Web Page Design: Heuristic Evaluation vs. User Testing

For

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By

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COM 221, Section 02

December 7, 2010
December 07, 2010

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Re: Project #4 – Analytical Report

Dr. Koller:

Enclosed you will find an analytical report entitled “Web Page Design: Heuristic Evaluation vs. User Testing”. This comparative report includes research on heuristic evaluation and user testing. Following the research are the conclusion and recommendation sections. The recommendations are directed toward WebsiteDesigner.com – a web design consultant company. In addition, business entrepreneurs, regardless of their business, can consider these recommendations when developing their initial company website.

Interestingly, there was no clear cut answer to the research question. Neither heuristic evaluation nor user testing is the superior evaluation method when evaluating the usability of a web page. In fact, the two methods complement each other, and as a result, the recommendations took this factor into consideration.

Please contact me if you have any questions or require further information. I can be reached via email at archerj1@my.erau.edu or by telephone at (386)-795-3033.

Sincerely,

Julian R. Archer

Enclosure
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Abstract

Website development is a major component of today’s businesses. As a result, businesses turn to web consultant companies for their web page design and evaluation needs. This report compares and contrasts heuristic evaluation and user testing as methods for critiquing the usability of an interface such as a website. This report outlines the benefits and limitations of both evaluation methods. It was found that heuristic evaluation identifies the most potential problems with an interface while user testing identifies less, but more significant problems. In the end, the report discusses that the most appropriate approach to evaluate a website would be to combine heuristic evaluation and user testing rather than use one of the two methods. However, if financial and/ time constraints exists, it is suggest to use heuristic evaluation to evaluate the web page.
Audience Scenario

The primary audience for this analytical report is WebsiteDesigner.com. This report will offer analysis and recommendations as to which evaluation method (user testing or heuristic evaluation) should be used by this web design consultant company when testing the usability of a website. Secondary audiences include entrepreneurs who are thinking about getting a new website to kick start their business (it doesn’t matter what business) and market their products and/ ideas.
Introduction

Background and Purpose

When designing a web page, it is important to understand the pros and cons of the various usability testing techniques. For this reason, companies turn to professional website consultant companies for help when trying to develop a website that is highly appealing and usable. However, these website consultant companies are then faced with the task of evaluating the created website before passing it off to the company of interest. The issue then becomes how to evaluate a website to ensure that it is well-designed. There are a variety of usability techniques out there to handle such an issue, but among them, heuristic evaluation and traditional user testing are the most popular. For this reason, the purpose of this analytical report is to compare and contrast heuristic evaluation and user testing in an attempt to determine which of these approaches would be most effective when designing a web page.

Sources of Data

The primary sources of data collected included reports from the International Journal of Industrial Ergonomics, Proceedings from the Human Factors Society’s Annual meetings, and scholarly articles published by members of higher education institutions. Also, a book on Human Factors testing and evaluation was utilized, followed by other web-based articles get a conceptual understanding of the research topic itself. Finally, an interview was conducted with Eric Vaden (a subject-matter expert on Human Computer Interaction) to obtain feedback on heuristic evaluation and user testing. The notes from the interview can be found in the Appendix. Note that most of the general information that constitutes this analytical report comes from the personal experience I have acquired from conducting usability testing quite a few times as an undergraduate student in Human Factory Psychology.
Supplement to Analysis

An Appendix which contains a person résumé and interview questions and responses from Mr. Eric Vaden can be found on page 13 – 15.

Working Definitions

Usability - “Degree to which the design of a device or system may be used effectively and efficiently by a human” (Charlton & O'Brien, 2002).

Usability Testing - “Three broad categories of techniques and tools that measure system usefulness” (Charlton & O'Brien, 2002)

Web page - “The traditional presentation of information online” (Glossary I - Z).

Website - “A website is made up of one or more web pages” (Glossary I - Z).

Scope of Analysis

This report begins by addressing the importance of usability testing in web page design. Next, heuristic evaluation and user testing are defined. After which, the following elements are discussed to address the research question: 1) Benefits of heuristic evaluation and user testing, 2) Limitations of heuristic evaluation and user testing, and 3) Case summaries that compared heuristic evaluation to user testing.
Collected Data

Importance of usability testing in web page design

According to data collected by corporate websites in 1997, 1999 and 2000, “Web site success is significantly associated with web site navigation (organization, arrangement, layout, and sequencing), content (amount and variety of product information), interactivity, and responsiveness (feedback options and FAQs)” (Palmer, 2002). Therefore, it is crucial that usability testing of the individual web pages, which constitutes the overall website be conducted. Reason being, if you’re a business trying to market your products or ideas, a web page that adheres to the users’ expectations will ensure that visitors – potential customers – are quicker to revisit and recommend your site to others (family, friends, etc.). Even if you’re skeptical, personal experience should tell you that if the user is not easily able to navigate and interact with the various web pages on the web site, they are bound to get frustrated and eventually leave the page, which means a potential lost for the company if the goal is to market something. Also, keep in mind that if one user becomes frustrated with your web page, just like good news, the bad news is going to spread, and it is possible that the effect is going to be detrimental to business at the global level.

Figure 1 illustrates that a functional web site is the byproduct of its usability and accessibility (the seamlessness of the website that is established by accounting for the user through usability testing). This is why usability testing of your web page is important. With the question of ‘is usability testing important’ answered, the question now becomes, which of the

![Figure 1: Relationship between User Experience and Website Design (Webdale, 2003)]
two evaluation strategies (heuristic evaluation or user testing) is most effective when designing a web page, because good usability is important to the success of your web page.

Comparing Heuristic Evaluation and User Testing

As mentioned earlier, heuristic evaluation and user testing are amongst the more popular interface evaluation approaches. In heuristic evaluation, “a person inspects a prototype or an existing [interface], and makes a list of all the changes necessary to optimize human performance and/or acceptance” (Baley, Allan, & Raiello, 1992). On the other hand, user testing is centered on the feedback of users interacting with a particular interface and is “usually conducted in a scenario-based environment” (Tan, Liu, & Bishu, 2009). Note, there are benefits and limitations of using either of the two usability testing approaches, and as a result, it needs to be understood whether the two methods are competing or complementary in nature.

A Comparison of the Benefits

Heuristic evaluation is a relatively inexpensive usability testing approach to begin with. In fact, it is very intuitive and straight forward; so straight forward that advanced planning is not required (Usability Professionals' Association, 2005). The method can be implemented early in the developmental process of the interface and the “test-retest” turnaround time is faster than that of user testing. On the other hand, user testing is good at “assessing the system in action, at identifying problems users experience while performing real tasks” (Doubleday et. al, 2009). Also, internal issues can be detected quickly and potential problems can be fixed before the product ever reaches the market.
A Comparison of the Limitations

Like positives there are negatives, and the first limitation to heuristic evaluation is that the evaluator must be an expert. In fact, individual evaluators have a tendency to identify only a small amount of usability issues and therefore multiple experts are required to find a large percentage of problems with the interface (Usability Professionals' Association, 2005). Figure 2 approximates the latter relationship.

![Figure 2: Relationship between number of evaluators and number of problems identified.](image)

Notice that when the number of evaluators increase, the number of potential problems identified with the interface also increases. However, when the number of evaluators continues to increase the situation becomes inefficient and the number of problems identified reaches the max and remains somewhat constant. Even though heuristic evaluation might identify more issues with the interface than user testing, there may be more minor than major usability issues identified. Additionally, heuristic evaluation may not be well suited for complex interfaces, and when using heuristic evaluation, solutions for the usability issues that are identified may not be readily available. Also, the perceptions of the heuristic evaluator might be biased because they are only imitating the users (they are not the users themselves). Therefore,
heuristic evaluations are prone to many false alarms (problems that are reported that are not usability problems in application). User testing on the other hand is not 100% representative of the target population. The method is qualitative and therefore does not provide large samples of feedback.

*Case Summary #1: Web Evaluation*

In a case study documented by Tan, Liu and Bishu, four existing commercial websites were evaluated using heuristic evaluation and user testing. The findings were summarized as followed: 1) in terms of the severity of the problems each method identified and 2) in terms of the problems found within the various site attributes.

There were three levels of severity of problems with the websites: 1) severe, 2) medium and 3) mild. Severe problems included catastrophic usability problems that were debilitating to the user. Medium problems included problems users would stumble across but could quickly adapt to. Mild problems included minor usability problems that users could have easily worked around. In figure 2 the distribution of problems (by severity) as identified by the two evaluation methods is illustrated. The graph shows that the respective proportion of problems of type ‘severe’, ‘medium’, and ‘mild’ is relatively the same for the two evaluation methods. However, the amount of problems identified by heuristic evaluation seems to be more than the amount of problems identified by user testing, which would imply that heuristic evaluation is better at detecting problems with the interface.

![Figure 3: Distribution of Problems by severity by the two evaluation methods (y-axis: severity score) (Tan, Liu, & Bishu, 2009)](image)
In terms of the problems found within the various site attributes by using heuristic evaluation and user testing, this paper will comment on five of the seven attributes: 1) navigation, 2) information content, 3) layout, and 5) common look and feel.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Type</th>
<th>Seven attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Severe</td>
<td>Common</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Heuristic</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>17</td>
</tr>
<tr>
<td>Medium</td>
<td>Common</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Heuristic</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>35</td>
</tr>
<tr>
<td>Mild</td>
<td>Common</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Heuristic</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 1: Distribution of problems (number of problems) by attributes severity level and evaluation types. (Tan, Liu, & Bishu, 2009)

Table 1 illustrates that heuristic evaluation seemed to be the superior method in identifying problems with the various website attributes. In every category, the mean score for problems identified by heuristic evaluation was always more than that of user testing. However, if we assessed the case study more closely and referred to the discussion section of the paper, it was found that both heuristic evaluation and user testing “address different problems and different levels of severity” (Tan, Liu, & Bishu, 2009). In fact, heuristic evaluation was found to reveal some of the more high level structural problems and was therefore likely to address some of the root causes of the problems. User testing on the other hand revealed more detail level problems of the interface because it required the users to enact the system at the task level.
Case Summary #2: The Telephone Index System

In a case study conducted by Bailey, Allan and Raiello, the usability of a graphical user interface for a telephone system was assessed. In the user testing scenario, 20 college students, with moderate computer experience performed a telephone billing inquiry task. They were divided into four groups: the first group walked through the system interface, commented on what worked and what didn’t; the system was revised and the process was redone until all four groups ran through the system. For the heuristic evaluation, 22 computer professionals assessed the telephone system interface. In the end, results from both test groups were compared.

Relaying the results, more potential problems were identified with the heuristic evaluation as opposed to the user testing method. The ratio was somewhere around 3:1. This statistic leaves the reader to believe that heuristic evaluation was obviously more superior to user testing. However, careful scrutiny of the results revealed that the ratio of potential problems identified to real problems was about 10:1. This meant that heuristic evaluation produced a large amount of false positives (i.e. problems identified that had no true effect on either performance or preference of the system interface) and therefore its value should be called into question. Despite the fact that user testing identified fewer problems, most were directly related to the true performance and/or user acceptance of the interface. In addition, it is assumed that user testing is time consuming, however, according to the results documented by Bailey et al., the time to complete user testing in the study was almost identical to the time required for heuristic evaluation. Also, realize that the experience and expertise of the person conducting the heuristic evaluation plays an important role in identifying potential problems with the interface and making system redesign recommendations. Taken together, the best approach to evaluating the usability of an interface would be to “combine the strengths of each of the techniques” (Baley, Allan, & Raiello, 1992).
**Case Summary #3: A Telephone Based Interface**

In this study conducted by Neilson and Mack, heuristic evaluation was one of the usability testing approaches compared to user testing results obtained for a telephone based interface (note: details of the interface were not given). There were three groups that evaluated the system interface: 1) experts, 2) non experts and 3) the original software developers of the system. Table 2 represents a summary of the results obtained by the study. The first row under the table headings indicates the number of usability problems and interface improvement ideas that were observed during user testing of the telephone based interface. The following row below that shows the percentage of these problems and improvement ideas found by evaluators using heuristic evaluation. Notice that of the 25 problems that occurred during user testing, 8% were identified by non-experts, 16% by software developers and 44% by experts. Likewise, for potential problems that could have occurred during the user testing, 3% were identified by non-experts, 24% by software developers and 31% by experts. Taken together, these results show that experts were best at identifying usability issues with the system interface.

<table>
<thead>
<tr>
<th>Method</th>
<th>Evaluators</th>
<th>Problems That Did Occur</th>
<th>Potential Problems</th>
<th>Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab</td>
<td>Observed with users</td>
<td>25</td>
<td>29</td>
<td>31</td>
</tr>
<tr>
<td>Heuristic Evaluation</td>
<td>Experts</td>
<td>44%</td>
<td>31%</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>Software developers</td>
<td>16%</td>
<td>24%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Nonexperts</td>
<td>8%</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Cognitive Walkthrough</td>
<td>Experts</td>
<td>28%</td>
<td>31%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Software developers</td>
<td>16%</td>
<td>21%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Nonexperts</td>
<td>8%</td>
<td>7%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Table 2: Summary of results comparing usability testing evaluation methods (Nielsen & Mack, 1994)
Conclusion

Summary of Findings

Based on data collected, it was apparent that both heuristic evaluation and user testing possessed their own unique benefits and limitations. According to general research and the three case studies addressed in this paper, neither method is superior. In fact, the degree to which each of the usability testing approaches identifies problems in the system interface depends on a number of factors. In heuristic evaluation, the effectiveness of the method depends on who is conducting the evaluation (whether it is a non-expert or expert); the more experienced the evaluator, the greater the chance of identifying system faults. Also, it depends on how many people are evaluating the system interface; more evaluators mean greater potential for identifying interface design flaws. In user testing, the size of the test group matters; the more persons that allowed to walk through the system interface, the greater the amount of problems that can be identified, and more reflective the results are of the population. Also, the ability of the observer and user to communicate exactly what are causing problems in the interface is a key factor. Hence, heuristic evaluation and user testing are complementary rather than competing in nature; the advantages of one method compensates for the disadvantages of the other method.

Overall Interpretation of Findings

There is no such thing as a superior usability testing approach. When designing a web page, the amount of resources available and the degree of constraints placed on the business will most likely determine which evaluation approach is used.
Recommendations

With the best interest of our target audience in mind, I recommend that WebsiteDesigner.com:

1) **Begin the web page design process with heuristic evaluation if resources are limited.** It is clear from research that heuristic evaluation is going to be the faster and cheaper of the two evaluation methods to conduct when designing an interface like a web page. Also, because heuristic evaluation has a tendency to identify a greater number of potential problems when compared with user testing, it would probably be a good base test to begin with if time and money are constraints. However, if heuristic evaluation is used, ensure that an expert evaluator assesses the interface so that a great amount of problems are detected early on in the design process. Recall, expert evaluators are better at applying problems than non-expert evaluators.

2) **If time permits but financial resources are limited, conduct a series of user testing evaluations on the web page design.** Research documented in this report stated that even though user testing identified less potential problems with the interface than heuristic evaluation, it was more capable of identifying significant problems with the interface. Therefore, because user testing is more representative of the actual users of the interface, possible performance and preference issues can be identified before the web page design ever hits the market and it’s too late or costly to change.

3) **If adequate resources are available, conduct heuristic evaluation followed by user testing.** According my research, heuristic evaluation can only get you so far as to identify many little potential problems with the interface. User testing on the other hand will specifically identify problems with the interface at the task level. As a result, to compensate for the individual limitations of the evaluation methods, it is recommend that both heuristic evaluation and user testing be used.
## Appendix

### Benefits and Limitations of Heuristic Evaluation and User Testing

<table>
<thead>
<tr>
<th></th>
<th>Heuristic Evaluation</th>
<th>User Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td>Relatively inexpensive and less time consuming</td>
<td>More representative of the target user population</td>
</tr>
<tr>
<td></td>
<td>It identifies a great amount of potential problems with the interface</td>
<td>Problems identified are sometimes not that significant and can be considered false alarms</td>
</tr>
<tr>
<td></td>
<td>Can be implemented early in the design phase of the interface</td>
<td>Problems identified depend of whether an expert or non-expert evaluates the interface</td>
</tr>
<tr>
<td></td>
<td>More evaluators mean more potential problems are found with the interface</td>
<td>Less evaluators mean less problems are found with the system</td>
</tr>
<tr>
<td></td>
<td>Problems identified could be biased</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Summary of the Benefits and Limitations of Heuristic Evaluation and User Testing
Interview of Eric Vaden (Human Computer Interaction Specialist)

Note: Questions followed by answers

1. Which of the two evaluation strategies is most effective when designing a web page: heuristic evaluation or traditional user testing?
   ✓ traditional user testing; always

2. Is the visual design of a web page important?
   ✓ Yes

3. What are the benefits of a better visually designed web page? (Open ended)
   ✓ Users will feel more comfortable and be willing to spend more time on web page
   ✓ Functionality in the page should be more apparent and critical features will not be overlooked
   ✓ Errors in action should be less likely

4. When designing a web page, what’s the first thing that comes to mind? (Open ended)
   ✓ Who’s the audience: As a Human Factors specialist, you might be the person who 1) goes out and collect requirements, 2) starts to define the system, 3) put standards in place for most of the pages so that you’re are using the same font styles, 4) does some wire framing so that this dedicated space is always for this or that, and 5) defines all that basic physical layout and functionality. But, someone else can do that you know. The Human Factors person can set down a thing of standard and say that this is generally what it’s going to look like, but I don’t think anybody else in the design process ever says: who is using this, what gender are they, what kind of experience do they have, what games do they play already...whatever.

5. Do you become frustrated when a web page is hard to read?
   ✓ Yes

6. Do you become frustrated when a web page has its content scattered all over the place?
   ✓ Yes

7. Do you become frustrated when a web page uses a weird color scheme?
   ✓ Yes

8. Do text heavy web pages frustrate you?
   ✓ Not necessarily, as long as I feel as it is organized

9. What’s the first thing you look for when you visit a web page? (Open ended)
   ✓ Searched term

10. What are some factors that would cause you to get frustrated about a web page? (Open ended)
    ✓ Slow loading, chaotic fonts and locations – general formatting

11. If you were designing a web page, what is the first thing you would consider? (Open ended)
    ✓ Target audience
12. Should your web page design be an on-going process?
   ✓ Yes

13. Have you ever had a bad web page experience?
   ✓ Yes

14. What was bad about the web page? (Open ended)
   ✓ Organization, format and speed – Blackboard Sucks

15. Have you ever had a good web page experience?
   ✓ Yes

16. What was good about the web page? (Open ended)
   ✓ Quickly found what I needed – information was integrated effectively for the purpose for which I believe the system was designed – see Google Scholar.

17. Do you think there is a correlation between company success and the visual design of a web page?
   ✓ Yes

18. As a user, what does a web page tell you? (Open ended)
   ✓ A web page tells you about the company’s attention to detail or understanding of the potential user’s perception of the company because of the way the website represents them.

19. Compare heuristic evaluation vs. traditional user testing (Open ended)
   ✓ Usability testing does take time; it does take participants; and even additional costs.

   ✓ If I’m a Human Factors person within the company and I’m being asked to do a heuristic evaluation, the cheap side of that (the beneficial side to the company) is that I only have to see it: me. Whereas, if I’m doing traditional usability testing, I have to find a place to test them and I have to motivate them somehow. You have to recruit those people from somewhere and you also have to take the time to test them.

   ✓ My real opinion about selecting usability testing over heuristic evaluation is that heuristics are only going to get you so far; they are like applying standards (only thing is that these are Human Factors, more touchy feely standards). Like, do you have all the appropriate feedback; do you have the right contrast; and have you overburdened the memory of the user...?) While they may set up an expectation of how you can improve the system, you’re really never going to see it unless you put it in front of somebody.

   ✓ Standards and heuristics are going to get you maybe 80-90 % of the screens and the functions and all that built well. But if you don’t have that 10% built well by existing standards or aren’t covered by heuristics, you don’t have a new product. You’re doing something that is old, and that 10% is going to costs you if you don’t sit someone that is representative of the user down
and see them try to use it. Standards just do not cover everything. Heuristic evaluations are only as good as the person applying the heuristics. And they’re heuristics, they’re not algorithms (they’re rules of thumb, so, what I believe might apply to every page, every person...it’s a rule of thumb). There is some probability that it’s not going to apply, and that’s why I would always be an advocate of seeing people use the system.

✓ My few experiences in the lab tell me that there are certain things that I could sit down with developers say. I could tell you that this is what’s going to happen, but I still want to see them do it. And even then, if I was correct in what was going to happen, like the heuristics would have been: don’t use technical language, provide appropriate feedback, don’t leave ambiguity in the system like the idea that downloading and installing was going to be one process...make sure you clarify that: you must a) download b) find the file and c) install it. So, I can tell you about all those things and inevitably what would happen is that the developer would still look me in the eye and say: no way, I’m not changing that, they’re idiots if they don’t know what a run time is. So, as soon as I sit down and the first person comes to me and says: what’s a run time? If nothing else, I have video footage that I can sit in front of a developer with, or have a developer watch me test that person and help me convince them that you’ve got to change it if that’s your target audience. So, with the heuristic evaluation, they might take my word for it but chances are, they are not going to take your word for it. You have to see the user perform with the system. That’s the whole point of user centered design.
Julian R. Archer  
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**EDUCATION**

**Embry-Riddle Aeronautical University, USA**  
Daytona Beach, Florida  
Bachelor of Science in Aeronautical Science  
Commenced in 2008  
Bachelor of Science in Human Factors Psychology  
Expected graduation in 2012  
GPA: 3.917/4.0

**University of Guyana, Guyana**  
Georgetown, Demerara  
Associate Degree in Mechanical Engineering  
Graduated in 2008

**RELEVANT COURSEWORK**

- Human Factors Principles and Fundamentals  
- Human Factors Methods and Technologies  
- Human Factors Test and Evaluation  
- Human Computer Interaction  
- Research Analysis in Psychology  
- Technical Report Writing

**RELEVANT PROJECTS**

- **Project#1 – Redesigning a Student Database**  
  Involved in a group project where the goal was to improve an existing student database known as Datatel. Heuristic evaluation and user testing was conducted on the interface.

- **Project#2 – Testing a Prototype Remote Control**  
  Designed an original TV remote control concept needed to satisfy the typical users. User testing was conducted multiple times to reach an optimal design.

- **Project#3 – Evaluating the Usability of Hotwire.com**  
  Evaluated the usability of Hotwire.com website as a group. A lot of user testing and a bit of heuristic evaluation was conducted on the interface.

- **Project#4 – Designing a NextGen Datacom interface**  
  As a group, developed a text based communication medium (with integrated synthetic speech) for commercial aircraft. A lot of user testing was carried out on the prototype interface.

**SOFTWARE SKILLS**

Microsoft Word, Excel, PowerPoint; SPSS; Arena, Survey Monkey

**HONORS/AWARDS**

- Embry-Riddle Dean’s List of Scholars, Fall 2008 – Spring 2010  
- Who’s Who Amongst Students In American Colleges and Universities, Years 2010 - 2011
Works Cited


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