Design graphs which describe the actual data under discussions - do not get bogged down in numbers
 - Ensure that the analysis outputs do not bother the reader to death! They have to follow simple rules (Chapter 7 covers the options):
 - The simple-is-better rule – make your outputs simple (Figure 4.1)
 - Less text
 - Tables should not be very large, containing volumes of data, as no one will read those. It is easier to explain them in graphical or map mode.
 - More graphics and visual tools help the reader understand the context. Visuals include:
 - Graphs
 - Photos
 - Maps
 - Graphics

Figure 4.1 – A Simple Chart



Reporting

As detailed earlier in the book, the results of a study can take various forms; mainly reports, articles in journals, books, computer presentations and other multimedia outputs. The main output has to be descriptive of the findings. The results must reflect the literature review, the methodology used and the analysis process as it is related to the literature and the uniqueness of the study.

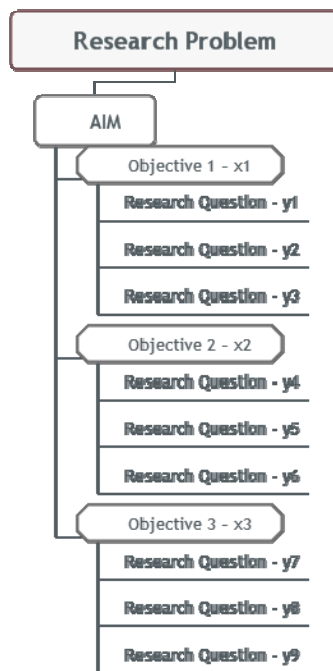
One has to draft a convincing report that mirrors the findings but does not replicate the analysis of the findings chapters. Be concise and ensure that the report includes a series of recommendations as built over a number of scenarios. Do produce an executive summary as it will be the primary document that will be read. It has to be interesting enough to drive the readers to go through the whole report and implement those actions that close the DIKA loop.

Aim, Objectives and Research Questions

Chapter 3 was dedicated to the description of the research phases with one particular step calling for the identification of the research problem. The logical approach identified a 3x3 structure which outlined the aims, objectives and research questions structure. The whole issue revolved around coming up with a series of identifiable research questions which should allow the researcher to test for relationships at the smallest and most detailed level.

Let us review them and see how each section can be aided by the structure described in this chapter, again revising the summary depicted earlier in Figure 3.1, replicated here as Figure 4.2:

Figure 4.2: The Aims, Objectives and Research Questions



- i) **A.** - Create an **AIM** which should be expressed as a statement that shows the topic of the study and the direction you wish your research to take.

The aim, though at high abstract level, has to identify the theme under study and has to be clear in terms of what the study should achieve. So if it is aimed at investigating the issue of the phenomenon of cart ruts in Malta, the aim has to specify the term 'cart ruts' and not deviate the reader to such issues as mysticism and prehistoric cults! This is a scientific study so the facts are what should be studied; thus cart ruts ARE an undeniable phenomenon and the researcher aims to understand what their origin was. If s/he aims to investigate who the potential builders were then the title has to state this, however the task to prove such a statement is more difficult, if not impossible as a study, since the facts pertaining to their use have not as yet been ascertained and one might fall in a cyclical trap of the proverbial "chicken and egg", where the establishment of use can lead to the understanding of the culture that built them. Vice-versa, the understanding of the culture can lead to the understanding of the usage. However the former has a fact to base itself on (the ruts), while the latter has yet to provide evidence of the composition of such a culture.

- ii) **B.** - The first of the 3x – create 3 **OBJECTIVES** based on the AIM.

The objectives bring the researcher closer to the variables that can be depicted in the matrix and eventually studied at the hypothesis level. Taking the cart ruts' study one can develop the research objectives as follows.

- a. The first objective (x1) should describe that you wish to understand a specific topic through the literature review

Objective 1: To seek an understanding of the literature on the phenomenon of cart ruts.

- b. The second objective (x2) should state what you want to achieve

Objective 2: To achieve an understanding of what cart ruts have been listed, those that have been lost, the related ancient structures identified close to the ruts, whether they were actually ruts, their purpose and structure.

- c. The third objective (x3) should state how you aim to achieve those results

Objective 3: To record all the cart ruts on the islands, to measure the structures and study them using spatial tools and try to identify relationships with meteorology, terrain, topology using digital terrain modelling systems. Also, to recreate the structures in a virtual world for scenario testing.

- iii) **C.** – For each of the objectives identify 3 **research questions**. This section closes the 3x3 loop as it allows for the creation of up to nine research questions.

The research questions bring the researcher into an arena where the actual literature themes and variables are investigated at the individual level.

- a. For Bx1 – the Research Questions (y1 to y3) could state that the researcher will investigate whether a relationship exists between, for example, the theoretical exponents and the realities on the ground.

Research questions for Bx1 could be as follows:

- i) What scientific literature exists on the phenomenon of cart ruts?
 - ii) What has been written in folklore literature?
 - iii) Is there evidence of the phenomenon in other countries apart from the Maltese Islands?
- b. For Bx2 – the Research Questions (y4 to y6) could state that the study will aim to identify the linkages between one theme and another.

Research questions for Bx2 could be as follows:

- i) Which ruts have been listed and where are they located, inclusive of those recorded but lost through degradation, development of reclamation?
 - ii) Have related structures been recorded in the vicinity of the ruts?
 - iii) What is the purpose of the phenomenon: were they actually the result of cart activity?
- c. For Bx3 – the first Research Questions (y7 to y9) could state that the researcher will investigate whether a relationship exists between the spatial data gathered and the literature review findings.
- i) Is there a relationship between the spatial terrain model, the climatic/meteorological issues and the location of the phenomenon?
 - ii) Can the virtual model show the relationship between the phenomenon and other structures?
 - iii) Have the findings supported the established literature or has it brought up a unique perspective to the literature?

As one can perceive from this process, considerable thought goes into coming up with research questions at the start of a research process. The process has to follow a methodological structure that enables researchers to provide ‘meat’ to their research’s bones.

Once the Aim to Objectives to Research Questions 3x3 model has been described, the final construct to understand concerns that termed “hypothesis testing”, which takes on where we left at the research questions level.

A need for a hypothesis

What is a hypothesis? This single sentence makes or breaks the study of a research theme. Having followed all the above rules and processes, it is essential that the most detailed analysis fits somewhere. Does a relationship between two variables indicate a relationship or has the relationship not been proven? Such is the need for a hypothesis.

A hypothesis aims to explain a phenomenon using scientific means to test it. Scientific studies call for the testing of two hypotheses, called the null hypothesis and the alternative hypothesis respectively.

Note that the difference between the two is as follows:

- The null hypothesis always states that there is **no** relationship between the variables (phenomena) under study. This hypothesis is presumed to be true unless proven otherwise.
- The alternative hypothesis states that there **is** a relationship between the two.

During testing:

H0 refers to the null hypothesis

H1 refers to the alternative hypothesis

As a case study, one can investigate the relationship between village core dilapidation and population loss. The study is trying to find if there is a relationship between the deterioration of the urban cores (village centres) and population loss from those centres.

H0 would be described as:

H0 - Village core deterioration does not cause depopulation

H1 would be described as:

H1 – Village core deterioration leads to depopulation

In summary, should one have created a DIKA flow, with the aim leading to a set of objectives and the objectives leading to the research questions, the latter should be tested for a relationship. If the relationship is not found then the null hypothesis holds; if it is established, then the alternative hypothesis stands.

Questions (refer to Appendix for the answers)

1. Briefly describe the datacycle approach and state why it is important.
2. How can a researcher achieve a clear view of what is required from her/his study?
3. What are the main methodology issues to be considered?
4. What are the main operational issues to be considered?
5. What are the main technical issues to be considered?
6. How/when can a research prove impossible to conduct?
7. What are the steps needed to structure the (research) mining and trawling process?
8. What is a matrix?

9. List the 3 types of measurement scales. Using the model questionnaire provided in this chapter (without looking/ copying) complete the following table:

Question Number	Measurement Scale	Very briefly explain your choice of Measurement Scale
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

10. Without looking/copying from this chapter, try to complete the following table:

Types of Variables to be Compared	Statistical Tests to be Used
Nominal vs. Nominal Variables	
Nominal vs. Ordinal	
Ordinal vs. Ordinal	
Descriptive Statistics	

11. What is a pilot study? Why is it necessary?
12. What are the questions asked post-mortem, after a pilot study?
13. List the main types of data-gathering methods.
14. When a researcher reaches the analysis phase which are the main issues to be considered?
15. What is a lineage and why is it important?
16. When it comes to research analysis there are some rules one must adhere to. List the main ones.
17. Briefly describe the ideal research report.
18. "Aims, Objectives and Research Questions": List the 3 main steps, adopting the 3x rule.
19. What is a hypothesis?
20. What is the difference between the null hypothesis and the alternative hypothesis?