MECHDAV: a quality model for the technical evaluation of applications development tools in visual environments

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APPLICATIONS DEVELOPMENT SOFTWARE IN VISUAL ENVIRONMENT

New technologies: simple and potent platforms.

1. Traditional service: console applications, of windows, etc.

2. Remote service: pages and services web.

3. Local service: nets of local area, architecture client-servant, intranet.

The services 2. and 3. should be independent of the programming language, of the platforms and of the pattern of components.
Fig. 1  Architecture used in MECHDAV model (ISO/IEC 9126 and 14598)
EVALUATION PROCESS

Guide of wise steps that express the evaluation requirements in terms of quality characteristic.

ACTIVITIES

• Evaluation requirements.
• Specifications.
• Evaluation design.
• Evaluation execution.
• Conclusion.
Establish the evaluation requirements

Specific the evaluation

Design the evaluation

Execution of the evaluación

End of the evaluation

Establish purpose of evaluation

Identify types of products

Specific quality model

To select metrics

Establish rating levels for metrics

Establish approach for evaluation

Production evaluation plan

Take measures

Comparison of values of approaches

Evaluation of results

Deliver reports

SQUARE Proyect, MECA Model, MECHDAV: a quality model for the technical evaluation of application development tools in visual environment.

ISO/IEC 9126-2 External Metrics
ISO/IEC 9126-4 Quality in use metrics
ISO/IEC14598-4 Process for acquirers
ISO/IEC14598-5 Process for evaluators

MECA, MECHDAV

MECHDAV: a quality model for the technical evaluation of application development tools in visual environment

Fig. 2. Process of evaluation of the proposed model
PROPOSAL SPECIFIC QUALITY MODEL

- Architecture based on SQUARE project.
- Three levels of quality:
  - Characteristic, Subcaracterísticas, Attributes-metrics
- New characteristic: Quality in use.
MECHDAV

FUNCIONALITY
- Consistency
- Completeness
- Correction
- Integrity
- Interoperability
- Standardization

RELIABILITY
- Maturity
- Tolerance of errors or failures
- Recoverability

USABILITY
- Understandability
- Learnability
- Operability
- Attractiveness
- Disamination

EFFICIENCY
- Time use
- Resources use
- Scalability

PORTABILITY
- Adjustment
- Instability

QUALITY IN USE
- Effectiveness
- Productivity
- Satisfaction

Fig. 3 MECHDAV: a quality model for technical evaluation of application development tools in visual environments.
### Compac model - Characteristic / Sub Characteristic / attribute / metric

<table>
<thead>
<tr>
<th>Sub Characteristic</th>
<th>Attribute / metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1.1.</td>
<td>Functionality / Completeness / Contained total / metric</td>
</tr>
<tr>
<td>1.2.1.1.</td>
<td>Functionality / Consistency / Uniformity of vocabulary, of symbols and other conventions utilized / metric</td>
</tr>
<tr>
<td>1.2.2.1.</td>
<td>Functionality / Consistency / Uniformity of structure, of content and of elements, components / metric</td>
</tr>
<tr>
<td>1.2.3.1.</td>
<td>Functionality / Consistency / Uniformity of procedure and its implementation / metric</td>
</tr>
<tr>
<td>1.3.1.1.</td>
<td>Functionality / Correction / Correct utilization of language / metric</td>
</tr>
<tr>
<td>1.3.2.1.</td>
<td>Functionality / Correction / Correct operation / metric</td>
</tr>
<tr>
<td>1.3.3.1.</td>
<td>Functionality / Correction / Correspondence of descriptions with objects / metric</td>
</tr>
<tr>
<td>1.4.1.1.</td>
<td>Functionality / Integrity / Check oneself / metric</td>
</tr>
<tr>
<td>1.4.2.1.</td>
<td>Functionality / Integrity / Security / metric</td>
</tr>
<tr>
<td>1.5.1.1.</td>
<td>Functionality / Interoperability / Exchange of data / metric</td>
</tr>
<tr>
<td>1.5.2.1.</td>
<td>Functionality / Interoperability / Exchange of components and interfaces / metric</td>
</tr>
<tr>
<td>1.6.1.1.</td>
<td>Functionality / Standardization / Standardization of vocabulary / metric</td>
</tr>
<tr>
<td>1.6.2.1.</td>
<td>Functionality / Standardization / Standardization of symbols / metric</td>
</tr>
</tbody>
</table>
Compae model

Characteristic / Sub Characteristic / attribute / metric

2.1.1.1 Reliability / Recoverability / Options to recover (self) / metric
2.2.1.1 Reliability / Tolerance of errors or failures / Error processing / metric
2.2.2.1 Reliability / Tolerance of errors or failures / Degraded processes / metric
2.3.1.1 Reliability / Maturity / Time between failures / metric

3.1.1.1 Usability / Understandability / Terminology in agreement to user / metric
3.1.2.1 Usability / Understandability / Adequate user interface / metric
3.1.3.1 Usability / Understandability / In line aid / metric
3.2.1.1 Usability / Learnability / Demo / metric
3.2.2.1 Usability / Learnability / Demo efficiency / metric
3.2.3.1 Usability / Learnability / Tutorial / metric
3.2.4.1 Usability / Learnability / Tutorial efficiency / metric
3.3.1.1 Usability / Operability / Help utility / metric
3.3.2.1 Usability / Operability / Help operability / metric
3.4.1.1 Usability / Attraction / Successful recovery / metric
3.4.2.1 Usability / Attraction / Attractive interaction / metric
3.4.3.1 Usability / Attraction / Time of operation / metric
3.5.1.1 Usability / Diffusion / Amplitude / metric
3.5.2.1 Usability / Diffusion / Frequency of operation / metric
Compex model

Characteristic / Sub Characteristic / attribute / metric

4.1.1.1 Efficiency / Use of time / Efficiency in time / metric
4.2.1.1 Efficiency / Use of resources / Efficiency in resources / metric
4.3.1.1 Efficiency / Scalability / Availability / metric

5.1.1.1 Portability / Instalability / Installation module / metric
5.1.2.1 Portability / Instalability / Configuration module / metric
5.2.1.1 Portability / Adjustability / Independence of hardware environment / metric
5.2.2.1 Portability / Adjustability / Independence of software environment / metric

6.1.1.1 Quality in use / Effectiveness / Tasks effectiveness / metric
6.1.2.1 Quality in use / Effectiveness / Tasks performance / metric
6.2.1.1 Quality in use / Productivity / Productive proportion / metric
6.2.2.1 Quality in use / Productivity / User relative efficiency / metric
6.3.1.1 Quality in use / Satisfaction / User favorite psychological effects / metric

Figure 4. MECHDAV: compacted model
CRITERION FOR ASSESSMENT

- Mensuration types
- Range of levels for metrics
- Formats for execution of the evaluation
- Formats for presentation of results
Fig. 6   Evaluation and ranking table.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>MEANING / INTERPRETATION</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>0.8</td>
<td>Satisfactory / Almost always</td>
<td>B</td>
</tr>
<tr>
<td>0.6</td>
<td>Acceptable / Regularly</td>
<td>C</td>
</tr>
<tr>
<td>0.4</td>
<td>Deficient / Sometimes</td>
<td>D</td>
</tr>
<tr>
<td>0.0</td>
<td>Unacceptable / Never or rare times</td>
<td>E</td>
</tr>
</tbody>
</table>

Fig. 5 Metrics ranks of levels [7]
### Characteristic: Functionality

#### Sub-characteristic: Consistency

**Attribute:** Uniformity in processing return

**Metric:** Proportion of adequate functions re-established after any depth level

**Method:** Knowledge of functional performance

**Formula:**

\[ X = 1 - \left( \frac{A}{B} \right) \]

- \( A \): Number of functions changed after introducing operations during a specific period
- \( B \): Number of specific functions

**Interpretation:** Stability of functional specifications objective

0 ≤ \( X \) ≤ 1; the closer to 1 the better

**Source of reference:** MECA, ISO/IEC 9126

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**Fig. 7** Exemple of documentation of a metric
6.3.1.1 Software responds quickly to entries.
6.3.1.2 Software is recommendable for mobile users.
6.3.1.3 Instructions and warnings are correct.
6.3.1.4 Software does not show operational errors.
6.3.1.5 It is easy to learn how to operate the software if you are a user.
6.3.1.6 The following steps to carry out are known.
6.3.1.7 The work sessions are enjoyable.
6.3.1.8 The information given is very useful.
6.3.1.9 If software stops, is easy to resume it.

Figure 8. Part of a verification list.
## Key Process Functionality Evaluation

### Tool Functionality

<table>
<thead>
<tr>
<th>Tool</th>
<th>Functionality 1</th>
<th>Functionality 2</th>
<th>Functionality 3</th>
<th>Functionality 4</th>
<th>Functionality 5</th>
<th>Functionality 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>B</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>C</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**AVERAGE**

### Average Total of Characteristic: Functionality

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionality 1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Functionality 2</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Functionality 3</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Fig. 9** Matrix of control for the evaluation of the tools for each quality characteristic.
REPORT FINAL OF SOFTWARE EVALUATION :  (NAME OF THE SOFTWARE)

<table>
<thead>
<tr>
<th>SUMMARIZE</th>
<th>QUALITY LEVEL CLASSIFICATION</th>
<th>QUALITY-CATEGORY</th>
<th>APPROACH</th>
<th>EVALUATION CONCLUSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionality</td>
<td>1.0 – [ ] Excellent</td>
<td>E – [ ] Superior</td>
<td>[ ] Accept without modifications</td>
<td>[ ] Accepted</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.8 – [ ] Satisfactory</td>
<td>S – [ ] First</td>
<td>[ ] To Make small modifications</td>
<td>[ ] Accepted</td>
</tr>
<tr>
<td>Usability</td>
<td>0.6 – [ ] Acceptable</td>
<td>A – [ ] Second</td>
<td>[ ] To Make big modifications</td>
<td>[ ] Accepted</td>
</tr>
<tr>
<td>Efficiency</td>
<td>0.4 – [ ] Faulty</td>
<td>D – [ ] Third</td>
<td>[ ] To make new design</td>
<td>[ ] Rejected</td>
</tr>
<tr>
<td>Portability</td>
<td>0 – [ ] Unacceptable</td>
<td>I - [ ] Without quality</td>
<td>[ ] Waste</td>
<td>[ ] Rejected</td>
</tr>
</tbody>
</table>

TOTAL : ______

OBSERVATIONS

ORGANIZATION: ___________________________________________

Appraiser: ____________________________ Area: _________________________

Position: ____________________________ Date: ____________________________

Sign : ____________________________ Hour: ____________________________
BIBLIOGRAPHICAL REFERENCES


