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SOFTWARE DEVELOPMENT QUALITY ASSURANCE (SDQA)

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1. CHANGES

EDITIO N	DATE	REASON FOR MODIFICATION	PREPARED BY	SIGNATURE	APPROVED BY	SIGNATU RE
1 st	01/01/04	FIRST EDITION	NIKOLOPOULOS K		HATZIANTONAKI K	

2. PURPOSE

The purpose of the “software development” procedure is to define the way of developing and controlling Projects that deal with software development, testing procedures and the quality assurance related with these activities.

The procedure is to be followed by the GIS and IT Department of ENB Ltd.

The procedure applies to both, “internal” development of IT applications (internal needs) and to development of software applications for external customers.

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3. Description of GIS & IT Department

The main applications that are being developed by the Department are:

- Geographical Information Systems (GIS)
- Relational Databases
- Specialized Applications under Prolog and Assembly (neural networks, AI)

The development environment consists mainly of Microsoft.NET framework, ESRI ArcObjects, ESRI MapObjects, Sun Java, Visual Prolog and Intel Assembly (32 & 64 bit).

The applications developed are mainly used as add-ons to commercial software such as ESRI ArcGIS, Oracle 9i, Microsoft Windows family (OS, Office etc) or as standalone applications.

The Department consists of the Programming and Analysis Team, one Project Manager, one Testing Unit and is being supervised by the General Manager of ENB Ltd. Support is being provided by the Secretariat and the Technical Support Department on request.

The Department follows all general QA procedures of ENB Ltd and also applies a series of extra QA and QC procedures and internal controls. These consist of 3 main subcategories:

- Departmental QA
- IT Project related QA
- Standards Library

More specifically:

- The Departmental QA procedures are “internal” procedures or work orders (methods) which deal with internal QA. They are updated when necessary and are documented with the indices: “DEPARTMENTAL QA”, version no, date of release and a short description. They apply to most of the Projects but are not binding unless so explicitly stated. They form “good practices” working orders and usually they describe technical procedures (for example the importing of GPS data into the ArcGIS software)
- The IT Project related QA are procedures and related documents that are bound and binding to a specific IT project. They have to be followed for the particular Project and are to be clarified and documented at the beginning of the specific Project. They always bear the Project code of the Project at all pages and electronic document.
- Finally, the Standards Library forms a repository of Standards that should be adhered to. Apart from the internal Standards that are followed by ENB Ltd (according to ISO 9000:2000 in this case) the Library stores important Standards such as ISO 8601:1988
- The Standards Library is only a repository and no Project is bound to following these Standards unless it is prescribed in the IT related QA explicitly. In any case it is advised to check for the updates of the Standards because the Library is not monitored on a regular basis. The Library can also contain “Guidelines”, draft standards and unofficial releases and documents.

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4. Description of the Software Development Quality Assurance – SDQA

The software Development Quality Assurance System of ENB Ltd is based on the following architecture:

1. Pre – Project (Contract Review, Development & Quality Plan, Maintenance contract review and Plan)
2. Project Life Cycle Assessment
 - a. Development Life Cycle Stage DLC (reviews, experts opinion and software testing).
 - b. Operation – Maintenance Stage OMS
3. Infrastructure Error Prevention and Improvement (Procedures, Training Instruction, Preventive Actions, Configuration management and Documentation Control).
4. Quality Management (Project progress control, software quality metrics).
5. Standardization, Certification and SDQA system assessment (QM standards and Process Standards)
6. Human Components (Organizational base)

➤ Pre – Project Components

- **Contract Review**
 - Clarification of the customer requirements
 - Review of Project's schedule and resource requirement estimates
 - Evaluation of capacities
 - Evaluation of the customer's capacity to fulfil his obligations
 - Evaluation of development risks
- **Development Plan (Project)**
 - Schedules
 - Required manpower and hardware resources
 - Risk Evaluation
 - Organizational issues (team members, subcontracts etc)
 - Project methodology and development tools etc.
- **Quality Plan**
 - Quality goals (measurable)
 - Criteria for starting – ending of each stage
 - List of reviews, test and other validation – verification activities

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- **Software Development Life – cycle components**
 - **Reviews**
 - Formal design reviews (DRs) – approval necessary
 - Peer reviews (inspections and walkthroughs)
 - **Experts opinion**
 - Can be subcontractor or freelance
 - **Testing**
 - Designed, planned according to development procedures. Include instructions and tests reports. Are classified in automated and manual tests.
- **Software maintenance components**
 - **Corrective**
User support services and correction of software code and documentation failures
 - **Adaptive maintenance**
Adaptation to current software
 - **Functionality Improvement**
Performance – related improvements of existing software
- **Infrastructure components for error prevention and improvement**
 - Procedures and Work instructions
 - Generally applicable procedures, work instructions are more specialised – both are based the accumulated experience of the Company. Need to be frequently updated.
 - Staff training, instruction
 - Preventive and corrective actions
 - Systematic study of failures, correction of similar faults, implement successful (tested) methodologies – sources of dta vary from reviews, test reports, customer complaints, forums etc.
 - Configuration management
 - Procedures for controlling the change process (versions, releases, history, release specifications etc.)
 - Documentation Control
 - Ensures availability of major documents
 - Functions:
 - Customer Requirement documents
 - Contract Documents
 - Design Review Reports, Audit Reports
 - Project Plans
 - Development Standards

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➤ **Management of SDQA components**

- Project progress control (incl. maintenance)
- Resource usage, schedules, budget and risk management activities
- Software quality metrics
 - Quality of software development or maintenance activities
 - Productivity of Team
 - Software faults density
 - Schedule deviations
- Software quality costs
- Costs of control (prevention costs, managerial preparation costs and control costs)
- Costs of failure (internal / external failure costs and managerial failure costs)

➤ **SDQA standards**

- Quality Management Standards
- Managerial quality system (see other Projects within the quality System) and the ISO 9000-3 Standard.
- Project process standards
 - Professional standards (for example ISO / IEC 12207 on major component processes of a complete software life cycle)
- Other Standards and Guidelines
 - Standards that are very specific and sometimes not officially released (for example OPENGIS Consortium Standards or recommendations for GIS Projects), INSPIRE (Infrastructure for spatial Information in Europe Architecture & Standards position papers)
 - ESRI Inc. ArcINFO/ArcSDE developing technical documents
 - ISO/TC 211 (on Geographic Information/ Geomatics)
 - ISO 19113 & 1914 (Quality for spatial data infrastructures)
 - W3C Recommendations & adopted Standards
 - ISO/IEC 13211-1 (PROLOG ISO Standard)

➤ **The human components**

- **Management's role in the SDQA (at all levels)**
 - Definition of quality policy
 - Follow – up
 - Allocation of staff
 - Solutions of schedule, budget or customer – related difficulties

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4. Responsibilities

4.1. Quality Manager

Is responsible for:

- ◆ Sound implementation of the procedure
- ◆ Internal Auditing
- ◆ Updating of the Projects Database

4.2. Software development Project Manager (SDPM)

- ◆ Supervision and controlling of the software development Projects
- ◆ Perform a simplified risk analysis on each software development Project
- ◆ Following, updating the SDQA, conducting internal QA audits and develops new QA components
- ◆ Training of personnel on the SDQA
- ◆ Updating of the Standards Library repository

4.3. Developers

- ◆ Software developing in a qualitative manner
- ◆ Inform the SDPM on special issues from the developers' view that might pose a risk for the Project
- ◆ Following procedures and checking for relevant standardization and procedures of the Project they are involved in
- ◆ Applying e-Data Security

4.4. Testers

- ◆ Use specific QC and test sheets (Project specific)
- ◆ Inform the SDPM on specific testing techniques that should be taken into account for the Project under development
- ◆ Following the procedures and checking for relevant standardization and procedures of the Project they are involved in
- ◆ Applying e-Data Security