

The GOMS (KLM) Exercise.

The task: Insert a blank 3-column, 5-row table at the end of a document in Microsoft Word 2003. Make sure the table starts on a new page in the document.

Software environment assumptions: The MS Word window is in the foreground. The menu bar and toolbars (standard and formatting) contain the default set of items and are visible in their entirety. The view magnification is set to 100% (also default). The default view—Print layout—is selected. The document has just been opened. Therefore, the insertion point (cursor) is at the start of the document. There is about one and a half pages of text in the document (which means that the end of the text is not visible).

User assumptions: The user is an expert user, who is familiar with his/her chosen method of accomplishing this task. S/he is an average, non-secretarial typist (40 wpm). The user doesn't have to search the interface for the next item to select, next field to type in, and so on. The user knows the approximate relative locations of the controls on the screen and within dialog boxes needed to accomplish the task steps. The user will not stop and check feedback from the system at every step, the way a novice user would.

Operators and Times used for calculations (from Kieras, 2001).

K – Keystroke: **.28 sec**

P – Point with a mouse to a target on the screen: **1.1 sec**

B – Press or release mouse button: **.1 sec**

BB – Click mouse button: **.2 sec**

H – Home hands between keyboard and mouse: **.4 sec**

M – Mental act of routine thinking or perception: **1.2 sec**

Method 1: Using the mouse. (User's hand is already on the mouse after opening the document)

Steps	Actions	Operators	Time	Notes
Place the insertion point at the end of the document.	Decide to do the task	M	1.2 s	
	Point mouse to scroll bar	P	1.1 s	
	Press and hold mouse button	B	.1 s	
	Drag scrollbar down	P	1.1 s	
	Release mouse button	B	.1 s	
	Point mouse to end of text	P	1.1 s	
	Click mouse at end of text	BB	.2 s	
	Verify that the insertion point is now at the end of text	M	1.2 s	

Insert a page break	Recall where the proper command is located	M	1.2 s	The command is located on the menu bar: "Insert > Break..."
	Point to "Insert" option on the menu bar	P	1.1 s	
	Click to display the "Insert" menu	BB	.2 s	
	Point to "Break..."	P	1.1 s	This also includes the time required to locate the "Break..." option on the menu (a mental operator), because the expert user is likely to perform both actions simultaneously.
	Click "Break..."	BB	.2 s	
	Verify that the "Page break" radio option is selected.	M	1.2 s	
	Point mouse to the "OK" button	P	1.1 s	
	Click the "OK" button	BB	.2 s	
	Verify that a page break was inserted and that the insertion point is at the top of the new page.	M	1.2 s	
Select the table size from the toolbar and place the table into the document	Choose to use the toolbar table button	M	1.2 s	
	Locate the icon on the toolbar	M	1.2 s	
	Point mouse to the icon	P	1.1 s	
	Press and hold mouse button	B	.1 s	
	Remember how many rows are required	M	1.2 s	There are two chunks of information here to be retrieved from memory, so two mental operators are required.
	Remember how many columns are required	M	1.2 s	
	Drag the mouse to select the required table rows and columns	P	1.1 s	
	Verify that the correct number of rows and columns has been selected	M	1.2 s	This mental operator is likely to occur at the same time as remembering how many rows and columns are required.
	Release the mouse button	B	.1 s	
TOTAL TIME (seconds)			20.8	

Method 2: Using the keyboard. (User's hand is on the mouse after opening the document)

Steps	Actions	Operators	Time	Notes
Place the insertion point at the end of the document.	Decide to do the task	M	1.20 s	
	Home hand from mouse to keyboard	H	.4 s	
	Remember that the correct shortcut key combination is "Ctrl-End"	M	1.20 s	Even though this is an expert user, Ctrl-End is not a very common key combination and the user has to think for a moment to remember it.
	Press and hold "Ctrl", press "End", release both	KK	.56 s	This is an equivalent of two separate keystrokes.
	Verify that the insertion point is now at the end of text	M	1.20 s	
Insert a page break	Press and hold "Ctrl", press "Enter", release both keys	KK	.56 s	Common command, so no mental operator is required
	Verify that the page break has been inserted	M	1.20 s	
Insert the table by going to "Table > Insert > Table" on the menu bar	Recall the correct keyboard shortcut to open the table menu.	M	1.20 s	
	Press "Alt-A"	KK	.56 s	
	Notice that the top menu option is currently selected	M	1.20 s	
	Press the "↓" key once	K	.28 s	
	Press the "→" key once	K	.28 s	
	Verify that "Table..." is highlighted in the flyout menu	M	1.20 s	
	Press "Enter"	K	.28 s	
	Notice that the focus is in the "Number of columns:" field	M	1.20 s	
	Remember how many columns are required	M	1.20 s	
	Type "3"	K	.28 s	
	Press "Tab"	K	.28 s	
	Remember how many rows are required	M	1.20 s	
	Type "5"	K	.28 s	
	Press "Enter"	K	.28 s	
	TOTAL TIME		16.4 s	

Results.

Keyboard is faster. The three steps in this task can be accomplished with the keyboard about 4.4 seconds quicker than with the mouse.

Discussion.

It is interesting that while the first two steps are faster with the keyboard, the third step—inserting the table—takes longer with the keyboard (8.4 w/mouse vs. 9.7 w/keyboard). Looking at the table of operators alone, one “culprit” here is the fact that more commands have to be retrieved from memory. Another one is that there are simply more actions to be performed, including calling up a dialog box, typing numbers for rows and columns separately, and pressing Enter.

Lessons learned.

Mental operators proved to be the trickiest to specify. The hardest part was making assumptions about when an advanced user will be performing a mental operation while moving hands or mouse. Another one was trying