

# Software Evaluation Approach

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**Resume:** *The paper performs an overview concerning the quality of the software products. Particularly workflow products, which operate on Web environments with multiple user access, are considered. Evaluation schemes are presented, which introduce quantitative ranking. Thus, the products can be assessed and compared to define the prospective set of software.*

**Keywords:** *software, evaluation methodology, software assessment, software criteria*

## 1. Introduction

Over the last decade there has been an increasing interest in information systems that are used to support, control, and/or monitor business processes. Examples of systems that are managed by implicit or explicit process models are Enterprise Resource Planning (ERP) systems, Work Flow Management Systems (WFMS) and Customer Relationship Management (CRM) systems [2]. These systems are implemented to support specific business processes. A set of formal languages have been worked out to support process-orientation in the context of web services - Business Process Execution Language for Web Services (BPEL4WS), Business Process Modelling Language (BPML), Web Services Description Language (WSDL), etc [6]. For choosing the most appropriate software product here arises the problem for evaluation of the software products. Analysis of the available methodologies for software assessment is presented below. On their basis, an alternative software approach is proposed for software products evaluation.

## 2. Smith's criteria for evaluation of Internet based software and informational resources

The developments in [7] address the problem of the definition of a methodology for the evaluation and comparison of Internet based software products, which implement appropriate information system, offering software and informational resources. The evaluation is performed by applying a set of criteria for Internet based information resources. The basis of the applied evaluation methodology is described below [7]. As a descriptive list of requirements, the most important features of the products are summarized.

### 2.1. Scope of the product

The scope of the product includes subject area, items, covered formats or types and time period. Usually in the scope is included as an introduction meta information. The scope of the product includes the following aspects:

*Breadth:* Are all aspects of the subject covered?

*Depth:* To what level of detail in the subject does the resource go?

*Time:* Is the information in the resource limited to certain time periods?

*Format:* Are any kinds of Internet resources (for example PDF, FTP) excluded?

### 2.2. Content

According to [7] the information for the product is factual or opinion. The software product can be an integral one, or it is integrated from several other resources. The typical

features related to the content of the product are the accuracy, authority, currency, its uniqueness.

*Accuracy:* As Internet has become a prime marketing and advertising tool, here arises the question about the motivation of the authors for placing information on the Net. Frequently, the answer is that the information is placed to advertise, or supports a particular point of view.

*Authority:* Here is important the organization (or expert) creating the product as well as the producer (who could be from another field). Necessary aspect is to be stated the sources of information. A positive characteristic of the product is the information to be verifiable. Another positive feature is the possibility the producer to be contacted for clarification or to be informed of new information.

*Currency:* It is about frequency of updating the product (if it is not a static one). If dates of update are stated, do they correspond to the information in the product? Does the organization hosting the product appear to have a commitment to ongoing maintenance and stability of the product?

*Uniqueness:* Is the information for this product available in other forms (for example other sites, WWW, print, CD-ROM)? If the product information is derived from another format, arise the problem of the difference with the original. For example, extra features can be added.

*Links made to other resources:* Here several aspects of the links are valid. The links have to be actual (regularly updated). The linked products should be appropriate and the notation of the link must clearly show the reference to external resource.

*Quality of writing:* The quality of writing is important for the content of the product description to be communicated clearly.

### 2.3. Graphic and multimedia design

If the upper products' characteristics are excellent and the graphic design is poor, the interest to the product decreases significantly. The appropriate visual effects and working examples can enhance the product successfully. If audio, video, virtual reality modelling, etc. are used, they have to be synchronized with the purpose of the product presentation.

### 2.4. Purpose

The purpose of the product has to be clearly stated. The product's resources have to fulfill the stated purpose.

*Audience:* The software products are developed for potential users (school students, PhD students, architectures, etc.). Evaluation of the product should report on the product's satisfaction to the users needs.

### 2.5. Reviews

The use of reviewing journals is a mainstay of collection development in print collections. In the Internet environment the evaluator need to become familiar with the strengths and weaknesses of the range of virtual sources reviewing the product.

## 2.6. Workability

Workability is about convenience and effectiveness of the product. Poor workability may indicate that the help library should store the data locally, if intellectual property considerations allow this. Workability includes also:

*User friendliness:* This characteristic includes all the aspects related to the easy work with the product like readability of screens, clear commands, useful design, etc.

*Required computing environment:* It is about the specific of the software product's environment. The product can use standard equipment and software or special software with specific requirements (users have to install appropriate software).

*Browsability and organization:* is related to the logical organization of the product's functionality.

*Searching:* It is about the effectiveness of information to be retrieved for the product functionality. Here could be available operators and ranking features. Useful search engine can be provided.

*Interactivity:* This includes workable interactive features such as forms and menus.

*Connectivity:* It is related with the reliable product's access in network environment.

## 2.7. Cost

Open code products are known as "free". However costs do exist, for the market available products.

## 3. Belyk's and Feist's software evaluation criteria

Another evaluation scheme for software products, related to wide network exploitation is developed in [1]. Its main characteristics are presented below.

### 3.1. Product Selection Criteria

A series of categories and criteria is suggested for the evaluation of online collaborative tools in the development, delivery, and administration online of software products.

*Cost (institutional and user):*

- System requirements for the product operation: open platform, platform-specific, server purchased vs. hosted.
- Bandwidth for network exploitation (modem, cable, ADSL, T-1, etc.).
- License fees (scaled per user).
- User software/hardware requirements.
- Peculiarity of the installation of the product.

*Complexity (user focus):*

- Technical support (user manual; frequently asked questions; online and off-line help).
- Collaborative tools if applicable (asynchronous – email, conferencing; synchronous – chat, audio- conferencing, whiteboard, virtual networking);

- Usability (seamless technology; degree of intuitiveness; ease of use; navigation; consistency; stability; functionality)

*Control:*

- Secured access (password protection; encryption; firewall).
- Personalization.
- Privacy.

*Clarity:* resolution, size, layout, etc.

Common Technical Framework: interoperability; integration, protocols, standards supported; scalability; platform; file-sharing.

*Features:* administrator tools (registration; report generation)

### 3.2. Weighting Product Selection Factors

Before selecting specific products, institutions should consider each of the above factors, balancing as far as possible the merits of specific products against the general features of the system. The selection of a specific product requires attention to:

- Software reliability.
- Availability of technical support by the institution to the users.
- Availability of support by the software supplier to the institution and the users.
- Cost to the institution (i.e., local server support).

### 3.3. Matrix weighted evaluation of the product

A quantification approach, using evaluation matrix is applied for the software product evaluation in [8]. The evaluation responses may be weighted using points scoring criteria and scorecards. Results can then be compared quantitatively according to the evaluation matrix. The review and the analysis of the responses are recommended to be performed in the following sequence.

- Analyze each evaluation response using a 'score card'.
- Review each requirement listed in the score card and check the answer(s). It is recommended to use a simple 'Yes or No' marking, or a combined weighting and scoring method to indicate to what degree the score card requirements are met by the evaluator.
- Repeat the process, using a new scorecard for each software product.
- The evaluation criteria have to formalize the requirements towards the software products.
- Requirement weighting: Essential (3 x), Desirable (2 x), Nice to have (1 x).
- Evaluation score is based upon reviewing and analyzing the score card. The evaluation marks are: 0 = does not meet requirements; 1 = partially meets requirements; 2 = meets requirements; 3 = exceed requirements.
- The total points for the evaluation are the multiplication: weighting x evaluation score.

An example of the weighted score card is presented in Table 1.

It may be obvious from the evaluator scorecard results which software product should be short listed. The preparation of a common comparison matrix, consisting the results of each of the scorecards above, can be a good choice for presentation of the total result in a table form.

Table 1. Matrix weighted evaluation of the software product

SCORECARD	Reviewer: Requirements	Date: 8/1/06	Products: A	Software qualification
Evaluation Criteria	Weighting	Evaluation Score	Points	Notes
Workflow functionality	3 x	3	9	good
Purchase order	3 x	3	9	strong
cost	3 x	3	9	excellent
Needs for training	3 x	3	9	limited
TOTAL SCORE				
MAX SCORE				

#### 4. Five criteria for evaluating Web pages

The development methodology in [3] is directly addressed for the evaluation of Web pages and Web presence. Because the domain of operation of the software products of workflow execution addresses the global network, from usability consideration it is beneficial to cope requirements from Web presence to workflow execution products. The criteria for evaluation of Web pages are discussed in [9]. The evaluation is advised to be performed according to Table 2 with requirements and appropriate recommendations [9].

Table 2 Five criteria for evaluating Web pages

Evaluation of Web documents	How to interpret the basics
<b>1. Accuracy of Web Documents</b> <ul style="list-style-type: none"> <li>Who wrote the page and can you contact him or her?</li> <li>What is the purpose of the document and why was it produced?</li> <li>Is this person qualified to write this document?</li> </ul>	<b>Accuracy</b> <ul style="list-style-type: none"> <li>Make sure author provides e-mail or a contact address/phone number.</li> <li>Know the distinction between author and Webmaster.</li> </ul>
<b>2. Authority of Web Documents</b> <ul style="list-style-type: none"> <li>Who published the document and is it separate from the "Webmaster?"</li> <li>Check the domain of the document, what institution publishes this document?</li> <li>Does the publisher list his or her qualifications?</li> </ul>	<b>Authority</b> <ul style="list-style-type: none"> <li>What credentials are listed for the authors?</li> <li>Where is the document published? Check URL domain.</li> </ul>

3. Objectivity of Web Documents <ul style="list-style-type: none"> <li>• What goals/objectives does this page meet?</li> <li>• How detailed is the information?</li> <li>• What opinions (if any) are expressed by the author?</li> </ul>	Objectivity <ul style="list-style-type: none"> <li>• Determine if page is a mask for advertising; if so information might be biased.</li> <li>• View any Web page as you would an information on television. Ask yourself why was this written and for whom?</li> </ul>
4. Currency of Web Documents <ul style="list-style-type: none"> <li>• When was it produced?</li> <li>• When was it updated?</li> <li>• How up-to-date are the links (if any)?</li> </ul>	Currency <ul style="list-style-type: none"> <li>• How many dead links are on the page?</li> <li>• Are the links current or updated regularly?</li> <li>• Is the information on the page outdated?</li> </ul>
5. Coverage of the Web Documents <ul style="list-style-type: none"> <li>• Are the links (if any) evaluated and do they complement the documents' theme?</li> <li>• Is it all images or a balance of text and images?</li> <li>• Is the information presented cited correctly?</li> </ul>	Coverage <ul style="list-style-type: none"> <li>• If page requires special software to view the information, how much are you missing if you don't have the software?</li> <li>• Is it free or is there a fee, to obtain the information?</li> <li>• Is there an option for text only, or frames, or a suggested browser</li> </ul>

## 5. WWW CyberGuide Ratings

Another approach for the evaluation of Internet based informational resources is described in [10]. The content evaluation and the quality of a Web site design is assessed by [4] for instructional purposes and the methodology is available from [11].

### 5.1. WWW Cyberguide rating for content evaluation [4]

*First look:*

- User is able to quickly determine the basic content of the site.
- User is able to determine the intended audience of the site.

*Information Providers:*

- The author(s) of the material on the site is clearly identified.
- Information about the author(s) is available.
- According to the information given, author(s) appears qualified on this topic.
- The sponsor of the site is clearly identified.
- A contact person or address is available so the user can ask questions or verify information.

*Information Currency:*

- Latest revision date is provided. Date last revised.
- Latest revision date is appropriate to material.
- Content is updated frequently.
- Links to other sites are current and working properly.

### *Information Quality*

- The purpose of this site is clear: business/commercial – entertainment – informational - news - personal page – persuasion.
- The content achieves this intended purpose effectively.
- The content appears to be complete (no “under construction” signs, for example).
- The content of this site is well organized.
- The information in this site is easy to understand.
- This site offers a sufficient information related to my needs/purposes.
- The content is free of bias, or the bias can be easily detected.
- This site provides interactivity that increases its value.
- The information appears to be accurate based on user’s previous knowledge of subject.
- The information is consistent with similar information in other sources.
- Grammar and spelling are correct.

### *Further Information*

- There are links to other sites that are related to the user needs/purposes.
- The content of linked sites is worthwhile and appropriate to the user needs/purposes.

## 5.2. WWW Cyberguide rating for Web site design [5]

*Speed:* the homepage downloads efficiently.

### *Home page:*

- The homepage is attractive, has strong eye appeal.
- The user can tell where he is immediately (clear title, description, image captions, etc.)
- There is an index, table of contents, or other clear indicator of the contents of the site.
- Site sponsor/provider is clearly identified.
- Information/method for contacting sponsor/provider is readily available.
- Copyright date or date site was established is easy to determine.

### *Ease of navigation:*

- User is able to move around within the site with ease.
- Directions for using the site are provided if necessary.
- Directions are clear and easy to follow.
- The links to other pages within the site are helpful and appropriate.
- Internal and external links are working properly (no dead ends, no incorrect links, etc.)

### *Use of multimedia:*

- Each graphic, audio file, video file, etc., serves a clear purpose.
- The graphics, animations, sounds clips, etc., make a significant contribution to the site.

*Browser compatibility:* site is equally effective with a variety of browsers such as Netscape and Internet Explorer.

#### *Content Presentation:*

- There is sufficient information to make the site worth visiting.
- The information is clearly labeled and organized.
- The same basic format is used consistently throughout site.
- Information is easy to find (no more than three clicks, for example).
- Lists of links are well organized and easy to use.

#### *Currency:*

- The date of last revision is clearly labeled. Date last revised.
- Out-dated material has been removed.

#### *Availability of further information:*

- A working link is provided to a contact person or address for further information.
- Links to other useful Web sites are provided.

## **6. Alternative software evaluation Criteria**

### **6.1. General Considerations**

There exist more available criteria for software evaluation but the above ones were selected as the most representative of outflanking. On their basis in this paper are summarized pointers for evaluating software as well as sources of specific information.

### **6.2. Content & Evaluation**

- Who is the audience?
- What is the purpose of the software product & what does it contain?
- How complete and accurate is the information and the links provided?
- What is the relative value of the software product in comparison with the range of information resources available for this topic?
- What other resources (print & non-print) are available in this area?
- What are the date(s) of coverage of the product and product-specific documents?
- How comprehensive is this software product?
- What are the link selection criteria if any?
- Are the links relevant and appropriate for the software product?
- Is the software product inward-focused, pointing outward, or both?
- Is there an appropriate balance between inward pointing links ("inlinks") & outward - pointing links ("outlinks")?
- Are the links comprehensive or do they just provide a sampler?
- What do the links offer that is not easily available in other sources?
- Are the links evaluated in any way?
- Is multimedia appropriately incorporated?
- How valuable is the information provided in the software product (intrinsic value)?

### **6.3. Source & Date**

- Who is the author or producer?
- What is the authority or expertise of the individual or group that created this software product?



- How knowledgeable is the individual or group on the subject matter of the software product?
- Is the software product sponsored by an individual or group that has created other software products?
- Is any sort of bias evident?
- When was the software product produced?
- When was the software product mounted?
- When was the software product last revised?
- How up to date are the links?
- How reliable are the links; are there blind links, or references to software products which have moved?
- Is contact information for the author or producer included?

#### 6.4. Structure

- Does the window follow good graphic design principles?
- Do the graphics and art serve a function or are they decorative?
- Do the icons clearly represent what is intended?
- Does the text follow basic rules of grammar, spelling and literary composition?
- Is there an element of creativity, and does it add to or detract from the window itself?
- Can the text stand alone for use in line-mode (text only) Web browsers as well as multimedia browsers, or is there an option for line-mode browsers?
- Are links provided to Web "subject trees" or directories; lists of subject-arranged Web sources?

#### 6.5. Others

- Is an appropriate interactivity available?
- When it is necessary to send confidential information out over the Internet, is encryption (i.e., a secure coding system) available? How secure is it?
- Are there links to search engines or is a search engine attached to (embedded in) the software product?
- All the question above can have an answer which positively reflect the features and capabilities of software.
- This is a "toolbox" of criteria that enable software to be evaluated for use in current commercial activity of transport field actors.

Another criteria, presented shortly as many of them have been mentioned above, are:

*Scope:* What items are included in the software ?

*Breadth:* Are all aspects of the software documentation covered?

*Depth:* To what level of detail of information provided does the software go?

*Time:* Is the information in the resource limited to certain time periods?

*Format:* Are certain kinds of Internet resources (for example FTP) excluded?

*Content:* Is the resource an integral resource updated by the information original source? Specific aspects related to the content include the accuracy, authority, currency and uniqueness of a resource.

*Accuracy:* Is the information in the resource accurate? The information is placed to advertise, or support a particular point of view.

*Authority:* Does the resource have some reputable organization or expert behind it? Are sources of information stated?

*Uniqueness:* Is the information in this resource available in other forms (for example other sites, print, CD-ROM)? Does it complement another resource, for instance by providing updates to a print source?

*Links made to other resources:* Are the links made in such a way that it is clear that an external site is being referred to.

*Quality of writing:* Is the text well written? The quality of writing is important for the content to be communicated clearly.

*Graphic and multimedia design:* Is the resource interesting to look at? If audio, video, virtual reality modeling, etc. are used, are they appropriate to the purpose of the source?

*Purpose:* What is the purpose of the resource? Is this clearly stated? Does the resource fulfill the stated purpose?

*Audience:* Who are the intended users of this resource?

*Workability:* Is the resource convenient and effective to use? This is the area where criteria for Workflow software resources differ most from print sources.

Aspects of workability include:

*User friendliness:* Is help information available? Have user interface issues been addressed, such as menu design, readability of screens, etc.

Required computing environment: Can the resource be accessed with standard equipment and software?

*Searching:* How effectively can information be retrieved from the resource?

*Browsability and organization:* Is the resource organized in a logical manner to facilitate the location of resources? Is the organizational scheme appropriate, for example chronological for historical source, or geographical for a regional resource?

*Interactivity:* Where interactive features (forms, cgi scripts) are provided, do these work?

Connectivity: Can the resource be accessed with standard equipment and software, or are there special software, password, or network requirements? Can the resource be accessed reliably?

*Cost:* Currently the costs of Internet information resources become important. Costs can be divided into

(a) costs of connecting to the resource and

(b) costs associated with the use of the intellectual property contained in the resource.

In terms of (a), users paying traffic charges are already having to consider the costs of connection, and may want to include this in criteria for selection.

## **6.6. Evaluation Level Concept**

An evaluation level defines the depth or thoroughness of the evaluation in terms of evaluation techniques to be applied and evaluation results to be achieved, both with reference to evaluation objectives (e.g. safety conditions, security constraints, economic risk, availability conditions, application constraints). As a consequence evaluation at different levels gives different confidence in the quality of the software product. The level can be chosen independently of each characteristic.

## 7. Conclusions

An overview of different methodologies, applied for the evaluation of the software products is presented. The overview demonstrates that there are several approaches and application methodologies for assessment of software products. Particular attention is done for those methodologies, which address information systems and products which commonly operate on global network environment and Internet surroundings.

The experience gathered in the domain of developing methodologies for assessment of software and informational products is presented by short description of several approaches, applied for software evaluation.

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