Figure 2. Illustration of each experimental condition

3. RESULTS

A two-way within-subject ANOVA were conducted with a significance level of 0.05 for judging the significance of effects. User performance was measured by the time of participants locate and select the target items. Figure 3a shows the search time data for each condition. There was a significant main effect of navigation position, $F(3, 69)=17.08$, $p<0.001$, $\eta_p^2= 0.43$. And it can be seen in the figure that participants were faster at locating target items in top menus of navigation (M=10.01s, SD =3.05) than both left menus (M=11.21s, SD=4.65), right menus (M=13.00s, SD=4.56) and bottom menus (M=14.76s, SD =4.09); There was not a significant main effect of navigation configuration, $F(2, 46)=3.19$, $p=0.05$, $\eta_p^2=0.12$; There was also not a significant two-way interaction between position and configuration, $F(6, 138)=0.47$, $p=0.83$, $\eta_p^2= 0.02$.

The primary measure of user subjective perceptions was subjective preference. There was a significant main effect of navigation position, $F(3, 63)=30.41$, $p<0.001$, $\eta_P^2=0.59$, where top menus (M=22.49, SD=5.16) and left menus (M=20.67, SD=4.91) resulted in more preferable than both right menus (M=15.29, SD=6.58) and bottom menus (M=12.82, SD =5.52) (see Figure 3b); There was a significant main effect of navigation configurations, $F(2, 42)=3.49$, $p=0.04$, $\eta_P^2=0.14$, that the score of user subjective preference was higher for 8×6(18.91, SD=5.13) than for 6×8(17.36, SD=5.79) and 12×4(M=17.17, SD=5.71) locations; The two-way interaction effect between position and configuration was also meaningful, $F(6, 126) = 2.25$, $p=0.04$, $\eta_P^2= 0.09$. The score of 8×6 top navigation is the highest (M=24.68, SD=4.24), and the lowest is 12×4bottom navigation (M=12.27, SD=5.04), which were suggested through the simple effect analysis. Another measure of user subjective perceptions was cognitive workload. According to Pearson correlation, we found that there is negative correlation between cognitive workload and subjective preference (r = -0.816, p<0.01).

4. CONCLUSION&DISCUSSION

Based upon the results, we found that the position influences user performance and subjective perceptions obviously. In addition, we found that the configuration has no effect on searching time, but users acknowledged that configuration does play a distinct role on their subjective perceptions (subjective preference and cognitive workload).

The search efficiency of top position and left position was higher than right position and bottom position, which was same as the users' preference. The result fit in previous researches and scans path theory. Besides. Users obviously preferred the configuration of 8×6 than 12×4 because they considered that the configuration of 8×6 brought them low cognitive workload. And this conclusion was corresponding with 7±2 rule. While commodity items in the first level of 12×4 were too many that users could not bear the

burden of cognition when they were searching. Furthermore, there was an interaction between configuration and placement. Only in the case of top and left position, configuration has an obvious impact on satisfactions. When the navigation was on the top, users preferred 8×6 configuration than 12×4 significantly. For left, users preferred 8×6 configuration than 6×8. And when navigation was in the right or bottom, which were difficult to browse, the influence of configuration was weak. Finally, the time that participants complete the search tasks with 8×6 top navigation was the shortest, and next were 6×8 top, 8×6 left navigation while the using time of 12×4 bottom navigation was the longest and 6×8 bottom navigation followed. All of these results can be referred for the designers when designing navigations.
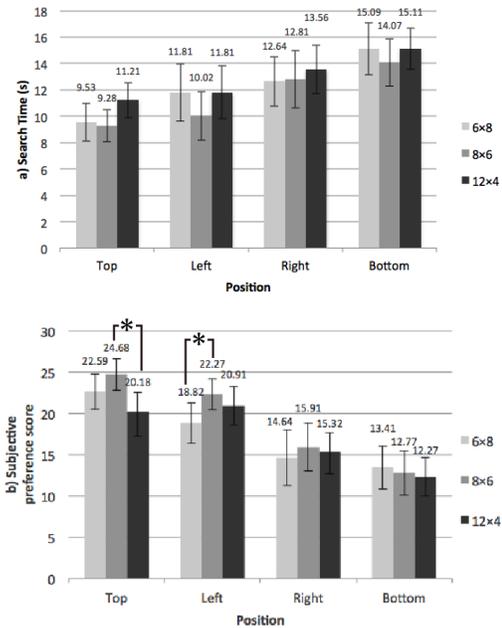

Figure 3. a) Mean search time data for each condition b)Mean subjective preference score for each condition *p < .05

5. ACKNOWLEDGMENT

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