

The differences in decision-making styles in the Croatian student population of military and nonmilitary studies

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Abstract. *Decision-making styles are the ways in which people make decisions. There are many approaches to analyse (dominant) decision-making styles. Some of them are more focused on the number of members involved in the decision process. In contrast, others are more focused on the way of thinking, the tolerance of uncertainty in the decision process, or the amount of information used in the process. In the theoretical part of this paper, we present several approaches to studying decision-making styles. In the practical part, we present the research results on the (dominant) decision-making styles of Croatian students, obtained using the Scott&Bruce instrument and the Rowe instrument. Some students are in the military field (army studies in Zagreb and navy studies in Split), while others are in the field of social sciences (studies of economics in Varaždin and ICT studies in Rijeka). After the data (demographic data and data related to the two instruments) were collected, descriptive statistics, t-tests with one-way ANOVA and χ^2 test were used in the analysis. In most cases, the differences in using certain decision-making styles (by both instruments) between groups considering demographic data were not confirmed. However, the analysis showed that the military students are less prone to use avoidant style than the nonmilitary students. Also, the military students more often apply conceptual style than non-military students.*

Keywords. Decision-making styles, military students, ICT students, economics students

1 Introduction

The decision-making style can be described as a habitual pattern which individuals use in decision making (Scott & Bruce, 1995). Generally, decision-making styles can be defined as the ways in which people make decisions. Many researchers have been studying this field to describe how people make decisions and how to determine which decision style is the most appropriate in a specific situation. In general, we can say that each style has advantages and

disadvantages—more precisely, while one decision style can be appropriate in one case, it can be inappropriate in a different situation.

Authors varied in their approaches to investigating decision-making styles. While some of them were more focused on the number of people engaged in the decision making process, others were focused on the way of thinking, the tolerance of uncertainty in the decision process or the amount of information used in the process.

This paper is organized as follows: Section 2 presents a short overview of approaches in decision-making-style analysis. Section 3 offers some current instances of research where different instruments for determining the dominant decision-making styles were applied. Section 4 presents the research methodology of dominant styles in Croatian military and nonmilitary student populations. Section 5 presents the research results. Finally, Section 6 delivers the final remarks about the topic.

2 The overview of approaches in decision-making styles analysis

2.1 Basic classification of decision-making styles

When discussing decision styles, we start with the primary classification in which we distinguish two types of decision-making styles. They are democratic and autocratic styles. This approach is based on the number of persons included in decision making. While in democratic style, all participants—who are in some way involved in the problem—are included in the decision making, in autocratic style one person makes the decision.

This classification is connected to individual and group decisionmaking. In individual decision making (autocratic style), main advantage is related to the short time in which the decision is made. The main advantage of group decision making (democratic style) is the participation of more people who have more knowledge than an individual. When a decision needs

to be made quickly, the autocratic style is more appropriate. However, if there is time and an important strategic decision has to be made, the democratic style would be more appropriate. More about the advantages and disadvantages of those styles can be found in relevant literature (Dyczkowska & Dyczkowski, 2018; Sikavica, Hernaus, Begičević Ređep, & Hunjak, 2014; Zhang, 2018).

2.2 Between autocratic and democratic styles

Democratic and autocratic decision-making styles can be seen as two endpoints of the continuum of decision-making-style types regarding the number of participants included in the decision process. Between those two endpoints, styles of decision-making vary depending on the number of people included. Based on this criterion, the researchers in this field defined several decision-style types. Different types of styles were defined by Likert (1967), Heller (1971), Vroom and Yetton (1973), Bass and Valenzi (1974), Muna (1980), and Ali (1993). The decision styles that they defined include autocratic styles, several types of consultative styles (decision maker uses information from associates), group styles, and delegation styles. One of the most well-known approaches here is the Vroom & Yetton model. Authors distinguish four styles, and three of them appear in two different shapes (Ali, 1993):

- Autocratic style: (1) manager makes the decision himself; (2) Manager makes decision obtaining the necessary information from subordinate.
- Consultative style: (1) manager shares the problem with subordinates and makes own decision; (2) manager shares problem with group and makes own decision.
- Group style: (1) Manager and subordinate together arrive at a mutually agreeable decision; (2) manager and the group discuss, evaluate, and make a group decision.
- Delegation of the decision to the subordinates.

Vroom and Yetton defined the listed styles and their shapes. In addition, they also provided a model in the form of a decision tree which helps the manager determine which of the styles/shapes is the most appropriate for the observed situation. Later, Vroom and Jago upgraded the model (with more activities in the decision tree), and the final model is known as the Vroom-Yetton-Jago or Vroom-Jago model (Lühns, Jager, Challies, & Newig, 2018).

The other authors mentioned defined the styles similarly; differences are often minimal. However, Ali introduced pseudo-styles: pseudo-consultative and pseudo-participative. In those styles, the manager makes the decision by himself and wants to create the feeling that the subordinate/group participated in the decision.

2.3 Analytical, conceptual, behavioral, and directive styles

The following types of decision-making styles discussed in this paper are analytical, conceptual, behavioral, and directive styles. Initially, those styles were proposed by Rowe and Boulgarides and further investigated by Rowe, Mason, Robbins, Coulter, and others.

The four styles can be graphically presented as in Figure 1.

- The y-axis shows the tolerance for ambiguity. Tolerance for ambiguity means how deep the decision-maker studies the decision-making problem. If the tolerance is low, the decision maker *simplifies* the problem—they are focused more on the global picture, without going into details (need for structure). If tolerance is high, the decision maker respects the problem's complexity and pays attention to the details. In addition, a high position on the y-axis is characterized by thinking (making new ideas), while the lower positions on the y axis is characterized by doing (acting).
- The x-axis was initially defined in terms of cognitive complexity (low: left side of the brain; high: right side of the brain) and value orientation (task or people). However, in future research, other authors found new possible interpretations that fit the general structure of the figure. Robbins introduced the way of thinking (Robbins, DeCenzo, & Wolter, 2016). Martinsons and Davison discussed group system support (GSS) and executive information system adoption (Martinsons & Davison, 2007).

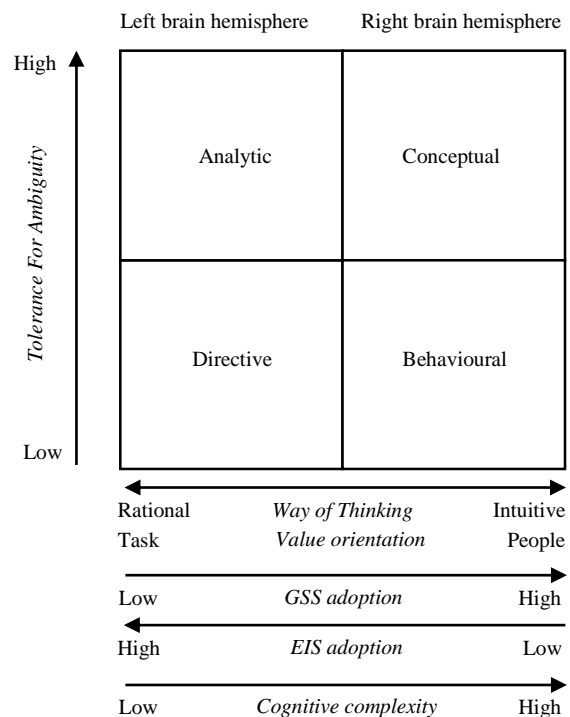


Figure 1. Rowe decisions styles

Analytical decision makers (A) enjoy problem solving, seek the best answer, undertake deep and careful analysis – they have a strong need for challenges. Directive decision makers (D) are often autocratic, act rapidly, give verbal instructions, use rules and intuition, focus on the short run, and expect results – they have a strong need for power. Conceptual decision makers (C) are creative and have a broad focus, and they are future-oriented (long-range) – they have a strong need for recognition. Behavioral decision makers (B) are often supportive and empathetic; they prefer discussion and communication, avoid conflicts, and use their intuition – they have a strong need for affiliation (Abdelsalam, Dawoud, & Elkadi, 2013; Robbins et al., 2016).

2.4 Decision-making style inventory by Scott and Bruce

Decision maker's thinking and reaction in a specific situation was the criterion for the definition of decision-making style inventory by Scott and Bruce. They came up with five decision-making styles:

- Rational style (R) is characterized by the deep search for information and logical evaluation of optional alternatives. This style is, by its definition, very similar to the analytical style described earlier. In addition, the decision makers who use this style process information sequentially and evaluate them systematically.
- Intuitive style (I) is characterized by a strong reliance on emotions, presentiments, hunches, and feelings. Decision makers who use this style process information simultaneously.
- Spontaneous style (S) is characterized by immediacy and desire to finish the decision process as quickly as possible.
- Dependent style (D) is characterized by extensive advice-seeking (consultations and directions).
- Avoidant (A) is characterized by an attempt to escape the choice situation and avoid or delay the decision.

The authors of those styles also created and evaluated the instrument which can be used to determine dominant styles of decision makers, General Decision-Making Style (GDMS).

2.5 Other types of decision styles

Other researchers in this field came up with additional decision-making style types. Some of them include some of the already mentioned styles, but some of them are entirely new.

Driver, Brousseau, and Hunsaker (1998) define five basic decision styles: decisive, hierarchic, flexible, and integrative. There are two criteria that determine those styles: information use and the focus (the number of alternatives) on decision-making problems.

Janis and Mann distinguish several types of decision styles: vigilance, hypervigilance, buck-

passing, and procrastination (Alzate Saez de Heredia, Laca Arocena, & Valencia Garate, 2004). They developed two instruments: Flinders Decision Making Questionnaire (FDMQ) and Melbourne Decision Making Questionnaire (MDMQ).

Dan Lovallo and Olivier Sibony identified five decision-making styles. They are Visionary, Guardian, Motivator, Flexible, and Catalyst (Lovallo & Sibony, 2013). Silver and Hanson distinguish four decision-making styles: sequential, logical, global, and personable (Silver & Hanson, 2003).

In addition, there are other approaches in defining the decision-making styles not mentioned here. Also, the decision-making styles are often studied in parallel with other relevant aspects of someone's behavior, such as leadership, learning, or conflict. Since all of these aspects are often part of the decision-making process, some authors study learning styles, leadership styles and conflict management styles in the light of the decision making.

3 Applications of decision-making styles instruments

Different approaches in defining decision-making styles are almost always followed by instruments used to determine someone's dominant decision-making styles. Those instruments were applied first by decision styles authors (for instruments' evaluations), and then by other researchers to obtain knowledge about the decision-making process of a specific population. In this section, we present some of these research projects. Research in this paper (Sections 3 and 4) is also an example of applying two instruments to the student population in Croatia.

Zhang was conducting research to identify the impact of different types of leadership styles on employee job satisfaction towards the organization. This research covers major leadership styles: autocratic leadership, democratic leadership, laissez-faire leadership, transactional leadership, and transformative leadership styles (Zhang, 2018). The effect of leaders' styles of decision making on perceived organizational effectiveness was studied in the case of Pakistan (Sajjad et al., 2011). The relationship between decision making styles and leadership styles was studied among public schools principals in Jordan (Al-Omari, 2013). Whether decision-making style is predictive of managers' entrepreneurial intentions was investigated in the case of Kosovo (Krasniqi, Berisha, & Pula, 2019).

Thunholm was exploring the relations between individual decision-making styles as measured by the GDMS test and certain mental abilities theoretically related to decision-making. The participants in the research were 206 Swedish military officers from all services (Thunholm, 2004). The GDMS was also applied to patient decision making in provider choice

(Fischer, Soyez, & Gurtner, 2015). The relationship between decision-making styles (GDMS) and decision making competencies and mental health as validity criteria was investigated in Slovak high-school and university students (Bavol'ár & Orosová, 2015). Decision-making styles in the context of colorectal cancer screening were studied in the Netherlands (Douma, Uiters, & Timmermans, 2020).

Revised FDMQ and MDMQ were applied in Spain at the University of the Basque Country to analyze the similarities and differences between their students and those from other cultures in decision patterns and decision-making self-esteem and to study the possible relationship between decision patterns and conflict coping styles (Alzate Saez de Heredia et al., 2004).

Rowe instrument was applied in investigating the relationship between the variety of managers' decision styles and seven variables: gender, age, ethnicity, educational level, educational major, administrative experience, and current position in the sample of 138 Egyptian managers (Abdelsalam et al., 2013). The same instrument was applied in Egypt to investigate the impact of leadership styles on decision making styles among nurses' managerial levels (Abood & Thabet, 2017). The effect of experiential learning on managers' strategic competencies and decision style was studied in executive MBA students using Rowe's instrument (Torres & Augusto, 2017).

4 The methodology

The research was conducted among undergraduate students coming from four cities in Croatia: military students from Zagreb (the Army) and Split (the Navy), and nonmilitary students from Varaždin (Economics) and Rijeka (ICT).

The data were collected through a survey that included two instruments with several general questions:

- GDMS (Scott&Bruce) instrument,
- Rowe's instrument,
- General questions about demographic data (gender, age, institution (also division to military-nonmilitary), year of the study, the type of high school education, average grade in high school).

The collected data were further analyzed using MS Excel and Medcalc. The methods that were applied are descriptive statistics, t-test, ANOVA, and χ^2 test.

The research questions that were the focus of this research are:

1. Is there a difference in achieved results per types of decision-making style by Scott&Bruce with respect to demographic data?
2. Is there a difference in achieved results per types of decision-making style by Rowe with respect to demographic data?
3. Is there a difference in the dominant decision-making style by Scott&Bruce with respect to demographic data?

4. Is there a difference in the dominant decision-making style by Rowe with respect to demographic data?

5 Results and discussion

During the data collection procedure, 198 responses were obtained. The structure of the responses is presented in Table 1.

Table 1. Demographic data about the respondents

Demographic characteristics	Values	Number of respondents	%
Gender	Male	89	44,95
	Female	109	55,05
Age	19	17	8,59%
	20	51	25,76%
	21	75	37,88%
	22	33	16,67%
	23	13	6,57%
	24	6	3,03%
	25	2	1,01%
	29	1	0,51%
Year of study	1 st	23	11,62%
	2 nd	58	28,79%
	3 rd	113	57,07%
	4 th	3	0,51%
	5 th	1	1,52%
High school education	vocational	94	47,47%
	grammar school	104	53,53%
Place of study	Rijeka	14	7,07%
	Varaždin	73	36,87%
	Split	46	23,23%
	Zagreb	65	32,83%
Type of student	military	111	56,06%
	nonmilitary	87	43,93%

Table 1. shows that there were more female students in the research than male students. In most cases, the students are 20 to 22 years old, and they are in the third year of the program. Mostly, they graduated from a vocational high school before enrolling into the university program. They are not equally distributed among places of study (only 14 in Rijeka). In most cases, they are military students (Navy students from Split and Army students from Zagreb).

To respond to the first question, several t-tests with one-way ANOVA were conducted: input variables were related to the demographic characteristics, and output variables were scores achieved by respondents in the Scott&Bruce test. The results are presented in Table 2. Columns R, I, S, D, A contain information about achieved averages of scores in Scott&Bruce test for respected decision-making style. Rows *p* are t-test and one-way ANOVA test scores.

Table 2. Results: research question 1

DC	Values	R	I	S	D	A
Gender	Male	19,54	18,66	14,67	16,71	11,96
	Female	19,88	19,17	14,39	17,62	12,80
	<i>p</i>	0,495	0,306	0,403	0,115	0,287
Age	19	21,00	19,47	13,88	16,59	11,18
	20	19,80	18,78	13,80	17,02	11,27
	21	19,32	19,21	15,00	17,43	12,36
	22	20,00	18,36	14,18	17,67	13,52
	23	19,54	20,15	17,15	16,77	15,92
	24	20,00	16,17	13,00	16,50	12,50
	25	17,50	20,00	14,50	20,00	14,00
	29	21,00	16,00	11,00	11,00	11,00
	<i>p</i>	0,349	0,053	0,616	0,066	0,062
Year of study	1 st	21,00	19,43	13,43	15,91	11,30
	2 nd	19,55	18,40	14,55	17,28	11,31
	3 rd	19,60	19,16	14,73	17,40	13,12
	4 th	18,00	18,00	14,33	16,67	17,00
	5 th	20,00	18,00	13,00	24,00	10,00
	<i>p</i>	0,175	0,274	0,464	0,075	0,574
High school education	vocational	20,18	19,19	14,23	17,40	11,90
	grammar school	19,29	18,73	14,83	17,05	12,95
	<i>p</i>	0,018	0,239	0,517	0,116	0,227
Place of study	Varaždin	20,00	18,97	14,29	17,38	13,68
	Rijeka	18,79	18,50	13,64	18,64	13,71
	Split	20,41	18,74	14,17	16,76	11,70
	Zagreb	19,14	19,15	15,20	17,03	11,23
	<i>p</i>	0,021	0,005	0,459	0,008	0,284
Type of student	military	19,67	18,98	14,77	16,92	11,42
	nonmilitary	19,80	18,90	14,18	17,59	13,69
	<i>p</i>	0,94	0,732	0,307	0,322	0,000

From the summary table for the first research question of t-tests and one-way ANOVA implemented, we can draw several conclusions:

- In most cases, there is no significant difference in scores achieved in Scott&Bruce test between groups based on demographic characteristics.
- There is significant difference in rational style in regards to the highschool education: The vocational students more often apply rational style than the students from grammar school.
- There is significant difference in rational, intuitive and dependent style between groups based on the place of study.
- The significantly important difference is in avoidant style based on the type of students: The military students are less prone to use avoidant style than the nonmilitary students.

To respond to the second research question, several t-tests with one-way ANOVA were also conducted: input variables were related to the demographic characteristics, and output variables were scores achieved by respondents in the Rowe test. The results are presented in Table 3. Columns D, A, C, and B contain information about achieved averages of scores in the Rowe test for respected decision-making style.

Table 3. Results: research question 2

DC	Values	D	A	C	B
Gender	Male	72,90	82,08	76,21	68,81
	Female	70,96	81,17	74,95	72,91
	<i>p</i>	0,143	0,706	0,735	0,042
Age	19	72,00	86,59	72,35	69,06
	20	70,78	83,88	76,10	69,24
	21	71,44	81,40	74,59	72,57
	22	73,82	76,27	77,82	72,09
	23	73,00	80,38	71,92	74,69
	24	73,83	80,00	78,83	67,33
	25	68,50	75,00	95,00	61,50
	29	66,00	106,00	82,00	46,00
	<i>p</i>	0,994	0,045	0,306	0,390
Year of study	1 st	71,91	87,74	72,35	68,00
	2 nd	71,00	83,12	76,03	69,84
	3 rd	72,17	79,81	75,80	72,22
	4 th	76,33	69,33	81,00	73,33
	5 th	67,00	87,00	71,00	75,00
	<i>p</i>	0,999	0,036	0,615	0,539
High school education	vocational	72,35	82,18	75,26	70,21
	grammar school	71,27	80,94	75,67	72,13
	<i>p</i>	0,657	0,502	0,849	0,398
Place of study	Rijeka	72,93	81,04	76,79	69,23
	Varaždin	70,00	79,14	76,86	74,00
	Split	73,04	84,76	73,28	68,91
	Zagreb	70,14	80,46	75,38	74,02
	<i>p</i>	0,350	0,239	0,361	0,074
Type of student	military	72,46	80,74	76,80	70,00
	nonmilitary	71,34	82,24	74,51	71,90
	<i>p</i>	0,914	0,39	0,0004	0,146

From the summary table for the second research question of t-tests and one-way ANOVA implemented, we can conclude:

- In most cases, there is no significant difference in scores achieved in the Rowe test between groups considering demographic characteristics.
- The significantly important difference is in behavioral style considering the gender of students: Female students are more prone to use behavioral style than male students.
- There is a significant difference in using analytic style between groups considering age.
- There is a significant difference in using analytic style between groups considering year of study.
- There is significant difference in using conceptual decision-making style between groups considering the type of students: Military students more often apply conceptual style than non-military students.

To respond to the third research question, several χ^2 tests were conducted: input variables were related to the demographic characteristics, and output variables were dominant decision-making style using the Scott&Bruce test. Columns I, D, R, S, A contain information about the distribution of students' dominant styles in the Scott&Bruce test.

Table 4. Results: research question 3

DC	Values	I	D	R	S	A	SUM
Gender	Male	24	9	48	4	4	89
	Female	28	11	62	3	5	109
$\chi^2=0,528, cv=9,488, p=0,970$							
Age	19	5	1	11			17
	20	13	5	31	2		51
	21	21	10	37	5	2	75
	22	8	3	19	3	3	33
	23	4	1	5	3	13	
	24			5	1	6	
	25	1		1		2	
$\chi^2=29,334, cv=0,359, p=0,395$							
Year of study	1 st	6	1	16			23
	2 nd	15	7	33	3		58
	3 rd	30	11	60	4	8	113
	4 th	1		1	1	3	
	5 th		1			1	
$\chi^2=23,586, cv=0,326 p=0,098$							
High school education	vocational	26	11	53	6	8	94
	grammar school	26	9	56	1	1	104
$\chi^2=8,711, cv=0,206 p=0,068$							
Place of study	Varaždin	16	6	41	3	7	14
	Rijeka	3	3	7	1	73	
	Split	10	2	32	1	46	
	Zagreb	23	9	30	3	65	
$\chi^2=19,089, cv=0,297 p=0,086$							
Type of student	military	19	9	48	3	8	111
	nonmilitary	33	11	62	4	1	87
$\chi^2=8,555, cv=0,204 p=0,073$							

From the results in Table 4, we can conclude that there is no statistical difference in dominant decision making style by Scott&Bruce considering any grouping in terms of demographic data (none of the p-values is less than 0.05).

To respond to the fourth research question, several χ^2 tests were conducted: input variables were related to the demographic characteristics, and output variables were dominant decision-making style using the Rowe test. Columns A, B, C, D contain information about the distribution of students' dominant styles in the Rowe test.

Table 5. Results: research question 4

DC	Values	A	B	C	D	SUM
Gender	Male	37	14	24	14	89
	Female	48	23	25	13	109
$\chi^2=1,667, cv=0,091 p=0,644$						
Age	19	9	2	2	4	17
	20	24	9	13	5	51
	21	34	18	16	7	75
	22	10	5	11	7	33
	23	5	3	2	3	13
	24	2		3	1	6

	25			2	2	
	29	1			1	
	$\chi^2=22,179, cv=0,317 p=0,389$					
Year of study	1 st	14	3	2	4	23
	2 nd	24	10	16	8	58
	3 rd	45	23	30	15	113
	4 th	1	1	1		3
	5 th	1				1
$\chi^2=7,854, cv=0,195 p=0,796$						
High school education	vocational	49	17	23	15	94
	grammar school	36	20	25	12	104
$\chi^2=2,040, cv=0,101 p=0,564$						
Place of study	Rijeka	31	11	18	13	14
	Varaždin	5	3	4	2	73
	Split	24	8	6	8	46
Zagreb	25	15	21	4	65	
$\chi^2=10,882, cv=0,228 p=0,283$						
Type of student	military	36	14	22	15	111
	nonmilitary	49	23	27	12	87
$\chi^2=2,143 cv=0,103 p=0,543$						

From the results in Table 5, we can conclude that there is no statistical difference in dominant decision making style by Rowe considering any grouping in terms of demographic data.

6 Conclusion

In the first part of this paper, we presented some of the most well know decision-making styles. According to the factors taken into account, there are several approaches to the study of decision-making styles: number of people included in the decision-making process, way of thinking, the amount of information used for decision-making, the number of alternatives created for making the decisions.

In the second part of this paper, we applied two tests to determine the dominant decision-making styles of the student population in Croatia. The tests were related to Scott&Bruce decision styles and Rowe decision styles. Also, demographic data about the students were collected. In the analysis, descriptive statistics, t-test, and χ^2 test were applied. The results show that there are few differences in decision styles in the observed student population.

Future research will be focused on a more thorough analysis of the data collected in the study and collecting more data. The deeper analysis could include analysis of subgroups in the sample (e.g., if there are any differences in decision-making styles of male students with respect to demographic characteristics).

Also, correlation analysis would give answers to questions related to the relationship between decision styles of different approaches (e.g. if there is a correlation between analytic style (Rowe) and rational style (Scot&Bruce)).

We plan to investigate if there is a difference in less-dominant decision-making styles by Scott&Bruce and Rowe with respect to demographic data. In literature, the focus was not on the less-dominant decision-making style, so the additional analyses can also include this aspect. The less-dominant decision-making style can be defined as the behaviour that is less often used by decision maker. Additionally, authors' idea is to discuss the intensity of dominance of dominant decision-making style, and the ways how to measure it. For example, one can achieve scores by Scott&Bruce, I=15, D=14, R=16, S=14, and A=15, and the other can have the following results: I=15, D=12, R= 22, S=15, and A=16. In both cases, decision makers have a dominant rational style. However, in the first case, rational is only slightly dominant over other styles, but in the second case, rational is highly dominant over other styles. It would be interesting to define approaches on how to measure dominance of one style over others, and test those approaches on the data that are already collected.

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