Consistent Development

Results of a First Empirical Study on the Relation Between Project Scenario and Success

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Abstract. Different project characteristics call for different project scenarios. It follows that, for a project to be successful, the scenario should fit project characteristics. In this study, we investigate statistical relations between different measures for project success and factors that characterize project situations. The study is based on a survey of project managers. The results provide valuable insight into factors that impact success.

1. Introduction

Each project should be developed according to a *project scenario,* a specific plan at the start of the project for the subsequent development of the information system. A project scenario is an organization of people, resources, products, activities, techniques and regulations called in to solve some information supply problem. Inventing a good scenario is difficult and takes a lot of time. Although there is considerable agreement nowadays that different situations demand different project approaches [1, 2], few quantative data are available on the relationship between a project's contingency factors, scenario chosen and success. Related studies include those concerned with failure factors e.g. [3], specific systems [4], system aspects [5] or process models [6]. Although their findings contribute to the insight in information engineering, they have not led to a theory that allows us to select a successful approach from given project characteristics. Such a theory is currently being developed by the authors. It is discussed in section 2. Then a research model is presented to study the effect of system development factors on project success (section 3). Based on this model, a survey was sent to a large group of project managers. The results were analyzed statistically. The results are presented and discussed in section 4. It follows that specific factors are related to specific kinds of success. These relationships may help a project leader in composing a scenario.

2. A Consistency Theory for Information Systems Engineering

In order to get insight into which scenarios are successful in a particular situation, we use an analogy between succesfully running a business and succesfully running a project. This allows us to profit from the extensive research done in this area. Much of this research is reflected in the consistency model of Broekstra [7] that models an enterprise in its environment. The term 'consistency' refers to the harmony that must exist between the different factors involved. Broekstra describes how a company, in

order to reach a successful performance in terms of effectiveness, efficiency and quality, must react to changes in its environment by making decisions about four variables:

1. the products and markets to service;
2. the (primary) processes and means necessary to manufacture and deliver products;
3. the way these processes and means will be controlled;
4. the behaviour of employees in relation to the first three choices.

Attention to only one of these variables is not enough. Both contingency variables (from environment and decisions made in the past) and design variables (the four choices) must be tuned to each other. E.g. if a new product is made, the right people and processes must be present and the product must comply with market and social developments in the environment. A decision to educate employees for their new task leads to changes in other variables such as hiring teachers. So the consequences of decisions must be taken into account. The consistency model names, groups and describes the various contingency variables and design parameters and their interaction. Therefore, it is useful for describing the current situation of an enterprise, the situation to be, the changes that must be abridged and the situation at times in between.

A project may be seen as a temporary business, established to deliver one main product, the information system (including all relevant organizational changes) to a customer. The primary process consists of modelling, realizing, testing and other activities to develop the system. The type of control is determined by the project management choices made. The employees are the project staff that carry out development or control activities. This enables us to introduce a consistency model for development, the Consistent Development-, or CD-model. The CD-model, an adapted version of the consistency model, is depicted in figure 1. It is a socio-technical interaction model (in line with e.g. [8]) that effectively deals with the drawbacks of a contingency approach [9, 10]. A more extensive discussion of the CD-model can be found in [11].

Six dimensions are distinguished. The *results* dimension pertains to statements about the system products to deliver, and accompanying delivery terms. These statements may be formal (as in the case of a software house and its customers) or more informal (often found when a company has its own system development department).

The *environment* dimension contains influence forces in the environment of the project organization which are not under control of the project organization. These factors include organizational structure and experience of parties in the environment of the project organization such as clients and users, along with available infra-structure and tools. They also include factors originating in developments in business, technology, society, or politics.

The *system development* dimension pertains to the particular development approach of the project. It includes factors used in constructing the system such as development method, analysis and design techniques, tools and other resources.

The project management dimension refers to managing the primary development process and the resources involved. Factors in this dimension are concerned with

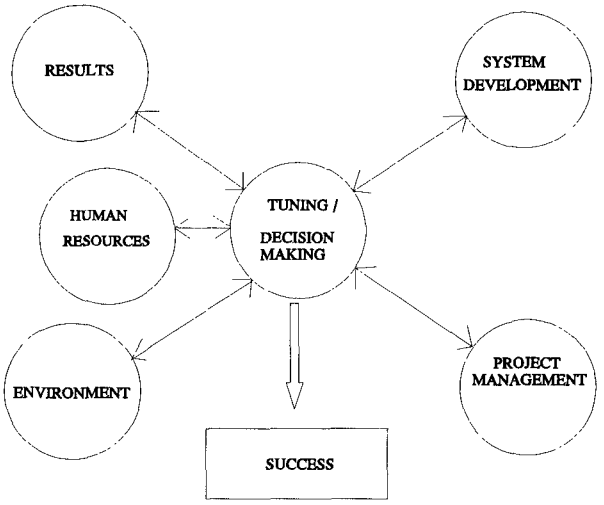

Figure 1. The CD-model.

operational control activities of defining, planning, organizing, staffing, directing, measuring, analyzing and evaluating of resources or aspects such as time, money, materials, developers, information and environment.

The *human resources* dimension is included to reflect the importance of socio-psychological influence factors in system development. Many studies neglect the influence of political power, motivation, skills and satisfaction of individuals and groups. Note that this dimension refers to properties of project members.

The *tuning or decision making* dimension is the one most crucial. In this dimension strategic and tactical decisions with respect to the project are made, concerning the definition of required results, the development and operational control approach and resources used in the development process, taking into account different influence factors and participants' goals. This dimension thus has to ensure that the other dimensions are mutually attuned. Decisions are often made in a steering committee in which various parties are involved.

The results and environment dimensions may be seen as the problem that must be solved in development and the other four as the solution chosen. It should be understood however that the dimensions interact and must be in harmony for successful development. It may be unclear however when a project is considered a success. In a company, success is associated with attaining certain performance levels of effectivity, efficiency, continuity, stability, flexibility or innovative power. In a project, success may e.g. be seen as satisfaction to all parties involved (win-win situation, see [12]), as delivery conform agreements, as staying within budget or time or as the degree of maintenance that is needed after the project is finished. In section 3 we offer a research model based on the CD-model to investigate the relationships between the various consistency factors and different measures of success.

3. Research Model

In this section we describe the current study (which may be considered a first step towards a more general study) in terms of hypotheses and methods. The CD-model does not directly lend itself to statistical research. It must first be translated into a causal model which shows the types of effects of variables on success. Such a model would include both direct effects (such as the effect of staff quality on success), indirect effects (such as the effect of the combination of a particular development method and a particular environment on success), and feedback effects (such as plan revision due to changes in the environment). In this first study we only investigate the direct effects of the variables in the 6 dimensions on success. In order to do so we need measures of project success. 10 potential success measures were chosen:

- *Success to User Organ*: the degree of success as experienced by the User Organization, i.e. the group of people for which the system development project is carried out.
- *Success to Client Organ*: the satisfaction of the Client Organization that controls the user organization, commissions the project and pays the bill. Most often, the user organization is a subset of the client organization.
- *Success to Project Organ*: the degree of success as experienced by the Project Organization. This temporary organization is the group of people and resources brought into being to develop the information system and to offer services to the user organization.
- *Success to Devel Organ*: the degree of success as experienced by the Development Organization. This organization controls several project organizations. It offers services, people and resources to project organizations.
- *Success to Project Manager*: the degree of success as experienced by the Project Manager.
- *Success to All Parties*: the degree to which all parties involved are satisfied with the results of the project. It is the average of the five aforementioned success measures.
- *Conformance to Budget*: the extent to which the project budget was exceeded, varying from 0% (highest success) to more than 100% (no success).
- *Conformance Time Sched*: the extent to which the project schedule was overrun, varying from 0% (highest success) to more than 100% (no success).
- *Absence of Result Change*: the extent to which changes to the agreement were needed during the project, varying from numerous changes (low success) to no changes (high success).
- *Succ Meet Qual Specs*: the degree in which the quality requirements posed in the agreement were met, varying from full (high success) to not at all (low success).

We hypothesize that consistency variables would exert different effects on different success factors. If this is true, it would be possible for a project manager to aim at special kinds of success by influencing the appropriate variables. Of course the research model may easily be extended with other interest groups, and/or other success measures. In order to study the direct effects relationship between consistency variables and success, we chose variables for each consistency construct (dimension in CD-model):

- *EnvirCooper* : environmental cooperativeness; environment dimension.
- *ResultComplx* : complexity of result; results dimension.
- *WinwinSituat* : considering interests of all parties on results; results dimension.
- *QualContract* : quality of contract; results dimension.
- *QualProjOrg* : quality of project organization; human resources dimension.
- *QualDevelop* : quality of development; system development dimension.
- *QualProjMngt* : project management quality; project management dimension.
- *QualDecis* : quality of decision making; tuning dimension.

For all variables we expect more success for a higher value of the variable, except for results complexity, in which case more complexity would lead to less success. For each variable, a number of indicators were defined, which are listed in the Appendix. Selection of indicators was based on theoretical methods, techniques and models of system development [11, 13].

In order to test our hypothesis that project characteristics impact project success in various ways, we conducted a survey amongst project managers. A questionnaire was developed which addresses the issues above. The questions mostly used a 7-point pseudo-interval scale whose endpoints were labelled (e.g. 1 very low satisfaction - 7 very high satisfaction). Sometimes 7-point ordinal scales were used (say, 1: 0-10%, 2: 10-20%,..., 7: > 100%). Because of this ambivalent character, we used both Pearson's (interval) correlations (P) and Spearman's rank (ordinal) product moment correlations (SP) to test the various hypotheses. The latter is more proof against deviations from normality, but may give trouble because of ties. The effect of missing cases was investigated by comparing Pearson correlations obtained by mean substitution (PMS) with Pearson correlations obtained by pairwise deletion of missing values (PMV). For each variable defined above a number of indicators (one question per indicator) was defined that was thought to contribute to the value of the variable. The resulting value of a variable was obtained by taking the average of all its contributing indicators. We describe the indicators shortly in the Appendix. Internal consistency of indicators in a variable was tested by inspecting the correlation between (corrected) item and total, and by Cronbach's alpha. An alpha greater than .50 suffices for earlier stages of basic research [14]. Content validity was looked at by the researchers and by a survey methodology specialist. Two project managers filled in the survey to test for clarity and comprehensibility. Although the questionnaire provided some help in clarifying conceptions, misunderstandings could not be ruled out. No other independent measurement instrument was used to assess criterium validity. A likely cause of bias is that project managers tend to rate their success higher than it is in reality. Real correlations may therefore be somewhat higher than those observed. This effect may be stronger because the survey sample was not entirely random. About two thirds of the project managers were selected by their managers, who perhaps chose more successful projects. Construct validity [15] was considered premature for a first survey.

4. Discussion of Results

The questionnaire was sent to 105 project managers of Cap Volmac, the largest information system supplier in the Netherlands; 63 responses were received. From those that did not respond, most appeared to be no project manager any more or did their last project more than two years ago. Some did not have real project manager experience and two persons did not want to answer the questions. Some global characteristics of the projects assessed (always the project manager's latest project) are: the average project manager has a fair amount of expertise (5 years), a variety of application domains was involved, and the average staffing of these projects is substantial (more than 20 people). In addition, about 35% of the projects was estimated to take more than 100 manmonths of effort, and to take more than 1 year to complete. For more information on these projects, see [16].

Table 1 shows the PMS-results of the effect of our variables on the various success measures. Only effects significant at the 5%, 2-tailed level (for 63 cases: corr. > .25) are shown. Some variables had a considerable number of missing cases due to one or two indicators (questions) that were not relevant for a number of projects, e.g. 'contract price' when there was no formal contract. These indicators were removed from the variable. Logically, for the variable 'QualContract' this was not possible and results for this variable are based on only about 30 cases. PMV-results were generally the same as PMS-results, both for significance and values of the correlation coefficient. As indicated in the table, values just around the significance level may pass this boundary with change of method. SP-values tended to be somewhat lower; extreme differences (> .07) are indicated in the table. Alphas varied from .51 (QualDevelop) to .91 (Success to All Parties). Deleted indicators, alphas, number of missing cases, mean, standard deviation and skewness of variables and indicators are listed in the Appendix.

	Success to All Parties	Success to Client Organ	Success to User Organ	Success to Devel Organ	Success to Project Organ	Success to Project Manager	Confor-mance to Budget	Confor mance Time Sched.	Absen ce of Result Change	Succ Meet Qual Specs
EnvirCooper	.41	.47--	.44		.29	.35	.32*	.47--	.40	
ResultComplx			-.32				-.38	-.33	-.48	
WinwinSituat	.44	.41	.55	X	.38	.38			.27*	
QualContract							.25	.28		
QualProjOrg	.46	.50--	.29	.32	.39	.44		.42		.26
QualDecis					.25					
QualDevelop					.29				.26*	
QualProjMngt	.36	.29*		.25*	.35	.35				

Table 1. Significant (>.25) PMS Pearson product moment correlations between consistency variables and success measures. *: disappears with PMV; X: appears with PMV; --: SP much lower (difference >.07).

The results do not contradict our hypothesis that success measures differ per consistency variable. Furthermore, all variables behaved like we expected, i.e., except for 'result complexity' they were positively correlated with success, albeit only for a limited number of success measures. Looking at the columns, we notice that

- the main contribuants to success in the sense of satisfaction of all parties, as advocated in [12], are (re the first column) cooperation of environment, presency of a win-win starting-point, quality of project staff and quality of project management;
- each party involved (clients, users, development organization, project organization and project manager) has its own set of variables correlated with success; the same applies to project results often associated with success such as staying within budget and time, no need for result change during the ride and meeting quality specifications. This suggests that it is possible for a project manager to influence the kind of success he is after by paying more attention to variables positively correlated with that kind of success.
- success in meeting quality specifications is correlated with only one variable.

Looking at the rows we find that

- two variables, environmental cooperativeness and quality of project staff, are correlated with almost all success measures. This suggests that concentrating on these factors pays off. This is in line with findings of e.g. Boehm [17] that personnel quality is the most important factor.
- each variable is correlated with some success measures, showing the relevance of all dimensions of the CD model.
- quality of decision making is, surprisingly, only correlated with one success measure, the success as felt by the project organization. There are a number of possible reasons for this result; correlations could be non-linear, or weak, the questions may have been interpreted wrongly or the wrong set of indicators may have been chosen. Alternatively, quality of decision making could have almost no effect on success measures. Further study should reveal whether such is the case.

To be able to look at influences on success in more detail, the effects on success of the individual indicators are presented in table 2. Only indicators that show significant correlation with at least one success measure are listed. Some SP-values were much higher than the corresponding P-values for the correlation coefficient. This effect is stronger for correlations between indicators that were considerably skewed and success indicators (all highly skewed). Since Pearson correlation values are decreased by skewness and Spearman correlations do not require normality of distribution, the higher SP-values are probably more reliable. For the variables of table 1, based on additive scales that better approximate normality, this effect is absent.

For every success measure (column) specific indicators are found that correlate with that type of success. This suggests that it is possible to aim at certain kinds of success by paying more attention to these indicators.

Per variable we discuss salient features of some indicators:

- indicators for environmental cooperativeness 'internal agreement on project within client organization' and 'quality of communication between users and project organization' show correlations with almost all success measures; 'simplicity and stability of organizational environment', 'internal agreement within the user

	Success to All Parties	Success to Client Organ	Success to User Organ	Success to Devel Organ	Success to Project Organ	Success to Project Manager	Confor-mance to Budget	Confor mance Time Sched.	Absen ce of Result Change	Succ Meet Qual Specs
ENVIRONMENTAL COOPERATIVENESS										
Organ. Stability							.30	X	.27	
Organ. Simplicity	.26	.34	.33++					.30	.33	
Absence Organ. Hostility		.29*	.37					.41		
Users Experience	.27	X		.29		.25				
Internal Agreement Client	.40	.44	.32		.33	.39	.27	.32	X	.26
Internal Agreement Users	X	X	X				.31	.32	.31	
User Motivation			.33							
QualCommun Users/ProjOrg	.53	.52	.50	.33++	.42	.45	X	.43	.40	
Availability DevelMethods								.28		.32
Change Capability Client								.30		
Rational Decisions Client			.35	X					.31	
COMPLEXITY OF REQUIRED RESULTS										
Project price (item deleted)			-.32						-.34++	
Project Size Estimate									-.32	
ProjDurationAgreed (deleted)			-.28							X
Organizational Complexity	-.26	-.29*	-.42						-.27	
Diversity of Results							-.28		-.33	
Innovativeness of Results							-.32	-.35	-.26	
Uncertainty User Results			-.28++					-.32		
Changes in Results	-.31	-.36	-.31++			-.30	-.51	-.51	-.61	
WIN-WIN SITUATION										
ResultAgreemntClient/ProjOrg	.51	.47	.57	X	.40	.49	X	.26	.32	X
Attention User Expectations	.27++	X	.35			X	X			
Attention Client Expectations			X							
ResultAgreement Client/Users	.31	.31	.41		.31				.26	
QUALITY OF CONTRACT										
Contract Clarity	.36	.35	.29	X	.26*	.36	.35	.42		
Absence Vague Agreements	.42++	.42	.31	.26	.35	.42	.31	.43		
ContractDefinitionsClear								.35		
AbsenceMeaningDifferences	.36++	.33	.37++		.29++	.34	.28	.37		
Documentation Specification			-.26							
Milestone Specification							.26			
Implementation Specification	.26++		.30++							.25
QUALITY OF PROJECT ORGANIZATION										
Absence Political Games								.30		
Motivation Project Staff	.41++	.45	.38		.39	.38				.34
Experience Project Staff	.56++	.57	.29	.48++	.52	.47		.33		.29
InternalCommunicProjStaff	.43++	.36	.35++	.32++	.35	.44		.34		

Table 2. Significant correlations (>.25) of indicators with success measures. Continued with explanation of notes on next page.

	Success to All Parties	Success to Client Organ	Success to User Organ	Success to Devel Organ	Success to Project Organ	Success to Project Manager	Confor-mance to Budget	Confor mance Time Sched.	Absen ce of Result Change	Succ Meet Qual Spec
QUALITY OF TUNING AND DECISION MAKING										
Feasibility of Agreements	.29*		.26		.29	.34			.29	
Tasks Staff Indicated		-.26*					X	-.26++	-.32	
Decion Making ProcedureSpecified					.27					
Activity List Agreed	.27*			.28	.37	.31	.25			
InfluenceProjManager onAgreemnts						.27*				
QUALITY OF DEVELOPMENT										
Quality of Used Methods					.32					
Quality of Used Tools	.36	.37	.29*		.38	.26				
Attention to Testing						.26				
Precisely Followed Procedures										.39
QUALITY OF PROJECT MANAGEMENT										
Poject Plan Surveyable	.25++			X	.32++	.35				
Attention to Client Goals	X		X							
Attention to User Goals	X	.30*	.43		X			X	.32	
Attention to Goals Developm Organ	X				X					.30
Attention to Goals Project Organ	.29			.26	.30	X				
MeasurementPossibilityProjManager	.34	.32		.34++	.31	.35	.36	.40		
Control Possibility ProjManager	.40	.38	X	.31	.30	.42	.30	.32		.34
Advantage of Measurement	.27++	.33		.28	X	.28	.27	.33		.26++
AttentionInfogatheringProjManager			.25*		.28					
AttentionMeasurementProjManager	.27			.27	.27					

Table 2 (continued). Significant correlations (>.25) of indicators with success measures. *: disappears with PMV; X: appears with PMV and/or SP; ++: SP much higher (difference >.07). Indicators without any significant correlation are left out (see Appendix).

organization', 'better communication between users and project organization' and 'rational decision making within client organization' are related with absence of result changes during the project; 'hostility of organizational environment' is correlated with staying within time, but not with staying within budget;

- almost all indicators of result complexity show that more complexity is associated with (re column) more changes during the project; the correlation coefficient of .61 between Changes in Results and Absence of ResultChange is not surprising, since these were based on equivalent, but slightly different phrased questions at the beginning and end of the questionnaire, respectively; no result complexity indicator is correlated with less success to development and project organization; an agreed longer project is probably correlated with better meeting quality specifications;
- agreement on results beween client and users as well between client and project organization are correlated with satisfaction of most of the parties involved;
- clearer contracts, represented by three of the first four indicators of the Quality of Contract variable, are associated with more success, whereas better definitions only

help in staying within time, and more elaborate documentation guidelines are even associated with less success (to the users!).
- motivation, experience and good communication of developers are strongly related to success, but do not help in staying within budget or in reducing changes during the project.
- more specification of the tasks of developers is associated only with less success (for four success measures).
- better tools are related to more satisfaction to almost all parties, while strictly following procedures leads to better meeting of quality specifications, but not to other types of success.
- better measurement and control possibilities are associated with most types of success but not with reducing the number of changes during the project.

No significant correlation with any success measure was found for a number of indicators, such as 'project necessity for client'. These are not included in table 2, mut may be derived by comparing table 2 with the Appendix. Absence of correlations offers some interesting information too. E.g., in general, more specifications in the contract are not associated with more success, in contrast to clearer specifications (see above). As noted before in the discussion of the results for the variable Quality of Decision Making, absence of significant correlation does not have to mean that correlations in reality do not exist.

Although a lot of significant correlations between consistency variables (or indicators) and success are found, this does not automatically mean that they cause the success. For this to be true there should at least be a good explanation of why the factor leads to more success. For most correlations this is the case, although we have no space here to discuss all these explanations. By doing this reasoning for themselves, and taking measures to influence the success factors found, project leaders may improve the success of their projects.

5. Conclusions

Although the effect of interaction has not yet been investigated in this study, the results show that the CD-model is a useful model for investigating the relationship between situational variables and success. A number of hypotheses were confirmed: both situation and approach chosen influence the success of a project. There is considerable difference in influences of the variables involved, depending on the kind of success that is considered. This makes it possible for project leaders to aim at different success objectives by influencing the right variables. This study already identified a large number of variables that may be used for that purpose, although the rate of success improvement per variable was not yet studied. The two tables contain a lot of valuable material for those who are interested in finding factors that determine the right kind of project scenario in a specific situation.

Like most of these kinds of surveys, a number of weaknesses in the research method (and thus possibly in the validity of the results) are present:
- All estimates of satisfaction of clients, users etc. were made by the project leader. These estimates may differ from the real values, resulting e.g. in a higher mean success. For correlations however, ranking projects as more succesful than they really are, results in lower values than in reality.

- Estimates of success may vary over time. E.g. it is possible that users consider a project a failure just after the end of the project, but are satisfied a year later, when they have become more familiar with the system. The present study has not taken these effects into account.
- The procedure for selecting project managers in the survey was not strictly aselect. However, a large part (63) of the population of project managers (some 200) were interviewed.
- Project managers may have interpreted the questions wrongly. This is a serious drawback of the automatic survey procedure. Although help texts were available, we don't know to what extent they were studied and whether this was necessary.
- The variables chosen within the dimensions may not be coherent enough. A factor analysis could be used to find logically formed clusters of indicators.
- Results may vary for different types of projects. To investigate this, we need more cases for each type of project.

We did not yet look at how much a variable or indicator contributed to a specific success type e.g. by means of causal analysis and modelling. Merely the presence or absence and value of a correlation between them was noted. In order to do the former, to look for indirect and feedback effects, and to overcome weaknesses mentioned; we will extend the study with qualitative and quantitative data on more variables by interviewing clients, users and project managers, as well as by using more advanced statistical methods to analyze available and new data.

6. Acknowledgements

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Appendix: description of indicators for consistency variables

Precise meaning success variables / indicators: see above	Missing cases	Mean	Standard deviation	Skewness
Success to All Parties Alpha: .91	17	5.2	1.2	-.38
Success to Client Organization	6	5.6	1.1	-1.0
Success to User Organization	9	5.3	1.2	-.93
Success to Development Organization	13	5.2	1.5	-.81
Success to Project Organization	5	5.3	1.4	-.83
Success to Project Manager	4	5.1	1.5	-.79
Conformance to Budget	1	5.4	1.7	.98
Conformance to Time Schedule	2	5.5	1.5	1.1
Absence of Result Change	5	4.0	1.7	.12
Success in Meeting Quality Specifications	7	5.0	1.0	-.74

Meaning variables / indicators	Missing cases	Mean	Standard deviation	Skewness
EnvirCooper: COOPERATIVENESS OF ENVIRONMENT Alpha: .81	13	4.0	.80	.17
Organ. Stability: stability of the organization	0	4.1	1.7	.17
Organ. Simplicity: simplicity of organizational environment	0	3.2	1.7	-.44
Absence Organ. Hostility: absence of hostility in organizational environment	0	4.2	1.5	-.1
Users Experience: user experience with automation	0	3.7	1.8	.15
Internal Agreement Client (on project)	0	4.5	1.5	-.16
Internal Agreement Users (on project)	0	3.8	1.6	.07
User Motivation (at project start)	9	3.4	1.7	.48
QualCommun Client/ProjOrg: Quality of communication between client and PO	2	4.1	1.5	-.04
Quality of communication between users and project organization	0	4.5	1.4	-.05
Availability DevelMethods: Availability of Development Methods	0	4.6	1.4	-.32
Availability of Resources (such as tools, means, time, money, staff)	0	4.8	1.2	-.31
Change Capability Client	7	3.4	1.1	.10
Project Necessity for Client	1	5.7	1.2	-1.0
Rational Decisions Client: degree of rational decision making of client organization	3	4.7	1.7	-.42
ResultComplx: COMPLEXITY OF REQUIRED RESULTS Alpha: .67	6	4.5	.95	-.21
Project price (indicator deleted): agreed price	11	6.1	1.0	-.84
Project Size Estimate: project size as estimated by project manager	6	4.9	1.7	-.43
ProjDurationAgreed (deleted): Proj. duration in manmonths according to contract	11	5.1	1.4	-.12
Complexity of automated part of system	0	5.1	1.2	-.21
Organizational Complexity: complexity of organizational change	0	4.2	1.7	-.09
Diversity of Results	0	4.5	1.4	-.19
Innovativeness of Results	0	4.5	1.6	-.35
Uncertainty User Results: uncertainty of users with respect to automation	0	4.3	1.9	.19
Changes in Results: degree of changes in result during project	0	4.4	1.7	-.07
QualProjMngt QUALITY OF PROJECT MANAGEMENT Alpha: .74	5	4.9	.63	-.19
project plan communicated to staff	1	3.7	1.7	-.75
Poject Plan Surveyable	2	5.2	1.4	-.41
Attention to Client Goals attention of PM to goals of CO	3	5.4	1.4	-.88
Attention to User Goals attention of PM to goals of UO	0	4.7	1.7	-.55
Attention to Goals Developm Organattention of PM to goals of DO	0	4.8	1.5	-.50
Attention to Goals Project Organattention of PM to goals of PO	0	5.2	1.2	-.62
attention of PM to strategic decisions	0	4.5	1.5	-.35
attention of PM to tactical decisions	0	5.0	1.3	-.65
attention of PM to operational decisions	0	5.3	1.3	-.53
MeasurementPossibilityProjManager (to measure aspects such as time and money)	0	4.1	1.1	.17
Control Possibility ProjManager (to control aspects such as time and money)	0	4.5	1.1	-.69
Advantage of Measurement (accoring to the project manager's expectation)	0	4.6	1.3	.17
AttentionInfogatheringProjManager (information on behalf of the project)	0	4.3	.84	-.25
AttentionMeasurementProjManager (attention paid by PM to measuring)	6	4.5	.98	-.17

Meaning variables / indicators	Missing cases	Mean	Standard deviation	Skewness
WIN-WIN SITUATION: considering interests of all parties Alpha: .72	7	4.6	1.1	-.68
ResultAgreemntClient/ProjOrg: results agreement between Client and PO	0	5.0	1.5	-.74
Attention User Expectations: attention paid to self-evident user expectations	6	4.6	1.6	-.84
Attention Client Expectations: attention paid to self-evident client expectations	6	4.5	1.6	-.70
ResultAgreement Client/Users: agreement between client and users on results	0	4.4	1.6	-.16
QualProjOrg: QUALITY OF PROJECT ORGANIZATION (PO) Alpha: .57	0	4.9	.94	-.84
Absence Political Games: absence of behaviour of PO driven by political reasons	0	4.7	1.9	.30
Motivation Project Staff: motivation of PO	0	5.3	1.1	-.77
Experience Project Staff: skills/experience of staff PO	0	4.7	1.2	-.49
InternalCommunicProjStaff: quality of internal communication PO	0	4.7	1.3	-.47
QualContract: QUALITY OF CONTRACT Alpha: .75	34	4.0	.90	-.55
Contract Clarity: clarity of contract	7	4.7	1.8	-.69
Absence Vague Agreements: absence of problems with vague agreements	8	4.9	1.9	.65
ContractDefinitionsClear: clear definitions in contract	11	4.7	1.5	-.44
AbsenceMeaningDifferences: absence of meaning interpretation problems	3	5.0	1.8	.99
quality requirements precisely defined	10	3.1	1.6	.37
Documentation Specification: agreements on documentation specified in contract	4	5.0	1.6	-.60
Milestone Specification: agreements on milestones specified in contract	5	4.7	1.7	-.56
agreements on education specified in contract	9	2.7	2.0	.78
Implementation Specification: agreements on implementation specified in contract	13	3.3	1.9	.06
agreements on warranty specified in contract	12	3.7	2.4	.05
agreements on maintenance specified in contract	1	3.1	2.6	1.0
agreements on acceptance specified in contract	7	4.4	1.9	-.30
QualDecis: QUALITY OF TUNING AND DECISION MAKING Alpha: .75	14	4.8	.87	.38
Feasibility of Agreements	7	5.4	1.5	-1.0
attention to general project plan	3	5.3	1.4	-.45
attention to project phase plans	6	4.8	1.8	-.74
authorizations and responsibilities PO specified	1	4.9	1.6	-.75
way of communication in PO specified	1	4.7	1.7	-.67
way of attaining adequate staff specified	6	2.7	1.8	.86
required facilities specified	1	5.7	1.5	-1.2
Decion Making Procedure Specified	4	4.5	2.0	-.54
Tasks Staff Indicated: function descriptions PO specified	2	3.4	1.9	.08
need for personnell specified	2	5.1	1.6	-.67
Activity List Agreed: survey of activities made	1	5.6	1.2	-.70
InfluenceProjManager onAgreemnts (deleted): effort estimates of PM used	25	3.8	2.5	.00
QualDevelop QUALITY OF DEVELOPMENT Alpha: .51	6	4.8	.84	-.15
Quality of Used Methods (and techniques)	0	4.7	1.1	-.35
Quality of Used Tools (for development)	0	4.5	1.4	-.47
Attention to Testing	0	5.4	1.3	-.47
use of automated support	0	4.4	2.0	-.38
Precisely Followed Procedures (PO working strictly conform procedures)	6	4.6	1.4	-.09