The ORION Context Model

Version 1.0

2019-05-06

The ORION Context Model consists of three hierarchy levels. At the top level, a narrative description of the overall context is provided. At the second level, the classification consist of five main context categories, each captured by a single text field and thus guiding the user to provide more detailed information related to these five categories while still not enforcing a particular format or selection of what to emphasize for each aspect.

At the third level, each category is further decomposed into a number of entries that help capture it in more detail. In order to facilitate the use of context information for automated activities, such as retrieval of similar previous decision cases, as many entries as possible have been given a well-defined and machine-understandable value domain. Some entries, however, were deemed too complex to be simplified into an ordinal or categorical scale, while a more detailed decomposition would result in too many third-level entries. In these cases, the value domain remain just plain text.

Below, Table 1 presents the five context categories at the second level, and Tables 2 to 6 present the entries under each respective context category, and the value domain of each entry.

Table 1: Context categories

Category	Description
Organization	Information concerning the structure of the organization(s) and the people in it.
Product	Information characterizing the product relevant in the context of a study.
Stakeholder	Information concerning affected and affecting stakeholders.
Development method and technology	Information concerning systematic approaches used in the development of the product.
Business and market	Information concerning external factors such as market, business, society etc.

Table 2: Organization

ID	Description and value domain
O1	**Description:** Application domain of the organization(s) (e.g. working with automotive, avionics, telecommunication, etc.) **Value domain type:** Multi-categorical **Values:** Accounting, Aerospace/Aviation, Advertising, Agriculture/Forestry/Fishing, Automotive, Biotechnology, Business/Professional Services, Computer [Software], Computer [Hardware], Construction/Home Improvement, Consulting, Corporate Communication, Education, Engineering/Architecture, Entertainment/Recreation, Finance/Banking/Insurance, Food Service, Government/Military, Healthcare/Medical, Internet/eCommerce, Logistics/Shipping, Manufacturing, Mobile Applications, Services [Hotels, Lodging Places], Telecommunication
O2	**Description:** Degree of distribution of the development site (consider factors such as local or global/distributed development with multiple development sites, multiple geographical locations, national or international). **Value domain type:** Ordinal **Values:** Low, Medium or High
O3	**Description:** Stability of the organization – frequency of changes in the organizational environment (structural, managerial, operational, strategic, etc.) **Value domain type:** Ordinal **Values:** Very Low stability: *Frequent changes on strategic level* Low stability: *Frequent changes on operational/managerial level* Medium stability: *Changes occur every 1-3 years* High stability: *Changes occur every 3-5 years* Very High stability: *Changes are very rare*
O4	**Description:** The current business strategy or goal of the organization – referring to what the organization wants to achieve in the near future **Value domain type:** Free text
O5	**Description:** The size of the organization (development site) in terms of the number of people. **Value domain type:** Integer
O6	**Description:** Average development team size (number of people). **Value domain type:** Integer
O7	**Description:** Maturity and process certification (maturity of the organization with respect to process capabilities, e.g. initial, repeatable, defined, managed and optimized processes, certified through e.g. ISO and CMMI). **Value domain type:** Multi-categorical **Values:** CMM, CMMI, SW-CMM, P-CMM, 91, ISO 9001:2000, ISO 9000 series, TickIT, Bootstrap, ISO/IEC 12207, ISO/IEC 15504, SPICE, SPIRE, PMBOK, SWEBOK, MOF, Six Sigma, IDEAL, QIP, PDCA(PDSA), Trillium, TQM, COBIT, SEI TSP, SEI PSP

O8	**Description:** Capacity and team resources (availability of critical resources for projects, such as availability of physical working environments, housing facilities, skilled team, experts, senior managements' commitment)
	Value domain type: Ordinal
	Values: Underload utilization: *An underload utilization is when resources are used or loaded incompletely.* Good capacity utilization: *A good capacity utilization is when resources are used just right.* High capacity utilization: *A high capacity utilization is when the maximum amount of utilization has been reached.* High overload: *A high overload situation means that there is a higher load than the capacity, and this makes the process flow almost jammed (analogous to road highways jams). If the capacity is almost completely utilized (the highway is quite full) then the flow moves slower, but still has a steady flow.* Critical overload: *A critical overload situation means that there is a substantial higher load than the capacity, and this is causing the flow to be almost standstill.*
O9	**Description:** Throughput and velocity of the organization (considering factors such as number of projects/year, average meantime between project deliveries, flexibility of the organization in terms of ability to change without negative impact)
	Value domain type: Ordinal
	Values: Low, Medium, High
O10	**Description:** Organizational model (characteristics that apply to the organization)
	Value domain type: Multi-categorical + "other"
	Values: Bureaucratic: *Tall organization with hierarchical structures and centralized power* Project team structure: *Team-based organization* Matrix structure: *Combination of bureaucratic and project team structure* Virtual: *Teams collaborate virtually and collaborate in a distributed environment*
O11	**Description:** Degree by which the organization is affected by external/outside relations, such as relations maintained with customers, partners, suppliers and competitors
	Value domain type: Ordinal
	Values: Low, Medium, High
O12	**Description:** Other
	Value domain type: Free text

Table 3: Product

ID	Description and value domain
P1	**Description:** Main functional purpose of the product **Value domain type:** Free text
P2	**Description:** System type **Value domain type:** Categorical + "other" in free text **Values:** Data-dominant software: *Consumer-oriented software (e.g. e-mail, text editor), business-oriented software (e.g. statistical analysis, project management), corporate management (e.g. real-estate and sales management), information management and expert systems (e.g. data warehousing, expert systems), design and engineering software (e.g. debuggers, prototyping, compilers), information display and transaction entry software (e.g. web applications).* Systems software: *Operating systems, networking and communications, device and peripheral drivers, support utilities (e.g. authentication, network traffic monitor), middleware and system components, servers, malware.* Control-dominant software: *Hardware control (e.g. firmware), embedded software, real-time control software, process control software (e.g. traffic control).* Computation-dominant software: *Operations research (e.g. simulation software), information management and manipulation (e.g. inventory control, sales forecasting), artistic creativity (e.g. photo and drawing, audio, music), scientific software (e.g. simulation software, signal analysis software), artificial intelligence (e.g. machine learning, robotics).*
P3	**Description:** Maturity of the product (related to how long it has been on the market, how many releases were there, certifications obtained, etc.) **Value domain type:** Ordinal **Values:** Low maturity: *The software has been recently released and not widely or commonly known nor used.* Medium maturity: *The software has been on the market or in use for a long time, but known defects have not been removed nor has the functionality of the software been evolved to better fit the needs of the market.* High maturity: *The software has been on the market or in use for a long time and has established itself as a widely used software product. The software has matured in terms of its quality (e.g. defects in the code.)*
P4	**Description:** Technical debt related to the product **Value domain type:** Multi categorical **Values:** Technical debt in the code (poorly written) Technical debt in the design and architecture (poor upfront design with under-focus on qualities such as maintainability and adaptability) Test debt (lack of test scripts and insufficient test coverage)

P5	**Description:** Complexity of the system (considering factors such as size in term of lines of code, number of sub-systems, structural complexity of the control flow, complexity of data structures)
	Value domain type: Ordinal
	Values: Low complexity: *Small scale applications and systems, usually few sub-systems or individual systems.* Medium complexity: *Systems of either large scale in terms of size or consisting of multiple systems (system of systems.* High complexity: *Systems of large scale in terms of size and consisting of multiple systems (system of systems) with complex interactions and dependencies.*
P6	**Description:** Degree to which the system or parts of the system (building blocks such as components) can be reused
	Value domain type: Ordinal
	Values: Low, Medium, High *Based on three factors: a) The systems interfaces are documented clearly to facilitate reuse. b) The user interfaces to the system are stable. c) The system can be configured to facilitate reuse in different contexts.*
P7	**Description:** Degree to which the product is available for modification by the organization's developers.
	Value domain type: Ordinal
	Values: Low, Medium, High
P8	**Description:** Quality attributes that are prioritized as most important for the product
	Value domain type: Multi categorical + "other" in free text
	Values: Functional suitability, Performance efficiency, Compatibility, Usability, Reliability, Security, Maintainability, Portability
P9	**Description:** Certification and rules/regulations/standards (e.g. mandatory compliances to for example safety, security)
	Value domain type: Multi categorical + "other' in free text
	Values: ISO26262, ISO13849, ISO15998, ISO/IEC27001, IEC62443, IEC61508, IEC61131-6, EN50126, EN50128, EN50129
P10	**Description:** Main programming languages used in the development of the product
	Value domain type: Multi categorical + "other' in free text
	Values: Access, Ada, ASP, Assembly, Basic, C, C#, C++, CLIPPER, COBOL, CUDA, EJB, Erlang, Haskell, IIS, J2EE Servlet/JSP, Java, Javascript, Lua, NATURAL, NOTES, Objective-C, OpenCL, ORACLE, Pascal, Perl, PHP, PL/I, PLEX, Prolog, Python, Ruby, Simulink, TELON, Visual Basic
P11	**Description:** Main architectural styles or patterns used in the product (e.g. microservices, layered, pipes-and-filter)
	Value domain type: Free text
P12	**Description:** Other
	Value domain type: Free text

Table 4: Stakeholders

ID	Description and value domain
S1	**Description:** Stakeholder roles **Value domain type:** Multi categorical + "other" **Values:** Each of the following roles come in two versions (*internal* and *external*): Business, sales and marketing; Production (e.g. architecture, implementation); Quality assurance (e.g., test); Product management; Legal; Consultant and services; Financial control; Business; Sales and marketing; Asset supplier; Consulting and services; Financial control; Asset user; Researcher; Operational control; Quality assurance; Production; Product management; Legal; Governmental; Association regulator; Assessor; Keystone; Manufacturer; Content provider; Service provider; Service operator; Integrator; Product owner; Regulatory agency; End user
S2	**Description:** Stakeholder experience with respect to the product **Value domain type:** Ordinal **Values:** Low: *Has worked with the product for less than a year OR only works with the product sporadically (i.e. the work related to the product is not the main focus)* Medium: *Has worked with the product for more than a year and less than two years AND the work with the product was the main focus of the work.* High: *Has worked with the product for more than two years AND the work with the product was the main focus of the work.*
S3	**Description:** Other **Value domain type:** Free text

Table 5: Development method and technology

ID	Description and value domain
D1	**Description:** Development methods **Value domain type:** Multi categorical + "other" in free text **Values:** Agile Software Development, Crystal Methods, Dynamic Systems Development Model (DSDM), Extreme Programming (XP), Feature Driven Development (FDD), Joint Application Development (JAD), Lean Development (LD), Rapid Application Development (RAD), Rational Unified Process (RUP), Scrum, Spiral Model, Systems Development Life Cycle (SDLC), Plan-driven/traditional development (often referred to as "Waterfall")
D2	**Description:** Development practices **Value domain type:** Multi-categorical + "other" in free text **Values:** Product back-log, User stories, Complete up-front documentation of requirements, Detailed up-front architecture, Extensive time planning, Sequential development phases, Daily/Scrum meeting, Burn-down chart, Kanban board, On-site customer, Retrospetive, Iterative/incremental development, Time-boxing, Collective code ownership, Pair-programming, Refactoring, Test driven development, Continuous integration, Continuous deployment, Model-driven development

ID	Description and value domain
D3	**Description:** Development environments and CASE tools used in the development of the product **Value domain type:** Multi-categorical + "other" in free text **Values:** Android Studio, Codenvy, Delphi, Eclipse, Enterprise Architect, GCC, Git, IntelliJ, Komodo, MATLAB, MATLAB/Simulink, Microsoft Visual Studio, NetBeans, Oracle JDeveloper, Papyrus, Rational ClearCase, Rational DOORS, Rational Rhapsody, Rubus ICE, Sublime Text, Subversion, SystemWeaver, Vim, Volcano Vehicle System Architect, Xamarin, Xcode, Xojo
D4	**Description:** Level of maturity of technologies, development methods and CASE tools used in the development of the product **Value domain type:** Ordinal **Values:** The following values: TRL 1. Basic principles observed TRL 2. Technology concept formulated TRL 3. Experimental proof of concept TRL 4. Technology validated in lab TRL 5. Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 6. Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 7. System prototype demonstration in operational environment TRL 8. System complete and qualified TRL 9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)
D5	**Description:** Ratio of proprietary and open technologies and CASE tools used in the development of the product **Value domain type:** Integer (0-100) 0%: *No proprietary tools and technologies, only open.* 100%: *Only proprietary tools and technologies, no open.*
D6	**Description:** Other **Value domain type:** Free text

Table 6: Business and Market

ID	Description and value domain
B1	**Description:** Type of market and market structure **Value domain type:** Multi categorical **Values:** The following categories: Monopoly: *There is only one provider of a product or service.* Oligopoly: *A market is run by a small number of firms that together control the majority of the market share.* Monopolistic competition: *A type of imperfect competition such that many producers sell products or services that are differentiated from one another (e.g. by branding or quality) and hence are not perfect substitutes.* Monopsony: *There is only a single buyer in a market.* Oligopsony: *A market where many sellers can be present but meet only a few buyers.* Perfect competition: *A market with low barriers to entry, products with little differentiation, many producers and consumers, and an elastic demand curve.*

B2	**Description:** Description of the market landscape (e.g. competitors, suppliers, partners, customers) and significant factors affecting the status of the market (e.g. external pressures, political factors).
	Value domain type: Free text
B3	**Description:** The level at which the market is affected by rules, regulations, and standards (e.g. certification, government imposed requirements)
	Value domain type: Ordinal
	Values: Not at all, slightly, moderately, to some extent, to a great extent
B4	**Description:** The degree of time pressure to release on the market indicating the speed of evolution in market trends
	Value domain type: Ordinal
	Values: Not at all, slightly, moderately, to some extent, to a great extent
B5	**Description:** Quality of the external relations of the organization with other stakeholders and ecosystems (includes level of trust, support, commitment among the parties)
	Value domain type: Ordinal
	Values: Very poor, poor, acceptable, good, very good
B6	**Description:** Flexibility of contracts and agreements related to the requirements, payments, etc.
	Value domain type: Ordinal
	Values: The following values: Stable: *Contracts and agreements signed at the start of the project and remain fixed over a period of time.* Flexible and adaptable: *Contracts and agreements change during the project.*
B7	**Description:** Other
	Value domain type: Free text