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Systems Intelligence and Team Performance

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Abstract

Systems Intelligence (SI) is the ability to operate intelligently within complex systems involving interactions and feedback. The concept was first introduced in 2002 and studied in a series of essay collections after that. The first quantitative measurement tool for SI was developed in 2012 by the Systems Intelligence Research Group at Aalto University. This measurement tool, called the Systems Intelligence inventory is in the form of a self-report questionnaire.

In this BSc thesis, the SI inventory is studied in the context of teams to understand if and how the scale can measure organizational SI. Survey data is gathered from the research groups of Aalto University and a comprehensive data analysis is conducted to study the data set in many aspects in addition to the main topic of organizational SI. The final data set consists of survey responses of 81 Aalto University researchers in 19 teams. Support is found for the usefulness of the new construct of *team's SI*. Future research will focus on trying to replicate this result with a larger data set and a more objective team performance scale.

Keywords Systems Intelligence, team performance, Systems Intelligence inventory, research groups

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Tiivistelmä

Systeemiäly on kyky toimia älykkäästi monimutkaisissa systeemeissä, joissa on vuorovaikutusta ja takaisinkytkentöjä. Konsepti esiteltiin ensimmäistä kertaa vuonna 2002, ja sen jälkeen sitä tutkittiin sarjassa esseekokoelmia. Ensimmäinen kvantitatiivinen työkalu systeemiälyn mittaamiseen kehitettiin vuonna 2012 Aalto-yliopiston systeemiälyn tutkimusryhmässä. Tätä mittaustyökalua kutsutaan systeemiälykyselyksi, ja se on itsearviointilomakkeen muodossa.

Tässä kandidaatintyössä systeemiälykyselyä tutkitaan tiimikontekstissa. Tällä pyritään selvittämään, voidaanko kyselyllä mitata organisatorista systeemiälyä. Tutkimusta varten Aalto-yliopiston tutkimusryhmistä kerätään kyselydataa, ja kyselytuloksille tehdään perusteellinen data-analyysi monien muidenkin tekijöiden kuin pääaiheen, eli organisatorisen systeemiälyn, tutkimiseksi. Lopullinen datajoukko sisältää kyselyvastaukset 81 Aalto-yliopiston tutkijalta, jotka kuuluvat 19:ään eri tiimiin. Uuden *tiimin systeemiälyn* käsitteen hyödyllisyydelle löydetään tukea ja myöhemmissä tutkimuksissa pyritään tämän tuloksen toistamiseen suuremmalla datajoukolla ja objektiivisemmalla tiimin tehokkuuden mittarilla.

Avainsanat systeemiäly, tiimin suorituskyky, systeemiälykysely, tutkimusryhmät

Contents

1 Introduction

The concept of Systems Intelligence (SI) was first introduced by professors Raimo P. Hämäläinen and Esa Saarinen in the Helsinki University of Technology (Hämäläinen & Saarinen, 2004). Originally they defined it as:

> "Intelligent behavior in the context of complex systems involving interaction and feedback. A subject acting with Systems Intelligence engages successfully and productively with the holistic feedback mechanisms of her environment. She perceives herself as a part of a whole, the influence of the whole upon herself as well as her own influence upon the whole. By observing her own interdependence in the feedback intensive environment, she is able to act intelligently." (Hämäläinen & Saarinen, 2004, p. 3)

Later the concept was studied in a series of essay collections, which focused on describing the concept qualitatively in different contexts, until only recently the SI inventory was developed (Törmänen, 2012). The SI inventory is a quantitative measurement tool for Systems Intelligence. This measurement tool is in the form of a self-report questionnaire, originally consisting of an inventory of 50 items and 8 factors. The SI inventory has been analyzed further and the final inventory consists of 32 items and 8 factors (Törmänen, Hämäläinen, & Saarinen, 2015).

In this BSc thesis, the SI inventory is studied in the context of teams to understand if and how the scale can measure organizational SI. Data is collected from the research groups of Aalto University. The SI inventory can possibly help to understand phenomena related to the performance of teams, and such understanding would be useful in organizations.

The main topics of this thesis are divided into two categories: individual level and team level. The individual level topics are the differences in respondents' evaluations about themselves and their team, and the differences between supervisors and members. There are three team level topics. The first one is the impact of high SI or low SI individuals or the supervisor on the team as a whole. The last two topics are the impact of heterogeneity on the team and the relationship between SI and experienced performance.

2 Background

2.1 Literature review

2.1.1 Team performance

One of the factors affecting team performance is team composition i.e. the combination of member attributes in a team. In an extensive meta-analysis (Bell, 2007) several deep-level composition variables were found to be positively related to team performance. These included team mean conscientiousness and the minimum of the team members' agreeableness. In field settings team mean emotional stability, team openness to experience and team preference for teamwork were also positively related to team performance. The individual level variables were operationalized in the team level in four different ways: as the minimum, maximum, average and variance. Then the operationalizations were tested to see which of them resulted in the strongest relationship between the team level variable and team performance.

A particularly interesting team level operationalization of an individual level variable is variance. It relates to the question if it is better to have homogeneity or heterogeneity in a given variable. This has been investigated in a field study, which included 71 military teams (Lim & Klein, 2006). In the study, team mental

model similarity and accuracy were both found to be positively related to team performance. Both taskwork mental models describing team procedures, tasks and equipment, and teamwork mental models describing team interaction processes were operationalized in the study. Meta-analytic support for the positive relationship between shared leadership and team performance has also been provided recently (D'Innocenzo, Mathieu, & Kukenberger, 2014).

2.1.2 Organizational learning

High-quality connections between team members have been recently suggested to play a major role in organizational knowledge creation, especially during intense high-stake projects (Aarrestad, Brøndbo, & Carlsen, 2015). Systems intelligence emphasizes the connections between individuals and the role of these connections in systems in a similar way. Measures of organizational learning have been developed. The Organizational Learning Survey (Goh & Richards, 1997) was validated with a study of five different organizations in knowledge intensive fields. The OL measurement instrument (Templeton, Lewis, & Snyder, 2002) was derived from a sample consisting of 119 knowledge-based firms. The organizational learning capability scale (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005) was validated with a study covering a sample of Spanish firms from the chemical industry, with a final sample size of 111.

Existing measures of organizational learning seem to have a similar approach to organizations as the SI survey. To clarify the relationship between SI and organizational learning further, the similarities between the items of two organizational learning scales and the SI inventory items are discussed in the following section.

2.2 Similarities between two organizational learning scales and the SI inventory

The first scale discussed here is the Organizational Learning Survey (Goh & Richards, 1997). All of the items of this scale are shown in Appendix C. The second measurement scale is the organizational learning capability scale (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005). The items of this scale can be seen in Appendix D.

The items in both scales focus on measuring the organization's openness to new ideas and the amount of freedom to discuss failures, flaws and proposals for improvement. Many of the items can be seen to be closely related to the SI survey items. Such items are collected in two tables to examine the relationship between the scales and the SI inventory. Some of the items in the tables are related to the SI of the respondent, and some to the SI of others e.g. managers or employees in general. Despite the similarities, the questions in the two scales are tailored to measure only organizational learning, whereas the SI survey can also be used in many settings outside of organizations.

Those of the items that are closely related to SI inventory items have been collected in table 1 for the Organizational Learning Survey (Goh & Richards, 1997) and in table 2 for the organizational learning capability scale (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005).

The SI inventory factors of Systemic Perception (PER) and Spirited Discovery (DIS) are most common in the two tables. There are also a few items from the factors Attunement (ATTU), Wise Action (WIS) and Positive Engagement (ENG). This suggests that in previous studies attributes related to these factors have been seen as especially beneficial to organizational learning. No connections were found with SI inventory items representing the factors of Attitude (ATD), Reflection (REF) and Effective Responsiveness (EFF).

Table 1: Items of the Organizational Learning Survey (Goh & Richards, 1997) and the closely related SI inventory items

#	Organizational Learning Survey item	SI inventory item (FACTOR)
2.	I do not understand how the mission of the organization is to be achieved (r).	1) I form a rich overall picture of situations (PER) 2) I easily grasp what is going on (PER)
5.	Senior managers in this organization resist change and are afraid of new ideas (r).	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS)
6.	Senior managers and employees in this organization share a common vision of what our work should accomplish.	1) I form a rich overall picture of situations (PER) 4) I keep both the details and the big picture in mind (PER)
7.	Managers in this organization can accept criticism without becoming overly defensive.	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU) 21) I am willing to take advice (WIS)
8.	Managers in this organization often provide useful feedback that helps to identify potential problems and opportunities.	5) I approach people with warmth and acceptance (ATTU) 21) I am willing to take advice (WIS)
9.	Managers in this organization frequently involve employees in important decisions.	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU)
10.	I can often bring new ideas into the organization.	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS) 16) I act creatively (DIS)
11.	From my experience, people who are new in this organization are encouraged to question the way things are done.	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS) 16) I act creatively (DIS)
12.	Managers in this organization encourage team members to experiment in order to improve work processes.	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS) 16) I act creatively (DIS)
13.	Innovative ideas that work are often rewarded by management.	26) I praise people for their achievements (ENG)
14.	In my experience, new ideas from emloyees are not treated seriously by management (r).	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU)

Table 2: Items of the organizational learning capability scale (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005) with connections to SI inventory factors

#	Organizational learning capability scale item	SI inventory item (FACTOR)
MC1.	The managers frequently involve their staff in important decisionmaking processes.	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU)
MC3.	The firm's management looks favorably on carrying out changes in any area to adapt to and/or keep ahead of new environmental situations.	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS)
MC5.	In this firm, innovative ideas that work are rewarded.	26) I praise people for their achievements (ENG)
SP1.	All employees have generalized knowledge regarding this firm's objectives.	1) I form a rich overall picture of situations (PER) 2) I easily grasp what is going on (PER)
SP2.	All parts that make up this firm (departments, sections, work teams, and individuals) are well aware of how they contribute to achieving the overall objectives.	1) I form a rich overall picture of situations (PER) 2) I easily grasp what is going on (PER) 4) I keep both the details and the big picture in mind (PER)
SP3.	All parts that make up this firm are interconnected, working together in a coordinated fashion.	1) I form a rich overall picture of situations (PER) 2) I easily grasp what is going on (PER) 4) I keep both the details and the big picture in mind (PER)
EX1.	This firm promotes experimentation and innovation as a way of improving the work processes.	13) I like to play with new ideas (DIS) 14) I look for new approaches (DIS) 15) I like to try out new things (DIS) 16) I act creatively (DIS)
EX2.	This firm follows up what other firms in the sector are doing, adopting those practices and techniques it believes to be useful and interesting.	14) I look for new approaches 15) I like to try out new things
EX3.	Experiences and ideas provided by external sources (advisors, customers, training firms, etc.) are considered a useful instrument for this firm's learning.	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU) 21) I am willing to take advice (WIS)
EX4.	Part of this firm's culture is that employees can express their opinions and make suggestions regarding the procedures and methods in place for carrying out tasks.	6) I take into account what others think of the situation (ATTU) 8) I let other people have a voice (ATTU)

3 Methods

3.1 Research questions

The following seven research questions were formulated.

3.1.1 Individual level research questions

1. Is there a difference between the respondent's answer about themselves and their team? Is there a difference between supervisors and members?
   1.1. Is there a difference in individual items?
   1.2. Is there a difference in individual SI factors?
   1.3. Is there a difference in SI scores?
2. Is there a difference between supervisors and members in their evaluation of their own SI score or their team's SI score?
3. Is there a difference between supervisors and members in their evaluation of team performance?

3.1.2 Team level research questions

4. Is there a correlation between the team's SI and experienced performance?
5. Do teams with high SI have smaller differences in opinion about *team's SI* and *performance*?
6. Do high SI or low SI individuals or the supervisor have a great impact on the whole team i.e. does the minimum, maximum or average of the individual SI scores or the supervisor's SI score correlate with *team's SI* or *performance* and how strongly?
7. Is it better to have a homogeneous team or a heterogeneous team i.e. does the variance of the individual SI scores correlate with *team's SI* or *performance*?

3.2 Data acquisition and participants

The data used in this study was acquired with a web-based SI survey. In the survey there were two versions of the SI inventory (Appendix A): the normal one for individuals and a second one referring to the whole team. The team version was formed by switching all pronouns in the original SI inventory items to the plural form. The order in which the inventories were administered to the respondents was randomized.

The respondents gave their answers with a 7-point Likert-type scale with the labels: "never", "very seldom", "seldom", "sometimes", "often", "very often" and "always". The answer labels were transformed to item scores as integers from 1 to 7 respectively for the positive items and vice versa for the negative items. In addition to the two batteries, the respondents were asked to assess the team's performance with respect to its objectives on an integer scale from one to ten. Some personal information was also asked. The respondents could answer the survey in either English or Finnish. The questionnaire used in the study can be seen in Appendix B.

Participants were invited with an email sent to the Aalto University professor's mailing list. In the email any teams within Aalto University were asked to participate. The team leader obtained an ID number that was used by the whole team when answering the survey. After receiving the ID number, the team leader would invite the rest of the team to answer the survey.

A total of 99 respondents answered the survey. 72 of those were members and 27 were supervisors. The respondents belonged to 26 different teams with one supervisor who had not provided a team ID. Three teams that consisted of a single supervisor only, two teams that had no supervisors (6 members total), two

teams that had two supervisors (4 members and 4 supervisors total) and the one supervisor without a team ID were removed from the dataset. One member didn't provide an assessment of her team's performance, but in the calculations it was assumed that this member's assessment was the same as the team average.

The final data set consisted the survey responses of 81 respondents of whom 62 were members and 19 were supervisors. These belonged to 19 different teams with the number of individuals in a team varying from two to seven. The answers were anonymous and the participants didn't get any compensation for completing the survey. Most of the answers were given using the questionnaire's Finnish translation.

3.2.1 Factor scores and SI scores

The factor scores were calculated by taking a weighted average of the item scores using the weights determined during the development of the SI inventory (Törmänen, Hämäläinen, & Saarinen, 2015) and subtracting 1. Thus the factor scores are in the range from 0 to 6.

The SI scores were calculated as an average of normalized factors. The normalized factors were used to make sure that each of the factors have a similar impact on the SI score. The normalization was done by standardizing each factor score distribution with respect to the mean and standard deviation of the joint distribution of the corresponding team and individual factor scores. Data from all respondents in the final data set was used in the normalization process. The SI scores approximately follow a standardized normal distribution without strict boundaries as opposed to the item and factor scores, because of the normalization.

The standardization could have been done by simply using the corresponding individual factor score distribution to standardize the individual factors and similarly for the team factor scores. Because the joint distribution was used instead, there is certainty that the team and individual SI scores are comparable in relation to each other.

Team's SI was defined as the average of the respondent's evaluations of their team SI score. The validity and usefulness of this construct is discussed in section 5.

3.3 Statistical methods

Microsoft Excel 2013 with Analysis Toolpak and Real Statistics Resource Pack (Release 4.2) add-ins was used for the data analysis. The item, factor and SI scores were assumed to follow a normal distribution. Graphical normality checks were made.

Student's t-tests and F-tests were used to answer the individual level research questions presented in section 3.1.1. The null hypothesis in all of the t-tests was that the populations have the same mean. For research question 1 paired two-sample two-tailed t-tests were conducted on the two populations (respondents' answers about themselves and their team) in each case. For research questions 2 and 3 the null hypothesis that the two populations under scrutiny (members and supervisors) have the same variance was first tested with an F-test. A two-sample two-tailed t-test for either equal variances or unequal variances was used depending on the results of the F-test.

Pearson product-moment correlation coefficient was used to measure the strength of the linear dependencies between variables in the statistical analysis of the team level research questions. Scatter plots were created in each case. The plots didn't suggest non-linear correlations, so the analysis of other than linear dependencies was omitted.

4 Results

4.1 Individual level results

4.1.1 Research question 1

The null hypothesis in this case was that the respondents evaluated themselves and their team in the same way. Student's t-tests were performed on the item, factor and SI scores. The results of these tests are displayed in table 4. Statistically significant ($p<.05$) or almost significant ($p<.1$) differences between the individual and team answers were found in 11 items and 3 factors. No difference was found between the SI scores. Most of the differences were found among members and almost all differences found among members also apply to the whole population. The low number of supervisors compared to members in the population can have contributed to these two observations.

Statistically significant ($p<.05$) differences among members arose in items 6, 12, 18, 19, 20 and 28 and in factors Attunement and Reflection. Members evaluated themselves higher than their team in these six items and two factors with the exception of item 28, where opposite behavior was observed. The texts of the items with statistically significant differences among members are shown in table 3.

Table 3: Items with statistically significant ($p<.05$) differences between members' answers' about themselves and their team. Members evaluated themselves higher than their team in the first five items and lower in the last item (number 28).

SI Item (FACTOR)
6) I take into account what others think of the situation (ATTU)
12) I let problems in my surroundings get me down (ATD)
18) I pay attention to what drives my behavior (REF)
19) I think about the consequences of my actions (REF)
20) I make strong efforts to grow as a person (REF)
28) I bring out the best in others (ENG)

Among supervisors notable differences emerged in item 1: "I form a rich overall picture of situations" and item 24: "I keep my cool even when situations are not under control". Supervisors rated themselves higher than their team in item 1 and lower in item 24.

Table 4: Results of the statistical analysis of research question 1: Is there a difference between the respondent's answer about themselves and their team? Is there a difference between supervisors and members?

The results related to each subquestion 1.1-1.3 are in their own table sections. ***Diff*** *represents the average of the difference between the individual score and the team score. A positive* ***Diff*** *thus means that, in the item or factor in question, respondents rated themselves higher than their team. Column* ***p*** *represent the p-value of the t-test, which is discussed further in section 3.3. Statistically significant (p<.05) or almost significant (p<.1) differences are highlighted.*

1.1	member		supervisor		all	
Item	Diff	p	Diff	p	Diff	p
1	-0.10	0.54	0.42	0.06	0.02	0.85
2	0.15	0.30	0.26	0.17	0.17	0.13
3	0.16	0.18	0.26	0.26	0.19	0.08
4	0.05	0.71	0.26	0.33	0.10	0.40
5	0.21	0.16	0.00	1.00	0.16	0.19
6	0.63	0.00	0.37	0.15	0.57	0.00
7	0.02	0.92	0.05	0.77	0.02	0.84
8	0.11	0.51	-0.11	0.61	0.06	0.66
9	0.16	0.21	-0.05	0.80	0.11	0.31
10	0.05	0.72	-0.11	0.54	0.01	0.91
11	-0.03	0.87	-0.11	0.54	-0.05	0.74
12	0.55	0.00	0.21	0.36	0.47	0.00
13	0.16	0.40	-0.05	0.85	0.11	0.49
14	0.16	0.37	-0.37	0.09	0.04	0.80
15	0.24	0.16	-0.26	0.29	0.12	0.39
16	0.18	0.33	-0.05	0.86	0.12	0.42
17	-0.05	0.74	-0.11	0.72	-0.06	0.63
18	0.90	0.00	0.32	0.19	0.77	0.00
19	0.42	0.00	0.47	0.08	0.43	0.00
20	0.90	0.00	0.16	0.45	0.73	0.00
21	0.21	0.14	-0.05	0.85	0.15	0.24
22	-0.05	0.71	0.05	0.80	-0.02	0.82
23	-0.15	0.18	-0.21	0.46	-0.16	0.13
24	-0.05	0.70	-0.53	0.02	-0.16	0.15
25	-0.11	0.43	0.16	0.45	-0.05	0.68
26	-0.08	0.58	0.16	0.38	-0.02	0.83
27	-0.19	0.22	0.05	0.79	-0.14	0.29
28	-0.29	0.03	0.05	0.83	-0.21	0.06
29	0.32	0.08	0.16	0.59	0.28	0.07
30	0.23	0.18	0.11	0.77	0.20	0.19
31	0.15	0.36	0.00	1.00	0.11	0.42
32	-0.08	0.63	-0.11	0.72	-0.09	0.55

1.2	member		supervisor		all	
Factor	Diff	p	Diff	p	Diff	p
PER	0.05	0.59	0.31	0.10	0.11	0.20
ATT	0.24	0.03	0.08	0.50	0.21	0.02
ATD	-0.14	0.17	-0.04	0.76	-0.12	0.16
DIS	0.18	0.24	-0.19	0.33	0.10	0.44
REF	0.58	0.00	0.20	0.14	0.49	0.00
WIS	-0.01	0.93	-0.20	0.23	-0.05	0.46
ENG	-0.17	0.09	0.10	0.39	-0.11	0.19
EFF	0.01	0.95	-0.03	0.91	0.00	1.00

1.3	member		supervisor		all	
	Diff	p	Diff	p	Diff	p
SI	0.10	0.25	0.03	0.80	0.09	0.25

4.1.2 Research question 2

The null hypothesis in this case was that there is no difference in average SI scores between members and supervisors. First F-tests and then t-tests were performed on the two populations for both the team SI score and the individual SI score. The null hypothesis could not be rejected in either case: the p-values associated with the t-test were 0.71 for the individual SI score and 0.59 for the team SI score. This means that on average supervisors evaluated their own SI and their team's SI as high as members respectively evaluated themselves and their team. This result was also confirmed with a graphical check of the SI score distributions.

4.1.3 Research question 3

The null hypothesis in this question was that there is no difference in average team performance evaluations between members and supervisors. F-tests and t-tests were performed. The average of the supervisors' performance evaluations was 8.32 and the same for members was 7.84. The p-value associated with the t-test was 0.0647, so it seems that supervisors had a slight tendency to evaluate their team's performance higher than members.

4.2 Team level results

Team's SI, which was mentioned in all of the team level research questions, was defined as the average of the respondents' evaluations of their team's SI. *Team's performance* was defined in a similar way as the average of the individuals' assessment of their team's performance with respect to its objectives.

4.2.1 Research question 4

Figure 1 shows *team's SI* and *performance* plotted against one another. The Pearson correlation coefficient between these variables was 0.84. This agrees with the plot indicating strong positive correlation between *team's SI* and *performance*.

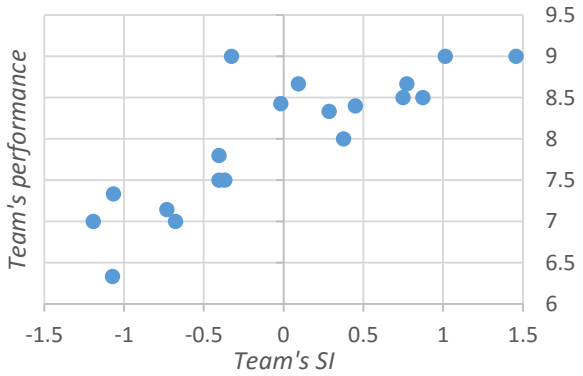

Figure 1: Scatter plot of *team's SI* and *performance* indicating strong positive correlation

Investigation about the validity of the definition of *team's SI* was also conducted. The average of the SI scores of individuals in the team was plotted against *team's performance* in figure 2. The Pearson correlation coefficient is lower, 0.59, and the plot also shows less correlation than in the previous case with *team's SI*. This result suggests that *team's SI* could be a valid construct and separate from the average of individual SI scores, offering more information about the team than examination of the individuals separately.

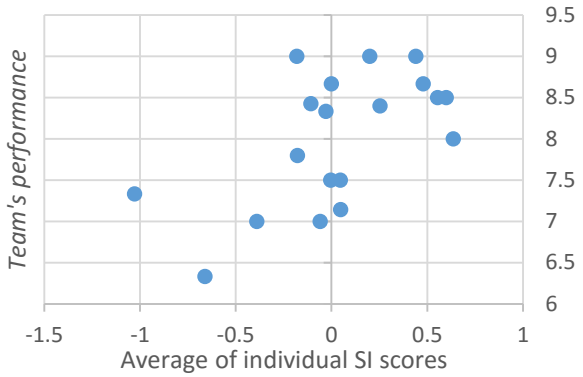

Figure 2: Scatter plot of the average of the SI scores of individuals in a team and *team's performance*

4.2.2 Research question 5

Team's SI was plotted against the variance of the respondents' evaluations of their team's SI score and the variance of the individuals' evaluations of their team's performance. Both of these plots are shown in Figure 3. The Pearson's correlation coefficients related to these plots are -0.15 and -0.38 respectively.

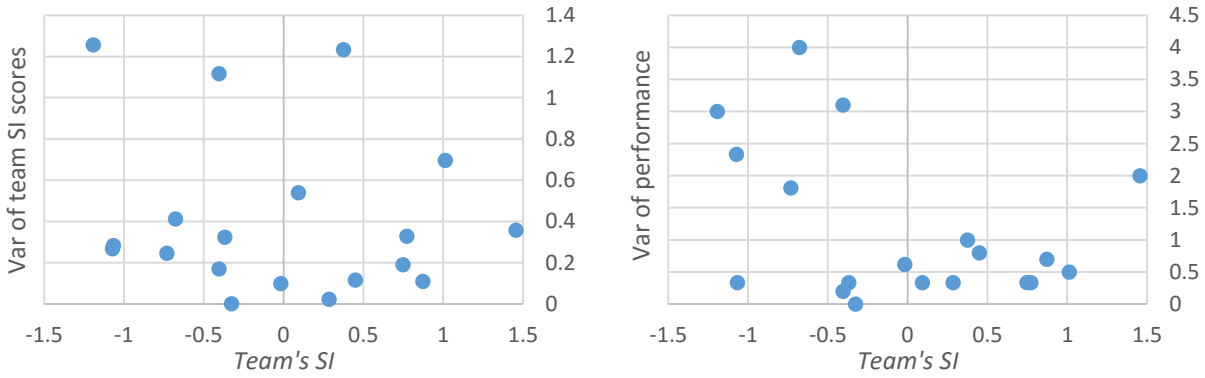

Figure 3: *Team's SI* plotted against the variance of the individuals' team SI scores and performance evaluations. Pearson's correlation coefficients related to the plots are -0.15 and -0.38 from left to right.

These datasets are quite scattered and the correlation coefficients might indicate a slight negative correlation, especially in the latter case. Examination of the plots reveals however that the result would change drastically if just a few data points were omitted. Therefore, teams with high *team's SI* don't seem to be having any smaller or larger variance in the individuals' team SI score or performance evaluations according to this data.

The second part of the analysis of this research questions was to find out if the results differ for teams with high SI individuals, but not necessarily high *team's SI*. The same plots were constructed as before with the exception of substituting team's SI with the average of the individual SI scores (figure 4). For the correlation between average of individual SI scores and variance of team SI scores the Pearson's correlation coefficient was 0.19. For the correlation between average of individual SI scores and variance of performance evaluations the coefficient was -0.22.

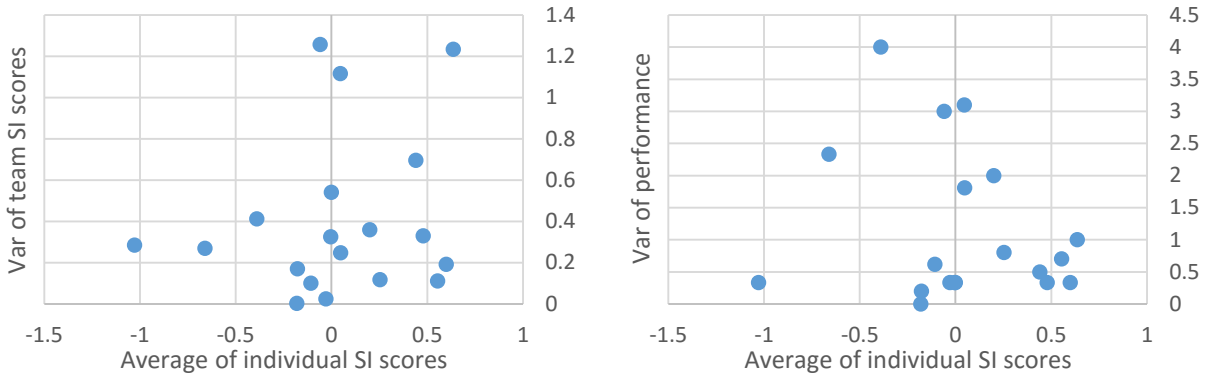

Figure 4: Average of the team's individuals' evaluations of their own SI plotted against the variance of the individuals' team SI score and performance evaluations. Pearson's correlation coefficients related to the plots are 0.19 and -0.22 from left to right.

Again the datasets are very scattered, and the correlation coefficients are small and sensitive to minor changes in the data. Therefore according to this data, teams with high SI individuals don't seem to be having any smaller or larger variance in the individuals' team SI scores or performance evaluations.

4.2.3 Research question 6

The minimum, maximum and average of the team's individuals' evaluations of their own SI and the supervisor's evaluation of their SI was plotted against *team's SI* and *performance*. Pearson correlation coefficients were calculated for each pair. These scatter plots and correlation coefficients are shown in figure 5.

According to the correlation coefficients and plots, min, max and average of individual SI scores all seem to correlate positively with both *team's SI* and *performance*. Slightly smaller correlations were observed for the minimum and maximum than for the average of individual SI scores. Had these correlations been identical, it could have been explained by assuming that individual SI scores are similarly distributed between teams with the exception of a different mean. In that case the minimum, maximum and average would all have contained the same amount of information about the whole distribution. Now it seems that the dissimilarities in the distributions drive the correlations with min and max down a bit. These results offer no support for any claims about the importance of high SI or low SI individuals for the dynamics of the whole team. It is clear however that in this study teams with high SI individuals were more likely, but not guaranteed, to have high *team's SI* and, as demonstrated in section 4.2.1, also high *team's performance*.

The correlations between the supervisor's SI score and the two team level variables are almost nonexistent. These correlations are much weaker than the corresponding correlations with min, max and average of individual SI scores. There is no support for the claim that teams with high SI supervisors would be more likely to have high *team's SI* or *performance*.

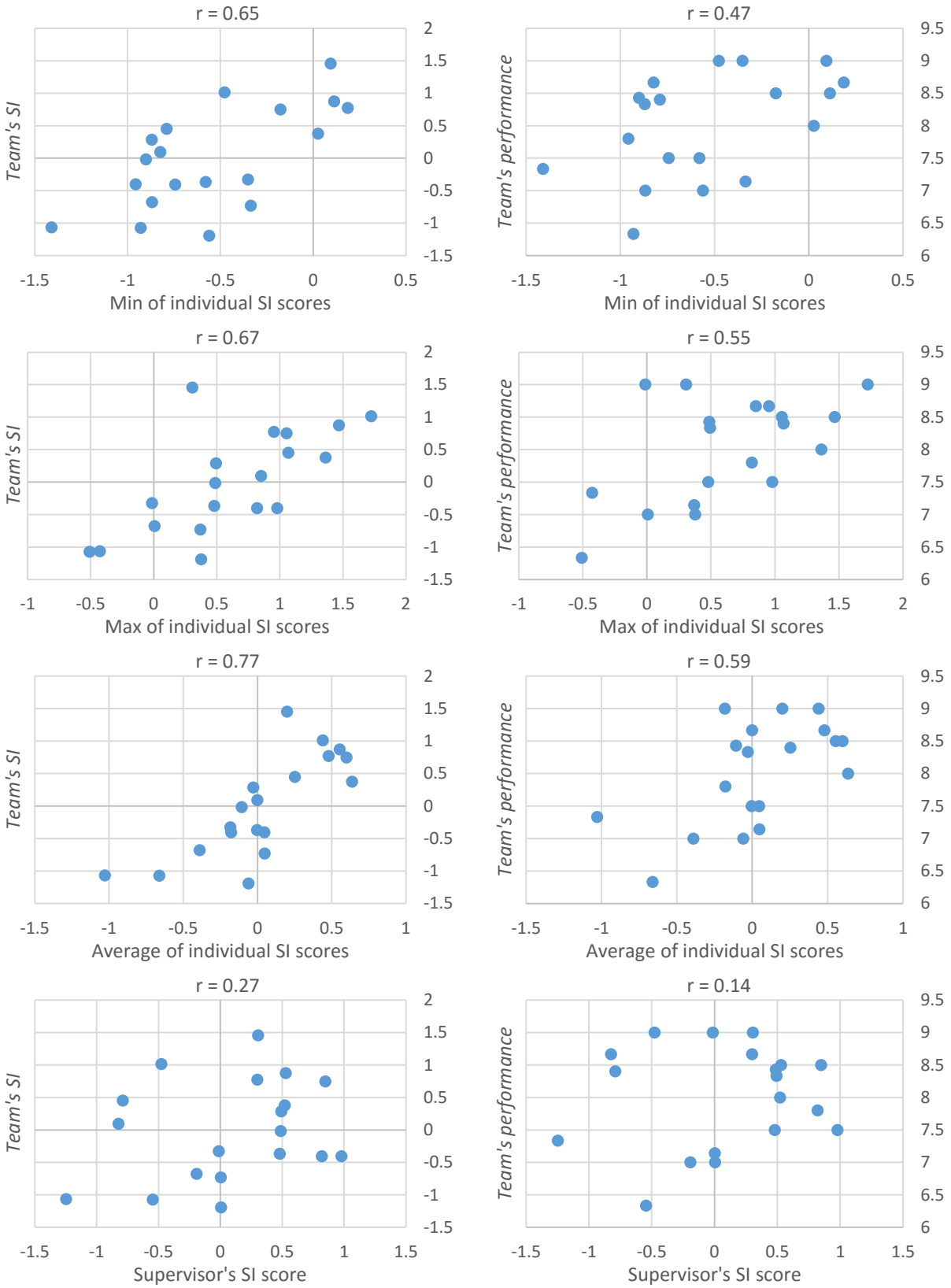

Figure 5: Minimum, maximum and average of the individual SI scores and the supervisor's SI plotted against *team's SI* and *performance*. Related Pearson correlation coefficients (r) are above the plots.

4.2.4 Research question 7

Pearson correlation coefficients were calculated for the variance of individual SI scores of a team and the two team level variables: *team's SI* and *performance*. Scatter plots were also made for the two variable pairs. These coefficients and plots are shown in figure 6.

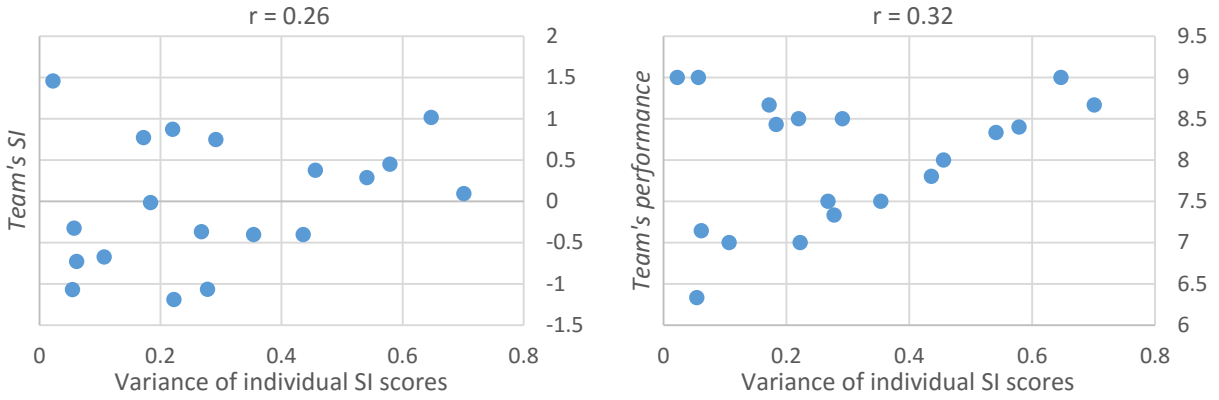

Figure 6: Variance of individual SI scores plotted against *team's SI* and *performance*. The related Pearson correlation coefficients (r) are shown above the plots.

The two correlation coefficients and the related scatter plots (figure 6) indicate a very slight positive correlation in both of the cases. Examination of the plots reveals that, especially in the plot with *team's performance*, there seems to be quite a strong positive correlation, except for a few outliers. It was hypothesized that variance of individual SI scores might not be a meaningful variable for teams that consist of only two individuals. Pairs could behave quite differently than larger teams when facing internal heterogeneity. The analysis was redone without teams that have only two individuals. Figure 7 shows the same plots and correlation coefficients as before in figure 6, but with teams of two (n=2) left out of the dataset.

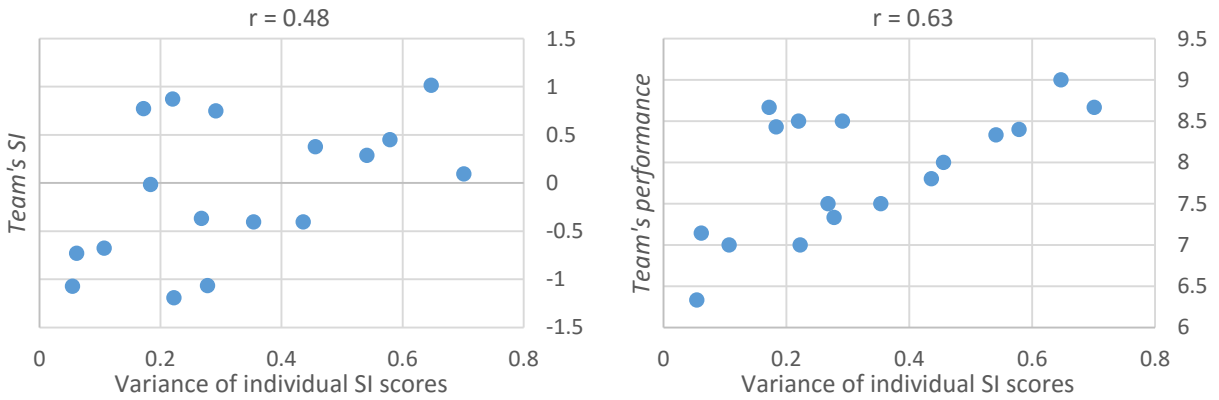

Figure 7: Variance of individual SI scores plotted against *team's SI* and *performance* with teams of two left out of the analysis. The related Pearson correlation coefficients (r) are shown above the plots.

Omitting the teams of two from the dataset reduced the number of outliers in the scatter plots significantly. The correlation coefficients and scatter plots in figure 7 show mediocre positive correlation between variance of individual SI scores and both *team's SI* and *performance*. This result shows that in this study teams with larger heterogeneity of individual's evaluations of their own SI were more likely to have high *team's SI* and *performance*.

5 Discussion

The results of the analysis of the individual level research questions are not too surprising. It seems very human to evaluate yourself over your team when it comes to things like personal growth, taking others into consideration, the effect of problems in your mood and reflecting your own behavior. These are all very personal things and an individual could be easily biased to think that she is different compared to others because she observes these things in herself more often than in others. Supervisors could have a better understanding of the overall picture because their role demands it or because people inclined to think about the whole more often end up in higher positions. It can also be easily understood that supervisors get more stressed when facing problems because the problems usually affect supervisors more directly than the team as a whole. The observation that supervisors evaluated their team's performance slightly higher than members did is very understandable as well. Team performance probably has more significance to the supervisor than to the members, and supervisors have a better overall picture of the team.

Differences in individual SI scores between members and supervisors were not found in this study, which could be related to the special characteristics of the research setting. It would be interesting to test this in a different setting, by studying business or military teams, to see if other kinds of groups exhibit differing behavior.

In the analysis of the team level research questions, *team's SI* was found to be positively related to *team's performance*. The correlation was stronger with *team's SI* than with the average of individual SI scores. This result indicates that *team's SI* is a useful construct, when analyzing the dynamics of a whole team, compared to a simple analysis of the individuals separately. This can reflect the idea that groups are more than the sum of their parts (for a discussion, see, e.g., Woolley, Chabris, Pentland, Hashmi, & Malone, 2010).

High SI teams were not found to have any smaller or larger differences in their evaluation of the performance or the SI score of their team. Also no support was found for the claim that high SI or low SI individuals or the supervisor's SI would be especially significant to the team as a whole. One of the positive results is that teams with larger heterogeneity of individual's evaluations of their own SI were found to be more likely to have high *team's SI* and *performance.* It would thus seem that research groups benefit from variety as opposed to military teams (Lim & Klein, 2006).

The number of teams and supervisors in the data set was quite small, and both the SI and performance of the teams were evaluated by the team members themselves. The data set was large enough for investigating SI in the individual level, and those results are indeed quite clear. The team level results on the other hand are in many situations too weak for a final verdict to be made one way or the other. The most important thing for similar future research is to find a more objective scale for team performance to see if the result of positive correlation between *team's SI* and *performance* holds in that case. Also the size of the data set should be increased, if at all possible, to find clearer results in the team level.

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Appendices

Appendix A – SI inventory factors and items (Törmänen, Hämäläinen, & Saarinen, 2015)

Factor	SI Item
Systemic Perception (PER)	1) I form a rich overall picture of situations 2) I easily grasp what is going on 3) I get a sense of what is essential to a given situation 4) I keep both the details and the big picture in mind
Attunement (ATTU)	5) I approach people with warmth and acceptance 6) I take into account what others think of the situation 7) I am fair and generous with people from all walks of life 8) I let other people have a voice
Attitude (ATD)	9) I explain away my mistakes 10) I have a positive outlook on the future 11) I easily complain about things 12) I let problems in my surroundings get me down
Spirited Discovery (DIS)	13) I like to play with new ideas 14) I look for new approaches 15) I like to try out new things 16) I act creatively
Reflection (REF)	17) I view things from many different perspectives 18) I pay attention to what drives my behavior 19) I think about the consequences of my actions 20) I make strong efforts to grow as a person
Wise Action (WIS)	21) I am willing to take advice 22) I take into account that achieving good results can take time 23) I am wise in my judgments 24) I keep my cool even when situations are not under control
Positive Engagement (ENG)	25) I contribute to the shared atmosphere in group situations 26) I praise people for their achievements 27) I'm good at alleviating tension in difficult situations 28) I bring out the best in others
Effective Responsiveness (EFF)	29) I prepare myself for situations to make things work 30) I easily give up when facing difficult problems 31) I'm able to put the first things first 32) When things don't work, I take action to fix them

Appendix B – The SI-questionnaire used

Aalto University
School of Science

Teams questionnaire

Suomeksi

The following phrases refer to ways of thinking, feeling, and acting. Please indicate as honestly and truthfully as possible how often you think, feel, and behave the ways described.

The questionnaire will take about 10 minutes to complete.

The ID number of our team (use the number given by the team leader)

My own assessment of the team's performance with respect to its objectives (1-10=best)

My role in the team
- supervisor
- member

Myself in a team

Think of **yourself as a member of the team** and then select the answer that you think describes it the best. Please choose the response that feels most "natural" to you if you are uncertain as to what to answer.

	never	very seldom	seldom	some-times	often	very often	always
1. I contribute to the shared atmosphere in group situations							
2. I easily grasp what is going on							
3. I approach people with warmth and acceptance							

	never	very seldom	seldom	some-times	often	very often	always
4. I think about the consequences of my actions	○	○	○	○	○	○	○
5. I am willing to take advice	○	○	○	○	○	○	○
6. I'm able to put the first things first	○	○	○	○	○	○	○
7. I bring out the best in others	○	○	○	○	○	○	○
8. I have a positive outlook on the future	○	○	○	○	○	○	○
9. I take into account that achieving good results can take time	○	○	○	○	○	○	○
10. I am wise in my judgments	○	○	○	○	○	○	○
11. I keep both the details and the big picture in mind	○	○	○	○	○	○	○
12. I let problems in my surroundings get me down	○	○	○	○	○	○	○
13. I am fair and generous with people from all walks of life	○	○	○	○	○	○	○
14. I take into account what others think of the situation	○	○	○	○	○	○	○
15. I look for new approaches	○	○	○	○	○	○	○
16. I make strong efforts to grow as a person	○	○	○	○	○	○	○
17. I act creatively	○	○	○	○	○	○	○
18. When things don't work, I take action to fix them	○	○	○	○	○	○	○

	never	very seldom	seldom	some-times	often	very often	always
19. I let other people have a voice	○	○	○	○	○	○	○
20. I pay attention to what drives my behavior	○	○	○	○	○	○	○
21. I view things from many different perspectives	○	○	○	○	○	○	○
22. I explain away my mistakes	○	○	○	○	○	○	○
23. I'm good at alleviating tension in difficult situations	○	○	○	○	○	○	○
24. I form a rich overall picture of situations	○	○	○	○	○	○	○
25. I prepare myself for situations to make things work	○	○	○	○	○	○	○
26. I easily complain about things	○	○	○	○	○	○	○
27. I keep my cool even when situations are not under control	○	○	○	○	○	○	○
28. I like to play with new ideas	○	○	○	○	○	○	○
29. I easily give up when facing difficult problems	○	○	○	○	○	○	○
30. I like to try out new things	○	○	○	○	○	○	○
31. I praise people for their achievements	○	○	○	○	○	○	○
32. I get a sense of what is essential to a given situation	○	○	○	○	○	○	○

Acting as a team

Think of your **team as a whole** and then select the answer that you think describes it the best. Please choose the response that feels most "natural" to you if you are uncertain as to what to answer.

	never	very seldom	seldom	some-times	often	very often	always
1. We contribute to the shared atmosphere in group situations	○	○	○	○	○	○	○
2. We easily grasp what is going on	○	○	○	○	○	○	○
3. We approach people with warmth and acceptance	○	○	○	○	○	○	○
4. We think about the consequences of our actions	○	○	○	○	○	○	○
5. We are willing to take advice	○	○	○	○	○	○	○
6. We are able to put the first things first	○	○	○	○	○	○	○
7. We bring out the best in others	○	○	○	○	○	○	○
8. We have a positive outlook on the future	○	○	○	○	○	○	○
9. We take into account that achieving good results can take time	○	○	○	○	○	○	○
10. We are wise in our judgments	○	○	○	○	○	○	○
11. We keep both the details and the big picture in mind	○	○	○	○	○	○	○
12. We let problems in our surroundings get us down	○	○	○	○	○	○	○
13. We are fair and generous with people from all walks of life	○	○	○	○	○	○	○

	never	very seldom	seldom	some-times	often	very often	always
14. We take into account what others think of the situation	○	○	○	○	○	○	○
15. We look for new approaches	○	○	○	○	○	○	○
16. We make strong efforts to grow as a person	○	○	○	○	○	○	○
17. We act creatively	○	○	○	○	○	○	○
18. When things don't work, we take action to fix them	○	○	○	○	○	○	○
19. We let other people have a voice	○	○	○	○	○	○	○
20. We pay attention to what drives our behavior	○	○	○	○	○	○	○
21. We view things from many different perspectives	○	○	○	○	○	○	○
22. We explain away our mistakes	○	○	○	○	○	○	○
23. We are good at alleviating tension in difficult situations	○	○	○	○	○	○	○
24. We form a rich overall picture of situations	○	○	○	○	○	○	○
25. We prepare ourselves for situations to make things work	○	○	○	○	○	○	○
26. We easily complain about things	○	○	○	○	○	○	○
27. We keep our cool even when situations are not under control	○	○	○	○	○	○	○
28. We like to play with new ideas	○	○	○	○	○	○	○

	never	very seldom	seldom	some-times	often	very often	always
29. We easily give up when facing difficult problems	○	○	○	○	○	○	○
30. We like to try out new things	○	○	○	○	○	○	○
31. We praise people for their achievements	○	○	○	○	○	○	○
32. We get a sense of what is essential to a given situation	○	○	○	○	○	○	○

Personal info

Your age

- ○ 15-19
- ○ 20-24
- ○ 25-29
- ○ 30-34
- ○ 35-39
- ○ 40-44
- ○ 45-49
- ○ 50-54
- ○ 55-59
- ○ 60-64
- ○ 65-69
- ○ 70-74
- ○ No answer

Gender

- ○ Male
- ○ Female
- ○ No answer

Professional status	○ Full-time employed ○ Entrepreneur ○ Student ○ Retired ○ At home ○ Other ○ No answer
Are you in a supervisor position?	○ Yes ○ No ○ No answer

By submitting you give the permission to use your answers in Aalto University research projects.

Submit answers

Further information about this questionnaire is available from professors Raimo P. Hämäläinen (raimo.hamalainen@aalto.fi) and Esa Saarinen (esa.saarinen@aalto.fi).

Appendix C – Items in the Organizational Learning Survey (Goh & Richards, 1997)

Clarity of Purpose and Mission

1. There is widespread support and acceptance of the organization's mission statement.
2. I do not understand how the mission of the organization is to be achieved (r).
3. The organization's mission statement identifies values to which all employees must conform.
4. We have opportunities for self assessment with respect to goal attainment.

Leadership Commitment and Empowerment

5. Senior managers in this organization resist change and are afraid of new ideas (r).
6. Senior managers and employees in this organization share a common vision of what our work should accomplish.
7. Managers in this organization can accept criticism without becoming overly defensive.
8. Managers in this organization often provide useful feedback that helps to identify potential problems and opportunities.
9. Managers in this organization frequently involve employees in important decisions.

Experimentation

10. I can often bring new ideas into the organization.
11. From my experience, people who are new in this organization are encouraged to question the way things are done.
12. Managers in this organization encourage team members to experiment in order to improve work processes.
13. Innovative ideas that work are often rewarded by management.
14. In my experience, new ideas from emloyees are not treated seriously by management (r).

Transfer of Knowledge

15. I often have an opportunity to talk to other staff about succesful programs or work activities in order to understand why they succeed.
16. Failures are seldom constructively discussed in our organization (r).
17. New work processes that may be useful to the organization as a whole are usually shared with all employees.
18. We have a system that allows us to learn successful practices from other organizations.

Teamwork and Group-Problem Solving

19. Current organizational practice encourages employees to solve problems together before discussing them with a manager.
20. We cannot usually form informal groups to solve organizational problems (r).
21. Most problem solving groups in this organization feature employees from a variety of functional areas.

Appendix D – Items in the organizational learning capability scale (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005)

Managerial commitment (MC)

MC1. The managers frequently involve their staff in important decisionmaking processes.
MC2. Employee learning is considered more of an expense than an investment.
MC3. The firm's management looks favorably on carrying out changes in any area to adapt to and/or keep ahead of new environmental situations.
MC4. Employee learning capability is considered a key factor in this firm.
MC5. In this firm, innovative ideas that work are rewarded.

Systems perspective (SP)

SP1. All employees have generalized knowledge regarding this firm's objectives.
SP2. All parts that make up this firm (departments, sections, work teams, and individuals) are well aware of how they contribute to achieving the overall objectives.
SP3. All parts that make up this firm are interconnected, working together in a coordinated fashion.

Openness and experimentation (EX)

EX1. This firm promotes experimentation and innovation as a way of improving the work processes.
EX2. This firm follows up what other firms in the sector are doing, adopting those practices and techniques it believes to be useful and interesting.
EX3. Experiences and ideas provided by external sources (advisors, customers, training firms, etc.) are considered a useful instrument for this firm's learning.
EX4. Part of this firm's culture is that employees can express their opinions and make suggestions regarding the procedures and methods in place for carrying out tasks.

Knowledge transfer and integration (TR)

TR1. Errors and failures are always discussed and analyzed in this firm, on all levels.
TR2. Employees have the chance to talk among themselves about new ideas, programs, and activities that might be of use to the firm.
TR3. In this firm, teamwork is not the usual way to work.
TR4. The firm has instruments (manuals, databases, files, organizational routines, etc.) that allow what has been learnt in past situations to remain valid, although the employees are no longer the same.

Appendix E – Yhteenveto (Summary in Finnish)

Systeemiälyn (SI) käsitteen esittelivät professorit Raimo P. Hämäläinen ja Esa Saarinen vuonna 2002 Teknillisessä korkeakoulussa. Alun perin he määrittelivät tämän käsitteen seuraavasti:

> ”Systeemiäly on älykästä käyttäytymistä monimutkaisissa systeemeissä, jotka sisältävät vuorovaikutusta ja takaisinkytkentöjä. Systeemiälykkäästi toimiva tekijä vaikuttaa onnistuneesti ja tuottavasti ympäristönsä holistisiin vuorovaikutusmekanismeihin. Hän havainnoi itseään kokonaisuuden osana, kokonaisuuden vaikutusta itseensä ja hänen omaa vaikutustaan kokonaisuuteen. Tarkkailemalla omaa riippuvuussuhdettaan paljon takaisinkytkentöjä sisältävään ympäristöön hän pystyy toimimaan älykkäästi.” (Hämäläinen & Saarinen, 2004, s. 3)

Myöhemmin systeemiälyn konseptia tutkittiin kvalitatiivisesti esseekokoelmien julkaisusarjassa. Ensimmäinen kvantitatiivinen työkalu systeemiälyn mittaamiseen kehitettiin vuonna 2012 Aalto-yliopistossa Systeemiälyn tutkimusryhmässä (Törmänen, 2012). Tätä mittaustyökalua kutsutaan systeemiälykyselyksi, ja se on itsearviointilomakkeen muodossa. Systeemiälykyselyä on kehitetty eteenpäin, ja lopullinen kysely sisältää 32 kysymystä ja kahdeksan faktoria (Törmänen, Hämäläinen, & Saarinen, 2015).

Tässä kandidaatintyössä systeemiälykysely vietiin tiimikontekstiin. Tällä pyrittiin selvittämään, voiko sillä mitata yksilön oman systeemiälyn lisäksi organisatorista systeemiälyä. Tälle organisatoriselle systeemiälylle eli yksilön sijaan kokonaisen ryhmän ominaisuudelle annettiin nimeksi *tiimin systeemiäly*. Tutkimusta varten Aalto-yliopiston tutkimusryhmistä kerättiin kyselyaineisto, ja kyselytuloksille tehtiin perusteellinen tilastollinen analyysi monien muidenkin tekijöiden kuin pääaiheen, eli organisatorisen systeemiälyn, tutkimiseksi. Lopullinen aineisto sisältää kyselyvastaukset 81 Aalto-yliopiston tutkijalta, jotka kuuluvat 19:ään eri tiimiin. Tutkitut aiheet jaettiin kahteen kategoriaan: yksilö- ja tiimitasoon. Yksilötasolla tutkittiin eroja vastaajien arviossa itsestään ja tiimistään sekä eroja tiimin jäsenten ja vetäjien välillä. Tiimitason aiheita oli kolme. Ensimmäinen oli korkean tai matalan SI:n omaavien yksilöiden tai vetäjän SI:n vaikutus tiimiin kokonaisuutena. Viimeiset kaksi aihetta olivat heterogeenisyyden vaikutus tiimiin sekä systeemiälyn ja tiimin suorituskyvyn välinen riippuvuussuhde.

Tulokset yksilötason aiheiden analyysistä eivät olleet kovin yllättäviä. Analyysissä havaittiin, että tiimien jäsenet arvioivat itsensä korkeammalle kuin tiiminsä viiden kysymyksen ja kahden faktorin osalta. Itsensä arvioiminen muita korkeammalle vaikuttaa hyvin inhimilliseltä sellaisissa kohdissa, jotka liittyvät henkilökohtaiseen kasvuun, muiden huomioon ottamiseen, ongelmien vaikutukseen omaan mielialaan ja oman käyttäytymisen arviointiin. Nämä ovat hyvin henkilökohtaisia asioita, ja yksilö voi helposti kuvitella olevansa erilainen kuin muut, sillä hän havaitsee näitä asioita useammin itsessään kuin muissa. Yhdessä kohdassa vastaajat arvioivat itsensä tiimiään matalammalle. Tämä kohta oli ”Nostan ihmisten parhaat puolet esiin”. Tämäkin tulos on ymmärrettävä: Yksilö tuntee helposti saavansa enemmän apua muilta kuin pystyy antamaan takaisin.

Vetäjien arviot itsestä ja tiimistä erosivat merkittävässä määrin kahden kysymyksen kohdalla. Kohdassa 24: ”Säilytän mielenmalttini hallitsemattomissakin tilanteissa” vetäjät arvioivat itsensä tiimiään matalammalle. Tätä selittää se, että vetäjät varmaankin kokevat enemmän stressiä ongelmatilanteissa, koska ongelmat usein vaikuttavat suoremmin heihin kuin muuhun tiimiin. Kohdassa 1: ”Muodostan monipuolisen kokonaiskuvan tilanteista” vetäjät arvioivat itsensä tiimiään korkeammalle. Vetäjillä voi todella olla parempi kokonaiskuva tilanteista, koska heidän roolinsa vaatii sitä tai koska sellaiset ihmiset, joilla on taipumus ajatella kokonaisuutta enemmän, päätyvät korkeampiin asemiin. Vetäjät arvioivat tiiminsä suorituskyvyn keskimäärin korkeammalle kuin jäsenet. Suorituskyvyllä on todennäköisesti enemmän merkitystä tiimin vetäjille, ja heillä on myös usein parempi kokonaiskuva tiimistä. Vetäjät arvioivat sekä tiiminsä että oman systeemiälynsä yhtä

korkealle kuin jäsenet. Tämä tulos saattaa liittyä akateemiseen tutkimusympäristöön. Sama tutkimus kannattaisi suorittaa esimerkiksi yritys- tai armeijaympäristössä, sillä olisi mielenkiintoista selvittää, käyttäytyvätkö muunlaiset tiimit eri tavalla tässä suhteessa.

Tiimitason aiheiden analyysissä selvisi, että *tiimin systeemiäly* korreloi positiivisesti tiimin suorituskyvyn kanssa. Riippuvuussuhde tiimin suorituskyvyn kanssa oli voimakkaampi *tiimin systeemiälyn* tapauksessa kuin tiimin yksilöiden systeemiälypisteiden keskiarvon tapauksessa. Tämä tulos viittaa siihen, että *tiimin systeemiäly* on hyödyllinen konstruktio analysoitaessa kokonaisen tiimin dynamiikkaa verrattuna yksilöiden analysoimiseen erikseen. Tämä saattaa olla esimerkki ajatuksesta, jonka mukaan ryhmät muodostavat jotakin suurempaa kuin niihin kuuluvien yksilöiden summan (ks. esim. Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Korkean systeemiälyn tiimien ei havaittu olevan muita yksimielisempiä tiimin systeemiälyä tai suorituskykyä arvioitaessa. Tukea ei myöskään löytynyt väitteelle korkean tai matalan SI:n omaavien yksilöiden tai vetäjän SI:n erityisen suuresta merkityksestä tiimille kokonaisuutena. Yksi positiivisista tuloksista ilmeni heterogeenisyyden vaikutusta tutkittaessa. Tiimit, joiden yksilöiden systeemiälypisteissä oli enemmän vaihtelua, olivat todennäköisemmin korkean *tiimin systeemiälyn* ja suorituskyvyn tiimejä. Tämän tuloksen perusteella näyttää siltä, että tutkimusryhmät hyötyvät erilaisuudesta toisin kuin sotilastiimit (Lim & Klein, 2006).

Tässä kandidaatintyössä käytetty aineisto sisälsi melko vähän tiimejä ja tiimin vetäjiä. Aineisto oli tarpeeksi laaja yksilötason aiheiden tutkimiseen, ja niissä tulokset ovatkin hyvin selkeitä. Tiimitason tulokset puolestaan ovat useissa kohdissa liian heikkoja lopullisten päätelmien tekemiseen suuntaan tai toiseen. Vastaajat arvioivat itse sekä systeemiälyä että tiimin suorituskykyä, mikä heikentää tulosten luotettavuutta. Samankaltaisessa myöhemmässä tutkimuksessa tärkeintä on löytää objektiivisempi mittari tiimin suorituskyvylle. Silloin voitaisiin selvittää, onko tulos positiivisesta korrelaatiosta *tiimin systeemiälyn* ja suorituskyvyn välillä pätevä. Tutkimusaineiston kokoa tulisi myös pyrkiä kasvattamaan tiimitason tulosten selkeyttämiseksi.