



Helsinki University of Technology
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Analysis of the Utility of Office Applications

Interim Status Report

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1.2 Project schedule

The upcoming activities' schedule is presented in Table 2.

Table 2 Upcoming activities' schedule

Activity List	Weeks				
	13	14	15	16	17
Phase 3: Case Spreadsheets					
<i>Task 1: Data collection</i>					
<i>Task 2: Analysis</i>					
Phase 4: Questionnaire development and analysis					
<i>Task 1: Questionnaire development</i>					
<i>Task 2: Data collection</i>					
<i>Task 3: Analysis</i>					

No major changes made in effort allocations.

1.3 Risk assessment

Table 3 Risk assessment

Risk description	Risk level	Risk probability	Risk management
Developed model for utility measurement inappropriate	Medium	<20%	The current model has achieved some stability. Adjust the model if needed.
Data collected insufficient for analysis	Low	<1%	Focus on developing a theoretical framework and/or defining future streams of research
Scheduling problems. Insufficient time to complete all the promised results.	Low	<20%	Use milestones to monitor the progress and take corrective actions if and when required. Reduce the number of applications to be considered without compromising on the model validation.

We have scaled down the risk level for each of the risks identified in the project plan. This is mainly due to greater visibility of the future course of action. We currently have a fairly stable model for utility and resource measurements. However, there is a medium level risk for this model to be

insufficient for our purpose. The other two risks are considered to be low. Table 3 presents our updated risk assessment.

1.4 Results and analysis

In this section we present our model for utility and resource measurement as well as the procedure adopted for normalization.

1.4.1 The model

We have developed our model based on multiple attributes that represent the end-user utility and resource required. The attribute scores are calculated and normalized in order to achieve the utility and resource indices.

1.4.1.1 Utility attributes

The utility attributes identified are as follows:

1. Usability

This attribute measures an end-user's experience in using an application in terms of the execution time taken for a certain task or function. We adopted GOMS model [2] for the evaluation of usability. A set of most commonly used functions were identified and a simplified version of GOMS, Keystroke-Level Model (KLM) [3] was used to estimate the execution time for each function. The functions identified for our analysis are as follows:

- a.** Save (into different formats)
- b.** Print a file (using the *Properties*)
- c.** Edit text
 - i.** Style and formatting
 - ii.** Find & Replace text
- d.** Insert table of contents
- e.** Insert pictures from a file
- f.** Adding symbols
- g.** Launching a web-link from the document
- h.** Using the help options

An example for the calculation of execution time using KLM is as follows:

Goal: To save a file into different formats

Application: MS Word 2002

Execution steps:

- | | |
|---------------------------|-----------|
| - Point to <i>File</i> | P |
| - Click | BB |
| - Point to <i>Save As</i> | P |
| - Click | BB |

- Home hands to keyboard
- Type in filename (20 chars) **T(20)**
- Home hands back to mouse **H**
- Point to File format drop menu **P**
- Point to desired file format **P**
- Click **BB**
- Point to *Save* **P**
- Click **BB**

Total execution time (based on KLM): $5 * P + 4 * BB + 2 * H + T(20)$
 = **12,7 sec**

2. Menu Count

While usability attribute provides measurement for the most common functions in an application, this is not sufficient to estimate the complete set of functionalities. Menu count provides the maximum number of functions available in an application. We have conducted the menu count manually up to two levels of menu items.

3. Cost

The amount of money (total cost of ownership) incurred on an application can be an additional factor that influences a customer's decision to use an application. Since we are focusing on the business users, cost may not be a major issue.

The sub-attributes considered for cost are as follows:

- a. Purchasing cost
- b. Maintenance cost (includes upgradation cost)
- c. Personnel cost (includes the cost of training/re-training as the versions change)
- d. Switching cost
 - Switching cost increases with greater network externality.

1.4.1.2 Resource attributes

In order to measure the resource requirements, we have identified the following sub-attributes.

- a. Runtime memory and CPU usage
- b. Installation package size

1.4.2 Proposed normalization procedure.

The normalization procedure for attribute scores adopted in our studies is as follows:

- Identify the highest attribute score among the applications considered in a case.
- Rank each of the applications with respect to the highest score by dividing respective scores with the highest score.
- Convert the resultant scores to the scales mentioned in Table 4.

Table 4 Attribute scales

Attributes	Scale
Utility	
Usability	1 to 5
Menu count	1 to 5
Cost	1 to 3
Resource required	
Memory usage	1 to 3
CPU usage	1 to 3
Installation package size	1 to 3

Each of the attribute scales, for utility and resource required, obtained after conversion will be added to get the respective indices.

1.4.3 Results and analysis

This section summarises some of the results achieved by applying the model in *phase 2* of our studies on word processor applications. We considered two cases in this phase for our analysis. In this report we have focused our attention on usability, menu count and resource comparisons. Cost comparisons will be included in the final report.

1.4.3.1 Case 1: Comparison of different versions of MS Word

In this case, we compared different versions of MS Word application spanning a period of over 5 years. Based on the data collected, it seems that there are very minor changes in execution times between different versions of MS Word (Table 5). In some cases, the execution times have increased slightly. One reason for this could be that when the number of functions (menu items) increases, the user interface needs to be re-designed for clarity. This might be the case with e.g. Style and Formatting.

Table 5 Functional comparison of different versions of MS Word

Functions	MS Word 97	MS Word 2000	MS Word 2002
Save	12,7	12,7	12,7
Print	5,2	5,4	6,5
Edit text			
Style and Formatting	2,6	2,6	5,2
Find&Replace	10,58	10,58	10,58
Table of Contents	5,2	5,2	6,3
Insert Picture	6,5	6,3	6,5
Add symbols	6,5	5,2	6,5
Launching weblinks	1,3	1,3	1,98
Help options	2,6	2,6	2,6
Menu count	154	178	178

Small changes in execution times indicate that these actions are considered to be of very basic level and commonly used by all users. Microsoft has not wanted to change the way these basic actions are performed in order to maintain the familiarity of the user interface.

Added value between the older and newer versions of MS Word does not seem to emerge from easier use of these basic functions. More probably, only the overall number of features could provide the users with an incentive to upgrade their MS Word applications. MS Word 97 has 154 second level menu items while MS Word 2000 and 2002 have 178 menu items. Thus, the overall number of functions available to the user has increased.

1.4.3.2 Case 2: Comparison of different word processor applications

In this case, we compared word processors offered by different providers. In order to avoid any discrepancy in comparison, all measurements were conducted on the same **notebook computer (HP Omnibook XE3) with Windows XP OS, 64MB RAM and a Pentium 3 processor**. The data collected are presented in Table 6 and Table 7.

Table 6 Functional comparison of different word processor applications

Functions	MS Word 2002	Open office(v1.1.2)	AbiWord
Save	12,7	12,6	13,8
Print	6,5	9,1	7,8
Edit text			
Style and Formatting	5,2	2,6	3,7
Find&Replace	10,58	13,4	10,58
Table of Contents	6,3	5	2,6
Insert Picture	6,5	8,7	3,8
Add symbols	6,5	5,2	6,5
Launching weblinks	1,98	1,3	NP* (0)
Help options	2,6	2,6	2,6

Table 7 Resource comparison

Resources required	MS Word 2002	Open-Office(v1.1.2)	AbiWord
Memory usage(in KB)	10868	27072	7932
CPU peak usage (in %)	60	43	97
Installation package size (in MB) *	237	146	44,63

Preliminary analysis shows that MS Word 2002 has better overall usability score over the other two applications. The resource required by MS Word

* Not possible to execute the function

• For MS Word 2002, we have considered the entire MS Office package size. Same applies to OpenOffice. AbiWord is a standalone package.

2002 is also quite reasonable when compared with AbiWord and much better than OpenOffice. However, it is to be noted that all three applications have differences in their design structure. While MS Word is a separate module in the MS Office suit, OpenOffice appears to have a monolithic design and AbiWord is a standalone word processor application. The differences in memory usage and installation package size can be attributed to these differences in design structures.

An extended analysis of *phase 2* will be included in the final report.

1.5 Reference

- [1] Project plan, "Analysis of the utility of office applications",
http://www.sal.tkk.fi/Opinnot/Mat-2.177/projektit2005/Projektisuunnitelma_Nokia.pdf
- [2] Bonnie E. John, "Why GOMS?", ACM Interactions Magazine, Vol. 2, Issue 4, October 1995.
- [3] Kieras D., "Using the Keystroke-Level Model to estimate Execution Times", <ftp://www.eecs.umich.edu/people/kieras/GOMS/KLM.pdf>