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Comparison of Date Entry Methods: An Update for the Internet Age

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This study examined seven methods for date entry on the web, including text input, selection using drop-down menus or radio buttons, and combination approaches. The focus was on the entry of dates that may be many years in the past, such as a date of birth. A total of 776 participants, randomly assigned to one of the seven methods, each entered ten dates in an online study. Speed and accuracy were measured, and subjective ratings of task ease were collected. The methods with three separate text-entry fields for month, day, and year, either with or without auto-tab, were the fastest and received the highest task ease ratings. However, they also had the highest error rates. Three separate dropdowns for month, day, and year yielded the lowest error rate. The implications of these results for the design of web forms are discussed.

INTRODUCTION

Most users of the web have entered a date on an online form at some point. For example, users are commonly required to enter dates when registering on a website, opening an account, booking a flight, or ordering dinner online. The two most common kinds of dates are ones that may be in the distant past, such as a date of birth or some other key event such as starting a new job, or ones that are likely to be in the relatively near future, such as the date for a travel reservation. Since the entry of a date in the near future often benefits from seeing what day of the week a date falls on, a pop-up calendar is commonly provided as an adjunct to the field(s) used for the entering the date. See Bainbridge (2002) for guidelines surrounding the use of calendar controls in conjunction with input and selection fields specifically on hotel websites. But the utility of a calendar control rapidly diminishes when dealing with dates in the distant past since the day of the week is usually not relevant. For this study, we decided to focus on the entry of dates potentially in the distant past (e.g., date of birth) where a calendar control is not appropriate.

The existing research and guidelines around date entry methods are far from comprehensive. One guideline is to avoid drop-down menus for data that is well known to users, such as their date of birth, since they are able to type this quickly (Nielsen, 2000). In addition, Koyani, Bailey, & Nall (2004) state that at least two studies have shown that text-entry methods of entering dates is faster and preferred to other methods, though it is more error prone.

Gould, Boies, Meluson, Rasamny, & Vosburgh (1989) examined seven methods of date entry, all of which were keyboard controlled. These methods were identified as either text-entry methods, for which the user had to type the date, or selection methods, for which the user hit buttons on the keyboard to select options on the screen. For example, for one text-entry method, participants typed the month, day, and year into three separate fields. They could type all or part of the month into the field, then press enter or tab to have the month entry completed by the computer and move to the next field. Another version of this method automatically completed the month field once the user had entered enough

characters to identify the desired month, then moved the focus to the next field. One of the selection methods, on the hand, required users to increase or decrease the date by using the up and down arrow keys until it reached the desired date. The results of the study indicated that, overall, the text-entry methods led to faster performance and fewer errors than the selection methods. It was also reported that decomposing date entry into individual fields for month, day, and year is advisable for both the text-entry and selection methods. Additionally, for the auto completion version of the text-entry method, it was noted that there may be problems with automatically moving between fields because of issues with "heads-down typing" (Smith & Mosier 1986, p. 55).

The primary purpose of the current study was to update the findings of the previous studies to the kinds of interactions common today on the web. For example, the main previous study, Gould et al (1989) was conducted without the use of a mouse for pointing and selection.

METHOD

Seven methods of entering or selecting dates were studied in the context of an online study. Employees of our company were recruited to participate through a daily email message sent to all employees. A total of 776 participants, 55% male and 45% female, ranging in age from their twenties to their sixties, completed the study.

Materials

Participants were randomly assigned to one of seven date-entry conditions, identified here as V1-V7. A between-subjects design was chosen in order to maintain consistency in the dates entered across conditions for comparison purposes, while preventing participants from becoming familiar with the dates. These conditions are shown in Figure 1.

In V1, the user selected the month from a drop-down menu, then entered the day and year in text entry fields. In the drop-down, the month was indicated first with a number, then the full name (e.g., 1 – January). V2 was similar, but the months in the drop-down were written with the full name first,

Month Day Year

Enter April 14, 1955: / /

Enter January 28th, 1975: / /

Enter 3/17/1965: / /

Enter 15 October 1988: / /

Enter February 5, 1991: / /

Enter 5/25/2005: / /

Enter 26 June 2007: / /

Enter November 2, 1967: / /

Enter 12/30/1948: / /

Enter July 19th, 1996: / /

Submit

V1

mm dd yyyy

Enter April 14, 1955: / /

Enter January 28th, 1975: / /

Enter 3/17/1965: / /

Enter 15 October 1988: / /

Enter February 5, 1991: / /

Enter 5/25/2005: / /

Enter 26 June 2007: / /

Enter November 2, 1967: / /

Enter 12/30/1948: / /

Enter July 19th, 1996: / /

Submit

V4

Month Day Year

Enter April 14, 1955: / /

Enter January 28th, 1975: / /

Enter 3/17/1965: / /

Enter 15 October 1988: / /

Enter February 5, 1991: / /

Enter 5/25/2005: / /

Enter 26 June 2007: / /

Enter November 2, 1967: / /

Enter 12/30/1948: / /

Enter July 19th, 1996: / /

Submit

V2

Month Day Year

Enter April 14, 1955: / /

Enter January 28th, 1975: / /

Enter 3/17/1965: / /

Enter 15 October 1988: / /

Enter February 5, 1991: / /

Enter 5/25/2005: / /

Enter 26 June 2007: / /

Enter November 2, 1967: / /

Enter 12/30/1948: / /

Enter July 19th, 1996: / /

Submit

V5

mm/dd/yyyy

Enter April 14, 1955:

Enter January 28th, 1975:

Enter 3/17/1965:

Enter 15 October 1988:

Enter February 5, 1991:

Enter 5/25/2005:

Enter 26 June 2007:

Enter November 2, 1967:

Enter 12/30/1948:

Enter July 19th, 1996:

Submit

V3

	Month	Day	Year
Enter April 14, 1955:	<input type="radio"/> Jan <input type="radio"/> Feb <input type="radio"/> Mar	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="text"/> 2010 <input type="text"/> 2009 <input type="text"/> 2008 <input type="text"/> 2007 <input type="text"/> 2006
Enter January 28th, 1975:	<input type="radio"/> Apr <input type="radio"/> May <input type="radio"/> Jun	<input type="radio"/> 9 <input type="radio"/> 10 <input type="radio"/> 11 <input type="radio"/> 12 <input type="radio"/> 13 <input type="radio"/> 14 <input type="radio"/> 15 <input type="radio"/> 16	<input type="text"/> 2010 <input type="text"/> 2009 <input type="text"/> 2008 <input type="text"/> 2007 <input type="text"/> 2006
Enter 3/17/1965:	<input type="radio"/> Jul <input type="radio"/> Aug <input type="radio"/> Sep	<input type="radio"/> 17 <input type="radio"/> 18 <input type="radio"/> 19 <input type="radio"/> 20 <input type="radio"/> 21 <input type="radio"/> 22 <input type="radio"/> 23 <input type="radio"/> 24	<input type="text"/> 2010 <input type="text"/> 2009 <input type="text"/> 2008 <input type="text"/> 2007 <input type="text"/> 2006
Enter 15 October 1988:	<input type="radio"/> Oct <input type="radio"/> Nov <input type="radio"/> Dec	<input type="radio"/> 25 <input type="radio"/> 26 <input type="radio"/> 27 <input type="radio"/> 28 <input type="radio"/> 29 <input type="radio"/> 30 <input type="radio"/> 31	<input type="text"/> 2010 <input type="text"/> 2009 <input type="text"/> 2008 <input type="text"/> 2007 <input type="text"/> 2006

V6

Figure 1. Screenshots of versions 1-6 of the date-entry methods tested. V7 was the same as V4 but with auto-tab between the component fields of each date.

then the representative number (e.g., January – 1). This difference is potentially relevant because of the way drop-down menus can be activated via the keyboard by typing the *first character* of the desired item. V3 was a single text-entry field, in the form of mm/dd/yyyy which is typical in the U.S. V4 was also text-entry, but with individual text fields for the month, day, and year. V5 was a selection method, with three drop-downs for month, day, and year. V6 was also a selection method, with radio buttons for each month and day, and a dropdown selection for year. Finally, V7 was similar to V4, with three text entry fields, but this version also included auto-tabbing between the fields when the required number of digits in a field had been typed.

Tasks

Participants were required to enter ten dates, which were displayed on the screen next to the date entry fields. So that the results were not biased toward one method of date entry versus another, the display method of the dates varied. For example, participants were asked to enter April 14, 1955; 3/17/1965; and 26 June 2007. The same ten dates were used in all conditions.

Measurement

Several measures were automatically collected during the online study. The completion time for entering all ten dates was measured in seconds, and the actual dates entered were recorded. Additionally, participants rated the ease of the task on a five-point scale, with one indicating difficult and five indicating easy.

In determining the accuracy of the dates entered, if there was an error in any part of the date it was considered to be incorrect. In the case of V3 in particular (single input field), there was some flexibility allowed. As was indicated on the screen, input was to be formatted as mm/dd/yyyy. However, we allowed any digits-only input that would be interpreted by Microsoft Excel as the correct date. So, for example, 4/15/1955 and 04-15-55 would both be accepted as correct entries for April 15, 1955. Note that leaving out delimiters (e.g., 41555) was not acceptable due to the ambiguity involved. Similar flexibility was allowed in V4 (three input fields), where, for example, the month and day could be entered with or without a leading zero, and the year could be 2 or 4 digits.

RESULTS

The mean task times, or the time it took participants to enter the ten dates, are shown in Figure 2. All error bars on all graphs in this paper represent the 90% confidence interval for the mean. T-tests were used to determine significant differences between conditions for all metrics. The time for V4 was significantly less than all other conditions except V7; these are the two versions with three input fields, respectively without and with autotab. The two methods that involved

purely selection, V5 and V6, took significantly longer than all other conditions.

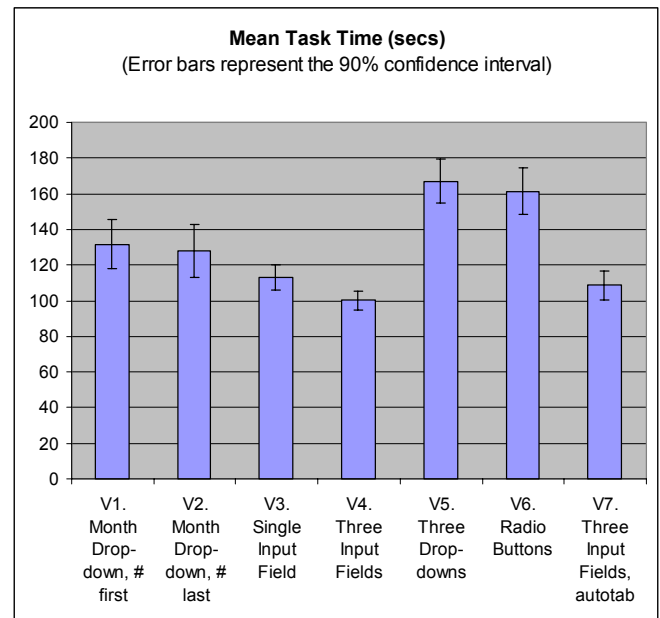


Figure 2: Mean task time (seconds)

Figure 3 shows the error rates for each of the seven conditions. The two purely selection methods (V5 and V6) were significantly more accurate than the two methods that used three input fields (V4 and V7). This is not surprising since the selection methods have fewer opportunities for errors.

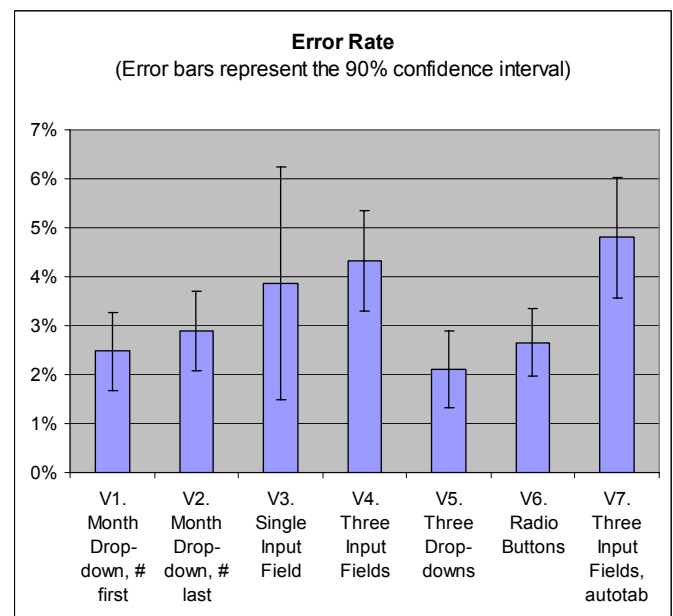


Figure 3: Error rate

Participants were also asked to rate their perception of the task ease on a five-point scale. The results are shown in Figure 4. The only significant difference was that V6 was

rated as significantly harder to use than most of the other conditions.

DISCUSSION

These results begin to address a long-debated question within the usability community. Although there are many other methods of date entry not represented here, this study provides some key metrics on commonly used date entry methods.

Consistent with earlier studies, text input methods tended to be faster than purely selection methods. Interestingly, however, three separate input fields, without autotab, was significantly faster than a single input field. A keystroke analysis of these two methods would show that both require the same number of keystrokes (with tab characters in V4 replacing the delimiters in V3).

The decision about which method of date entry to implement on a web form should be made based on the context of use, the users, and the impact of possible errors. In a back-office environment where the users might be entering hundreds of dates a day, they will become highly experienced with the method used and one could reasonably assume that their error rates would approach zero. In this case, the three-field entry method is probably best. Further, since auto-tab allows for fewer keystrokes, it should probably be included.

On the other hand, if accuracy is critical and the users may not be highly practiced in the use of the date-entry method, one of the hybrid methods (V1 or V2) may be a more appropriate choice. Although they took slightly longer than the three-field method, they were significantly more accurate.

Further research is needed to examine different date-entry methods in different contexts and with different users. Additionally, future studies could explore prediction of the efficiency of date-entry methods through performance models, again taking context and user into account.

REFERENCES

Bainbridge, Alex. (2002). Hotel Date Entry: Design and Usability Report. *Travel UCD*. 07/2002. Travel UCD, Retrieved 22 Feb 2010 from http://www.tourems.com/company/research/pdf/date_entry_hotel_july2002.pdf.

Gould, J.D., Boies, S.J., Meluson, A., Rasamny, M., & Vosburgh, A.M. (1989). Entry and selection methods for specifying dates. *Human Factors*, 31(2), 199-214.

Koyani, Sanjay J., Robert W. Bailey, and Janice R. Nall. *Research-Based Web Design & Usability Guidelines*. Retrieved 22 Feb 2010 from <http://www.usability.gov/pdfs/guidelines.html>.

Nielsen, Jakob. "Drop-Down Menus: Use Sparingly." *Alertbox* 11/12/2000. Retrieved 21 Feb 2010 from <http://www.useit.com/alertbox/20001112.html>.

Smith, S. L., & Mosier, J. N. (1986). Guidelines for designing user interface software. Report ESD-TR-86-278. Bedford, MA: The MITRE Corporation.

Tullis, Tom, and Albert, Bill (2008). *Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics*. Morgan Kaufman: Burlington, MA.

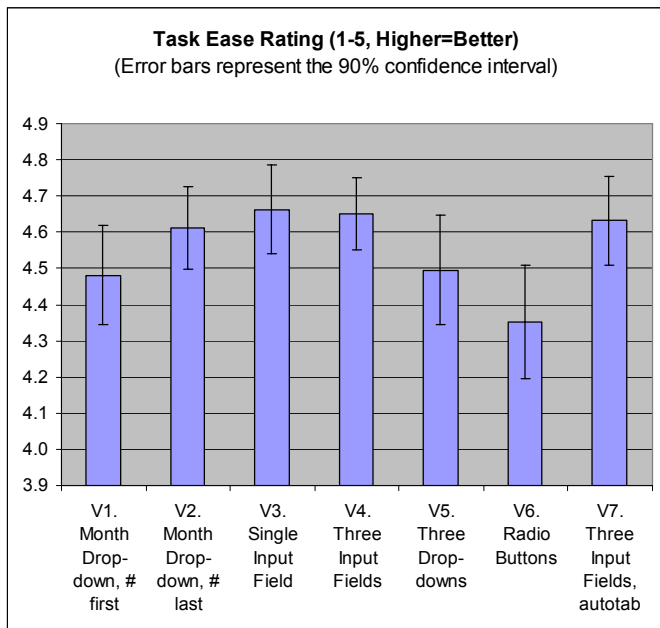


Figure 4: Task ease rating

To summarize these results, an "Overall Usability Index" was calculated by converting the three primary metrics (accuracy, speed, and rating) to percentages and then averaging those together for each condition. (See Tullis & Albert, 2008.) As shown in Figure 5, the three text-entry fields without autotab, V4, came out the best, and the two purely selection methods, V5 and V6, came out the worst.

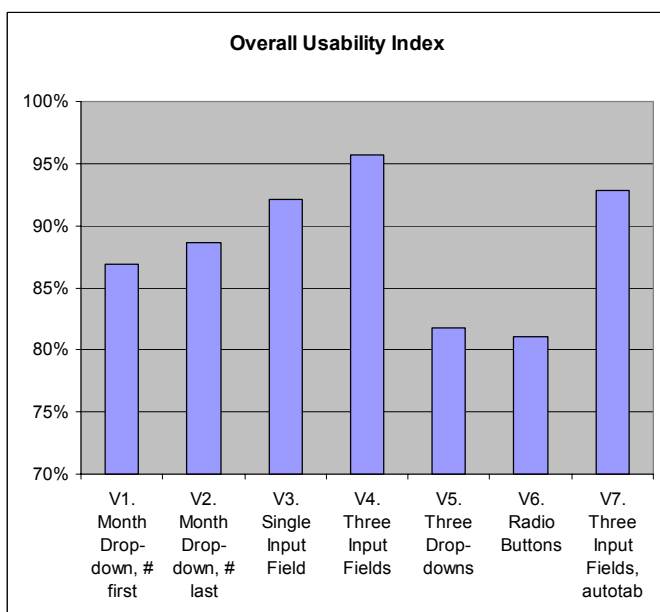


Figure 5: Overall usability index