Q Methodology
An introduction (2/2)

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Q Methodology: outline

Session 1:

- **Theory**

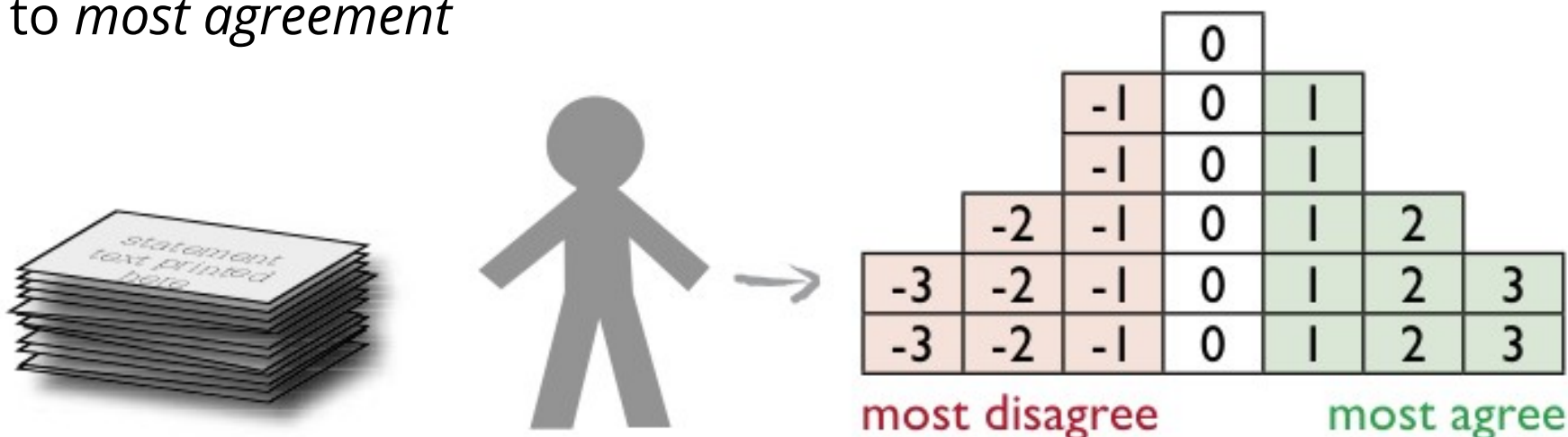- **Research design**

- **Data collection**

Session 2:

- **Analysis**

- **Interpretation**

- **Report writing**

Recap

How do I investigate perspectives within a group on a topic of concern?

- In brief:
respondents (the **P-set**) rank
a set of statements (the **Q-set**) on a grid,
usually from *most disagreement*,
to *most agreement*

most disagree   most agree

Recap

The process at a glance:

A. Research question

B. <u>Q-set – statements</u>

C. Shape of the distribution

D. Condition of instruction

E. <u>P-set – participants</u>

F. Piloting

G. Administering

H. Data introduction

I. <u>Analysis</u> (What criteria to use to decide in each step of the analysis)

J. <u>Interpretation of the perspectives</u> (***)

K. Report a QM study

Key terms:

- ***Concourse***
- ***Q-set***
- ***P-set***
- ***Condition of instruction***
- ***Shape of the distribution***
- ***Q-sort***
- ***Q-sorting***

H. Data introduction

- Raw data

	A	B	C	D	E	F	G	H
1								
2	**0**	**- - -**	**- -**	**-**	**=**	**+**	**+ +**	**+ + +**
3	Juan Martinez				22			
4	(ejemplo)			20	19	26		
5				14	21	16		
6			23	17	25	15	10	
7		7	5	13	3	18	6	24
8		12	4	11	2	8	9	1
9	**1**	**- - -**	**- -**	**-**	**=**	**+**	**+ +**	**+ + +**
10	nombre							
11								
12								
13								
14								
15								
16	**2**	**- - -**	**- -**	**-**	**=**	**+**	**+ +**	**+ + +**

H. Data introduction

- A matrix where rows are Q-sorts, statements are columns, and cell values correspond to the value given in the distribution

	qsor	St 1	St 2	St 3	St 4	St 5	St 6	St 7	St 8	St 9	St 10	St 11	St 1
4	S01	1	2	2	0	1	1	-2	-3	1	2	0	
5	S02	1	0	1	-3	-1	-3	0	0	1	-1	2	
6	S03	1	-1	1	0	-1	0	-1	-1	0	0	-1	
7	S04	3	-1	-1	-2	-1	1	-2	-3	3	1	1	
8	S05	2	1	-2	0	-1	-1	-1	0	3	2	-1	
9	S06	3	0	0	-2	-2	2	-3	1	2	2	-1	
10	S07	1	3	3	1	-2	0	-1	1	2	1	0	

The **analytical process** at a glance

1. Correlation matrix between Q-sorts*, need to decide on:*

   - [A] *Method* for factor extraction

2. Factors*, need to decide on:*

   - [B] **How many** factors

   - [C] Which type of *rotation*

3. Factor loadings *(relate Q-sorts with the factors)*

4. 'Flag' Q-sorts *(indicate which ones are the most representative of the factor)*

5. Statements scores *(weighted average response for each factor)*

6. Distinguishing & consensus statements *(to help define and **interpret** each factor)*

7. General factor characteristics

*Full statistical details in Brown 1980, Chapter 4*

factor = perspective

Factor 1

- - -	- -	-	=	+	++	+++
			12. Mis terrenos se están cansando			
		7. Sembrar bastante mataratón o guash significa mucho esfuerzo y poco beneficio	17. Si tuviera más terreno, le sembraría mataratón o guash en lugar de aumentar mis vacas	16. Me conviene más invertir dinero en tener mejores pasturas que en tener más vacas		
		18. En secas no hay otro remedio que soltar las vacas al monte	6. Podría obtener más ganancias de criar ganado sin por ello estropear la tierra	22. Pruebo cosas nuevas en mi trabajo		
	15. Es necesario que me den más subsidios para que mis hijos no tengan que ir a vivir a otro sitio	5. Con los programas de plantar árboles recibo más dinero por mi trabajo	1. En las tierras que trabajo, trabajarán también mis hijos y nietos	20. Me conviene deshierbar mi parcela de mataratón o guash aunque tenga mucho trabajo, para tener más forraje	24. Necesito mejorar mis potreros porque si no se acabará el alimento para mis vacas en unos años	
23. Prefiero vivir de los subsidios que del trabajo en mis tierras	26. Para excluir una hectárea de mataratón o guash por dos años, necesitaría más terreno del que tengo	13. Lo que da el ganado es mucho más de lo que pierde la tierra	3. Lo que más me interesa de los programas es lo que aprendo para ganar más dinero	11. Hago las cuentas de lo que mejor me sale y me dedico a ello	2. Prefiero 2 hectáreas de pasto de corte que 1 hectárea de mataratón o guash	10. Conservar el bosque es responsabilidad del dueño del terreno
21. Si el gobierno no me da subsidios, no me beneficia cuidar el bosque	14. El mataratón y el guash para forraje tardan demasiado en crecer	8. Participo en todos los programas que traen recurso	25. Puedo ganar más como ganadero si dejo vivir a los otros animales del bosque	4. Puedo mantener a mi familia con mi propio trabajo. Los subsidios sólo ayudan	19. Con más capacitación, podría mejorar mucho mi trabajo con el ganado	9. Me conviene más producir mi propia comida que comprarla

Factor 2

- - -	- -	-	=	+	++	+++
			11. Hago las cuentas de lo que mejor me sale y me dedico a ello			
	20. Me conviene deshierbar mi parcela de mataratón o guash aunque tenga mucho trabajo, para tener más forraje		21. Si el gobierno no me da subsidios, no me beneficia cuidar el bosque	8. Participo en todos los programas que traen recurso		
		4. Puedo mantener a mi familia con mi propio trabajo. Los subsidios sólo ayudan	2. Prefiero 2 hectáreas de pasto de corte que 1 hectárea de mataratón o guash	16. Me conviene más invertir dinero en tener mejores pasturas que en tener más vacas		
	7. Sembrar bastante mataratón o guash significa mucho esfuerzo y poco beneficio	22. Pruebo cosas nuevas en mi trabajo	13. Lo que da el ganado es mucho más de lo que pierde la tierra	15. Es necesario que me den más subsidios para que mis hijos no tengan que ir a vivir a otro sitio	6. Podría obtener más ganancias de criar ganado sin por ello estropear la tierra	
12. Mis terrenos se están cansando	17. Si tuviera más terreno, le sembraría mataratón o guash en lugar de aumentar mis vacas	5. Con los programas de plantar árboles recibo más dinero por mi trabajo	18. En secas no hay otro remedio que soltar las vacas al monte	25. Puedo ganar más como ganadero si dejo vivir a los otros animales del bosque	9. Me conviene más producir mi propia comida que comprarla	1. En las tierras que trabajo, trabajarán también mis hijos y nietos
23. Prefiero vivir de los subsidios que del trabajo en mis tierras	14. El mataratón y el guash para forraje tardan demasiado en crecer	26. Para excluir una hectárea de mataratón o guash por dos años, necesitaría más terreno del que tengo	3. Lo que más me interesa de los programas es lo que aprendo para ganar más dinero	19. Con más capacitación, podría mejorar mucho mi trabajo con el ganado	10. Conservar el bosque es responsabilidad del dueño del terreno	24. Necesito mejorar mis potreros porque si no se acabará el alimento para mis vacas en unos años

1. Correlation matrix between Q-sorts

Correlation matrix between respondents 25 to 29
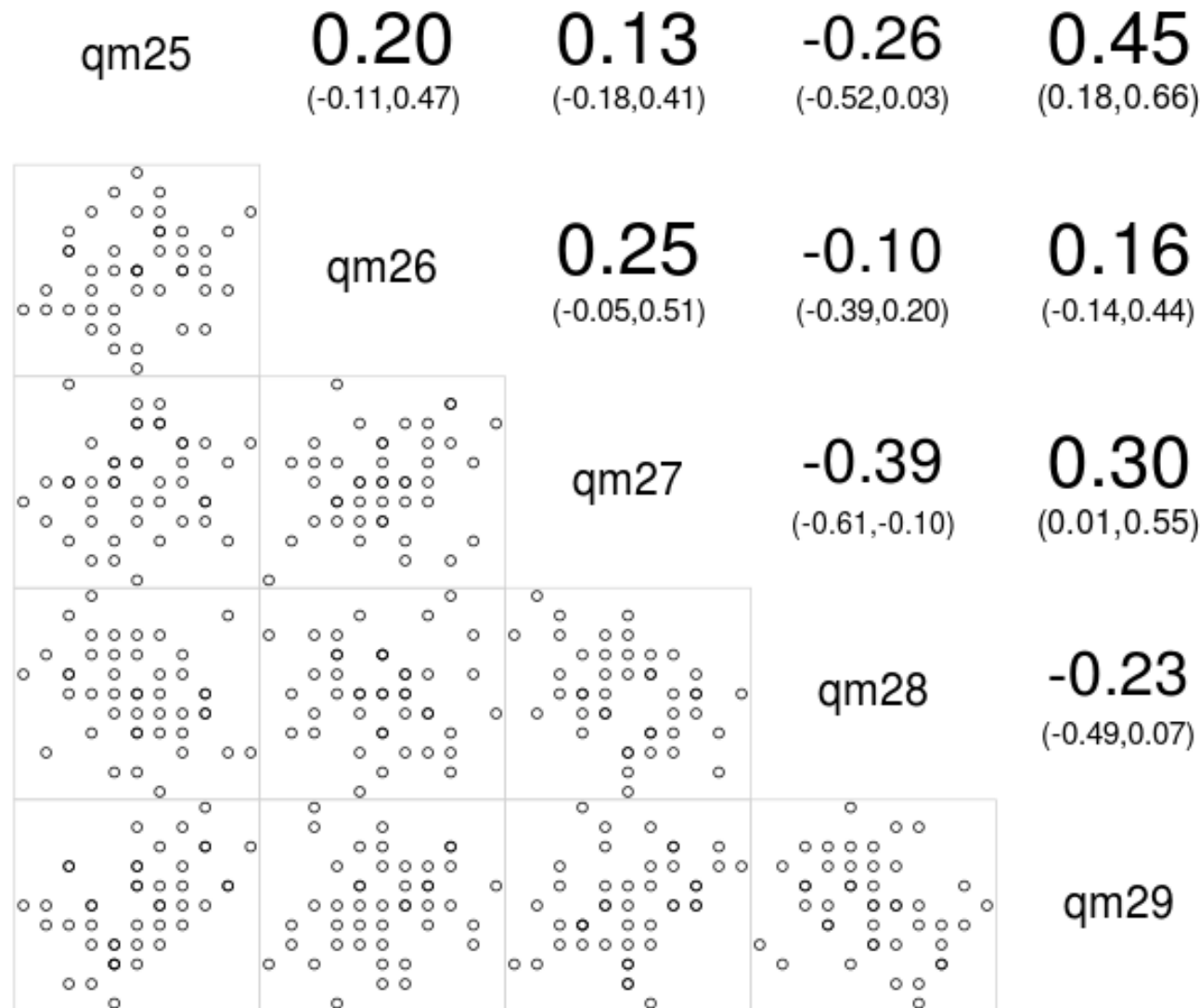
1. Correlation matrix between Q-sorts

Our example

	V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	1.00	0.19	0.16	0.25	0.15	0.29	-0.02	0.29	0.35
V2	0.19	1.00	0.11	0.30	0.14	0.40	0.26	0.26	0.26
V3	0.16	0.11	1.00	0.03	-0.08	0.34	0.15	0.06	0.19
V4	0.25	0.30	0.03	1.00	0.34	0.11	0.31	-0.09	0.34
V5	0.15	0.14	-0.08	0.34	1.00	0.23	0.05	0.11	0.05
V6	0.29	0.40	0.34	0.11	0.23	1.00	0.00	0.42	0.21
V7	-0.02	0.26	0.15	0.31	0.05	0.00	1.00	-0.20	0.23
V8	0.29	0.26	0.06	-0.09	0.11	0.42	-0.20	1.00	0.23
V9	0.35	0.26	0.19	0.34	0.05	0.21	0.23	0.23	1.00

Method for the extraction of factors

- Centroid factor extraction VS Principal Components analysis
- This results in *unrotated* factor loadings

Our example of unrotated factor loadings:

|	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6	Comp.7	Comp.8	Comp.9
V1	-0.38	0.15	-0.09	-0.54	0.22	-0.46	0.51	0.02	-0.09
V2	-0.41	-0.07	0.01	0.38	-0.51	-0.43	-0.12	-0.19	-0.44
V3	-0.23	0.09	0.63	0.15	0.55	0.05	-0.14	-0.41	-0.13
V4	-0.34	-0.48	-0.24	-0.14	0.12	-0.21	-0.43	-0.22	0.54
V5	-0.24	-0.13	-0.63	0.28	0.41	0.36	0.13	-0.09	-0.36
V6	-0.42	0.32	0.06	0.39	0.16	-0.06	-0.07	0.66	0.30
V7	-0.18	-0.56	0.30	0.20	-0.17	0.24	0.62	0.04	0.21
V8	-0.30	0.53	-0.13	-0.02	-0.33	0.36	0.14	-0.47	0.37
V9	-0.40	-0.12	0.17	-0.51	-0.21	0.48	-0.31	0.28	-0.31

How many factors

- Why do we need to decide how many?

  – *How many slices does the cake have?*

  – *What is an acceptable number of slices?*

- What **criteria**?

  1. Eigenvalues (higher than a threshold, e.g. Kaiser Gutman criterion EV > 1) and screeplot

  2. Total variance explained

  3. Two or more Q sorts with significant loading.
     PQMethod uses this to 'flag' Q sorts in its automatic mode

     Threshold for significant loadings at 0.01 = 2.58 * (1 + sqrt(y))
     – y being the number of statements

  4. (A factor for every 6-7 respondents)

  5. Your knowledge of the case, and your expectation based on the research question

  6. Parsimony and interpretability

Screeplot

eigenvalues / factors
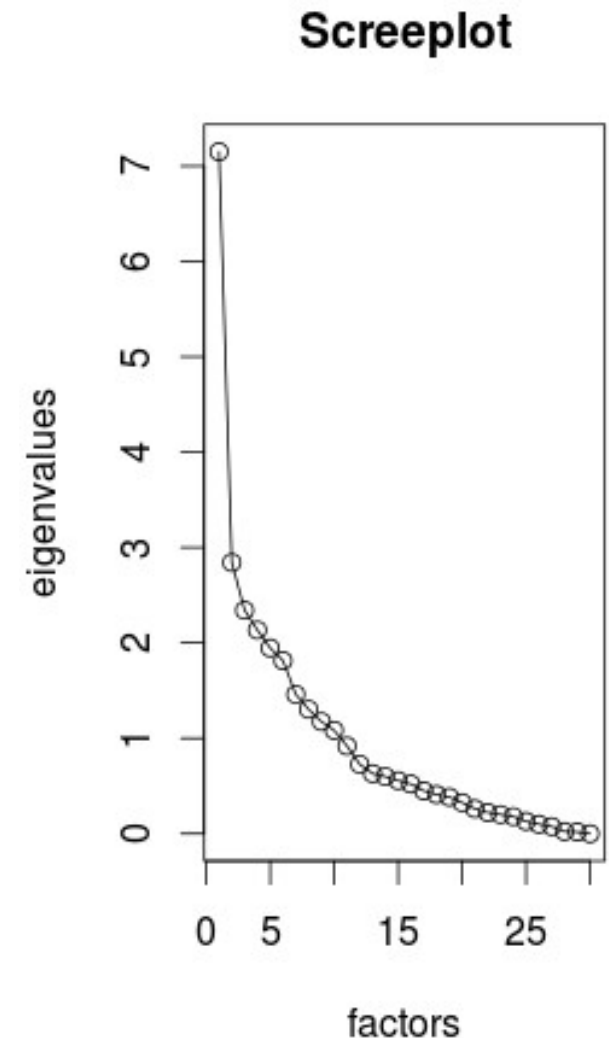
Method for rotation

- Why rotate?
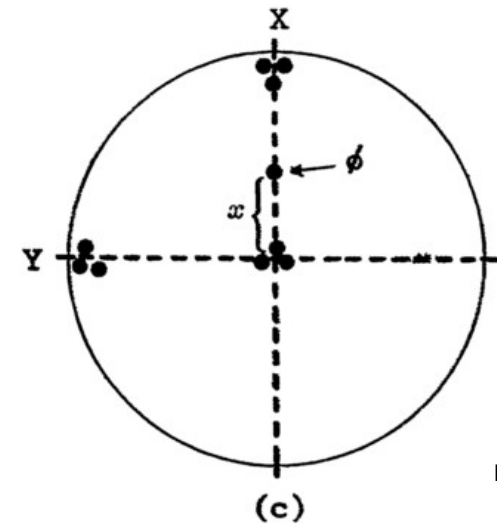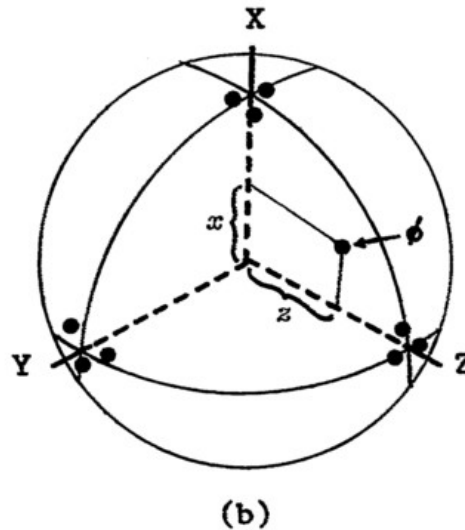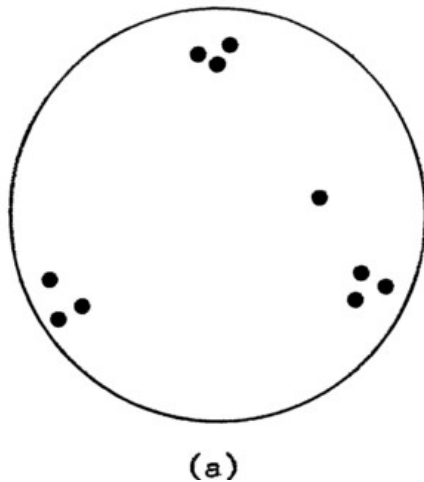
Brown, 1980

- Different methods:
  - Theoretical / manual
  - Mathematically optimal, e.g. varimax
- Criteria to choose
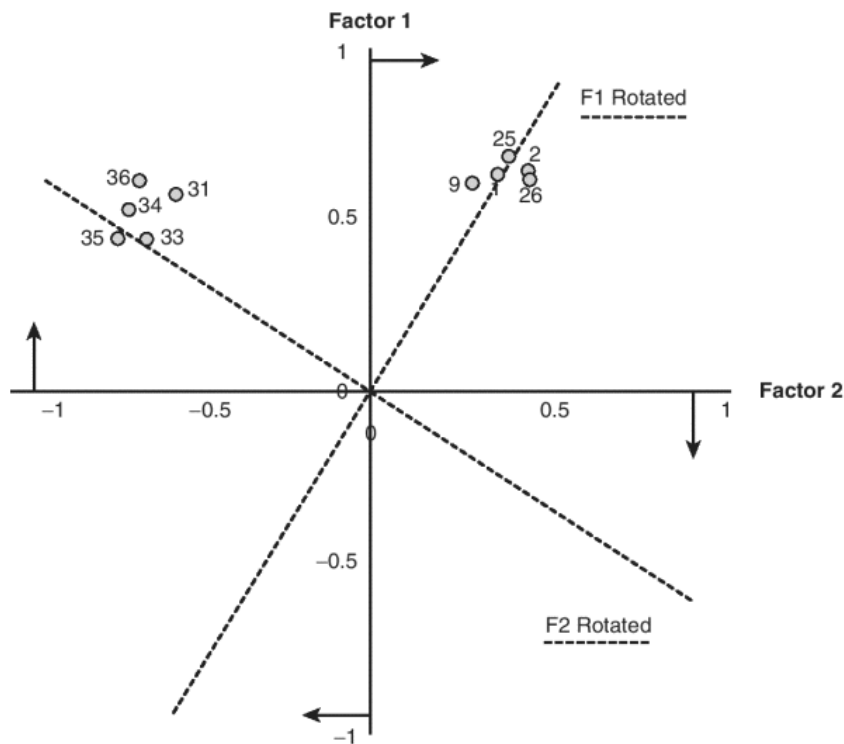
Rotation: example of two factors

Figure 6.3 Example factor rotation of Factors 1 and 2. Factors 1 and 2, indicated by the bold axes, have been rotated clockwise about the origin of the axes into more favourable positions, indicated by the dotted axes labelled F1 Rotated and F2 Rotated. F1 and F2 Rotated now offer the best possible viewpoints from which to see (and understand) the respective viewpoints of our two distinct groups of example Q sorts.
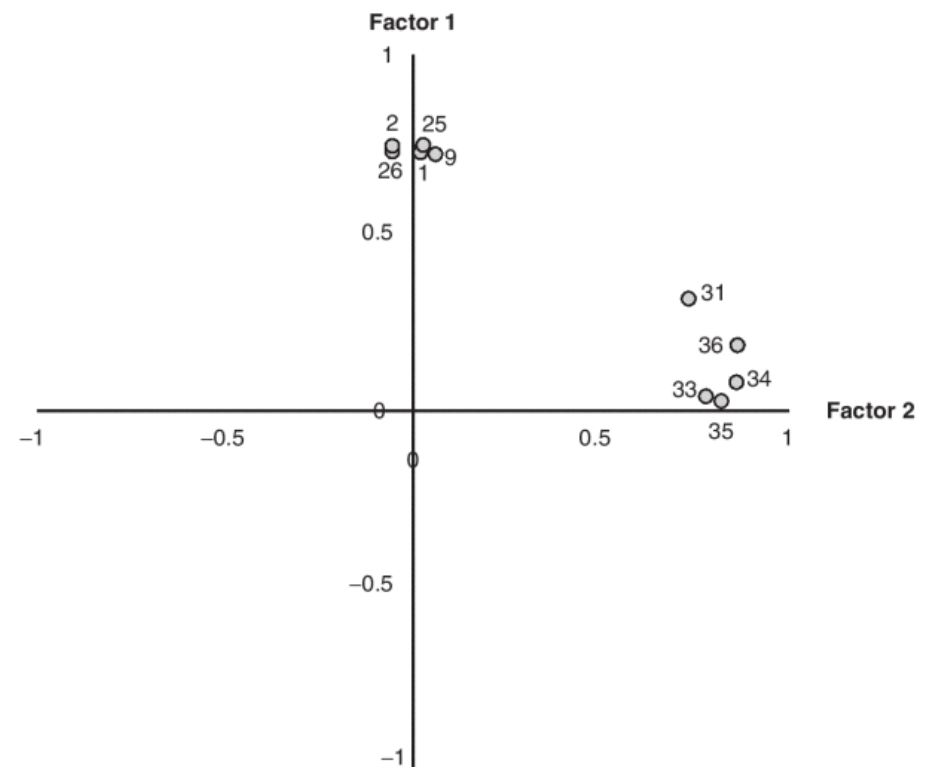
Figure 6.4 Completed rotation of Factors 1 and 2. Notice that the viewpoint of Factor 3 has, because of the orthogonal nature of the rotation process, also been rotated through 180 degrees, along with Factor 2. As a result, we are now effectively looking at our data from behind Figure 6.3.

Stenner & Watts, 2012

3. Results for Q-sorts

- **Factor loadings**: correlate Q sorts with each factor

- *Useful for posterior studies which relate perspectives with observable characteristics of the participants*

Our example:

	f1	f2
V1	0.60	0.20
V2	0.49	0.44
V3	0.37	0.13
V4	0.10	0.80
V5	0.22	0.35
V6	0.78	0.07
V7	-0.16	0.74
V8	0.77	-0.26
V9	0.44	0.48

4. Flagging Q-sorts

- To select which ones are most representative of the factors

- Subsequent computations take into account only those Q-sorts flagged

- *Automatic* or *manual*

Rotated factor loadings:

Our example:

```
Q-sort factor loadings
(* indicates flagged Q-sorts) :
```

	flag_f1	f1	flag_f2	f2
V1	*	0.60		0.20
V2	*	0.49		0.44
V3	*	0.37		0.13
V4		0.10	*	0.80
V5		0.22	*	0.35
V6	*	0.78		0.07
V7		-0.16	*	0.74
V8	*	0.77		-0.26
V9		0.44	*	0.48

5. Results: statement scores

- Statement **z-scores**: correlate statements with each factor

- Statement **factor scores *(or factor estimates, or factor array)*:** the z-scores matched to the scores in the distribution

	Statement	z-scores		Factor score	
		F1	**F2**	**F1**	**F2**
1	When I think about what I did yesterday, my mind sees words as opposed to pictures.	-1.36	-1.28	-4	-2
2	When solving problems in a group, I am likely to think of the solution in term of possible consequences or applications.	0.97	-0.02	2	0
3	When I am learning something new, it helps me more to think about it than to talk about it.	-0.46	-1.37	-1	-3

5. Results: from z to factor scores

	zsc_f1		fsc_f1
sta_10	-2.18	sta_10	-4
sta_7	-2.03	Sta_7	-4
sta_16	-1.57	sta_16	-3
sta_3	-1.45	sta_3	-3
sta_8	-1.27	Sta_8	-3
sta_11	-1.12	sta_11	-2
sta_22	-0.64	sta_22	-2
sta_27	-0.60	sta_27	-2
sta_14	-0.57	sta_14	-2
sta_5	-0.54	sta_5	-1
sta_15	-0.45	sta_15	-1
sta_20	-0.30	sta_20	-1
sta_31	-0.24	sta_31	-1
sta_29	-0.21	sta_29	-1
sta_23	-0.06	sta_23	0
sta_2	0.00	sta_2	0

z-scores

Factor scores

6. Distinguishing and consensus statements

- **Distinguishing** and **consensus** statements

Statement		z-scores		Factor score		Distinguishing & consensus		
		F1	F2	F1	F2	z-score difference		Significance
1	When I think about what I did yesterday, my mind sees words as opposed to pictures.	-1.36	-1.28	-4	-2	0.08		Consensus
2	When solving problems in a group, I am likely to think of the solution in term of possible consequences or applications.	0.97	-0.02	2	0	0.98	**	Distinguishing
3	When I am learning something new, it helps me more to think about it than to talk about it.	-0.46	-1.37	-1	-3	0.91	**	Distinguishing

Practical

- Download the file from
  http://aiorazabala.net/learnQ/demo/data/Q_method_demo_1_0.csv

- In R or a spreadsheet, select only the data corresponding to the Q-sorts: columns **sid** and **s1** to **s44** and save the file

- Open R in your computer (and connect to Internet)

- Copy and paste the following code:

```
source("http://aiorazabala.net/Qworkshop/
qmethod-gui-install.R")
```

- A browser window will open with the visual interface

- Follow the instructions (upload the *.csv)

To restart the application

- If the browser window closes, or if you want to restart the application, copy and paste:

  `runApp("qmethod-gui")`

To open the application next time

- To open the application another day, you can repeat the above or do it all offline (locally):
  - Open R, and copy & paste the following code:

    ```
    setwd("C://Mypath")
    library(shiny)
    runApp("qmethod-gui")
    ```

    - Replace '*Mypath*' with the location of the folder *qmethod-gui* on your computer,
      - e.g. if the location is *C://My Documents/qmethod-gui/* :

        ```
        setwd("C://My Documents")
        ```

7. Results: general factor characteristics

- Some general numbers about the study:
  - **Cumulative explained variance**
  - Correlation between factor scores
  - **Number of defining variables**
  - Standard Error of factor scores
  - Standard Error for differences

Interpretation

- Look at the table with all the statements and the factor arrays

- Reconstruct how the perspective sorted the statements; e.g. rebuild the pyramid, by looking at the factor scores of each factor

- Identify the distinguishing statements

- If your set of statements was *structured* (by subtopics) look at each group of statements. Do the perspectives agree on the subtopics? Are they contentious?

Interpretation: a suggested approach

- For each factor:
  - Identify the statements **in the extremes**
  - Identify the statements which rank **lower and higher than in other factors**
  - Ask yourself: ***Why** are these statements there?* --get a sense of the general story
  - Build '**the story**': describe the perpective, discourse etc. Represented in that factor
  - Add the demographic/ **background information** gathered at the beginning, to help complete the story: *Are all Q sorts in factor one from a given gender?*
  - Look through **other statements** that were not identified above: those in the centre, others that were not in the extremes but are distinguishing,...
  - Use the **qualitative comments** written by participants about their responses

Reporting

- Brief mention to the method, and reference to one of the many works that describe it in detail
- Research design:
  - **Process of selection of the statements and if there is any structuring**
  - **Number of statements**
  - Distribution shape, and forced/non-forced
  - **Number of participants and form of selection**
  - Administration: format and condition of instruction

- Analysis:
  - **Method for extraction**
  - **Number of factors extracted**
  - **Method of rotation**
  - Number of Q sorts flagged in each factor
  - Number of Q sorts not loading on any factor
  - Software used
- Results:
  - Factor loadings (non-essential)
  - A table with statements' results, either z-scores or factor scores, and indication of which ones are distinguishing and consensus
- Interpretation: description of each of the perspectives, with a name for them

An example of interpretation

Table 2

Statements sorted by participants, and the idealised sorting pattern (from −4 to +4) for each factor.

Statement	Idealised sort pattern		
	1	2	3
1. Geoengineering is about fruitlessly trying to solve problems with the same mind-set that created them: attempting to control nature.	−3	−4	2
2. Geoengineering can only ever be fundamentally undemocratic.	−2	−1	1
3. The risks of not doing geoengineering research outweigh the risks of doing it.	3	2	−2
4. Hasty pursuit of international regulation of geoengineering risks lock-in to commitments that might soon be regretted, such as a total ban on research or testing, or burdensome vetting of even innocuous research projects.	1	3	−2
5. Calls for more science on geoengineering don't really make sense: full trials are unethical and small scale experiments are pointless (since any impacts are drowned in the noise of global weather).	−4	−3	2
6. We might once have trusted nature to look after the environmental regulation, but not any more: like it or not, we are the planetary maintenance engineers.	1	3	−2
7. Deliberate geoengineering of the climate has been happening for decades; the current suggestion that it's all about dealing with climate change is just a front intended to legitimise on going activities that have other motivations.	−4	−2	0
8. One of the central motivations for the growing interest in geoengineering research is the potential for strategic military applications of these technologies.	−4	−2	1
9. The belief that technological solutions can be found to social problems, and to problems arising in earlier technological development, is a dangerous illusion which fails to address political and social drivers and implications.	−1	−1	3
10. Geoengineering is a bit like chemotherapy: the decision to undertake it would be difficult, but it could turn out to be the least bad option we are going to have.	2	1	−3
11. Carbon emissions will never be reduced to zero because this would require a complete change in the way humans are.	0	2	0
12. At the very least, we need to do more research in order to learn what approaches to avoid even if we become desperate.	4	2	0
13. It is inappropriate to make geoengineering research decisions subject to 'upstream engagement' or public control.	−2	0	−4
14. Geoengineering is the most revolutionary and potentially valuable new idea in climate policy today.	−3	2	−1
15. Geoengineering is potentially the key to unlock the mitigation puzzle: a way of controlling climate risks during the many decades that it will take to transform the global energy system.	0	1	−3
16. The idea of actually deploying a geoengineering system would be very controversial, but the narrower question of a research programme should not be.	3	−1	−1

Example: Cairns and Stirling on framing geoengineering (*Global Environmental Change*)

A B S T R A C T

'Climate geoengineering' is becoming an increasingly prominent focus for global discussion and action. Yet, in academic, policy and wider political discourse, the frequent shorthand term 'geoengineering' is routinely used in very broad, ambiguous and multivalent ways. This study aims to contribute to understandings of these divergent current framings of 'geoengineering' and their implications. It asks not only about disparate understandings of geoengineering itself, but also what these reveal about deeper political dynamics around climate change, science and technology. To this end, the paper applies Q methodology to analyse geoengineering as a subjective discursive construct, the bounds of which are continually negotiated and contested. Thirty-five participants from a variety of political and institutional backgrounds in the UK, US, Canada and Japan undertook a 'Q sort' of 48 statements about geoengineering between December 2012 and February 2013. Four distinctive framings emerged from this analysis, labelled: 'At the very least we need more research'; 'We are the planetary maintenance engineers'; 'Geoengineering is a political project'; and 'Let's focus on Carbon.' Results indicate a strong polarity around divergently construed pros and cons of geoengineering as a whole – underscoring the political salience of this term. But additional axes of difference suggest a more nuanced picture than straightforward pro/anti-positioning. The ambiguity of the term is argued to offer interpretive flexibility for articulating diverse interests within and across contending framings. The paper questions whether increasing terminological precision will necessarily facilitate greater clarity in resulting multivalent governance discussions and public engagement. It argues that the merits of any given form of precision and their policy implications will depend on particular framings. Much ambiguity in this area may thus be irreducible, with the challenges lying perhaps less in the ordering of discourse and more in reconciling the wider material political pluralities that this suggests.

The process at a glance

A. Research question

B. Q-set – statements

C. Shape of the distribution

D. Condition of instruction

E. P-set – participants

F. Piloting

G. Administering

H. Data introduction

I. Analysis (the number of typologies and other analytical decisions)
- Method for factor extraction
- How many factors?
- Method for rotation
- Results:
  - Q sort factor loadings,
  - statements scores
  - distinguishing and consensus statements

J. Interpretation

K. Write up and reporting

Questions?

Slides and handout in
http://aiorazabala.net/learnQ

Further **bibliography** in the handout

Send me an email:
az296@cam.ac.uk
aiora.zabala@gmail.com

Thank you

Aiora.Zabala@gmail.com

Some additional slides on using **PQMethod** software

http://schmolck.userweb.mwn.de/qmethod/

PQMethod: the files of a project

- ***.dta**

  – contains Q sort data, one Q sort per row

- ***.sta**

  – contains statement data, one statement per row

- ***.lis**

  – full report of the analysis

PQMethod: introducing data

- Open ***PQMethod.exe***, and when prompted type:

  `Enter [Path and] Project Name:`
  - **`Projects/yourproject`**

- Introducing data:
  - One by one, using:

    `1- STATES` and `2 - QENTER`
  - Directly typed in the files using a plain text editor

- Check the status of a project:

  `2 – QENTER`

  then

  `Q – to query the status...`

```
1 - STATES    - Enter (or edit) the file of statements
2 - QENTER    - Enter q sorts (new or continued)
3 - QCENT     - Perform a Centroid factor analysis
4 - QPCA      - Perform a Principal Components factor analysis
5 - QROTATE   - Perform a manual rotation of the factors
6 - QVARIMAX  - Perform a varimax rotation of the factors
7 - QANALYZE  - Perform the final Q analysis of the rotated factors
8 - View project files hall.*
X - Exit from PQMethod
```

     Last Routine Run Successfully - (Initial)

2

 Checking old input data file ....

Ready to process another sort.
Enter one of the following codes:

A - to add a new sort
C - to change a previous sort
D - to delete a sort
S - to show a previous sort
Q - to query status of this study
X - to exit QENTER (stop entering/changing sorts)

q

Information on current study . . .

Title of Study   --   hall- replication for SSRMC module on Innovative Q

Column Range   --   -5   TO   5

Depth of Columns --   1 2 4 5 6 8 6 5 4 2 1

Sorts Entered   --   30

Press <ENTER> to continue

- Centroid factor extraction VS Principal Components analysis

    3 — QCENT (centroid)

    4 — QPCA   (principal components)

Practical

- Once you have run the full analysis:

  `4 - QPCA`

  `6 - QVARIMAX`

      three factors

      automatic flagging: **F6** to run, **F8** to save, **F9** to exit)

  `7 - QANALYZE`

- Open the file: *C:/.../PQMethod/Projects/***hull.lis**
  with a plain text editor

  – Copy and paste all the text into a word document

  – Change the font type to a monospace one, and adjust the font size (e.g. 6pts?) so that every text line fits in one line