APPENDIX A - RESULTS OF THE STATISTICAL TEST

Table A.1. The results of the statistical tests regarding the seriousness of the OSR vs. demographic part of the survey (survey questions 2 and 10, 11, 12^1)

	Seriousne	ess o	f OSR vs.	Seriousne	ss of	OSRs vs.	Seriousne	ss of	OSRs vs.	
	responder	nts' rol	es	organizati	ons' siz	ze	development methodologies			
	Null hypo	othesis	(H0): there is	Null hypo	thesis (H0): there is	Null hypo	thesis (H0): there is	
	no signifi	cant as	sociation	no signific	ociation	no signific	cant ass	sociation		
	between t	the resp	ondent role	between the	ne size	of the	between the development			
	and the se	eriousn	ess of OSRs	companie	s that th	e respondents	methodologies used and the			
				work for and the seriousness of			seriousnes	ss of O	SRs	
				OSRs						
	Value	Df	Asymp Sig.	Value	Df	Asymp Sig.	Value	Df	Asymp Sig.	
			(2-sided)			(2-sided)			(2-sided)	
Pearson Chi-	20.363 ²	24	p=0.68	10.380 ³	18	p=0.92	10.38 ⁴	30	p=0.117	
Square										

Table A.2. The results of the statistical tests regarding the relationship between the definition of OSRs and the respondents' roles, the size of organizations and the development methodologies (questionnaire questions 1 and 10, 11 12).

	Definition of OSR vs. respondents' roles				Seriousness organizations	Seriousness of OSRs vs. development methodologies							
	The null hy assumes the significant is between the roles and the OSRs. Whi hypothesis is significant is between the	nt there relation e respo e defin le, the (H1) prelation	e is no niship indents' nition of alternative redicts a niship	ve	The null hypothat there is no relationship be organizations of OSRs. Besi hypothesis (H significant rel two variables.	ion	The null there is n between and the d methodol	o signi the def evelop	ifican initio	nt relation on of OSF	ship		
	Value	Df	Asymp		Value	Df	Asymp Sig	ŗ.	Value	Df	As	ymp Sig.	(2-
			Sig. (2-				(2-sided)				sid	ed)	
			sided)										
Pearson	X2 =	48 p=0.628			X2=32.897 ⁶	36	p=0.617>0	.05	X2 =	60	p=0	0.003<0.0)5
Chi-Square	44.2285								94.03 ⁷		AS	SUMPTI	ONS

http://fileadmin.cs.lth.se/serg/ExperimentPackages/Obsolete/AppendixB SurveyQuestions.pdf

¹ The questionnaire questions can be found at

² 19 cells (52.8%) have expected count less than 5. The minimum expected count is .73.

³ 14 cells (50.0%) have expected count less than 5. The minimum expected count is .67.

 $^{^4}$ There are more than 20% of cells have expected cell counts less than 5, and some cells have expected values of less than one

⁵ Chi-square test requires that at most 20% of the cells have predicted value less than 5. But, there are some roles like 'system integrator' and 'software maintainer' that received 3 and 2 responses, respectively. These two categories were merged with the 'others' category in order to reduce the number of cells that received less than 5.

⁶ In addition, in this test, one of chi-square test conditions was violated i.e. more than 20% of cells have expected cell counts less than 5. Thus, chi-square results may be invalid.

-					
- 1					VIOLATED
П					VIOLITED

Table A.2a. The results of the statistical tests regarding the relationship between the definition of OSRs and the top 5 methodologies used by our respondents.

	Seriousness of OSRs vs. top 5 development methodologies								
	The <i>null</i> hypothesis assumes that there is no significant relationship between the definition of OSRs and the top 5 developments methodologies.								
	Value	Df	Asymp Sig. (2-sided)						
Pearson Chi-Square	X2 = 50.578	30	p=0.011 <0.05 ASSUMPTIONS						
			NOT VIOLATED						

Table A.3. The contingency table between the development methodologies and the definition of OSRs. (questionnaire questions 1 and 15)

	Not required	No value	Duplicated	Rejected	Never	Others
					implemented	
Ad hoc (no	9.1%	10.5%	6.8%	9.8%	7.6%	11.1%
method)						
Waterfall	37.2%	32.6%	32.2%	41.5%	45.5%	40.7%
Incremental	42.1%	37.2%	42.2%	39%	33.3%	48.1%
Spiral dev.	6.6%	5.8%	8.5%	14.6%	10.6%	14.8%
Agile	43%	48.8%	47.5%	48.8%	53%	74.1%
Rapid App.	7.4%	10.5%	8.5%	7.3%	7.6%	22.2%
Prototyping	19%	15.1%	13.6%	19.5%	21.2%	37%
Rational	9.9%	11.6%	10.2%	7.3%	16.7%	33.3%
Unified						
Components-	8.3%	11.6%	16.90%	9.8%	9.1%	22.2%
based						
Formal	6.6%	4.7%	8.50%	2.4%	0%	7.4%
methods						

Table A.4. The results for the question "*How likely the following types of software requirements* will become obsolete". The respondents could select one answer from the *Likert* scale from 1 to 5 where 1 where 1 is not likely and 5 is very likely. (questionnaire question 3)

	Not likely	somehow likely	likely	more likely	very likely	Rating average	Responses count
Requirements related to laws and regulations.	34.9% (76)	24.8% (54)	23.4% (51)	9.2% (20)	7.8% (17)	2.30	218

⁷ The violations are: there are more than 20% of cells have expected cell counts less than 5, and some cells have values of less than one. These reasons invalidate the results of the chi-square test. As a result, the null hypothesis (H0) is accepted. Thus, there is no significant association between the two variables.

Requirements related to	30.4%	30.9%	24.0%	11.5%	3.2% (7)	2.26	217
standards.	(66)	(67)	(52)	(25)	3.270 (1)	2.20	217
Requirements obtained from	9.7%	27.6%	30.0%	22.6%	10.1%	2.96	217
market analysis, domain experts	(21)	(60)	(65)	(49)	(22)	2.50	217
and competitors.	(21)	(00)	(05)	(47)	(22)		
Requirements about the	10.6%	21.8%	38.4%	20.4%	8.8%	2.95	216
company's organization and	(23)	(47)	(83)	(44)	(19)	2.50	210
policies.	(25)	(.,,	(00)	(,	(1)		
Hardware related requirements.	12.0%	34.3%	21.3%	20.4%	12.0%	2.86	216
	(26)	(74)	(46)	(44)	(26)		
Functional requirements	14.4%	22.7%	26.9%	21.8%	14.4%	2.99	216
originated from customers.	(31)	(49)	(58)	(47)	(31)		
Functional requirements	14.8%	22.7%	24.1%	21.3%	17.1%	3.03	216
originated from end users.	(32)	(49)	(52)	(46)	(37)		
Functional requirements	7.3%	23.4%	29.8%	25.2%	14.2%	3.16	218
originated from developers.	(16)	(51)	(65)	(55)	(31)		
Incorrect requirements	5.6%	9.3%	19.6%	22.4%	43.0%	3.88	214
(misunderstood stakeholders	(12)	(20)	(42)	(48)	(92)		
requirements).							
Ambiguous requirements	6.5%	9.8%	21.0%	30.4%	32.2%	3.72	214
	(14)	(21)	(45)	(65)	(69)		
Inconsistent requirements.	4.7%	10.0%	24.2%	28.4%	32.7%	3.74	211
	(10)	(21)	(51)	(60)	(69)		
Requirements related to third	7.0%	29.4%	34.1%	22.0%	7.5%	2.93	214
party components e.g. COTS.	(15)	(63)	(73)	(47)	(16)		
Requirements related to design	14.0%	36.3%	27.0%	17.2%	5.6%	2.64	215
and architecture.	(30)	(78)	(58)	(37)	(12)		
Replaceability requirements.	10.7%	36.3%	29.3%	15.8%	7.9%	2.74	215
(How easy it is to exchange a	(23)	(78)	(63)	(34)	(17)		
given software component within							
a specified environment)							
Usability requirements.	15.1%	34.4%	23.9%	19.3%	7.3%	2.69	218
	(33)	(75)	(52)	(42)	(16)		
Interoperability requirements.	14.6%	26.5%	28.8%	22.4%	7.8%	2.82	219
(the ability of a software	(32)	(58)	(63)	(49)	(17)		
component to interact with other							
components or systems)							

Table A.5. The results of statistical test between the ways to discover OSRs and the respondents' roles, size of organizations and the development methodologies (questionnaire questions 4 and 10, 11,12).

	Ways to disc	cover (OSRs vs.	Ways to discove	er OSF	Rs vs. size of	Ways to	discove	r OSRs vs.
	respondents	' roles	1	organizations			developn	ient	
							methodo	logies	
Hypotheses	Null hypothe	sis: the	ere is no	Null hypothesis:	there i	s no	Null hypo	thesis: 1	there is no
	significant re	lations	ship	significant relati	onship	between the	significan	t relatio	nship
	between the	ways t	o discover	ways to discover	OSRs	and the size	between t	he ways	s to
	OSRs and the	e respo	ondents'	of organizations			discover OSRs and the		
	roles						developm	ent met	hodologies
	Value	df	Asymp.	Value	Df	Asymp. Sig	Value	Df	Asymp.
			Sig (2-			(2-sided)			Sig (2-
			sided)						sided)
Pearson Chi-	72.622 ⁸	50	p-value	X2=29.443 ⁹	30	p=0.494	110.404	50	1.89 E-
Square			0.02						6 ¹⁰
						1	More tha	n 20%	of cells in
							this table	have e	xpected

 $^{^8}$ The chi-square statistic is significant at the 0.05 level. More than 20% of cells in this sub-table have expected cells counts less than 5. The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid.

¹⁰ More than 20% of cells in this sub-table have expected cell count less than 5. Chi-square results may be invalid.

3

 $^{^{9}}$ More than 20% of the cells have expected cell counts less than 5. Thus, chi-square results may be invalid.

	cell counts less than 5. Chi-
	square results may be
	invalid.

Table A.5a. The results of statistical test between the ways to discover OSRs and the top 5 development methodologies (questionnaire questions 4 and 10, 11,12).

	Ways to discover OSRs vs. top 5 development methodologies						
Hypotheses	Null hyp	othesi	s: there is no				
	significa	nt rela	ationship between				
	the ways	to dis	scover OSRs and				
	the deve	lopme	ent methodologies				
	Value	Df	Asymp. Sig (2-				
			sided)				
Pearson	48.134	25	p-value =0.004				
Chi-Square			ASSUMPTIONS				
			NOT				
			VIOLATED				

Table A.6. The results of statistical test between the actions to be taken against OSRs and the respondents' roles, size of organizations and the development methodologies (questionnaire questions 5 and 10,11,12)

	Actions to be	taker	against	Actions to l	e take	en against	Actions to	be taker	n against
	OSRs vs. res	sponde	ents' roles	OSRs vs. si	ze of o	rganizations	OSRs vs. development		
						methodologies			
Hypotheses	Null hypothesis: there is no			Null hypoth	esis: th	ere is no	Null hypot	thesis: the	ere is no
	significant relationship between			significant r	elation	ship between	significant	t relations	hip between
	the actions to	be tak	en against	the actions to be taken against			the actions to be taken against		
	OSRs and the	respo	ndents'	OSRs and the	SRs and the size of		OSRs and the development		
	roles			organization	organizations		methodolo	ogies	
	Value	df	Asymp.	Value	Df	Asymp. Sig	Value	Df	Asymp. Sig
			Sig (2-			(2-sided)			(2-sided)
			sided)						
Pearson Chi-	33.16311	40	p=0.769	37.92812	50	p=0.895	71.015 ¹³	50	p=0.027
Square									ASSUMPTIONS VIOLATED

¹¹ More than 20% of the cells have expected cell counts less than 5. Therefore chi-square results may be invalid.

¹² More than 20% of the cells have expected cell counts less than 5 and the minimum expected count of some cells is less than one. Therefore, chi-square results may be invalid.

¹³ This result is significant but rejected due to violations of chi-square test conditions (the conditions are: more than 20% of the cells have expected cell count less than 5 and many cells have minimum expected cell count of less than one).

Table A.7. The results of statistical test between the existence of requirements process that takes into consideration OSRs and the demographic part of the survey (questionnaire questions 2 and 10, 12)

	Phases of RE probe managed vs.		where OSRs should ndents' roles	Phases of RE process where OSRs should be managed vs. development methodologies			
Hypotheses	Null hypothesis: relationship betw requirements eng respondents role	veen th	E		n the org	there is no significant relationship anizations size and the presence of	
	Value	df	Asymp. Sig (2-sided)	Value	Df	Asymp. Sig (2-sided)	
Pearson Chi- Square	X2=98.425 ¹⁴	80	p=0.079	TO FIX		Non-significant	

Table A.8 The results of statistical test between the respondents' roles and the methodologies used by the respondents and the existence of the process of managing OSRs. (questionnaire questions 9 and 10, 12, 14).

	Existence of OSRs process			Existence of OSRs process			Existence of OSRs process vs.		
	vs. respondents' roles			vs. size of organizations			development methodologies		
Hypotheses	Null hypothesis: there is no			Null hypothesis: there is no			Null hypothesis: There is no		
	significant relationship			significant relationship			significant relationship between the		
	between the respondents roles			between the organizations		development methodologies used by			
	and the existence of the OSR			size and the presence of OSR		the respondents and the present of			
	process			process		OSR process			
	Value df Asymp.		Value	Df	Asymp.	Value	Df	Asymp.	
			Sig (2-			Sig (2-			Sig (2-
			sided)			sided)			sided)
Pearson Chi-	25.485 ¹⁵	8	0.0012	4.759 ¹⁶	6	0.58	18.247	10	0.051
Square									

Table A.8a The results of statistical test between the type of requirements engineering and the existence of the process of managing OSRs (questionnaire questions 9 and 15).

	Existence of OSRs process vs. types of requirements engineering			
Hypotheses	Null hypothesis: there is no significant relationship between the types of requirements engineering and the existence of the OSR process			
	Value	df	Asymp.	

¹⁴ More than 20% of cells in this case have expected cell counts less than 5. As a result, chi-square may be invalid.

 $^{^{15}}$ 4 cells (22.2%) have expected count less than 5. The minimum expected count is 3.08.

 $^{^{16}}$ 5 cells (35.7%) have expected count less than 5. The minimum expected count is 2.84.

			Sig (2- sided)
Pearson Chi-	11.826	5	0.059
Square			

Table A.9. Cross-tabulation between the respondents' roles and results for the question regarding the existence of OSR process (questionnaire questions 10 and 9)

Role	No	Yes	Total
Software project manager	5.6% [12]	4.7% [10]	10.3% [22]
Software product manager	4.7% [10]	0.9% [2]	5.6% [12]
Software team leader	5.1% [11]	2.3% [5]	7.5% [16]
Software architect/designer	8.9% [19]	1.4% [3]	10.3% [22]
Requirements specialist	17.3% [37]	7.9% [17]	25.2% [54]
Developer/Programmer/coder	7.5% [16]	0.5% [1]	7.9% [17]
Software tester	5.1% [11]	0.5% [1]	5.6% [12]
Researcher/academician	11.2% [24]	0.5% [1]	11.7% [25]
Other	8.9% [19]	7% [15]	15.9% [34]
TOTAL	74.3% [159]	25.7% [55]	100% [214]

Table A.10 Contingency table between development methodologies and the existence of OSR process.

Development methodology	Answered No to Question 9	Answered Yes to the	
	in the questionnaire [1]	questionnaire question 9 [1]	
Agile	24.9%	23.3%	
Incremental/Evolutionary	20.30%	16.7%	
Waterfall	18.5%	15.8%	
Prototyping	7.8%	12.5%	
Rational Unified Model	7.5%	8.3%	
Components-based software engineering	5%	8.3%	
Ad hoc (no method)	6.8%	1.7%	
Rapid application development	3.9%	5%	
Spiral development	2.5%	5.8%	
Formal methods	2.8%	2.5%	

Table A.11 The result for the top 5 methodologies and the first question.

	Waterfall	Incremental/	Agile	Prototyping	Rational	Response
	development	evolutionary	software		Unified	Totals
		development	development		model	
Is no longer	63.4% 45	64.6% (51)	53.1% (52)	60.5% (23)	37.5% (12)	61.1% (113)
required for						
the current						
release						
Has no value	39.4% (28)	40.5% (32)	42.9% (42)	34.2% (13)	31.3% (10)	40% (74)
for the						
potential						

users						
Is	26.8% (19)	31.6% (25)	28.6% (28)	21.1% (8)	18.8% (6)	29.2% (54)
duplicated/						
redundant						
Is rejected	23.9% (17)	20.3% (16)	20.4% (200	21.1% (8)	9.4% (3)	19.5% (36)
Was never	42.3% (30)	27.8% (22)	35.7% (35)	36.8% (14)	34.4% (11)	33.5% (62)
used or						
implemented						
Answered	71	79	98	38	32	185
questions						