eLion Usability Analysis
IST 331.002 - Dr. Frank Ritter
December 16, 2007

Authored by:
Michael Bennett
Joseph Schwork
Taylor Shephard
Matt Slocum

Acceptable to reprint by Dr. Ritter and PSU/eLion employees only.
# Table of Contents

ABSTRACT .......................................................................................................................... 3  
BACKGROUND .................................................................................................................. 3  
RESOURCES ....................................................................................................................... 3  
STUDY .................................................................................................................................. 4  
ELION USABILITY TEST .................................................................................................... 4  
  RESULTS ............................................................................................................................. 7  
PROPOSED PROTOTYPE ...................................................................................................... 10  
  RECOMMENDATIONS ..................................................................................................... 10  
  TEST DESCRIPTION AND PROCESS ............................................................................. 15  
  TEST RESULTS ................................................................................................................ 15  
INTERPRETATIONS & CONCLUSION .................................................................................. 17
Abstract

The International Organization for Standardization defines usability as “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” eLion, the interface between students, the PSU Registrar, and the PSU Bursar, is a very effective and useful tool. This study focuses on increasing the effectiveness of eLion through increased efficiency and user satisfaction. Currently, there are redundant and unnecessary actions required within the degree audit and registration portions of eLion. Through this study, we will attempt to quantify the efficiency of the current system, discover weaknesses through free-response comments, propose an improved prototype system, and quantify the efficiency of the prototype system. The results of this study are meant to provide quantitative data to the eLion development team.

Background

The eLion system is the web-interface between users and the Penn State Bursar and the Penn State Registrar. The eLion system is used by students, parents, and faculty. This study focuses on student usage of eLion. The system provides students the ability to view academic records, view financial records, submit tuition payment, schedule classes, and plan future semester class schedules. As a result, eLion is critical to each student at Penn State. Our team is very familiar with eLion and like many other students, use it at least monthly. As students and frequent users of eLion, we believe there are many areas of opportunity to improve the usability of eLion in hopes of increasing efficiency and user-satisfaction.

When discussing eLion internally with our team, we identified two key processes that will be the focus of our study: Degree Audit, and Registration. Both of these processes have been the targets of general complaints by our team and other students. Each process contains redundant steps and wasted time. Because students schedule in large batches, many times the speed of scheduling could determine if you receive a seat in that class. The speed and ease of scheduling is a major concern considering the failure mode of unsuccessfully scheduling a class.

Resources

There were several important resources our group leveraged during our usability study of eLion. The office of the university registrar provided us with access to test accounts with test login IDs, changes they are currently testing with eLion, and statistics that we will use to help us analyze the system.

One of the people that assisted our group is Todd Clouser from the Registrars office; he is a lead programmer/analyst that works with eLion. Other members of the university registrar that helped us are Karen Schultz and Carol Findley.

The eLion Application Statistics page, https://eLion.oas.psu.edu/cgi-bin/eLion- student.exe/launch/ELionStatisticsGUI, currently provides information from February 2002 to October 2007. This site provides usage statistics regarding total student usage by application and total student usage by day. This information was able to help our group determine what applications were most important to student users of eLion.

The test server enabled our group to test and time subjects without either our group members or the subjects worrying about making real time changes to any person’s accounts. The subjects were able to view their Degree Audit and make changes to a course schedule using the Drop/Add applications without actually changing their schedule. This is important because not all users would be able to perform our study using their real eLion account.
STUDY

Our final project will examine the eLion interface; specifically retrieving a degree audit and scheduling of courses. We chose to do an in depth analysis on these two major processes. Upon receiving log statistics from the eLion administrators these two processes ranked within the top 10 tasks students performed while using the eLion interface. In order to analyze these processes more closely several research methods were implemented to achieve a detailed report. These methods include: Task analyses, which includes a Goals, Operators, Methods, and Selection rules (GOMS) analysis and Keystroke Level Model (KLM) analysis, learning analysis, and finally a visual perception analysis. Through the combination of these research methods we were able to effectively hypothesize a newer more efficient work flow for our selected processes.

By executing a task analyses for our selected tasks a statement can be made about the efficiency of these tasks. By using KLM, we predicted the time it would take to complete each task. This was done by breaking down the processes step by step and calculating a time for each step. These predicted times were used to cross reference our actual times we recorded when testing our subjects. In addition to the KLM model we utilized the GOMS method of analysis as well. GOMS focused on the cognitive steps taken throughout our selected processes. This allowed us to visually analyze the steps, breaking down our processes further. This is a great way to see how efficient the eLion work flow really is. From these specific analyses we can analyze which steps may be cut out or made more efficient in order to achieve the best possible work flow for these particular processes.

The methods of research described above have more of a focus on the interface itself, which is a great way of analyzing specific tasks; however that is not the only area which needs attention. Another area of focus we chose to analyze was how the user learns over time when performing a specific task. Hypothetically, over time a user will learn the processes presented thus shortening their execution time. By examining this trend we were able to see how much improvement our subjects had over several trials of retrieving a degree audit. Our data will show that over time our subjects did improve, but there were several factors with this process that the learning curve did not account for. These types of things included loading times, internet connectivity, and other unforeseen variables, but the overall trend is still present. By analyzing this data we made informed decisions as to where improvements could be made.

Based on the tests performed and the results gathered, we were able to develop a prototype of an eLion that would help make students’ lives easier. This prototype took into account not only the test times, but also the comments gathered after the trials of the production eLion test.

eLion Usability Test

To determine the usability of eLion in terms of obtaining a degree audit and scheduling a class, we will break down the task into a single steps using GOMS and the Keystroke Level Model and compare predicted times to a 39 subject trial.

Our group started off by using Natural GOMS Language (NGOMSL) in order to describe the tasks at hand and how one would go about doing this. “GOMS is an acronym for Goals, Operations, Methods and Selection rules” (pg. 177). With this method a different set of steps or actions can be listed according to the parameters of the GOMS method. From this, we were able to produce a Keystroke Level Model (KLM) to predict the amount of time one should expect to be able to complete each task. “The KLM is a fast and approximate way to compute how long users will take to perform a task” (pg. 180). Each operation within a task can be analyzed down to their particular actions. So by breaking down each action to a predicted time one can sum the actions’ time and produce an estimated predicted time for each given task. Within this method there are 4 basic operators, each containing a

---

specific predicted time (please note: we used the information provided on page 180 in the ABCS textbook). They are as follows:

(K) – Keystrokes: (0.08 – 1.2 s/keystroke, mouse click, or button press)

(P) – Pointing: (approx. 1.1s to move the mouse to a target)

(H) – Homing: (0.4s moving hand to/from mouse and keyboard)

(D) – Drawing: (0.9s n + 0.161s – n = number of segments, 1 = length of segments)

With these predicted times one can approximate the total time it takes to complete a specific task. With both predicted and actual times a comparison can be made as to the steps of each task.

Upon completing the predicted times, we set out and tested eleven subjects on both tasks (Table 1 shows the statistics on each test subject). We were then able to compare and contrast the predicted times with the tested times.

Our NGOMSL for scheduling EGEE 102 section 5 is as follows:

Goal: Run Degree Audit then Schedule EGEE 102, section 5

Method for goal: Submit major degree audit screen
   Step 1. Locate "Degree Audit" in eLion menu
   Step 2. Click "Degree Audit"
   Step 3. Click "Current Major" radio button
   Step 4. Click "Continue"
   Step 5. Click "submit degree audit"
   Step 6. Accomplish Goal: Submit Current Major Degree Audit

Method for goal: View submitted degree audit
   Step 1. Click view audit request status
   Step 2. Click check status
   Step 3. Decide: if status is not ready yet, repeat step 2
   Step 4. Click radio button to select audit
   Step 5. Click view audit
   Step 6. Accomplish Goal: View Current Major Degree Audit

Method for goal: Navigate to your schedule
   Step 1. Find drop/add on the menu
   Step 2. Click drop/add
   Step 3. Choose the correct semester
   Step 4. Click submit
   Step 5. Accomplish goal: navigate to your schedule

Method for goal: Find Schedule of courses for EGEE 102
   Step 1. Find schedule of courses link
   Step 2. Click schedule of courses
   Step 3. Select semester in drop down menu
   Step 4. Select campus in drop down menu
   Step 5. Select EGEE abbreviation
   Step 6. Fill in course number
   Step 7. Click view schedule
   Step 8. Accomplish goal: find schedule of courses for EGEE 102
Method for goal: Schedule EGEE 102 section 5

- Step 1. Find section 5
- Step 2. Copy schedule number
- Step 3. Navigate back to drop add page
- Step 4. Paste in schedule number
- Step 5. Click adjust registration
- Step 6. Accomplish goal schedule EGEE 102 section 5

Based on this NGOMSL model, we were able to do a Keystroke Level Model to predict an upper and lower bound of time it should take to complete the task of obtaining a degree audit and then scheduling EGEE 102 section 5.

“NGOMSL is an acronym for Natural GOMS Language, which is a structured natural language used to represent the user’s methods and selection rules.” Below is a list of processes that need to get done in order to complete each step with the appropriate operators. One thing we must note is that KLM does not account for connection speeds and other system-side time. KLM simply looks at the user and predicts the time a user would spend on each task.

1. Find degree audit in eLion menu (M)
2. Click degree audit (K P)
3. Determine which degree audit you are looking for (M)
4. Click degree audit radio button (K P)
5. Click continue button (K P)
6. Click degree radio button (K P)
7. Click submit degree audit (K P)
8. Click correct degree audit radio button (K P)
9. Click view audit request status (K P)
10. Recheck status until ready (K P M W) (5s)
11. Click radio button for audit (K P)
12. Click view audit (K P)
13. Find drop/add on the menu (M)
14. Click drop/add (P K)
15. Choose the correct semester (P K)
16. Click submit (P K)
17. Find schedule of courses link (M)
18. Click schedule of courses (P K)
19. Select semester in drop down menu (P K M P K)
20. Select campus in drop down menu (P K M P K)
21. Select EGEE abbreviation (P K M P K)
22. Fill in course number 102 (P K H 3K)
23. Click view schedule (H P K)
24. Find section 5 (M)
25. Copy schedule number (P K D H 2K)
26. Navigate back to drop add page (H P K)
27. Paste in schedule number (P K H 2K)
28. Click adjust registration (H P K)

Number of each operator: P=26; M=9; K=31; H=6; D=1; W=1(5s)

Upper bound: 26p*1.1 + 9m*1.35 + 31k*1.2 + 6H*.4 + 1d*.9(1) + .161(2) = 86.57 seconds
Lower bound: 26p*1.1 + 9m*1.35 + 31k*.08 + 6H*.4 + 1d*.9(1) + .161(2) = 51.85 seconds

As seen in the equation above, we found that it should take somewhere between 51.85 seconds and 86.57 seconds to complete the task of scheduling EGEE 102 section 5. With these numbers in mind, we will begin our study.

We tested 39 subjects across each grade level at Penn State. These subjects were chosen based on availability to our team members. The distribution of the test subjects is as follows:

---

Table 1: Test Subject Distribution

<table>
<thead>
<tr>
<th>Class</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>25.64%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>20.51%</td>
</tr>
<tr>
<td>Juniors</td>
<td>20.51%</td>
</tr>
<tr>
<td>Seniors</td>
<td>25.64%</td>
</tr>
<tr>
<td>Grad Students</td>
<td>7.69%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>71.79%</td>
</tr>
<tr>
<td>Female</td>
<td>28.21%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>23.08%</td>
</tr>
<tr>
<td>IST</td>
<td>20.51%</td>
</tr>
<tr>
<td>Other</td>
<td>20.51%</td>
</tr>
<tr>
<td>Sciences</td>
<td>15.38%</td>
</tr>
<tr>
<td>Film</td>
<td>12.82%</td>
</tr>
<tr>
<td>DUS</td>
<td>7.69%</td>
</tr>
</tbody>
</table>

Each subject was run on the eLion Test Server. The eLion account was logged in and users were tasked with the following set of instructions (starting from the eLion home screen):

1. Select Degree Audit (Start Timer)
2. Run a Degree Audit for your current major
3. View your Degree Audit
4. Select Registration or Drop/Add
5. Go to Schedule of Courses
6. Find the schedule number for EGEE102.005 for next semester
7. Go back to the registration screen and register this class (End Timer)

Each user was then prompted to give any comments about the system regarding usability. The use of a free-response question will help us understand more complicated issues than just the quantifiable time to complete. It also is bias-free and does not imply we are looking for negative feedback. Our results were gathered over a four day period, and were recorded using different computers and internet connections.

Results

The table shown below contains cumulative data collected from the 39 subjects that completed the task. The table includes the average, standard deviation, maximum time, and minimum time averaged throughout the 7 trials. By looking at this data we can hypothesize several things. As the trials progressed and the task repeated; the average time taken to complete the task decreased every trial. It is important to note the max and min times throughout the trials. This shows that in some instances the trials took much longer than others, which could be due to different internet connectivity, load screens, and other variables. Another important piece of information that will be considered with the redesign is the average total time taken to complete the task, which was 87 seconds. This number is an important benchmark and basis for comparison when testing the newer modified prototype.

Table 2: Time to Complete Task (in seconds)
<table>
<thead>
<tr>
<th></th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
<th>Trial 6</th>
<th>Trial 7</th>
<th>Average Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>116</td>
<td>95</td>
<td>87</td>
<td>81</td>
<td>79</td>
<td>76</td>
<td>75</td>
<td>87</td>
</tr>
<tr>
<td>St Dev</td>
<td>36</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>22</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Max</td>
<td>215</td>
<td>158</td>
<td>139</td>
<td>170</td>
<td>118</td>
<td>117</td>
<td>122</td>
<td>122</td>
</tr>
<tr>
<td>Min</td>
<td>46</td>
<td>44</td>
<td>23</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

The bar graph shown below is a good visual representation of the data above. The graph visually shows the decrease in time taken to complete the task. The bars are descending in a left to right manner, decreasing in time as the trials increase. This shows that after several trials of the same task there is a learning factor, which affects the time taken to complete the task. On average the user was able to complete the task much quicker in the latter trials showing that they did in fact learn, and adapt to the interface.

Figure 1: Average Time to Complete Task (in seconds)

The bar graph shown below adds another variable to the existing data. The axis are the same as the previous example (trials vs. time [sec]) but are now grouped according to grade level. This was done to see how different grade levels and experience effect completion time. On average grad students had the fastest times. To sum this data up, one could say that because grad students have used the interface for the longest time, they are the quickest to complete the task. However, of the subjects tested only 8% were grad students. This does not drastically effect the overall data, which shows that on average the older the grade level, the more experience, and therefore a faster completion time.
The table shown below contains the data for the bar graph shown above. This data is important to see how grade level effects completion time. Throughout all of the tests a similar trend remains and that is that over several trials completion time decreases because of the learning that comes into play when operating the eLion interface.

<table>
<thead>
<tr>
<th>Class</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
<th>Trial 6</th>
<th>Trial 7</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>111</td>
<td>94</td>
<td>86</td>
<td>80</td>
<td>82</td>
<td>78</td>
<td>77</td>
<td>87</td>
</tr>
<tr>
<td>Sophomore</td>
<td>135</td>
<td>105</td>
<td>91</td>
<td>84</td>
<td>78</td>
<td>76</td>
<td>74</td>
<td>92</td>
</tr>
<tr>
<td>Junior</td>
<td>106</td>
<td>91</td>
<td>86</td>
<td>85</td>
<td>78</td>
<td>75</td>
<td>73</td>
<td>85</td>
</tr>
<tr>
<td>Senior</td>
<td>121</td>
<td>100</td>
<td>91</td>
<td>84</td>
<td>87</td>
<td>84</td>
<td>83</td>
<td>93</td>
</tr>
<tr>
<td>Grad Student</td>
<td>90</td>
<td>74</td>
<td>64</td>
<td>55</td>
<td>54</td>
<td>50</td>
<td>52</td>
<td>63</td>
</tr>
</tbody>
</table>

All the data in the figures above can be used to help redesign the eLion degree audit and scheduling tasks within the eLion interface. This data is very important for creating a prototype. We will use this data to compare with data collected from testing the prototype in the same fashion. After running subjects through several trials with the new prototype a comparison can be made to see if the prototype improved the previous interface. The proposed prototype should make the eLion interface much more efficient, suiting the needs for all the grade levels at Penn State University.

<table>
<thead>
<tr>
<th>Comments (Current System)</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have to Copy/Paste Schedule number</td>
</tr>
<tr>
<td>Waiting for Degree Audit</td>
</tr>
<tr>
<td>Must change semester and campus every schedule search</td>
</tr>
<tr>
<td>Very detailed instructions</td>
</tr>
<tr>
<td>Degree Audit Helpful</td>
</tr>
<tr>
<td>Easy to use</td>
</tr>
<tr>
<td>No need to go to an advisor</td>
</tr>
</tbody>
</table>
Table 4 lists the free-response comments from test subjects in the production eLion study. The most common comments were complaints about having to copy the schedule number from the schedule of courses to the eLion registration page and waiting for the degree audit to run.

**Proposed Prototype**

With a few minor adjustments, eLion can be transformed from a time consuming tool to a fast and easy tool. Students always look for quick and easy ways to do simple tasks. All stakeholders need to be taken into account in order to produce the best product. Our group has studied users on the current system, and with this, we were able to create a number of suggestions that would help increase the speed of the eLion process and to make it a more positive experience for students. Through these suggestions, we have designed a prototype eLion in order to test subjects on speed and experience while also showing all potential stakeholders what it is we are suggesting. To see the prototype, go to [http://www.personal.psu.edu/jts5041/eLion](http://www.personal.psu.edu/jts5041/eLion).

**Recommendations**

Through a tutorial-like process, we will display the recommendation we have come up with. Please note that we have used the code from the current eLion to try and produce a product similar to the current system. We have made a few minor adjustments to the code to produce the recommendations.

The log in process has stayed the same for our prototype. We feel that the process is very secure and students do not have much of an issue with this. Our first recommendation comes once a student logs into eLion.

![Figure 3: Left Menu Changes](image-url)
One of the topics that occasionally were talked about by test subjects was the left menu. Figures 4 and 5 are examples of the recommendations. Currently it is in alphabetical order. We feel that alphabetical order is a good idea, but we feel that if the links were grouped into three categories to ease the searching process. The three would be ‘Educational Services,’ ‘University Services,’ and ‘Additional Services.’ The ‘Educational Services’ would involve directly with a student’s education which includes, grades, course registration, and final exam schedule. These services are generally most used by students and it will be a quicker find for students. ‘University Services’ would include the financials and student changes. This is second on the list because they are generally less used with students. Third would be the ‘Additional Services’ that involve the verifications and tax credit. We also suggest making the list of links shorter by using only one name per link. Currently, there are a number of duplicates links with different names. Shortening the list will help students go faster through the list.

Our second recommendation involves the Degree Audit. The Degree Audit currently is set up by asking the user to select their major or minor. Once the user selects the degree audit they wish to view, there is a wait time for the system to load it, and then it is available to be viewed after x amount of time. We recommend that eLion should use a similar process for the Degree Audit as the current Student Schedule. The schedule is displayed almost instantly when clicked on. The Degree Audit does not need to be in real time because it is only changed 3 or 4 times a semester. If it is updated in the system weekly or after the student performs an action that changes his/her degree audit, then the students will be able to have their degree audit on demand. Figure 6 is an example of the Degree Audit on demand.
The main focus of our recommendations surrounds the scheduling process. Almost every student is on their computer ready to schedule the first day they are able to. It is a very challenging event to get into the classes they wish. With this in the back of everyone’s mind, we asked the original test subjects on their feelings of the eLion process (good and bad). Many of the subjects suggest that change is necessary for the scheduling process.

The original Drop/Add screen will continue to stay the same—asking for the semester they would like to schedule for. The next screen will be a user’s list of classes for the semester chosen. Overwhelmingly, the test subjects wanted better integration between the schedule of courses and eLion. Our recommendation is to do just that. Figure 7 displays the first screen in the schedule of courses.

We have determined a good way to speed up the scheduling process is to pre-fill some of the options for students. We suggest that the semester is changed based on when scheduling starts for the next semester. On the first day of when seniors are allowed to schedule, this page should have the next semester already filled. The integration between this page and eLion begins with the campus location. We recommend that this be filled in based on the
user’s eLion account. eLion knows the campus a student is located in and should be transferred to this page. Of course, both of these dropdowns will allow for students to change it, but it makes life simpler for the student because the vast majority will schedule for the campus they are located on.

During our testing of the current system, we made all users schedule EGEE 102, section 5. We chose to update this page to display our recommendation on the course-list pages. Figure 8 is EGEE scheduling page.

Figure 8: EGEE scheduling page

The first change to be noticed is the green lines. In a visual perception lab which was conducted in our IST 331 class, we determined that it is easier and more accurate to read tables with a light fill color in every third line. These colored lines will greatly help the students to quickly figure out they are signing up for the course they really want to. The improvement will be greater with courses that have many more sections (for example, ENGL 015). The idea is to place a green row every third row. In the same visual perception lab, we found that green was a very good color when trying to help users find numbers quicker. The second change is to make the seats remaining in real-time. Students overwhelmingly would like to see a real-time system that will help them determine how to find courses to take.

Now for the third and fourth change, please focus on EGEE 102. We have included links for the Schedule Number and the Section. Figure 9 is a screen of Section 5’s information. When clicking the section number, a page with the section’s information is displayed. This can be a teacher’s page or just a general description of the course. Either way, it can help students determine what course they want to take.
The last change is probably the most progressive of all the changes to the eLion system. We recommend the ‘One & Scheduled’ system that will link the schedule of courses back to the Student’s Registration. Currently, a student needs to find the course, copy & paste the registration number to the Drop/Add, and then click adjust schedule. This will allow a student to schedule a course in a much easier and quicker way. A student will click the registration number and then it will automatically schedule the course for the student. Figure 10 displays the outcome upon clicking the registration number for EGEE 102, section 5.

Please notice in Figure 10 that a user will still be able to copy & paste a registration number if they chose to.
Test Description and Process

Again, these recommendations will greatly improve the usability for students. In order for us to prove this, we decided to test a number of subjects on this prototype system. This prototype has not been shown to anyone other than our group prior to testing and because of this, we feel that it was not necessary to test as many people. The system is new to everyone while the old system has an experience factor that needed to be taken into account.

We have decided to test in the same way as we did for the old system. We will ask the user to get a degree audit, then to schedule EGEE 102, section 5. We will time them twice each and then we will ask for their comments about the prototype. Please note that we only created full pages for those pages that a test subject will use in this process. All other pages will have a ‘Wrong Page’ to it so that all links look the same. It should also be noted that because the prototype is being hosted on a personal PSU webpage and that some functionality could have been lost when it comes to the prototype that times may not be 100% accurate. The test is to hopefully provide a guideline as to how much faster it could be on the average.

To determine the usability of the proposed eLion prototype, we timed 14 subjects in two trials of obtaining their degree audit and scheduling EGEE 102 section 5. The subjects were chosen by availability to our team across each class level. Each users was tasked with the same goals as the production eLion trials.

1. Select Degree Audit (Start Timer)
2. Run a Degree Audit for your current major
3. View your Degree Audit
4. Select Registration or Drop/Add
5. Go to Schedule of Courses
6. Register EGEE102.005 (End Timer)

The task is identical to the production eLion trials, but the KLM model looks significantly different:

1. Find degree audit in eLion menu (M)
2. Click degree audit (K P)
3. Determine which degree audit you are looking for (M)
4. Click degree audit radio button (K P)
13. Find drop/add on the menu (M)
14. Click drop/add (P K)
16. Click submit (P K)
17. Find schedule of courses link (M)
18. Click schedule of courses (P K)
21. Select EGEE abbreviation (P K M P K)
22. Fill in course number 102 (P K H 3K)
23. Click view schedule (H P K)
24. Find section 5 (M)
25. Click on the registration number to schedule (P K)

Number of each operator:  P=10; M=6; K=13; H=2;

Upper bound: 10p*1.1 + 6m*1.35 + 13k*1.2 + 2H*.4 = 35.5 seconds
Lower bound: 10p*1.1 + 6m*1.35 + 13k*.08 + 2H*.4 = 30.3 seconds

As you should be able to notice, the time range has become much smaller and the upper bound of the prototype is roughly 16 seconds less than the lower bound of the production eLion timing prediction.

Test Results
Much of the testing yielded very promising times and opinions. Table 5 shows the timed results from the 14 test subject in each trial. In trial 1, the test subjects averaged a total time of 32 seconds while in trial 2, the subject averaged 22 seconds. The first trial was within the upper and lower bound predicted times. The second trial was roughly 8 seconds better than the lower bound.

Table 5: Time to Complete Task in Prototype System (in seconds)

<table>
<thead>
<tr>
<th></th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Average Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>32</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>St Dev</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>45</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>21</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

The statistics on this are very promising because students will be able to cut their essential eLion activities by roughly 31% (based on the averages of the times collected for the production eLion and the prototype eLion). In Figure 11, we compare the average test times in seconds from the last trial of the Production eLion test with the first trial of the Prototype eLion test. Based on this comparison, students cut their times by more than half by doing the exact same tasks only with two different interfaces. To be exact, the average time for the seventh trial of the Production eLion test was 75 seconds while the first trial average for the Prototype eLion test was 32 seconds.

Figure 10: Average Cycle Time in Seconds Comparison

Upon completion of the two trial runs, we had asked for feedback on the prototype system. Overwhelmingly, the feedback was very positive. Every test subject thought the new system was quicker than the current version. Some comments also pertained to the new features implemented in the prototype. Based on a few comments, we have learned to be more explicit as to what to do. Some people seemed confused at first as to what to do once in the prototype system. We recommend that if any changes were to be done within eLion, the utilization of tooltips or other direction displays would be a great help in the beginning. Within the prototype, we did not use any direction displays, and thus the reason for those types of comments. Table 6 has a list of categorized comments and the number of test subjects who mentioned those in their comments. Please note, only twelve of the fourteen test subjects provided feedback to us.
Table 6 lists the free-response comments from test subjects in the prototype eLion study. Each test subject mentioned that the system was faster and easier than the production eLion system. Many mentioned that you don’t have to copy the schedule number from the schedule of courses to the registration page, and that the semester and campus drop down boxes are auto-filled. One user mentioned that the new system was difficult to get used to immediately. This is an important consideration if the eLion system would be changed.

### Interpretations & Conclusion

Upon completion of this project, we feel that the recommendations noted in this paper are ones that maximize the user experience of eLion. Each student uses eLion as a tool, and as a stakeholder, students would greatly benefit from simplifying this process. By conducting these tests, we believe an individual’s past behavior can predict future behavior. We are able to interpret a user’s actions on eLion because it is a good indicator for future actions. We believe that with minor adjustments to the current system, students will schedule faster and more accurately. Even if this exact prototype is not produced, this can be used as a guideline for one that will help students greatly.

---