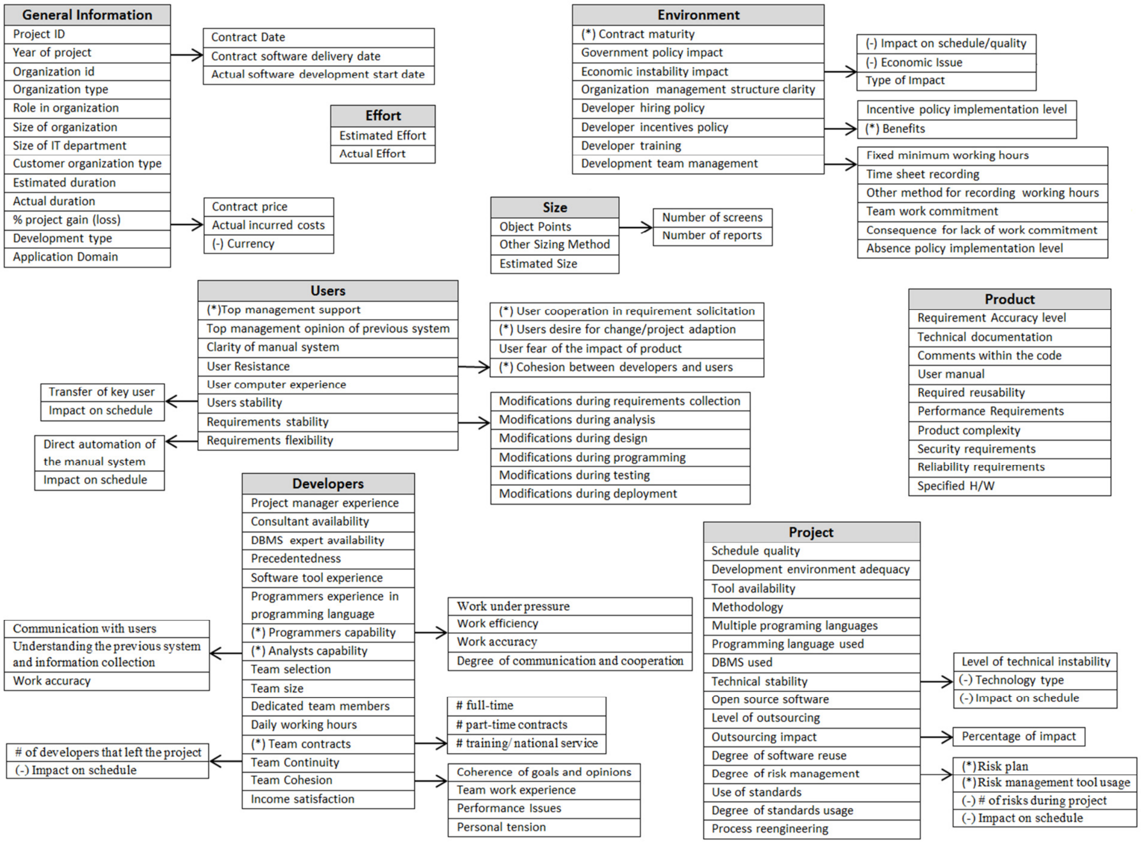
SEERA Dataset Attribute Formulas

I: SEERA dataset attributes by category.



General Information
- Project ID
- Year of project
- Organization id
- Organization type
- Role in organization
- Size of organization
- Size of IT department
- Customer organization type
- Estimated duration
- Actual duration
- % project gain (loss)
- Development type
- Application Domain

Year of project →
- Contract Date
- Contract software delivery date
- Actual software development start date

% project gain (loss) →
- Contract price
- Actual incurred costs
- (-) Currency

Effort
- Estimated Effort
- Actual Effort

Environment
- (*) Contract maturity
- Government policy impact
- Economic instability impact
- Organization management structure clarity
- Developer hiring policy
- Developer incentives policy
- Developer training
- Development team management

Economic instability impact →
- (-) Impact on schedule/quality
- (-) Economic Issue
- Type of Impact

Developer incentives policy →
- Incentive policy implementation level
- (*) Benefits

Development team management →
- Fixed minimum working hours
- Time sheet recording
- Other method for recording working hours
- Team work commitment
- Consequence for lack of work commitment
- Absence policy implementation level

Size
- Object Points
- Other Sizing Method
- Estimated Size

Object Points →
- Number of screens
- Number of reports

Users
- (*)Top management support
- Top management opinion of previous system
- Clarity of manual system
- User Resistance
- User computer experience
- Users stability
- Requirements stability
- Requirements flexibility

User Resistance →
- (*) User cooperation in requirement solicitation
- (*) Users desire for change/project adaption
- User fear of the impact of product
- (*) Cohesion between developers and users

Users stability →
- Transfer of key user
- Impact on schedule

Requirements stability →
- Modifications during requirements collection
- Modifications during analysis
- Modifications during design
- Modifications during programming
- Modifications during testing
- Modifications during deployment

Requirements flexibility →
- Direct automation of the manual system
- Impact on schedule

Product
- Requirement Accuracy level
- Technical documentation
- Comments within the code
- User manual
- Required reusability
- Performance Requirements
- Product complexity
- Security requirements
- Reliability requirements
- Specified H/W

Developers
- Project manager experience
- Consultant availability
- DBMS expert availability
- Precedentedness
- Software tool experience
- Programmers experience in programming language
- (*) Programmers capability
- (*) Analysts capability
- Team selection
- Team size
- Dedicated team members
- Daily working hours
- (*) Team contracts
- Team Continuity
- Team Cohesion
- Income satisfaction

(*) Programmers capability →
- Work under pressure
- Work efficiency
- Work accuracy
- Degree of communication and cooperation

(*) Analysts capability →
- Communication with users
- Understanding the previous system and information collection
- Work accuracy

(*) Team contracts →
- # full-time
- # part-time contracts
- # training/ national service

Team Continuity →
- # of developers that left the project
- (-) Impact on schedule

Team Cohesion →
- Coherence of goals and opinions
- Team work experience
- Performance Issues
- Personal tension

Project
- Schedule quality
- Development environment adequacy
- Tool availability
- Methodology
- Multiple programing languages
- Programming language used
- DBMS used
- Technical stability
- Open source software
- Level of outsourcing
- Outsourcing impact
- Degree of software reuse
- Degree of risk management
- Use of standards
- Degree of standards usage
- Process reengineering

Technical stability →
- Level of technical instability
- (-) Technology type
- (-) Impact on schedule

Outsourcing impact →
- Percentage of impact

Degree of risk management →
- (*)Risk plan
- (*)Risk management tool usage
- (-) # of risks during project
- (-) Impact on schedule

II: Transformation scale for percentages.

Ranges of percentages	Levels of scale
0% – 20%	5
21%- 40%	4
41% – 60%	3
61% – 80%	2
81% - 100%	1

III: SEERA dataset attribute complexity.

Attribute complexity		Rating
simple	I: short answer or mutually exclusive options	one score
	II: multiple options	sum/count of scores
derived	I:combination of direct sub-attributes	formula
	II: combination of direct sub-attributes and other attributes	
	III: combination of other attributes	

IV: Formulas of the SEERA dataset derived attributes.

	Attributes	Formulas
General info.	Year of project	Extract *year* from *actual software development date* if null then from *contract date* if null then from *contract software delivery date*
	% project gain (loss)	((Contract price - Actual incurred costs)/ Contract price) * 100
Size	Object Points	Number of screens + Number of reports
Effort	Estimated effort	[Estimated duration * (Dedicated Team members + (Team size - Dedicated Team members) * 50%)] * (Daily working hours * 22)
	Actual effort	[Actual duration * (Dedicated Team members + (Team size - Dedicated Team members) * 50%)] * (Daily working hours * 22)
Environment	Contract maturity	[Reverse scored [(Penalty clause for late payments + Penalty clause for contract cancelation + Penalty clause for schedule overrun + Documentation availability + Users training + Technical support + Ownership of source code) = (0,7)]]→ [1, 8]
	Economic instability impact	[(Unavailability of software tools + Losses due to inflation + Customer defaulted on payment or cancelled the contract + High Developer turnover + Developer immigration + Cut back of phases and/or programs during development) = (0, 6)]→ [1, 7]
	Developer incentives policy	Incentive policy implementation level + Reverse scored (Count(Benefits))
	Development team management	Reverse scored (Fixed minimum working hours +(Time sheet recording OR Other method for recording working hours) + Team work commitment) + Consequence for lack of work + Absence policy implementation
Users	Top management support	Reverse scored (Review and approval of the requirements + Review and approval of the design+ System testing (functional and non-functional requirements) + Moral support of the development team)
	Clarity of manual system	Level of clarity^{L}+ User experience in manual system^{L}
	User Resistance	Average(Reverse scored (User cooperation in requirement solicitation^{L}, Users desire for change/project adoption^{L}, Cohesion between developers and users^{L}) + User fear of the impact of product^{L})
	Users stability	[If (Transfer of key user = 1) then (Transfer of key user * Impact on schedule^{L} * 5) OR if (Transfer of key user = 0) then (Transfer of key user + Impact on schedule^{L})] → [1,5]
	Requirements flexibility	[If (Direct automation of the manual system = 1) then (Direct automation of the manual system * Impact on schedule^{L} * 5) OR if (Direct automation of the manual system = 0) then (Direct automation of the manual system + Impact on schedule^{L})] → [1,5]
	Requirements stability	[(Modifications during requirements collection * 1) + (Modifications during analysis * 2) + (Modifications during design *3) + (Modifications during programming * 4) + (Modifications during testing* 5) + (Modifications during deployment * 6)] → [1,6]
Developers	Precedentedness	[Reverse scored (new software tools + new architecture + new complex algorithms)]
	Programmers' capability	Reversed range (% Work under pressure + % Work efficiency + % Work accuracy + % Degree of communication and cooperation)
	Analysts capability	Reversed range (% Communication with users + % Understanding the previous system and information collection + % Work accuracy)
	Team contracts	Reversed range [(# full-time * 100% + # part-time *50% + # training/national service * 100%) → (0%,100%)] → [1,5]
	Team Continuity	(# of developers that left the project / Team size)* 100
	Team Cohesion	Average(Reverse scored (Coherence of goals and opinions^{L}) + Reverse scored (Team work experience^{L})) + Performance Issues + Personal tension
Project	Tool availability	[Reverse scored (Code checking tools(e.g. error detection) + Software frameworks + CASE tools + Version control tools + (Automated) Testing tools + Integrated Development Environments+ (Automated) Quality control tools)]
	Development environment adequacy	[Reverse scored (Comfortable Office + Enough PCs + Available LANS)]
	Degree of risk management	Reverse scored (Risk plan + Risk management tool usage)
	Degree of standards usage	[Reverse scored (Standards used for Requirement collection + Standards used for analysis + Standards used for design + Standards used for Programming + Standards used for testing + Standards used for deployment)]
	Process reengineering	[If (reengineering = 1) then (reengineering * Impact on schedule^{L}) OR if (reengineering = 0) then (reengineering + Impact on schedule^{L} * 5)] → [1,5]
Product	Performance Requirements	[(Execution time + Response time + Particular architecture) = (0, 3)] → [1, 4]
	Security requirements	[(Code security and encryption + Database security + Program security and encryption + Basic authentication) = (0, 4)]→ [1, 5]
L = sub-attribute is calculated from a Likert-type scale. All other sub-attributes are options or values. → = mapped to		