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Q-Methodology

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On Policy Analysis

Positivist Policy Analysis

From an epistemological point of view:

Three cross-cutting and non-exclusive currents can be discerned:

- Analycentrism;
- Neo-positivism;
- Critical rationalism;

Source: J.S. Dryzek (1993), "Policy analysis and planning: from science to argument", in Fischer and Forester (1993), pages 213-232.

Post-positivist turn in policy analysis

- A relativistic policy analysis
- A critical-theoretical approach to policy analysis
- Forensic policy analysis
- Participatory policy analysis
- Argumentative policy analysis

Source: Hoppe, R. (1999). Policy analysis, science and politics: from 'speaking truth to power' to 'making sense together'. Science and public policy, 26(3), 201-210.

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- Default mode:
  - Forensic and/or Participatory Policy Analysis (&Design)
- Creative applications:
  - Post-positivist Argumentative Policy Analysis (& Design)

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Asking questions including:

- *What is the range of communicated ideas in a particular discourse?*
- *What are the prevalent variations in it?*
- *How do these variations logically relate to each other?*
- *…*

While there are more formal ways to express them, these three questions underlie a Q study. It has five major parts:

1. Collecting a discourse from people involved in it;
2. Selecting a sample representative of the range of communicated ideas in the discourse;
3. Selecting respondents from among people involved in the discourse and asking them to arrange the sample of ideas in their preferred order of importance;
4. Formally comparing these arrangements provided by the respondents by factor analysis;
5. Analyzing the results of the factor analysis and other information gathered from the respondents.

In a nutshell- How to apply in 7 Steps

1. Decide on the *(policy relevant)* debate.
2. Construct your concourse *(the universe of most important statements of the debate)*
3. Detect Q participants *(P-Set)*
4. Sample your Q sample statements *(selection)*
5. Design your Q grid *(+5, - 5 is common)*
6. Collect Q-sorts from Q-participants (P-Set) *(face-to-face or online)*
7. Use PQMethod or alternative software and its manual, to analyze these Q-sorts.

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M.Sc. Theses written in the Institute

- Hoeltke J. (2012). **The European Union's Energy Policy – A Challenge to Govern a Complex Transition to Sustainable Energy**. Masters thesis, UNU-MERIT/MGSoG Maastricht University, Maastricht, The Netherlands, 110 pages, Second Reader: René Kemp

- Tasker, A. (2013).**Social Perspectives on Electric Utility Transformation in Massachusetts, USA: A Q- Methodological Study.** Masters thesis, UNU-MERIT/MGSoG Maastricht University, Maastricht, The Netherlands, 98 pages, Second Reader: René Kemp

- Van den Bergh, J. (2017). **Social Perspectives in Maastricht on the Renewable Energy Transition in the Netherlands ~ A Q-Methodological Analysis ~** Masters thesis, UNU-MERIT UNU-MERIT/MGSoG Maastricht University, Maastricht, The Netherlands, 83 pages, Second Reader: Pui-hang Wong

- Droell L. (2017) **Integration through Innovation- Social Perspectives on Refugee Apps in Europe,** Masters thesis, UNU-MERIT/ MGSoG Maastricht University , Maastricht , The Netherlands, 74 pages, Second Reader: Eszter Timar

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- The Q-Methodology is used to provide information about **persons' subjective "viewpoints, opinion, beliefs, attitudes and the like"** (Van Exel, 2005, p.1). It is a tool to combine a qualitative and quantitative assessment. Q-methodology has been primarily utilized in the fields of psychology, sociology, political sociology and political sciences (Durning, 1999).

- The Q-methodology participants are ask **to rank a set of statements** depicting a discussion or topic according to preferences and views **from "most disagree" to "most agree".**

- **The large numbers of statements (Q-Set)** sorted by a rather **smaller number of respondents (P-Set)** enables to assess correlations and similarities, as well as differences in the person's profiles and subjective viewpoints eventually leading to the detection of **specific clusters of subjectivity.**

- Differently said **"the method employs a by-person factor analysis in order to identify groups of participants who make sense of a pool of items in comparable ways"** (Watts & Stenner, 2005, p.68). Subsequently, the identification of patterns suggests "that there are inter-subjective orderings of beliefs that are shared among people" and which give information of social perspectives (Webler et al, 2009, p.7).

- As it is a **by-person factor analysis the Q-methodology allows drawing conclusions from a small sample size, which however must be carefully selected according to its relation to the subject matter.** From this clusters of subjectivity of different stakeholders involved it is hoped to gain information permitting to conclude on the potential policy recommendations.

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- The procedure of conducting a Q-methodology can be differentiated into **five steps** (Van Exel and De Graaf, 2005).

- The first step is **primarily qualitative** and involves **defining the concourse**, namely iterating *the entire universe of a debate as to capture all the ideas and opinions concerning the topic to be investigated*. As aforementioned, *the concourse consists of a vast body of literature that combines old and new media, but can also incorporate aspects that are brought up by the researcher himself* (Donner, 2001).

- From the concourse, **a subset of statements that most comprehensively represented the ongoing debates around a theme, namely the Q-statements**, is derived.

- The following step consists of **determining and selecting the participants for the study, the P-set.** *This consists of identifying the most relevant actors to the research subject who hold sufficient understanding regarding the research topic, as to concisely sort the statements* (Van Exel and De Graaf, 2005).

- In the fourth stage, **the participants are then asked to sort the Q-statements according to their consensus into an inverted pyramidal grid ranging from 'most disagree (-5)', 'neutral' to 'most agree (5)'** *The shape of the grid is noteworthy as it imitates a normal distribution curve of errors and represents a pragmatic way of differentiating amongst statement rankings regarding subjectivities* (Watts and Stenner, 2005).

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Q-Methodology

	Entity/Relationship	Agency	Motivation
Definition	Competitive markets encourage distribution companies to adapt to 21st century electricity innovation Lack of transparency and information prevents markets from generating clear price signals and slows the adoption of distributed energy resource technology	The value of distributed generation to the distribution system implies that interconnection related costs should be borne by the distribution companies The traditional electricity grid is vulnerable to bypass; its importance will diminish as customers seek alternative supply options	Fixed customer charges disproportionately penalize low-income customer Network use charges will more accurately reflect costs and benefits of distributed resources Cost allocation of system upgrades is linked to distributed generation's value to the system

Fact/Opinion; Prescriptive…

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Q-Grid Design

Name:

Organization:

Years of experience in the field of energy:

Please fill in the assigned number of the statements according to your consent with these statement's content.

Most disagree **Most agree**

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

1. Innovation is inhibited by market barriers
2. Member state's achievements with regard to sustainable energy do not diverge noticeably
3. Current energy policy is basically uncoordinated
4. The community method is hampering a transition to sustainable energy

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Q-Methodology

This individual rank-sorting then yields **the so called Q-sorts, which quantitatively 'capture' the respondents view on the statements.**

In the final step, **the Q-sorts are subject to a factor analysis, which enables identifying patterns of similarities and differences amongst the various Q-sorts and thus viewpoints of participants. The factor analysis yields three basic outputs.**

1. Firstly, **as all Q-sorts are correlated against each other, the factor analysis enables the identification of clusters of participants whose sorts are significantly correlated with one another.** The resulting clusters of people that sorted their statements likewise therefore form a common perspective on the elaborated subject referred to as factor or **simply perspective.**

2. Secondly, **for each detected subgroup of participants, those statements that are attributed a value that significantly differs from the value that other subgroups have typically attributed to the same statement, are drawn out as distinguishing statements**. Those distinguishing statements form the analytical basis upon which the different perspectives are discerned. Normalized factor scores list all the statements in descending order of ranked importance, for each subgroup. The Z-scores reveal how far from the overall mean (measured in standard deviations) each item is for the group (Donner, 2001, p. 34).

3. **The final output reveals the areas of consensus amongst the different subgroups. The area of consensus is of particular value to putting forth policy recommendations, as it embodies a progressive and inclusive way of providing insight for a political or policy decision** (Durning, 1999).

Q-Methodology

- In the preparation phase, *while covering step 1 and 2, the concourse and the inherent statements are determined and collected.*
- The concourse will *consist of verbal statements that are extracted from the range of literature that was used in the literature review to answer the research question. Different kinds of statements both positive and negative in nature are collected that are typical and significant within the discourse around the debate.*
- These statements are then selected by their operant nature as either being descriptive, prescriptive or reflecting a certain opinion.
- The final number of statements is determined e.g. 47 - balanced in a way that a wide range of opinions and arguments are incorporated in order to guarantee representativeness of the debate (Van Exel, 2005, p.8; Watts & Stenner, 2005, p.75).

Q-Methodology

- In step 3 the P-Set which describes the groups of respondents is selected. The P-Set ideally "is a structured sample of respondents who are theoretically relevant to the problem under consideration" and thus "may define a factor" (ibid, p.6).
- As said the P-Set may not consist of many people, should be smaller than the number of statements and commonly approximates a ratio of 1:3 or at maximum 1:2 in relation to statements (Webler et al, 2009, p.10).
- Normally, an adequate ratio is perceived 3:1 suggesting that in light of the Q-Set encompassing e.g. 47 statements, the ideal number of participants amount to around and above, at least 15 (ibid).

Q-Methodology

- On P-Set
- *Please approach to a high number of people, reason originated from a rather realistic assumption that the majority of people will not be willing to spend the time doing the Q-sort as approximately 30 minutes are needed to sort the statements*.

Q-Methodology

- Step 4 is the conduct phase in which the actual Q-sorting takes place.
- The participants (P-Set) can be provided with *an introductory text shortly explaining what their Q-sorts are used for, as well as they should be informed of the research question which is crucial to explain the nature of the Q-sorting* (Watts & Stenner, 2005, p.75).

Q-Methodology

- Subsequently, each individual in P-Set is asked to rank statements according to a provided normal distribution scheme ranging from 'most disagree' (-5) to 'most agree" (+5)
- *To facilitate the procedure, it is suggested to begin with a rough sorting of the statements they generally agreed to, those they were undecided or neutral about and those they generally disagreed to. Then they are solicited to proceed by picking two statements they most agreed to from the 'agree batch' and continued until all slots were filled in.*
- *After having finished the sorting procedure they are furthermore requested to comment on the two statements they agreed most and respectively two statements they disagreed most with*.

Q Sorts									*Demographics*
−4	−3	−2	−1	0	+1	+2	+3	+4	(*Nationality*, sex, age, party, philosophy, social class, mean differences, probability of *t*)
16	17	3	1	2	6	13	14	27	1. *United States*, female, 22, Independent, liberal, middle class, 0.37, $p = 0.652$
20	18	5	8	4	11	22	21	33	
	30	31	10	7	12	28	23		
		32	15	9	24	29			
			19	26	25				
9	4	18	1	2	7	5	6	13	2. *United States*, male, 28, Democrat, liberal, working class, 0.37, $p = 0.652$
30	16	19	3	10	8	11	21	33	
	32	22	12	17	15	25	28		
		31	14	20	23	27			
			29	24	26				
7	8	2	5	6	9	1	12	4	3. *United States*, male, 23, Independent, liberal, upper-middle class, 2.06, $p = 0.006$
10	11	3	18	15	19	14	13	32	
	16	22	28	20	21	17	26		
		25	30	23	27	24			
			31	29	33				
10	3	8	4	9	2	18	1	19	4. *United States*, male, 49, Republican, liberal, upper-middle class, 1.70, $p = 0.025$
16	7	14	5	12	22	28	6	21	
	15	20	11	25	23	30	13		
		24	17	29	26	32			
			27	33	31				
1	24	18	2	12	5	8	3	7	5. *Japan*, male, 23, Democratic Socialist, moderate liberal, old aristocracy, −2.31, $p = 0.002$
9	25	19	4	15	6	11	14	10	
	26	30	13	17	23	16	27		
		32	21	20	29	22			
			33	28	31				
15	2	7	12	3	1	25	4	6	6. *Canada*, female, 62, Conservative, conservative, middle class, −0.97, $p = 0.216$
24	22	9	17	8	11	26	5	28	
	33	10	20	14	13	30	16		
		21	23	18	19	32			
			29	27	31				
15	8	3	7	2	4	1	17	16	7. *England*, female, 29, Labour, liberal, upper-middle class, −0.73, $p = 0.639$
24	23	21	10	5	6	14	25	28	
	29	26	12	9	11	18	32		
		33	22	19	13	20			
			31	27	30				
5	4	1	8	3	11	2	23	6	8. *United States*, male, 28, Democrat, anarchist, lower-middle class, 0.97, $p = 0.216$
27	19	30	9	7	13	21	24	15	
	25	31	10	16	18	22	28		
		32	12	17	20	33			
			14	29	26				
5	6	9	15	3	2	7	1	14	9. *France*, male, 21, *Republicain*, liberal, upper-middle class, −0.12, $p = 0.874$
28	22	12	18	10	4	8	21	33	
	23	16	27	11	13	17	31		
		24	30	26	20	19			
			32	29	25				

Q-Methodology

- The data of the Q-sorts is analysed by using the free software package PQMethod::
- & Q-methodology site:

https://qmethod.org/

- & Software option:

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

- &Video playlist: from concourse to interpretation :

https://www.youtube.com/watch?v=Hb8y7JzR4zs&list=PLDCNyWYkp3IbuN4JbQg4E9h5FWohV9ZPk

Q-Methodology

- After having entered all the information regarding the constitution of the normal distribution scheme and the statements, a by-factor analysis is performed by using both factor extraction methods of centroid and QPCA and the automatic rotation function *varimax*.
- Centroid is used in order to gain a first correlation matrix between the Q-sorts based on unrotated factor-analysis.
- Also it provides information on by-default set: seven unrotated factors with indication of their correlation with Q-sorts, **their "Eigenvalues"** and their percentage explanation of variation

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- The alternative function to centroid i.e. QPCA was used that allowed a principal components analysis.
- QPCA differed from centroid with regard to the size of Eigenvalues.
- Which function to use is said to be a matter of taste whereby both functions produce solid results (Watts & Stenner, 2005, p.81)
- Based on the centroid unrotated factor analysis a varimax factor rotation can be done in order to **reveal factors that are standing for a certain perception or viewpoint of a group of respondents (factors are more or less cluster of viewpoints**).
- Varimax factor rotation is often used instead of manual rotation because **varimax maximizes the variance between each of the factor, "adjusting the weight given to each element of each factor"** (Schmolk, 2012, p. 32).

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- The Eigenvalue of a factor is the sum of squared factor loadings for that factors (Watts & Stenner, 2005, p.87
- In order to *interpret the filtered factors and describe the perspective they are revealing* , it is important to have a look at the *factor scores i.e. the normalized weighted average statement score of participants that define that factor* (Van Exel, 2005, p.9)., 2005, p.87)
- Two levels of statistical significance of distinguishing statements are represented, (*) meaning $p<0.05$ and (**) referring to statements with a statistical significance of $p<0.01$.

Examples

Figure 7: *QPCA Unrotated Factor Analysis*

Eigenvalues		As Percentages	Cumul. Percentages
1	5.9712	39.8079	39.8079
2	2.2411	14.9410	54.7489
3	1.2027	8.0183	62.7672
4	1.1272	7.5147	70.2819
5	0.9327	6.2183	76.5001
6	0.7963	5.3086	81.8087
7	0.6605	4.4034	86.2120
8	0.5402	3.6015	89.8136
9	0.4155	2.7703	92.5838
10	0.3627	2.4183	95.0021
11	0.2627	1.7512	96.7533
12	0.2078	1.3856	98.1389
13	0.1310	0.8732	99.0121
14	0.0913	0.6087	99.6208
15	0.0569	0.3792	100.0000

Examples

- In determining the appropriate number of factors, the Horst-centroid method can be utilized.
- This method determines when to stop extracting (unrotated) "according to what Horst(1965) suggested as the limiting level of residual correlations (average r2< 1/NITEMS) (Schmolk, 2012).

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Examples

Figure 8: *Factor Matric with an X Indicating a Defining Sort*

Factor Matrix with an X Indicating a Defining Sort				
	Loadings			
QSORT	1	2	3	4
P1	0.0231	0.5330 X	0.1686	-0.1115
P2	0.0707	0.3469	0.8111 X	0.0544
P3	0.3921	0.1587	0.7635 X	0.0391
P4	0.2496	0.0671	0.7413 X	-0.1465
P5	0.3699	0.8085 X	-0.0946	-0.0041
P6	0.2908	0.8846 X	0.1265	0.0203
P7	0.7211 X	0.0954	0.3828	0.2253
P8	0.6469 X	0.0859	0.5375	0.1166
P9	0.4327	0.1644	0.2721	-0.6492 X
P10	0.8730 X	-0.0012	0.0866	-0.0470
P11	0.7974 X	0.1543	0.2941	-0.0700
P12	-0.1279	0.6706 X	0.2595	0.2201
P13	-0.0846	0.7944 X	0.2476	0.0442
P14	0.3499	0.4193	0.6233 X	0.0854
P15	0.2763	0.1467	0.1396	0.7513 X
% expl. Var.	21	21	20	8

Figure 9: *Correlation Between Factor Scores*

Correlation Between Factor Scores				
	1	2	3	4
1	1.0000	0.2832	0.5439	-0.0029
2	0.2832	1.0000	0.4626	0.0552
3	0.5439	0.4626	1.0000	0.0089
4	-0.0029	0.0552	0.0089	1.0000

By performing an "automatic pre-flag" cases , that loaded cleanly into a factor were identified. The affiliation of participant R6 was manually added to Factor 5, following Schmolck's guideline that "the minimum threshold for loading on a group is just about 0.50 or -0.50" (Schmolk, 2012, p. 33)

Examples

- The idealized Q-sorts serve as a first glimpse into the different social perspectives.
- Idealized Q-sorts help interpret the filtered factors and describe the differing social perspectives with the help of the normalized weighted average statement score of participants that define that factor (Van Exel, J. & De Graaf, G. 2005, p.9).
- Idealized Q-sorts, thus, *represent how a respondent that would 100% load into one factor, would have structured the sort.*
- Additionally, the table provides information on both the *characterizing* statements of each factor and the distinguishing statements for each factor.
- Characterizing statements refer to statements belonging to a value of -5, -4, 4 and 5.
- Distinguishing statements refers to the magnitude of difference between the score of statements on factors, for it to be statistically significant (ibid. p.9). Two levels of statistical significance of distinguishing statements are represented, (*) meaning $p<0.05$ and (**) referring to statements with a statistical significance of $p<0.01$.

Figure 10: Idealized Q-sorts

Factor Q-Sort Values for each Statement	Factor Arrays			
No. Statement	1	2	3	4
1. The role of the government in the renewable energy transition is to facilitate a level playing field	-3	0	3**	0
2. Technological improvements in the renewable energy sector facilitate job creation	3**	0	0	-1
3. Dutch society is moving towards an energy system in which the role of renewable energy is dominant in (…)	0	-3	1	-3
4. The Dutch government should intensify the use of Public-Private Partnerships (PPPS) to create a (…)	4	4	3	1*
5. Companies and institutions causing CO2 emissions have no real incentive for change	-1	-1	-5**	-1
6. The national energy system will transform from a top down energy market into an energy market where (…)	2*	-3**	-1	0
7. The current energy system is unable to support long-term energy security	-1	-1	3*	0
8. Networks open-up policy making in transition management to groups who would otherwise (…)	1	3	1	3
9. The construction of wind-turbines in Maastricht will hinder air traffic (…)	-3	-2	-2	-1
10. Biomass should be the main renewable energy source in the Netherlands	-4	-4	-1	-1*
11. Gas production should continue until a stable 'web' of	-3**	0	0	2

Figure 14: Factor Z-Scores & Q-sort Values Distinctive Statements for Factor 4

	Statement	Factor Z-Score	Q-Sort Value
S25	Cooperative networks of actors are suited to lead the renewable energy transition	2.53	5
S16	Utility companies should charge higher prices the longer the distance between the location of production and the end consumer, to promote the integration of decentral renewable energy-sources	1.72	5
S28	A fully independent generation of energy by local generators is a prerequisite for a good transition to energy from renewable sources	1.12	3
S34	The negative effects of gas-production in Groningen (earthquakes) are disproportionately higher than the financial gains for the Dutch society	1.10	3
S36	Civil society organizations are not active in the renewable energy transition	0.69	2
S18	CO2-emission is an environmental problem that effects the Netherlands today	-0.60	-2

Z-scores may also be positive or negative, with a positive value indicating the score is above the mean and a negative score indicating it is below the mean. Positive and negative scores also reveal the number of standard deviations that the score is either above or below the mean

A Z-score is a numerical measurement of a value's relationship to the mean in a group of values. If a Z-score is 0, it represents the score as identical to the mean score.

Figure 15: Consensus Statements by Sort Value per Factor

	Consensus Statement	Q-SV Factor 1	Q-SV Factor 2	Q-SV Factor 3	Q-SV Factor 4
S8	Networks open-up policy making in transition management to groups who would otherwise not have a voice	1	3	1	3
S9	The construction of wind-turbines in Maastricht will hinder air traffic for the Maastricht Aachen airport	-3	-2	-2	-1
S24	Civil society and universities should work together to accelerate the renewable energy transition	1	2	0	1
S27	The Netherlands should keep a wide playing field of renewable energy sources	2	4	3	2
S33	Energy producing companies are positioned to act as a financing agent for renewable energy supply projects	1	0	0	2
S46	Throughout the transition, the current energy infrastructure in the Netherlands remains intact, but final energy fuels will be both renewables and 'clean' fossil fuels	0	-1	1	1

Note: (1) Consensus statements are those statements that do not distinguish between any pair of factors. (2) Highlighted statements (24, 33 & 46) are significant at $P > .05$.

Post-analysis

- *Interpretative efforts towards policy*
- *Designing a step-wise policy agenda*

References

- Visit Q-methodology site, https://qmethod.org/
- Software option: http://schmolck.userweb.mwn.de/qmethod/#PQMethod
- Video playlist: from concourse to interpretation :
- https://www.youtube.com/watch?v=Hb8y7JzR4zs&list=PLDCNyWYkp3IbuN4JbQg4E9h5FWohV9ZPk
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Thank you for your attention!

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