DESIGN AND EVALUATION OF AN E-LEARNING SERVICE FOR ONLINE SELF-PRESENTATION EDUCATION: A USER-CENTERED DESIGN APPROACH

Zhihua Dong
Purdue University

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By Zhihua Dong

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Design and Evaluation of an E-learning Service for Online Self-presentation Education: A User-centered Design Approach

For the degree of Master of Science

Is approved by the final examining committee:

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Approved by: Patrick Connolly 04/18/2014

Head of the Department Graduate Program Date
DESIGN AND EVALUATION OF AN E-LEARNING SERVICE FOR ONLINE SELF-PRESENTATION EDUCATION: A USER-CENTERED DESIGN APPROACH

A Thesis
Submitted to the Faculty
of
Purdue University
by
Zhihua Dong

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of
Master of Science

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ABSTRACT


With the booming of Web 2.0, cyber recruiting becomes much more prevalence. This makes online self-presentation literacy a necessity for college students to prepare for better career opportunities. This study proposed to design and implement a working prototype of an online educational platform for college students to learn about online self-presentation management. The design and implementation of the working prototype followed an iterative design process, through which the design was created, evaluated, and improved. Within this process, cognitive walkthrough study, competitive analysis, and usability testing study were adopted as major methods to design and evaluate the prototype.

Through the design study, many existing design guidelines for online learning platforms were confirmed, such as segment learning materials, index learning contents, and ensure learner flexibilities. In addition, new design implications were discovered, pointing out new design focus of online learning platforms.
By conducting thorough competitive analysis and integrating Web experience analysis methods with general usability testing methods, this study identified opportunities to improve procedures and outcomes of such design study.

The outcomes and contributions of this study are three-folds: (1) a working prototype was delivered with relatively high perceived usability and utility; (2) design suggestions for designing online educational platforms were provided, to supplement existing design guidelines; and (3) implications for improving procedures of future design study of this kind were discussed.
CHAPTER 1. INTRODUCTION

1.1 Background

With the booming of the Internet, people are provided various ways to present themselves in the virtual world (Buffardi & Campbell, 2008). Self-presentation online shares common grounds with face-to-face self-presentation: from the view of Symbolic Interactionism (Blumer, 1986), they both are constructed through linguistic and other symbolic interactions. According to Goffman (1959), the goal of a self-presentation is to present oneself as an acceptable person without embarrassment in certain contexts. People prepare themselves with techniques and resources available to them in order to present acceptable selves. This remains the foundation for both online and offline presence of oneself. However, online self-presentation also differentiates itself from identity formed through face-to-face interactions. The difference majorly comes from the contexts of the interactions. In real world circumstances, people are immersed in contextual cues, which guide them to present themselves appropriately. For example, people can behave accordingly judging whether they are running into an old friend on the street, or talking to the boss in her office with the door closed. These contexts are necessary to help people make informed decisions on self-presentation. However, in the online environment, we largely
lose the control over contexts that are presented in face-to-face interactions. Information intended for a specific social group might be public in another way that one couldn’t anticipate. This phenomenon is so called “context collapse” (boyd, 2008). Meanwhile, online self-presentation has evolved along with the development of Social Networking Sites (SNS) online. In the age of chat rooms, people mainly remained anonymous online, which disconnected online identity and offline identity (or real-world identity). However, after the pervasive use of real names on the Internet (e.g., on Facebook, MySpace, Twitter, and LinkedIn), online identity has become an extension of one’s offline identity. This so-called “anchored” relationship places constrains in online self-presentation construction (S. Zhao, Grasmuck, & Martin, 2008), which further turned online space a good place to vet an individual without meeting in real-life.

Facilitated by Web 2.0 services, one has a new set of symbols to form the online identity: color scheme of personal website, profile images of Facebook page, photos and videos, list of friends, or descriptions of work experience. These symbols claim an individual’s self-presentation either implicitly or explicitly. It is not new that people can infer one’s personality through browsing and analyzing her/his online information (Gosling, Gaddis, & Vazire, 2007; Vazire & Gosling, 2004). The transparency of Web 2.0 makes it convenient for recruiting professionals to utilize online information to investigate and screen perspective employees (Cross-tab, 2010; Jobvite, 2012). It is known that online-presentation can have either positive or adverse impact on one’s career opportunities,
depending on how it is managed and displayed (Berkelaar, 2010; Jobvite, 2012; Reppler, 2011).

Nevertheless, most college students are not aware of this situation (M. Vorvoreanu, Clark, & Boisvenue, 2012). Even for those who have concerns, they usually don’t have the necessary knowledge for managing this situation (M. Vorvoreanu et al., 2012). This knowledge gap makes many college students vulnerable in the job market. Even though there are some Websites that provide online activity monitoring services, without fully understanding the importance of online self-presentation and basic knowledge on what to look out for, college students don’t have clue or motivation to use those monitoring services. Thus, I argue the need for an online-identity-management educational platform to facilitate education of online identity management literacy in college (M. Vorvoreanu et al., 2012).

1.2 **Significance**

Survey studies have revealed that 70% of employers have rejected job candidates because of information found online (Cross-tab, 2010; Reppler, 2011). In this sense, Google has become another resume for college students. Providing online identity management literacy for college students can not only prepare them to have a success career start point, but also help with their career development in the long run. While there are related information and tools on the Internet, a well-designed and centralized educational platform can facilitate better
online-identity-education delivery in college through accessible and flexible learning.

1.3 Statement of Purpose

With the pressing facts of inequity of knowledge on online identity between employers and college students, I plan to design a Web-based educational platform to help college students gain better insights of online self-presentation management. The ultimate goal of this platform is to raise college students' awareness of the importance of online self-presentation management and equip them with necessary knowledge to manage their online identities. In order to achieve the goal, the following 3 objectives need to be attained:

- To understand the design requirements of Web-based educational platforms.
- To design and implement a working prototype using proper tools and technologies.
- To evaluate the effectiveness of the prototype and identify improvement areas.

1.4 Research Questions

The central research question this research tries to answer is how to design and evaluate a Web-based learning platform delivering online identity management knowledge to college students.
Based on this central question, followings are the research questions need to be answered through this study:

**Research Question 1:**
What are the major design implications for online learning platform design?

**Research Question 2:**
What can be learned from this design study to improve design and research procedures?

1.5 **Assumptions**

Usability evaluation with perspective users are involved in different stages of prototype designs to inform the system design. This participation is totally voluntary and this research assumes that participants provide honest responds to the tasks and questions.

1.6 **Limitations**

Due to the limitation of time and budget, the usability evaluation and learning-experience evaluation might not have enough sample size. This may lead to difficulty in finding significant relationships from data in quantitative analysis. Furthermore, part of the usability evaluation relies on participants' self-reported data. This can bring limitations to the research because self-reported data can only be taken at its face value with potential bias coming from selective memory, exaggeration, or telescoping. However, I tried to minimize the effects of bias by combining performance-based data with self-reported data..
Participants recruited for both usability study and learning experience study were from a US Midwestern public university. This population might not be able to represent the population of college students across all types of institutions and regions. However, we believe the results can be generalized to reflect majority of college-student population in the US.

1.7 Delimitations

As a researcher with interests in understanding how online self-presentation can affect college students’ career opportunities, it is impossible and unnecessary for me to cover all aspects of online self-presentation. Instead, I chose to focus on the effects of online self-presentation on career-relevant aspects, and probed deeply into the relationships between online self-presentation and career development.

The focus of this research is on designing and implementing a working prototype of the Web-based educational platform. Thus, this research doesn’t include the creation of the educational content delivered through the platform. Instead, existing educational content were adapted and delivered through this platform.

Furthermore, the study isn’t aiming to develop a fully functioned site with complete contents. The prototype design and evaluation, and the findings along the process are the focal point.

Last, this study is partially built upon a previous interview study (M. Vorvoreanu et al., 2012) conducted with college students majored in engineering
and technology. This indicates that the system designed might be better suited for college students who major in engineering or technology, and have limited interests for students from other majors. Nevertheless, in the usability and learning-experience evaluation process, students across different majors will be recruited to give further answers and explanations to this delimitation.

1.8 Definitions

For this study, there are some key terms that need to be defined:

**Online self-presentation** – The image and presentation that one gives or gives off in online environments.

**Web 2.0** – The second generation of the World Wide Web that features in individual creation and sharing of information.

**User-Centered Design (UCD)** – A design philosophy and methodology in the field of Human-Computer Interaction (HCI) that places users in the center of design by incorporating the understanding of users’ characteristics, contexts, and behaviors into product design.

**Usability** – Measurements that concern the ease of use and ease of learning of a product, including the consideration of effectiveness, efficiency, and satisfaction.

1.9 Chapter Summary

This chapter provides a brief background of online identity construction on the age of Web 2.0 and its impact on college students’ career opportunities. The
existence of online self-presentation and its close relationship with real-world identity makes it feasible for recruiters to research job candidates and judge their qualifications online. Meanwhile, the unawareness of this situation, as well as the lack of relevant knowledge of managing online presentations have placed college students in an adverse position in job markets. A previous study on college students majored in engineering or technology has pointed out the urgent need of incorporating online identity management literacy into college education. Building upon these backgrounds, this thesis study aims to design a Web-based platform to deliver educational contents on online identity management to college students. To achieve the goal, I took a user-centered design approach and incorporate usability evaluation and learning-experience assessments into the iterative design process.
CHAPTER 2. REVIEW OF RELEVANT LITERATURES

2.1 Approach of This Review

Self-presentation has been studied intensively since Erving Goffman’s classical work *The Presentation of Self in Everyday Life* (Goffman, 1959). Along with the development and prevalence of the Internet, there have been new channels and environments for self-presentation. There are a plethora of studies focusing on various issues and benefits brought by self-disclosure in the online environment. Besides introducing the context of research, I also reviewed theoretical and practical design guidelines for online education platforms. The goal of this chapter is to provide informative foundations to inform the design and evaluation of an educational tool to solve existing problems, and to provide future researchers a starting point to continue related discovery.

2.2 Definition of Online Self-Presentation

2.2.1 Presentation of Oneself

Self-presentation was studied thoroughly in the context of face-to-face encounters. Symbolic interactionism is an important social-science paradigm that is employed in the study of self-presentation, which emphasizes the importance of interactions in establishing and defining the “world” we are in (Blumer, 1986).
The most legendary example of using symbolic interactionism to study self-presentation appears in Erving Goffman’s legendary book *The Presentation of Self in Everyday Life*. In this frame, presentation of oneself is not static, but dynamic and shaped through one’s interactions with others. During these interactions, both verbal and nonverbal symbols convey meanings. Goffman made distinctions between symbols that are “given” and “given off”. The former one refers to verbal expressions or their substitutes that are given by an individual intentionally to his audience, who can make easy connection between the meaning and the symbols. This kind of symbols is easy to manipulate and control. The latter refers to subtler clues, such as postures and facial expressions, which are often leaked out unconsciously and harder to control (Goffman, 1959).

By analyzing these interactions, people can reach judgments about one’s motivations and identities (Wetherell, Yates, Taylor, & University, 2001). Under the framework of symbolic interactionism, Goffman introduced a dramaturgical analogy to illustrate self-presentation (Goffman, 1959). By analogizing presentation of self in everyday life to actors playing a role on the stage, Goffman explained the motivations and means of self-presentation (Goffman, 1959).

According to Goffman, an actor on a stage plays in constrains of certain plots and audiences, with the goal to leave audiences the impressions consistent with the desired character. In order to reach the goal, the actor needs to make use of techniques backstage to shape the desired image through “giving” and “giving-off” appropriate symbols. Similarly, an individual in real life also tries to act appropriately according to different contexts and audience. The ultimate goal of
the presentation is to present oneself as an acceptable person without embarrassment in certain contexts (Goffman, 1959).

When Goffman studied self-presentation, self-presentation was established through face-to-face interactions. To date, the framework proposed by Goffman has been carried on to study self-presentation on the Internet environment, while some detailed makeups have been altered by the new characteristics of online interactions.

2.2.2 Online Self-Presentation

Studies of online self-presentation have honored and built upon the symbolic interactionism framework and the dramaturgical analogy (Buckingham, 2008; Donath & Boyd, 2004; Pearson, 2009). To better understand how online environment maintains as well as changes the way of presenting oneself, it is necessary to look at two major environmental differences brought by the Internet: the pervasiveness of Social Networking Sites and context collapse.

2.2.2.1 Pervasiveness of Social Network Sites

We are living in a connected world, contributed by the pervasive use of Social Networking Sites (SNSs). SNSs were defined as “web services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system” (Boyd & Ellison, 2007, p. 211). As the most popular SNSs, at
the time of writing, Facebook has 1.19 billion monthly active users. Founded on 2004, Facebook was originally designed to facilitate connecting with friends and was restricted to college populations. It was gradually expanded and finally open to anyone who is older than 13 years old with a valid email address in 2006. Besides Facebook, there are other SNSs that dedicated to specific functions and areas. For example, LinkedIn is a SNS that focuses on connecting professionals (Papacharissi, 2009) and Twitter is a microblog to share short updates (Kwak, Lee, Park, & Moon, 2010). Content on SNSs is composed by “bits” of both self-expression and interactions between people (danah boyd, 2010). Boyd summarized four affordances of SNSs that manifest from characteristics of these “bits”: persistence, replicability, scalability, and searchability (danah boyd, 2010). These affordances indicate that contents shared on SNSs are automatically recorded, easily duplicated and shared, largely visible, and searchable (danah boyd, 2010). These affordances determine common characteristics and effects of SNSs: (1) the public display of personal profiles and connections anchors the online self-presentation to the offline identity – offline and online networks are bridged (D. M. boyd & Ellison, 2007; Donath & Boyd, 2004; S. Zhao et al., 2008); (2) real-time updates of interaction symbols, such as personal status, photos, and other activities, in the form of news feeds make personal updates consumable, and blur the boundary between private and public sphere (Boyd & Ellison, 2007; Donath & Boyd, 2004; Vitak, 2012); (3) Co-existence of different social groups and invisible audience exacerbates the so called “context collapse”
issue, which leads to harder management of self-presentation (Gross & Acquisti, 2005; Hawkey, 2009).

2.2.2.2 Context Collapse

As illustrated by Goffman (1959), contexts serve as the most important clue in face-to-face interactions, depending on which, individuals make decisions on how to present themselves. Farnham and Churchill made similar argument that there is no one “true” identity of an individual, but faceted self-presentation depending on different contexts (Farnham & Churchill, 2011). In their online questionnaire study with 631 participants, Farnham and Churchill (2011) found that it is a common case to maintain a few facets of self depending on different life roles and social contexts. People tend to avoid across-boundary communication because overlapped contexts make presentation of an appropriate self more difficult (Clark, 2000). Context collapse deprives the awareness and control of contexts from individuals (boyd, 2008; Vitak, 2012; D. Zhao & Rosson, 2009). The notion of context collapse was illustrated by Vitak (Vitak, 2012, p. 454): “the technical features of SNSs obfuscate temporal, spatial, and social boundaries that enable individuals to keep various audiences separate. Instead, these audiences are flattened into one homogenous group”. This leads to the co-presence of multiple social groups and even unknown audiences simultaneously in one dimension (DiMicco & Millen, 2007; Farnham & Churchill, 2011; Hewitt & Forte, 2006; Lampinen, Tamminen, & Oulasvirta, 2009).
Facing the affordances brought by SNSs and exacerbated context collapse, managing online self-presentation requires knowledge and skills. On the other end, the freely accessible pool of information and the promotion of content through SNSs serve as a one-way-mirror for hiring professionals to acquaint themselves with potential employees without notifying them. This situation leads to the investigation on how one’s online identity can affect their career opportunities.

2.3 Online Self-Presentation and Career Opportunities

As illustrated in the previous section, online environment and communication technologies such as SNSs have made the world much flatter. The visibility of individuals is thus much higher than before.

There are different roles in the hiring process, mainly HR professionals, recruiters, and hiring managers, etc. Here I use recruiters to represent all these possible roles for simplification reasons.

In this section, I discussed how individuals’ online self-presentation can affect their career opportunities. Generally, quality and approaches of online presentation can bring either positive or negative impact on one’s job opportunities.

2.3.1 Cyber Recruiting

The phrase “cyber recruiting” used here combines the ideas of “cyber vetting” and “social recruiting” introduced in previous studies and reports
Cyber vetting refers to using online information to screen job applicants (Berkelaar, 2010), and social recruiting refers to use of SNSs to search for and screen potential candidates. Cyber recruiting integrates these meanings, referring to the behaviors of using online information (including SNSs) to actively look for potential candidates and vet applicants in the hiring process. Cyber recruiting exists because of the convenience provided by the Internet: personal information intended for other purposes can be obtained by recruiters and used to evaluate the candidates.

2.3.1.1 Personality Can Be Assessed Through Online Self-Presentation

Previous research has studied intensively on how offline personalities such as self-esteem, narcissism, and need for popularity can affect online self-presentation (Buffardi & Campbell, 2008; Krämer & Winter, 2008; Mehdizadeh, 2010; Utz, Tanis, & Vermeulen, 2012). A reversed direction was to study if an individual’s characteristic traits, especially the Big Five personality traits that are well-established within organizational contexts (Kluemper, Rosen, & Mossholder, 2012), can be inferred and perceived by viewing the individual’s online profiles (Gosling et al., 2007; Kluemper et al., 2012; Marcus, Machilek, & Schütz, 2006; Utz, 2010; Vazire & Gosling, 2004). Kluemper et al. (2012) analyzed theoretical foundation for using SNSs as sources to access personalities and concluded that “personality-related information available from social networking profiles may be of sufficient quantity and quality as to permit others viewing this information to draw reasoned inferences concerning target individuals’ Big Five personality
traits” (p. 1146). They also recruited 586 undergraduate evaluators to rate 274 Facebook profiles, including main profile frame, wall posts, information session, and photos, and reported high inter-rater reliability, high internal validity, and valid convergent with self-rated personality traits (Kluemper et al., 2012).

Consistent with Kluemper et al., other studies based on personal websites and SNSs also found viewers’ perceptions reached high convergence with self-rated and close-acquaintance-reported personality traits (Gosling et al., 2007; Marcus et al., 2006; Vazire & Gosling, 2004).

There are numerous previous studies connecting individuals’ personality traits with their job performances, however most of they were focused on self-rated personality traits (Barrick & Mount, 1991; Tett, Jackson, & Rothstein, 1991). Kluemper et al. (2012) extended it to address the validity of others-rated personality traits on forecasting job performance. They demonstrated correlation between others-rated personality traits with job performance and hirability.

Thus, it is known that (1) personality traits can be perceived from online personal presentation; (2) these others-rated personality attributes are valid predictors for job performance, which together provide foundations for evaluating job candidates through their online profiles. Currently, organizations have been using information obtained through viewing online profiles, on top of resumes and reference letters, to make judgment of person-job (P-J) fit and person-organization (P-O) fit (Bowie & Domke-Damonte, 2010; Kluemper et al., 2012).

The need for investigating this kind of cyber recruiting is highlighted by its increasing trends over the years.
2.3.1.2 Cyber Recruiting is at an All-Time High

The availability of personal information online, and the ability of this information to forecast candidates’ qualifications, makes search engines and SNSs a second resume. This information serves to supplement or verify the traditional self-composed resume to evaluate perspective employees’ qualifications (Brown & Vaughn, 2011; SHRM Staffing Research, 2008). Information obtained through these channels is comprehensive, relative reliable and authentic (Back et al., 2010; Donath & Boyd, 2004; S. Zhao et al., 2008), and economically friendly (Brown & Vaughn, 2011). Therefore, the number of employers adopting cyber recruiting is increasing (Cross-tab, 2010; Haefner, 2009; Jobvite, 2012; SHRM Staffing Research, 2008). For example, in a 2008 survey conducted by Society for Human Resource Management (SHRM), 84% of the participants reported having used online search engines to screen candidates, while the number was 77% in 2006 (SHRM Staffing Research, 2008). Likewise, a survey conducted in 2012 including over 1000 recruiter participants revealed that 92% of the participants have used SNSs or social media to support the recruitment, up from 82% in 2010 (Jobvite, 2012). Sources of information used by recruiters included search engines, SNSs, blogs, and video sharing sites (Berkelaar, 2010; Cross-tab, 2010; Haefner, 2009; SHRM Staffing Research, 2008). Search engines are most used among others (Cross-tab, 2010), while among SNSs, LinkedIn, Facebook and Twitter are most popular cyber recruiting platforms (Haefner, 2009; Jobvite, 2012; Reppler, 2011). Recruiters surveyed also indicated that the online information found can affect their hiring decisions
(Bowie & Domke-Damonte, 2010; Reppler, 2011; Shea & Wesley, 2006), which makes this cyber recruiting a serious matter.

Although there have been debates about the ethical and validity concerns using online information to vet candidates caused by lacking of regulations and policies (Brown & Vaughn, 2011; SHRM Staffing Research, 2008), the prevalence of this practice is un-doubtable. This situation can be a two-edged sword for college students who are looking for future career opportunities.

2.3.2 Positive Effects of Favorable Self-presentation

The Internet has provided platforms for enhancing online self-presentation by enabling easier self-promotion (Arruda & Dixson, 2010; Dijck, 2013). Self-promotion refers to the behavior of directing the attentions to one's accomplishments and strength (Rudman, 1998). Online platforms have been facilitating self-promotion through broadcast mechanisms such as status updates and feeds, and affordances encouraging self-display, such as main profile photo, self-introduction paragraph, and affiliated organization information (danah boyd, 2010; Dijck, 2013; Mehdizadeh, 2010). With the ability of showing different selected perspectives of individuals, Web 2.0 platforms such as SNSs, blogs, and online forums have torn down the barriers for transmitting an individual's competencies of knowing-why (display of one’s motivations), knowing-how (display of one’s skill sets, and expertise), and knowing-whom (display of one’s networks) (Arruda & Dixson, 2010; Khapova, Arthur, Wilderom, Gunz, & Peiperl, 2007). Online platforms not only makes self-promotion much easier, it also
leverages the efforts by making these promotions accessible to broad and diverse audience. As context collapsed in online environment, it is intrinsic for online platforms to offer free broadcasting widely.

A desired self-presentation with proper self-promotion brings positive effects on one’s job-hunting process mainly through two pathways: providing appealing images to recruiters when they vet the profiles, and taking advantage of bridging social capital.

2.3.2.1 Provides Appealing Images to Recruiters

Offline self-promotion has been recognized as beneficial to generate positive hiring or promotion decisions (Rudman, 1998), such as in the process of resume screening and interviewing. Scholarly publications as well as professional reports published by recruiting agencies has revealed that online self-promotion contents have great positive impact on today’s hiring process (Asmaro, 2011; Bohnert & Ross, 2010; Cross-tab, 2010; Haefner, 2009; Jobvite, 2012; Reppler, 2011). More specifically, research found that family-oriented and professional-oriented SNSs profiles (Bohnert & Ross, 2010), items regarding “memberships in professional organizations”, and volunteer experience (Jobvite, 2012) made positive impressions to a majority of recruiters. Overall, self-branding conveying one’s qualifications can generate positive impact. This impact not only manifests in hiring process, but also shows in starting salaries once hired (Bohnert & Ross, 2010).
Besides influencing recruiters on their hiring decisions, self-promotion online also contributes to leverages bridging social capital gathered through SNSs.

### 2.3.2.2 Leverages Bridging Social Capital

Social capital broadly refers to the returns and benefits gained from social connections (Lin, 2002). Robert Putnam distinguished two types of social capital in his famous book *Bowling Alone*: bonding social capital and bridging social capital (Putnam, 2001). Bonding social capital alludes to social capital gained within closely knitted and homogeneous social networks (e.g., family members, and close friends), which is often composed of emotional support, comforts, and companionship (Burke, Kraut, & Marlow, 2011; Putnam, 2001; Wellman & Wortley, 1990). Bridging social capital, on the other hand, is gained through a much loosely tied social networks containing heterogeneous backgrounds and values (Putnam, 2001). Compared to strong ties among close relationships, studies of both offline and online environment have agreed that weak ties lead to access of more diverse information, fresh ideas, and new influences that one and his/her close circle lack (Burke et al., 2011; Donath, 2007; Granovetter, 1973). These benefits of bridging social capital include accessibility to new career opportunities and job recommendations (Burke et al., 2011; Burt, 2005; Vitak & Ellison, 2012).

SNSs are well suited for managing large and diverse networks with much fewer efforts (Donath & Boyd, 2004; N. B. Ellison, Steinfield, & Lampe, 2007;
Wellman, Haase, Witte, & Hampton, 2001). Personal profiles on SNSs make creations of new connections easier through building the sense of authenticity and trust that new friendship counted for (Berkelaar, 2010; Donath & Boyd, 2004; N. B. Ellison, Lampe, Steinfield, & Vitak, 2010) and constructing the common grounds for initiating a new relationship (DiMicco & Millen, 2007; N. B. Ellison et al., 2010; Lampe, Ellison, & Steinfield, 2007; D. Zhao & Rosson, 2009). SNSs also facilitate preservation of established weak connections. Reverse chronological news feeds supply up-to-date information about one’s network. Features such as status update, status comments, retweet, and “Like”, enabled lightweight social interactions with weak ties, which much lowered the cost of connection maintenance (N. B. Ellison et al., 2007; N. Ellison, Steinfield, & Lampe, 2006).

Despite the advantages of weak ties, trust is an issue preventing people from fully utilize bridging social capital since trust is often correlated with strength of ties (Kavanaugh, Reese, Carroll, & Rosson, 2005; Levin & Cross, 2004). When individuals seek for information of job candidates, the perceptions and beliefs in target person’s field-related quality and credibility affect the decision making process (Donath, 2007). A dedicatedly crafted online presentation can add perceived credibility of one’s qualifications among weak ties and leverage the affordance of SNSs. Once one can take full advantage of bridging social capital in job seeking process, the rewards will be considerable as a recent survey showed that employers valued referred candidates high as perceiving them as candidates with best quality (Jobvite, 2012).
2.3.3 Negative Impact of Adverse Self-presentations

While an exclusive self-promotion image can make a favorable impression, an unprofessional self-presentation can directly hurt one’s job opportunities in cyber recruiting (Cross-tab, 2010; Haefner, 2009; Jobvite, 2012; Reppler, 2011). In the survey commissioned by Microsoft in late 2009, the percentage of recruiters who turned down applicants based on information found online has reached 70% (Cross-tab, 2010). This data is consistent with another survey study involved over 300 hiring professionals, where they reported the number being 69% (Reppler, 2011). Top reasons of rejecting job candidates include publishing inappropriate photos or comments (Cross-tab, 2010; Haefner, 2009; Reppler, 2011), posting negative comments about previous employers, co-workers, or clients (Cross-tab, 2010; Reppler, 2011), revealing contents related to drug using, alcohol using or sexual nature (Bohnert & Ross, 2010; Haefner, 2009; Jobvite, 2012; Reppler, 2011), and displaying poor communication skills (Cross-tab, 2010; Haefner, 2009; Reppler, 2011). News media also noticed this adverse “byproduct” of online self-presentation and published warnings with real-life cases for college students who were unaware of this situation (Du, 2007; Finder, 2006; Samborn, 2007).

With understandings on the practices of recruiters, it is necessary to study how the counterparts – college students are dealing with this situation.
2.4 Current Practices and Strategies of College Students

As a generation growing along with the blossoming of the Internet, current college students have higher level of literacy on the technologies and thus are confident and comfortable incorporating the Internet in their life (Jones, 2002). However, this confidence might lead to more reckless usage compared with relatively cautious practice of older-generations when certain risks are beyond full awareness. In this section, I showed that privacy paradox predicted this lax usage patterns. Furthermore, for those who are willing to take actions to manage their online presentation, more defensive strategies than proactive ones were adopted.

2.4.1 Privacy Paradox

While online services encourage users to share information with each other (Matyszczyk, 2010), thoughtless sharing of personal information has caused privacy concerns and consequences (Gulotta, Faste, & Mankoff, 2012; Houghton & Joinson, 2010; Hull, Lipford, & Latulipe, 2011).

Studies have discovered many reckless information-publishing behaviors from college students through profile analysis and surveys (Christofides, Muise, & Desmarais, 2009; Shea & Wesley, 2006). A survey study with more than 300 undergraduate participants showed that participants felt comfortable sharing personal information online, even including photos showing drinking at parties (Christofides et al., 2009). Similarly, a survey conducted by Purdue Center for Career Opportunities (CCO) also revealed that students were lack of judgments
on contents to be posted online or anticipation of future impact of those contents. As a result, it was a common case to post photos of underage drinking or with sexual nature (Shea & Wesley, 2006). A phenomenon behind this practice is so called “privacy paradox”. Privacy paradox has been found repeatedly in several studies, which revealed that though users claimed to understand privacy issues, they still uploaded harmful personal information (Acquisti & Gross, 2006; Barnes, 2006; Debatin, Lovejoy, Horn, & Hughes, 2009; Gross & Acquisti, 2005; Spiekermann, Grossklags, & Berendt, 2001). The existence of privacy paradox has placed college students at a vulnerable position if they don’t realize the potential risks.

2.4.2 Defensive rather than Proactive Strategies

While some college students are suffering from privacy paradox, some have adopted strategies to protect their online self-presentation. Researchers have been investigating how college students manage and make decisions on who to connect, what information to disclose, and who can view their profiles and updates (Vorvoreanu et al., 2012). These strategies can be grouped into two categories based on the vehicle that one depends on: function-dependent strategies and coping strategies.

People adopting function-dependent strategies take advantages of available access controls such as privacy settings and audience segmentation afforded by SNSs (danah boyd, 2010; Farnham & Churchill, 2011). To deal with context collapse caused co-presence of multiple social groups, college students
have applied audience segmentation strategy to make conscious disclosure to intended groups (N. B. Ellison, Vitak, Steinfield, Gray, & Lampe, 2011; Lampinen et al., 2009; Stutzman, Vitak, Ellison, Gray, & Lampe, 2012; Vitak, 2012). Other function-based strategies include restricting profile visibilities (Stutzman et al., 2012; Tufekci, 2008), and un-tagging oneself from photo posted by friends (Pempek, Yermolayeva, & Calvert, 2009). However, users’ needs are not completely fulfilled by these functions (Karr-Wisniewski, Wilson, & Richter-Lipford, 2011; Wisniewski, Lipford, & Wilson, 2012). The gap is then filled through coping mechanisms, which are “behaviors developed by SNS users outside of the SNS interface or through the unintended use of interface features in an attempt to effectively maintain or regain their interpersonal boundaries” (Wisniewski et al., 2012, p. 609). A popular coping mechanism used by college students is self-censorship (Hogan, 2010; Sleeper et al., 2013; Wisniewski et al., 2012), which indicates that people make judgments on the appropriateness of information based on certain criteria before making it public. Other coping mechanisms adopted include creating separate SNS accounts to manage different social circles (Cross-tab, 2010; Wisniewski et al., 2012), and using a pseudonym to disconnect from offline identity (DiMicco & Millen, 2007; Wisniewski et al., 2012).

These strategies serve to eliminate negative effects posed by undesired online self-presentation, rather than proactively contributing positive impact through employing appropriate self-promotion. An interview study in 2011 with college students in a midwestern public university majored in engineering and technology pointed out that the lack of online impression management literacy of
college students limits their tactics to a passive manner instead of a proactive manner (M. Vorvoreanu et al., 2012).

2.5 Education on Online Self-Presentation Management

The neglect and unawareness of online self-presentation’s impact might be another reason that recruiters would like to investigate applicants online, with expectation to get a glimpse of personal characters behind well-crafted self-presentation on resume and interviews (SHRM Staffing Research, 2008). While In this section, I organized the literatures to illustrate the urgent need for online self-presentation management literacy for college students, and how education can serve to ameliorate the situation.

2.5.1 Recruiters are Well-Equipped

As discussed in Section 2.3, cyber recruiting used by recruiters are in all-time high (Jobvite, 2012; SHRM Staffing Research, 2008). Contrary to the unawareness and lack-of-skill status of college students, most recruiters consider themselves as savvy in using Internet tools to vet applicants (Jobvite, 2012). Meanwhile, there have been reports and scholarly publications providing guidance for recruiters to better conduct cyber recruiting (Davison, Maraist, & Bing, 2011; Davison, Maraist, Hamilton, & Bing, 2012; Fishman & Morris, 2010). The guidance on actions widens the power difference between recruiters and college students. As studies have revealed that higher awareness can promote more self-monitoring behaviors and thus achieve desired online self-presentation
(Debatin et al., 2009; Turnley & Bolino, 2001), the foremost step is to raise college students’ awareness of this positional difference, after which education on strategies could be better appreciated and accepted.

2.5.2 Current Online Self-Presentation Management Tools

Some businesses reacted on cyber recruiting by providing online presentation management services, which often require subscription fees (Bilton, 2011). These services offered functions such as multiple SNS accounts management, activity analytics, and search engine optimization et al.. However, as argued in an analytic research on these available services, these tools are lacking support of some key features that can help users to identify online presentation problems and leverage their efforts to manage online presentation (Vorvoreanu, Boisvenue, Portela, & Bao, 2013). Furthermore, as pointed out in previous sections, a fundamental problem for college students to adopt these tools is their lack of full awareness. Without acknowledging the importance of managing one’s online self-presentation, it is hard for college students to commit time and money on this course.

2.6 Design of Online Education Platform

My preeminent consideration in designing this educational platform is the cognitive load posed by the learning materials and the instructional designs to learners. After reviewing the instructional design guidelines based on Cognitive Load Theory, general platform design suggestions from researchers in e-learning
field were reviewed and summarized. Combined together, they provided comprehensive design guidance for future designs of online learning platforms.

2.6.1 Cognitive Load Theory and Learning System Design

Cognitive Load Theory (CLT) is a major theoretical framework used to assess cognitive processes in learning and guide the design of instructions (Paas, Renkl, & Sweller, 2003). Before going into the discussion of how CLT guides the instructional design, I provide a brief introduction of CLT.

2.6.1.1 Cognitive Load Theory

Limited capacity of working memory is a defining characteristic of human cognitive architecture (Sweller, Van Merrienboer, & Paas, 1998). CLT is concerned with the allocation of cognitive resources in the learning and problem solving process to handle the limitation of working memory capacity (Sweller, 1988, 1989). To understand CLT, we need to first understand the difference between three forms of cognitive loads, which share the limited working memory: intrinsic cognitive load, extraneous cognitive load, and germane cognitive load (Paas et al., 2003). *Intrinsic cognitive load* is determined by the inherent element interactivity of the instructed materials (Chandler & Sweller, 1991), which is relatively unchangeable by different instruction types. *Extraneous cognitive load* is imposed by the presentation of information and the learning activity, which does not directly contribute to schema acquisition (Paas et al., 2003). Thus, the information structures and presentations can affect the efficiency and
effectiveness of learning through the extra cognitive load they impose. With the opposite effect of extraneous cognitive load, *germane or effective cognitive load* facilitates learning by allocating cognitive resources to schema acquisition and automation (Paas et al., 2003; Sweller et al., 1998). Similar to extraneous cognitive load, germane cognitive load is affected by the form of information presentation and required learning activities (Paas et al., 2003; Sweller et al., 1998).

Based on the fact that extraneous cognitive load and germane cognitive load (1) have the opposite effects on learning; and (2) are both affected by information structure and learning activity design, CLT suggested 2 approaches to boost learning effects: promoting germane cognitive load and decrease extraneous cognitive load (Sweller et al., 1998).

2.6.1.2 Cognitive Load Theory and learning instruction design

Many instructional designs based on CLT have gone through rigorous experimental validation. In this section, I go through some major CLT-based instructional design principles, either reducing extraneous cognitive load or promoting germane cognitive load.

2.6.1.2.1 Split-attention Effects

Learning materials that require learners to split their attention on information from multiple sources, and integrate them mentally can place heavy cognitive load on working memory (Chandler & Sweller, 1991; Sweller et al., 1998; Sweller, 1994). Thus, physically integration of learning materials can
reduce the waste of cognitive resource and redirect learners’ efforts on forming schemas.

2.6.1.2.2 Modality Effects

Another approach we can take under split-attention situation is to provide dual modality presentation that presents visual information in auditory format (Sweller et al., 1998). In this way, more sensor channels can be involved to share the cognitive load.

2.6.1.2.3 Redundancy Effects

Redundancy effect is also related to split-attention effect. When multiple sources of information contain redundant information, they should be eliminated rather than combined. Elimination of redundancy can reduce working memory load and save more resources for schema formation and automation. While this is especially helpful for advanced leaners, novice learners might benefit from redundant information.

2.6.1.2.4 Variability Effect

Variability effect is based on the finding that increase the variability of tasks and practices might lead to better transfer of training. Thus, offering higher variety of problem situations can enhance learning effects by increasing germane cognitive load (Sweller et al., 1998).

To summarize, based on CLT, instructional design of the educational contents should consider the following principles:
• Physically integrate resources that require learners to split attentions, especially if the attention is required in the same sensory modality.

• Provide dual modality rather than single modality can reduce working memory load.

• Avoid redundant information. However, keep some if they are helpful for novice learners.

• Provide various practice situations to promote learning transfer.

2.6.2 Platform Design Guidelines

Major benefits found in online education include: improving the cost effectiveness of educational resources, increasing access to educational resources, enabling asynchronous learning flexibility, enhancing the capacity of educational systems, and delivering more engaged learning experience (Moore & Kearsley, 2011). To fully leverage these benefits of online education, besides the instructional design based on CLT, the overall design of the platform that is used to deliver the learning material and enable direct interactions with learners is another vital element to consider.

Previous research studies have revealed the factors that account for the effectiveness of computer-assisted instructions. These guidelines can be further divided into content-delivery guidelines, and learner-experience guidelines. While content-delivery guidelines focus on effectiveness of the platform to structure and
deliver the educational content, learner-experience guidelines concern the emotional and affective design aspects of the system.

2.6.2.1 Content-delivery Guidelines

In this section, both theoretical and practical implications on designing the content delivery were discussed.

From the theoretical perspective, media richness is a framework that has great value when designing communication channels. Media richness refers to the capacity of facilitating shared meaning and understanding (Daft & Lengel, 1983). There are four indicators of media richness: verbal and nonverbal cues can be used to convey meanings during a communication course, the immediacy of feedbacks available, the allowance of personal focus, and the degree of use of natural languages, based on media richness theory (Daft & Lengel, 1986). The perceived media richness can affect people’s willingness and preference for interacting with the platform (Fulk, Schmitz, & Ryu, 1995; Fulk, 1993), thus affect the learning performance and satisfaction. Perceived media richness in online learning environment was found to be less comparing to traditional face-to-face learning environment as communication cues were reduced, which appeared to be the most powerful factor of successful delivery of education. This indicated a need to improve media richness by exploiting full spectrum of media available when designing online education platforms. A designed experiment conducted by Sun & Cheng (2007) confirmed that high richness media presentation facilitate learning of course with uncertain and equivocal contents. Other studies also
supported the positive relationship between richness of media and learners’
concentration level and perceived usefulness towards the learning materials (Lim
& Benbasat, 2000; S.-H. Liu, Liao, & Pratt, 2009). Besides the richness of media,
media synchronicity theory (Dennis, Fuller, & Valacich, 2008) and task-
representation fit model (Goodhue & Thompson, 1995) make an emphasis on the
importance of the match between technology used and the task intended to
accomplish as well as the characteristics of the communication demanded.

More practically, Bowles-Terry, Hensley, & Hinchliffe (2010) found several
specific design suggestions for content delivery on online education platforms to
facilitate effective learning. For example, it is suggested to break online
instructional video into one-minute segments to accommodate varied attention
spans (Bowles-Terry et al., 2010). Meanwhile, learning objectives have to be
broken down to a level that accomplishable in a video segment (Kellogg, 2013).
A table of content can be used to offer a quick overview of the structure and
contents of a video, as well as enable flexible watching choice. They also
indicated the need to offer multiply speed in the video as one speed cannot fit
requirements of diverse audience (Bowles-Terry et al., 2010). In terms of
accessibility consideration, captions should be included to fulfill the needs of
disabled learner, learner who view the video without audio outputs, or non-native
speakers (Bowles-Terry et al., 2010).

To summarize, when designing for delivery of the educational content, one
should take the following principles into careful consideration:

• Enhance the media richness;
• Match the technology and the content to be delivered through the technology;
• Segment content and learning objectives to accommodate limited attention span;
• Provide clear indexing mechanism and flexibility upon segmenting the contents.
• Pay attention to accessibility issues (e.g., provide speed-control and captions for non-native speakers, or provide captions for disabled learner).

2.6.2.2 Learner-experience Design Guidelines

The affective dimension of the platform can contribute to the motivation to use the technology at first place, and higher engagement after usage. As Norman argued in his classic book *Emotional Design*, attractive design works better as they can elicit enjoyable usage and trust towards the technology, which further induce higher-quality thinking and problem solving (Norman, 2004). Studies have explicitly outlined professional-looking graphics and quality of interface design as an important factor to render higher learner satisfaction (Bowles-Terry et al., 2010; Volery & Lord, 2000). A high-quality interface should provide consistent layout and clear navigation (Janicki & Liegle, 2001).

Another factor to enhance the learning experience is interactivity (Bianco, 2005; Holmes, 2002; Stansfield, McLellan, & Connolly, 2004; Swan, 2001). Interactivity includes interaction with content, interaction with instructors, and
interaction with learning mates (Moore, 1989), which can be obtained through support of activities such as social-media alike interactions, sharing ideas and opinions, peer discussions and assessments, and exercises and testing etc. (Janicki & Liegle, 2001; Stansfield et al., 2004; Swan, 2001). Empirical researches have provided supports for these arguments. For example, segmented lecture video with questions and problem-solving in between promotes course engagement and retention (Waldrop, 2013). Swan (2001) found higher levels of satisfaction and higher levels of learning reported from students who reported high levels of interactions with their learning mates. These design principles have been widely adopted in online-education platforms including digital library instructions (Bowles-Terry et al., 2010), and Massive Online Open Courses (MOOCs) like Coursera (“Coursera,” 2013).

2.7 Chapter Summary

This chapter offered detailed literature review that covers the definition and characteristics of online self-presentation, its positive and negative influences on college students’ job-hunting process, and current practice and strategies employed by college students. Online self-presentation in Web 2.0 age is empowered by the popularity of SNSs. Large networks held and the push for sharing and interacting, leads to a self and other co-constructed online self-presentation. On the other hand, the availability of the data and affordances offered by the online platforms offer a convenient and cheap way for employers to “meet” job candidates without the awareness from the candidates. Further, I
identified the gap between recruiters’ cyber recruiting practice and college students’ low awareness and lack of knowledge. These situations call for urgent need to provide online self-presentation management literacy for college students.
CHAPTER 3. METHODOLOGY

3.1 Introduction

This chapter outlines the refined aims of this proposed research, re-stated research questions and provides detailed research plan to achieve the aims.

Through literature review, the initial goal of the study was gradually refined and adjusted to reflect a better understanding of the research contexts. The aim of this study is to design and implement an effective and user-friendly prototype of a Web platform, which will be used to educate college students’ literacy on their online identity management. To achieve the goal, following research questions need to be answered through the study:

**Research Question 1:**

What are the major design implications for online learning platform design?

**Research Question 2:**

What can be learned from this design study in terms of design and research methods and procedures?

In the rest part of this chapter, I discuss data collection and analysis methods employed. Limitations of the methods will be acknowledged and a summary of the chapter is offered at the end.
3.2 Data Collection Methods

3.2.1 Research Methods

3.2.1.1 User-Centered Design

To answer the research questions, a User-Centered Design (UCD) framework (Norman & Draper, 1986) was employed to ensure that the product helps users to achieve their goals and meets their expectations. UCD called for a paradigm shift of design focus from technology to goals and intentions of users, which includes considerations of understandings of users and their activities, information flow, as well as the contexts of computing (Norman & Draper, 1986). As Boar (1984) pointed out, 60% to 80% of system problems can be tracked down to requirement definition stage, and 20% to 40% can be traced to design stage. Cost of fixing design problems increases along the design stage and soars after final delivery (Vredenburg, Isensee, Righi, & Design, 2001). Thus, adopting the philosophy of UCD and incorporating approaches of UCD ranging from user research to usability evaluation, can help to avoid big issues in product design and development.

Popular UCD methods used in industries include field studies, user analysis and profiling, iterative design, usability testing, and heuristic evaluation etc. (Gunther, Janis, & Butler, 2001; Vredenburg, Mao, Smith, & Carey, 2002). In this study, I used secondary research (Vorvoreanu et al., 2012) to extract the goals and needs of the potential user groups. The primary research was focusing on usability and user-experience assessments.
3.2.1.2 Iterative Design Process

To integrate these assessments with design and development of the system, I adopted an iterative design model, which incorporates usability evaluations to each design iteration (Mayhew, 1999; J. Nielsen, 1993). This iterative development model requires steady refinements and improvements of design based on “user testing and other evaluation methods” (J. Nielsen, 1993). Usability evaluations can help designers discover usability problems and emerged user needs, which serve as the lessons learnt from last iteration to inform the improvements for next version.

Nielsen (1993) streamlined the process of conducting usability evaluation as defining quality goals, identifying quality attributes and their metrics, and realizing with actual measurements. He also pointed out that not all usability attributes are equal and designers should prioritize usability attributes based on the goals of the designed systems (Nielsen, 1993). It is known that clear usability goals and accurate measurements are vital for efficient and effective iterative design that can converge to an optimal solution fast (Vredenburg et al., 2001).

As stated in (Ardito et al., 2006), the primary goal of an online educational system is “to allow students to learn the didactic material while devoting minimum effort to interaction with the system”. Based on CLT reviewed above, the cognitive load posed by the interactive system that doesn’t directly contribute to learning is extraneous cognitive load, which should be reduced.

Usability for educational application has to consider additional usability dimensions associated with its educational nature and users’ learning goals
A user of an online educational system have a double-persona: she is both an user of an interactive system and a learner whose goal is to learn (Zaharias & Poylymenakou, 2009). Researchers have further associated general usability with the user persona and the instructional usability with the learner persona (Zaharias & Poylymenakou, 2009). A similar view addressed the general platform as the “container”, whose “content” is the instructional modules (Ardito et al., 2006). However, some characteristics of instructional usability depend on the platform performance and capability (Ardito et al., 2006). Thus, it is necessary to consider both when evaluating an online educational system. In this study, as I majorly focused on the design and development of the platform itself rather than instructional design of educational content, the evaluation focus was also placed on platform usability, with inclusion of instructional usability that associated with platform functionalities.

Based previous literature review on design guidelines for online educational platform and some epic usability studies on e-learning systems (Ardito et al., 2006), the major usability goals of the proposed systems are: ease of learning, learner flexibility, ease of navigation, supportiveness for learner communication, supportiveness for problem-based learning and hypermediality. Detailed descriptions of the goals are shown in Table 3.1.
Table 3.1 Overall Usability Goals of the System

<table>
<thead>
<tr>
<th>Usability Goals</th>
<th>Descriptions</th>
<th>Category (P=Platform Usability, I=Instructional Usability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of learning</td>
<td>System is easy to learn for novice users.</td>
<td>P</td>
</tr>
<tr>
<td>Learner Flexibility</td>
<td>Users are able to customize personal learning goals and progress.</td>
<td>I</td>
</tr>
<tr>
<td>Ease of Navigation</td>
<td>It is easy to find information and easy to navigate from page to page.</td>
<td>P</td>
</tr>
<tr>
<td>Supportiveness for Learner Communication</td>
<td>Provide communication mechanism for both learner and instructors.</td>
<td>I</td>
</tr>
<tr>
<td>Hypermediality</td>
<td>Provide media-richness to support different learning habits and learner accessibility.</td>
<td>P &amp; I</td>
</tr>
</tbody>
</table>

These usability goals guide the design of usability evaluation, but not all of them would be tested in every evaluation stages. Usability evaluation methods have a spectrums from quantitative to qualitative methods, used based on the fit with different design stages and size of the product (J. Nielsen, 1993). This iterative design cycle model has been well accepted among HCI community and adopted in software and web-based application design (Ali, Hatala, Gašević, & Jovanović, 2012; Debaeke et al., 2009; Sox et al., 2010).

I employed both usability inspection and user-based usability testing in this research study. As Ardito et al. (2006) argued, a “systematic usability evaluation (SUE)”, which combines usability inspections and user-based testing, can overcome the drawbacks of each method thus achieve a better assessment quality.
Evaluation methods mapping to development stages are listed in Table 3.2.

Table 3.2 Mapping between Usability Evaluation Methods and Development Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Evaluation Methods</th>
<th>Participants</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype Evaluation</td>
<td>Usability testing and user experience assessments with end users.</td>
<td>5~7 Potential end users.</td>
<td>A working prototype. Specific tasks. Pre-test survey, post-test survey; Semi-structured interview.</td>
</tr>
</tbody>
</table>

In the following sections, I provide detailed research plan for these evaluation methods, including justification of using the corresponding methods, data collection approaches, sampling strategy, data analysis methods, and validity assessments.

3.3 Research Methods Breakdown

3.3.1 Information Architecture Design

The foremost step of designing the application is the design of its information architecture. Information architecture (IA) refers to the organization and labeling of information of a Website or application, which has been demonstrated to be highly correlated with the usability of the site or application.
(Gullikson et al., 1999). To build the information architecture, I followed the documented IA design guidelines (“Information Architecture Tutorial | Webmonkey | Wired.com,” 2010; Wodtke & Govella, 2009) through conducting site goals analysis, user analysis, site content and functionality analysis, and finally designing site structure and navigation system. The final result of this stage is documented process, and documented site structure. With these preliminary outcomes, I coded a lo-fi prototype accordingly to carry out a cognitive walkthrough study to examine the site structure and ease of learning.

### 3.3.2 Cognitive Walkthrough Study

#### 3.3.2.1 Overview

Cognitive walkthrough is focusing on evaluating the ease of learning by exploration (Wharton, Rieman, Lewis, & Polson, 1994). As an inspection method, cognitive walkthrough doesn’t require the participation of real end-users. Instead, usability experts or designers walk in perspective users’ shoes and go through “correct steps” in order to accomplish specific user tasks (Rieman, Franzke, & Redmiles, 1995; Wharton et al., 1994). During this process, each step is examined by asking if users will take the right action and if they understand the interface at each step (Wharton et al., 1994). Comparing to other usability evaluation methods, cognitive walkthrough has a relative narrow emphasis on the ease of learning. Though ease of learning is only one aspect of usability, I still
adopted cognitive walkthrough as the usability evaluation method at the design stage, based on the following reasons:

1. Ease of learning is an important usability goal of the proposed online educational systems.

2. It is believed that other usability attributes such as functionalities and ease of use are related to ease of learning, because issues associated with ease of learning reflect the essential usability issues such as mismatch between designer’s mental model and user’s mental model, the mis-design of the affordance, and the lack of system feedback (Wharton et al., 1994). With proper task design, evaluation on ease-of-learning can cover other aspects of usability from the perspective of novice users.

3. With the limitation of time and access to users, I saved the user participation to the usability evaluation of the working prototype for optimized outcomes and efficiency.

4. Comparing to other inspection methods such as heuristic evaluation and guideline reviews (Jakob Nielsen, 1994), cognitive walkthrough has greater value in later stages of the design process as the designed key tasks can be used in user testing and further verify the results of cognitive walkthrough.
3.3.2.2 Sampling

Convenience sampling was used to recruit experts who were trained and had experience on Web design, Web development, or usability inspections (Patton, 2002). Experts were compensated with food and drinks for their time. Recruitment was done through emailing list of CGT department, where part of academic focus was on Web development and HCI. A total number of 3 participants were summed. While there was no specific guidelines or rules on the appropriate number of participants in group cognitive walkthrough, 3 was feasible for the limited time frame and manageable as I was the only facilitator, session recorder, and note taker.

3.3.2.3 Instruments

Lo-fi Prototypes

Based on initial sketches, I coded a lo-fi prototype using HTML5, and CSS. This prototype has the following basic types of pages (see Figure 3.1). Figure 3.1 (a) shows the home page with placeholders for banners. (b) shows the profile analysis page after logging in through Facebook account. (c) represents a learning page example, where left-hand side serves as menu to navigate among different learning subject and learning sections. (d) shows the learning dashboard, from which learners could access different learning subject page.
Figure 3.1 Screenshots of the Lo-fi Prototype
3.3.2.4 Procedures

I followed the streamlined cognitive walkthrough procedures as described in Spencer's (2000), which was adapted from Wharton et al. (1994):

Table 3.3 Overview of the Cognitive Walkthrough Process

<table>
<thead>
<tr>
<th>Phase</th>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-analysis</td>
<td>1</td>
<td>Define inputs to the walkthrough</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Convene the walkthrough</td>
</tr>
<tr>
<td>Analysis</td>
<td>3</td>
<td>Walkthrough the action sequences for each task</td>
</tr>
<tr>
<td>Post-Analysis</td>
<td>4</td>
<td>Record critical information</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Revise the interface to fix the problem</td>
</tr>
</tbody>
</table>

I further grouped the 5 steps into 3 phases: pre-analysis phase, analysis phase, and post-analysis phase.

3.3.2.4.1 Pre-analysis Phase

In the pre-analysis phase, the inputs to the walkthrough including proposed interface, key tasks, assumptions on user groups and contexts of use, and a list of correct actions to follow for each task are defined (Spencer, 2000; Wharton et al., 1994). Also, everyone participates in the walkthrough should be aware of and agreed on the goals of the walkthrough (Spencer, 2000).

To define inputs to the walkthrough, I followed the guidance in Wharton et al. (1994). The users of the system are college students. I identified key tasks that probe potential usability problems as well as concern with usability goals (Dumas & Redish, 1999). Table 3.4 shows the list of tasks, with associated action steps and usability goals tested besides ease of learning.
Before the actual walkthrough (the analysis phase), the goal of the walkthrough, which is examining system ease of learning, was emphasized to bring all participants on the same page. This is one of the major adaptations Spencer (2000) made upon the version of Wharton et al. (1994), to ensure all participants focus on the same aspect and make analytical efforts to point out tentative issues.

Table 3.4 List of Tasks for Cognitive Walkthrough

<table>
<thead>
<tr>
<th>Task</th>
<th>Action Steps</th>
<th>Other Usability Goal Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign in with Facebook account</td>
<td>• Scroll down the home page&lt;br&gt;• Click the “Sign in with Facebook” button</td>
<td>Ease of Navigation</td>
</tr>
<tr>
<td>From profile analysis page, enter to learn courses.</td>
<td>Click “Proceed to Learn” button</td>
<td>Ease of Navigation</td>
</tr>
<tr>
<td>Navigate to another learning subject</td>
<td>Click the circled navigation menu on left-hand side</td>
<td>Ease of Navigation, Learner Flexibility</td>
</tr>
<tr>
<td>Find overall information on all courses offered on the site.</td>
<td>Click the “Learn” item in the global navigation system on top of the page</td>
<td>Ease of Navigation</td>
</tr>
<tr>
<td>From the dashboard page, go to “Learn How” subject page.</td>
<td>Click the “Learn How” tile</td>
<td>Ease of Navigation</td>
</tr>
<tr>
<td>Track learning progress</td>
<td>Check the “check mark” beside the title of a section</td>
<td>Learner Flexibility</td>
</tr>
</tbody>
</table>

3.3.2.4.2 Analysis Phase

The cognitive walkthrough was carried out as a group activity (Wharton et al., 1994). A total of 4 participants participated in this study, including myself.
Only 1 participant (myself) is familiar with the methods of cognitive walkthrough. The study session took around 30 minutes.

As we attempted to do the each task, we examined each step, along the action sequences. For each step, two questions were asked and answered:

Table 3.5 Two Questions to Ask in the Streamlined Cognitive Walkthrough Procedure from (Spencer, 2000)

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Will the user know what to do at this step?</td>
</tr>
<tr>
<td>2</td>
<td>If the user does the right thing, will they know that they did the right thing, and are making progress towards their goal?</td>
</tr>
</tbody>
</table>

The first question is concerned about whether the users can successfully match correct action with their goals, while the second question focuses on the system feedback and status visibility after the user takes the correct action.

During the session, I assumed the role of session leader, while the other participants contributed their expertise to identify potential usability issues and provided design ideas. Video recording was used in order to keep record of the entire evaluation process for future examination and retracing (Wharton et al., 1994).

3.3.2.5 Data Analysis

I revisited and analyzed video recordings from the study session. Three categories of data were noted down in the reviewing process, based on (Spencer, 2000): (1) Design ideas: design solutions discussed by participants; (2) Design
gaps: lacking of functionality that resulted in task failure; and (3) Potential
learnability issues.

3.3.3 Working Prototype Evaluation

Usability testing using working prototypes with potential end-users was
feasible and desirable to provide more insights from users. Because this study
followed an exploratory approach with limited time frame, it was infeasible to
follow a very rigorous procedure of iterative design to test consistent tasks with
users for different iterative stages and see improvements. However, I expected to
be able to generally compare the usability results from user testing in this session
with the cognitive walkthrough performed in last stage (J. Nielsen, 1993). Though
it was still a formative evaluation on a prototype, given the scope of this study,
this could be counted as a summative evaluation for the prototype.

To assess the system usability, I conducted a task-specific and user-
based usability testing.

3.3.3.1 Instruments

A lab-owned DELL laptop installed with Windows 7 Enterprise and a
screen resolution of 1366x768 was used for the usability testing. The working
prototype tested in the usability testing study was coded using HTML5, CSS, and
jQuery, and saved in the local drive of the laptop. The browser used for testing
was Chrome version 33.0.1750.154m.
Task description and surveys were administrated through Purdue Qualtrics (“Information Technology at Purdue,” n.d.) on my laptop.

3.3.3.2 Sampling

I adopted convenience-sampling strategy to recruit first-year undergraduate students majored in engineering or technology majors from a mid-western public university (Patton, 2002). Because of the design stage and limited time and budget, inferential statistics don’t contribute much value (Dumas & Redish, 1999). I planned to have the sample size be between 5-7 participants aiming for discovering of 80% of the usability problems (Virzi, 1992). Participants recruited in this session were different from concept validation session to eliminate learning transfer effects (J. Nielsen, 1993). Participants were compensated with food and drinks for their participation.

3.3.3.3 Procedures

Participants were asked to complete a set of tasks and participated in follow-up surveys and semi-structured interviews. A usability research tool called Morae was used to facilitate and screen record the usability sessions (“TechSmith | Morae, User Experience and Market Research,” n.d.).

To plan the usability testing, I followed the guidelines in Dumas & Redish’s (1999). The fundamental step in designing a usability test is deciding the usability goals, specifying these concerns as more detailed usability concerns, and developing measurable attributes that can reflect these concerns (Dumas & Redish, 1999). As a result, usability testing was focused on the usability goals
mentioned in section 3.2.1.2. Key tasks were selected to reflect usability goals to be tested, and measurements to follow with tasks. I took both performance measures and self-reported measures. Performance measures measure objective and quantitative metrics on user performance (Dumas & Redish, 1999; Tullis & Albert, 2010). In this study, completion rate were captured and reported. Self-reported or subjective measures record participants’ perceptions, opinions, and comments towards the tasks and the system. Self-reported measures were gained through post-test survey, post-session survey, and open-ended interviews after the testing (Dumas & Redish, 1999; Tullis & Albert, 2010). In this study, ease of use rating in the form of Likert scale, user satisfaction rating in the form of Likert scale, System Usability Scale (SUS) (Brooke, 1996; Sauro, 2011), and post-session interviews were adopted to understand overall usability.

Finally, some of the originally designed tasks were not tested due to the limited functions realized in this working prototype, such as switching between different media formats, and activating practicing modules associated with learning sections. This limitation will be discussed further in Section 5.4. Tested tasks and a mapping between measures to tasks and usability goals are shown in Table 3.6.

For every testing session, recorded data includes: screen activities recorded by Morae, audio recording of participants’ think-aloud protocols, observation notes taken by myself, post-task surveys and post-session surveys gathered through Qualtrics (detailed survey questions, see Appendix A), as well as audio recordings of post-session interviews.
Table 3.6 Measures Mapping to Usability Goals and Concerns

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Usability Concerns</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse the home page. Select a learning section in course &quot;Learn How&quot;.</td>
<td>1. Will users easily understand the structure of learning contents?</td>
<td>1. Task success rates</td>
</tr>
<tr>
<td></td>
<td>2. Will users easily select the section they want to join and be aware of they’ve selected?</td>
<td>2. Ease of use rating in post-test survey</td>
</tr>
<tr>
<td>Assume you finish viewing the video. Mark the video as viewed/completed.</td>
<td>1. Will users understand the function and purpose of “Mark as Completed” button?</td>
<td>3. User satisfaction rating in post-test survey</td>
</tr>
<tr>
<td>Choose another learning section in the same course. Mark that section as viewed.</td>
<td>1. Will users easily understand how to navigate to another learning section?</td>
<td>4. SUS survey as part of post-session survey</td>
</tr>
<tr>
<td></td>
<td>2. Do they easily notice the change of progress bar?</td>
<td>5. Perception of the UI design as part of the post-session survey</td>
</tr>
<tr>
<td>Find out your current progress in learning the course. Orally report your progress.</td>
<td>1. Will users immediately understand the meaning of the progress bar and read the value of it?</td>
<td>6. Intention for recommending the platform to friends as part of the post-session survey</td>
</tr>
<tr>
<td>Go to your course dashboard to check out overall learning history and other available learning sections.</td>
<td>1. Will users easily locate their personal dashboard?</td>
<td>7. User feedback in interviews</td>
</tr>
<tr>
<td>Bookmark learning sections that interest you.</td>
<td>1. Will users easily understand the function and associate the icons with it?</td>
<td></td>
</tr>
<tr>
<td>Go to the &quot;Learn What&quot; subject page. Imagine you are suddenly curious about learning materials in &quot;Learn How&quot; course. Go to &quot;Learn How&quot; course from here.</td>
<td>1. Will users understand the course structure implemented?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Will users easily discover the navigation system that enables quick jumping among different subject page?</td>
<td></td>
</tr>
</tbody>
</table>
3.3.3.4 Data Analysis Methods

Collected data included screen recording of task performance, audio recordings of participants' think-aloud data when they perform tasks, post-task survey and post-session SUS survey, audio recordings of post-session interviews, and notes taken by me during the testing.

To analyze the data, I started by reviewing task performance recording (screen recordings and think-aloud recordings) participant-by-participant and task-by-task. Task completion instance, errors, and all potential usability issues were noted down and organized by participants and tasks. Next, I examined the follow-up interviews, and supplemented new information to the notes from the previous stage. After these two steps, I had a collection of both quantitative and qualitative data extracted from video and audio recordings, as shown in Figure 3.2. It took a total of around four hours to complete the extraction.
I conducted data analysis on this collection of data and digitally administrated surveys to reveal potential usability issues. Detailed data analysis methods were discussed in the following sections.

3.3.3.4.1 Quantitative data analysis

Task completion rate, error counts and self-reported measurements were analyzed and reported using descriptive statistics. These calculations enabled me to further organize usability issues by their frequency, scope, or severity (Dumas & Redish, 1999).

3.3.3.4.2 Qualitative data analysis

I conducted inductive thematic analysis (Boyatzis, 1998; Braun & Clarke, 2006) on the qualitative data extracted from video and audio recordings. After reviewing gathered data, I developed codes using an inductive approach (Boyatzis, 1998). Codes were applied to all the data and refined through thorough examination. I then clustered and grouped codes under emerged common patterns and themes. The aim was to supplement quantitative data and provide more insights towards understanding the reasons behind usability issues.

3.4 Chapter Summary

In this chapter, I laid out detailed research plan for this study. To summarize, an iterative user-centered design approach was adopted to design the proposed platform, which integrated usability evaluation into each design
stage and evolved the design based on evaluation results. In next chapter, results of each stage are reported and design implications are discussed.
CHAPTER 4. RESULTS

In this chapter, I divide and present results of this study in two parts. The first part presents results of the platform design, including information architecture design study, cognitive walkthrough, and an emerged competitive analysis study. The second part reports results of the platform evaluation (i.e., the usability testing study). For each individual study, I present the study findings, preliminary discussions on design implications, and derived design decisions if applicable.

4.1 Design Studies

4.1.1 Information Architecture Design

Design of the information architecture (IA) is the first step towards the design and evaluation of the site. Based on established IA design guidelines ("Information Architecture Tutorial | Webmonkey | Wired.com," 2010; Wodtke & Govella, 2009), I derived the preliminary design of site structure and navigation systems based on 3 stages of analysis: Website goals analysis, user analysis, and content analysis. In the following paragraphs, I presented the results of each stage in detail.
4.1.1.1 Site Goals Analysis

As illustrated in Chapter 2, main problems this study aims to solve are the low awareness and lack of proactive strategies on online self-presentation management among college students. Therefore, the problem statements directly inform the construction of the missions of the proposed Web application: the Website is built to enhance college students’ awareness of the concept of online self-presentation and its role in future employment, and pass on knowledge of tactics on manage and make positive use of one’s online self-presentation. Besides these long-term and ultimate goals of the site, there is also short-term and immediate usage of the site: experts on online self-presentation management can avoid repetitive education sessions with college students by putting the educational content on the site. This Website thus will enable the recycling of the materials, which saves educators’ time and efforts, and makes the information accessible by wider range of audience, at flexible hours. Both the long-term and short-term goals lay the foundation of the site – they helped to define what the site is supposed to accomplish, whom the site is about to serve.

4.1.1.2 User Research

The second step after defining the goals is understanding the primary users. The primary user groups of this site are first-year college students majored in engineering and technology. A secondary user research was based on a previous interview study with the target users. This study discovered lacking of awareness of the importance of online identity management among college
students, in the form of using social media majorly as tools to communicate with friends and family; rarely publishing self-constructed contents; and not knowing the cyber vet practice of employers. It also showed that students only adopted passive means such as hiding or deleting their information on social media to protect their online presentation. The need of education on social media literacy and online identity management was also confirmed by almost all participants (14 out of 15) in the study (Vorvoreanu et al., 2012). Before this online identity management education being fully integrated into any formal education system, the site will have to serve as an informal learning platform to supplement the lack of counterpart in formal curriculum. The nature of informal learning indicates that students may need to use the platform on top of their regular schoolwork load and prefer flexible and self-paced learning schedule.

4.1.1.3 Site Content and Functionalities Analysis

Based on understanding of users goals, I created an inventory of content elements and corresponding functions (Table x).

The basic unit of the site will be courses, within which nested learning materials, recourses, and other communication channels and functions.
Table 4.1 Content Inventory and Function Inventory

<table>
<thead>
<tr>
<th>Content Elements</th>
<th>Functions</th>
</tr>
</thead>
</table>
| • Brief Facebook profile analysis | • Social login through Facebook  
| | • Generation of word clouds from wall posts and social network graphs from friends list |
| • Courses with broken-down sections  
| Each section match to one video with a stand-alone topic  
| Meta-data associated with each course and section | • Course dashboard showing index of courses and sections  
| | • Flexible learning in terms of sequences and paces |
| • Media: videos, transcripts, subtitles and possibly PDFs. | • Video player  
| | • Toggle subtitles on/off  
| | • Materials downloading functions |
| • Comments and discussions  
| User feedbacks to the administrators | • Comments and discussions  
| | • Links to provide feedback |
| • Bookmarks or wish lists | • Bookmarking functions |
| • Social sharing links | • Social sharing functions |

4.1.1.4 Site Structure and Navigation System

Considering the goals of the proposed site, which are to enhance college students’ awareness of the concept of online self-presentation and its role in future employment, and pass on knowledge of tactics on manage and make positive use of online self-presentation, I designed three major learning subjects. These subjects map to the suggested learning process for learners:

• Learn “What”

This subject aims to provide background information and definition of online self-presentation.

• Learn “How”
This subject aims to offer detailed strategies and skills that learners can use to build a positive online self-presentation.

• Learn “More”

This subject aims to review and recommend online self-presentation management tools on the market, to facilitate learners’ further efforts on managing online self-presentation more effectively.

Each subject can be composed with multiple courses or sections, depending on the complexity and comprehensiveness of the educational contents. For the purpose of building a working prototype and due to the limitations of available contents at this stage, there is one level break-down below the “subject” level, which is section. This means that “subject” will be the basic unit of the information structure. However, I fully anticipate the growth of the body of contents in the future, which can easily follow the hierarchical structure as reviewed in the competitive analysis part. For example, there can be courses within subjects, and sections within courses. In addition, with the growth of the contents, more attributes should be used to create other branches of the hierarchical structure. By way of illustration, there may be another way of organizing the courses, such as by social media platforms (e.g., Facebook, Twitter, blog, and LinkedIn).

To accommodate current design of the site, the initial idea of site structure is illustrated as in Figure 4.1.
Based on this blueprint, I quickly sketched out some concepts for the site as shown in Figure 4.2.

Through some quick discussions with other CGT fellows, who were experienced in Web design and development, I chose the last version to fully developed sketches of key pages, as shown in Figure 4.3.
Figure 4.2 Four Concept Sketches
Figure 4.3 Sketches on Critical Pages

On next stage, I coded a lo-fi prototype based on this group of sketches and conducted cognitive walkthrough study to test the usability of the prototype.
4.1.2 Cognitive Walkthrough

4.1.2.1 Demographics of Participants

Recorded demographics were age, gender, and Web specialty area. Participants had an age of 23, 25, and 30, respectively. Among all three participants, two were females. Lastly, there were two participants specialized in Web programming, while the other one specialized Web design.

4.1.2.2 Usability Issues Found in Cognitive Walkthrough Study

A total of eight potential issues and two design ideas were identified. Of these eight potential issues, five were design gaps, which indicated lacking of necessary functions, while three were potential learnability problems caused by mismatch with users’ mental model (Spencer, 2000). A summary of all issues found is in Table 4.2.

There were two design ideas identified. First, making the “Learn” page the landing page where after login learners can quickly grasp the overall content structure of the site, and track site-wide learning progress at the same time. Second, include design of footer to indicate the end of main contents on the pages.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
<th>Usability Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion over Sign-in Options</td>
<td>In the homepage before signing in, there are two sign-in options: 1 as a global navigation item on top, 1 as a leading option after promotion information. The difference was unclear for potential users.</td>
<td>Learnability</td>
</tr>
<tr>
<td>Missing overview of course structure on certain pathway</td>
<td>When users navigate from their profile analysis page to the first learning section through clicking the link on the profile analysis page, they wouldn’t see the overall course structure offered only in the “Learn” page. This miss of critical view caused difficulties understanding the overall utility of the site.</td>
<td>Design Gap</td>
</tr>
<tr>
<td>Confusions over hierarchical organization of course contents</td>
<td>Potential users had trouble understanding the relationships between the subject icons (1, 2, 3, &amp; 4 in rounded shape) and the sections below.</td>
<td>Learnability</td>
</tr>
<tr>
<td>Missing site-wide progress tracking</td>
<td>Although within-subject progress tracking is available, there is no overview of progress throughout all subjects/courses.</td>
<td>Design Gap</td>
</tr>
<tr>
<td>Missing consistent local information system and page design</td>
<td>A serious perception issue was identified that potential users had confusions on the relationships between profile analysis and the other 3 learning subjects. The tile design on the “Learn” page as well as the local navigation system in learning subjects page, profile analysis page has an equal hierarchical level as the other 3. However, on the profile analysis page, due to missing of the consistent local navigation system and consistent page layout, the structure was not clearly defined. In addition, there was no direct and flexible pathway from profile analysis page to other 3 subject pages.</td>
<td>Design Gap</td>
</tr>
<tr>
<td>Unclear affordance of the circled navigation system</td>
<td>The affordance of click-ability is not well conveyed visually.</td>
<td>Design Gap</td>
</tr>
</tbody>
</table>
### Table 4.2 Continued

| Unclear triggering mechanism for completeness marking | Potential users had concerns on the triggering mechanism of completeness marking for each learning section. They had debates on if a video should be automatically marked as completed once it was load, even without finishing viewing. | Learnability |
| Possible technical issues using Facebook sign-in | One participant mentioned possible technical issues due to frequent change of Facebook backend design, which might cause high maintenance cost. | Design Gap |

#### 4.1.2.3 Implications of Cognitive Walkthrough

Reflecting upon the design and execution of this Cognitive Walkthrough study generates the following two research implications.

First, Web professionals participating in Cognitive Walkthrough study might easily fall back to their mindsets of designers or developers, which leads to heavy engagement in discussions of alternative design solutions, deviating from usability evaluation. This discovery resonated with a drawback of cognitive walkthrough identified by Spencer, as “lengthy design discussions”, which impeded this methods becoming more popular (Spencer, 2000).

Second, the fact that majority of the usability issues identified (five out of seven) in this study were design gaps suggested that my understandings on the design problems were not solid. This might be due to lack of first-hand user research, and/or lack of examination of other similar platforms. Therefore, before evolving the original design and implementing new prototypes only based on
results of this study, I decided to conduct a competitive analysis on other online learning platforms.

### 4.1.3 Competitive Analysis

Before moving onto revising the prototype based on findings from the cognitive walkthrough study, I looked into competitive sites to learn more about established practice and identify pitfalls and opportunities. Ideally, this step should be completed during the design of information architecture of the proposed site, and before the inspection of the prototype. At this stage, I am aiming at learning from established design practice and patterns, which may inform the revision as well as confirm the findings of the Cognitive Walkthrough study.

Competitive sites I looked at were other well-established online learning platforms. To analyze online learning platforms, my specific learning objectives were (1) identifying overall structures to organize learning materials, (2) comparing and recognizing good patterns of segmenting and indexing learning sections, (3) identifying reward mechanism that helps to engage and motive learners, and (4) discovering other functions that enables smooth and personalized learning experience. Therefore, feature and criteria wise, I focused on their site structure, layout, and key features such as saving progress, making comments, choosing learning sections, etc.

The analysis was focused on four of the major players currently on the market ("Major players in online education market," 2014, “Online Learning
Landscape – A Map of the Major Higher Education Players,” 2013), which offered free or college-students-accessible online courses. Among the four platforms I analyzed, two of them focused more on academic disciplines, while the other two geared towards professional and skill training.

The list of competitive platforms analyzed in this section was shown in Table 4.3.

Table 4.3 List of Competitor Platforms Analyzed

<table>
<thead>
<tr>
<th>Academic Sites</th>
<th>Skill-learning Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursera</td>
<td>Udacity</td>
</tr>
<tr>
<td>edX</td>
<td>Lynda.com</td>
</tr>
</tbody>
</table>

Features and criteria evaluated were:

1. Sign up and sign in requirements
   Does the site require learners to create an account and sign in in order to take classes? What learners can do without creating an account?

2. Landing page after signing in
   After signing in one’s account, where does the learner land? Is it different from the landing page before signing in? What can the learner do from there?

3. Information architecture
   What is the overall information architecture for the learner to navigate the site and learn?

4. Course content structure
   How are learning materials organized and shown for each course?
5. Progress tracking

What is the mechanism to mark learners’ learning progress? How can learners recognize their learning progress?

6. Content downloading

Does the site allow learners download learning materials?

7. Content sharing

Does the site support learners sharing their learning experience, learning materials, or learning progress?

8. Bookmark or wish-list feature

Does the site support bookmarking feature, which saves interested contents for later decision?

9. Reward mechanism

What is the mechanism used to acknowledge learners’ progress?

What are used to engage or motive learners to learn?

10. Color scheme

What is the color scheme of the site? What kind of emotion or atmosphere is it conveying?

In the following sections, each of the four sites was analyzed respectively around the above ten features and criteria, with screenshots when applicable. After individual analysis, a summary table was shown to give an overview of the results.
4.1.3.1 Coursera

Coursera ("Coursera," 2013) is a MOOC platform that aggregates many online courses offered by established universities and institutions. Though different courses have slightly different types of contents, Coursera has a unified structure and site design.

Sign up and Sign in Requirements

Coursera doesn’t allow joining classes as guests. Account creation and signing in are required to join courses and access course materials. However, users are allowed to browse courses offered on the site and general information about each course without registering or signing in.

The following screenshots show what users can view without registering or signing in their accounts. Figure 4.4 shows the landing page (home page) of Coursera before signing in. Figure 4.5 show the three major pathways of exploring courses: (a) by courses; (b) by specialization areas; and (c) by institutions offering courses. Figure 4.6 shows an introduction page of a course, offering general information about this particular course.
Figure 4.4 Home page of Coursera.org
Figure 4.5 Three Information Structures to Explore Courses on Cousera.org
Landing Page after Signing in

The landing page after signing in to one’s account is the learner’s course dashboard, where the learner can see courses they are enrolled, view course progress, and go to the course home base of enrolled course (Figure 4.7). I noticed that in this page, the progress bar is showing the teaching progress, not reflecting learners’ learning progress.
The overall information architecture on Coursera is constructed around users’ tasks and objectives. Users can choose what courses to learn through (1) browsing course list, combining with filter functions; (2) aiming at obtaining a
specialization certificate and following courses under that specific certificate; or (3) targeting at certain institutions and browsing course offered by those institutions. Users are free to combine these 3 different approaches to customize their own learning profile. Basic unit of the structure is each course. This IA is relatively hierarchical as shown in Figure 4.8.

![Information Architecture of Coursera.org](image.png)

**Figure 4.8 Information Architecture of Coursera.org**

**Course Content Structure**

Within each course, there are in-house course-learning contents and functions. Though slightly varying among courses, major components of a course are home page with announcements and calendars, achieve of course information, lecture videos, assessment materials (quizzes, writing assignments, and exams), and other supplement materials or functions (e.g., discussion forums, course wiki, and Meetup groups). All these contents are organized and accessed through a left-hand side global navigation system (as shown below).
Every course on Coursera has a "Video Lecture" page, where all course videos are listed and accessed from. Courses on Coursera are offered in a timely base, which means learners have to follow the schedule of courses, similar to the way they do in real universities. The only difference is that learners have the flexibility within certain timeframe to decide when and where they would like to attend the virtual lecture. Therefore, courses are posted and organized by week. Each week has a stand-alone topic and is segmented to smaller learning chunks. These learning chunks have clear defined learning objects and can be accessed independently. Each chunk corresponds to a section of video lecture and the length of time each chunk required is also marked out clearly. The interface is shown in Figure 4.10.
Progress Tracking

Progress tracking can happen on two levels: site-wide level where learners can track their learning progress across all courses they are taken; and within-course level where learners track their progress of a certain course.

As discussed earlier, site-wide progress tracking is not available at the time of this analysis on Coursera, as only the teaching progress instead of learning progress is shown for each course on the course dashboard page.

Within a course, a video is loaded on top of the page if users click the title of the video. Once the video is loaded, no matter how much it is viewed, a check mark will be automatically placed in front of the title indicating this sub-topic has been visited. Thus, the “Video Lecture” page functions to list and index detailed course contents, and also record the learning history in terms of viewing lectures of learners (as shown in Figure 4.11). Another aspect of learning history, which is quiz and assignment history, is accessible through dedicated pages.
Content Downloading

Depending on different courses, different course materials are provided for downloading. Usually, videos, lecture slides, and subtitles for videos are downloadable for all the learning sessions, directly from the “Video Lecture” page.

Content Sharing and Social Media Involvement

Sharing functions on Coursera is limited to sharing information of courses on social media sites (e.g., Linkedin, Facebook, and Google+). Share of specific contents within the course or broadcast of one’s learning progress is not supported by the site.

In a broader sense, social media is involved in a way that some courses have dedicated social media pages or activities where learners can meet virtually to discuss or share related information, beyond the platform of Coursera.

Bookmark or Wish-list Feature
Coursera allows users to save a course to their “watch list” if users choose not to join the most recent opening sessions (Figure 4.12). Saved courses are shown in users’ course dashboard.

Figure 4.12 Watchlist Function is Available for Not-yet-scheduled Learning Sessions

Reward Mechanism

Coursera offers course certificate upon completing the course on time and scoring higher than certain percentage. Course certificates are claimed to be very helpful for students’ academic application and job application.

Color Scheme

Coursera use colors in cool temperature, mainly different shades of grey and blue on the site, as shown in Figure 4.13.

Figure 4.13 Color Scheme of Coursera.org
4.1.3.2 edX

Unlike Coursera and Udacity, edX is a nonprofit MOOC platform, founded by MIT and Harvard.

Sign up and Sign in Requirements

Same as on Coursera, learners can only browse course information but not take courses without creating accounts. Landing page on edX before signing in, course exploration pages also have similar function and layout as on Coursera, except that edX doesn’t offer specialization areas as a way of organizing courses.

Landing Page after Signing in

The landing page after signing in is the learner’s course dashboard, where the learner can see courses they are enrolled, and go to the course home base of enrolled course (Figure 4.14). Different from Coursera, the dashboard page on edX doesn’t indicate either the teaching progress, or the learning progress of each course.
Figure 4.14 Landing Page after Signing in on edX

Information Architecture

Similar to Coursera, the information architecture on edX is constructed around users’ tasks and objectives. Users can choose what courses to learn through (1) browsing course list, combining with filter functions; or (3) targeting at certain institutions and browsing course offered by those institutions. Basic unit of this structure is each course. This IA is relatively hierarchical as shown in Figure 4.15.
Course Content Structure

Similar to Coursera, within the basic unit of each course, there are various resources and functions serving the construction of a course. Major elements are course information, course materials (videos and other readings), discussion forums, learning progress tracking and course wiki. These contents and functions are supported by a global navigation system placed horizontally on top of the page (Figure 4.16).
Every course on edX has a “Courseware” page, where all course videos and assessments are listed and accessed from. This design is different from Courses in a way that videos and assessments are integrated together and are accessible from the same place.

Similar to Coursera, courseware on edX is organized by week. Each week has a stand-alone topic and is segmented to smaller learning chunks (called “sections” on edX). These sections have clear defined learning objects and can be accessed independently. Unlike on Coursera, course structures are not positioned as the main content of the courseware page, but organized as a local navigation system on the left-hand side (Figure 4.17).

Figure 4.17 An Example of Local Navigation System (Index of Course Content) of a Course Page on edX
Each chunk (section) on edX contains multiple video sessions and/or reading materials and/or quizzes. To indicate all available materials and progress, a local navigation system is used within each section, on top of the main canvas (as highlighted in Figure 4.18). The learning materials (videos, reading materials, and quizzes) are placed as main contents of the page. Therefore, there is no information of time required for each chunk defined and shown. Within a course, learners are free to choose among different sections and within each section, among different learning materials.

![Learning Materials within a Learning Section of a Course on edX](image)

**Figure 4.18 Learning Materials within a Learning Section of a Course on edX**

**Progress Tracking**

There is no site-wide progress tracking on edX either. The course dashboard page only indicates if an enrolled course is still on session in terms of
its teaching progress. For courses still open to give certificate, reminders on the grades a learner gained, comparing to the grade required to gain the certificate is shown. This concept is very similar to Coursera though with different visual design (Figure 4.19).

Figure 4.19 Course Dashboard Page Shows Course Teaching Progress and Final Grades

Unlike Coursera, on the courseware page, there is no visual indicators showing learning progress. However, when landing on the courseware page, the left-hand-side navigation bar will automatically expand the week the learner last visited and a reminder is posted on the main-content area reminding the learner which section within that week he or she last visited (Figure 4.20). However, it is
not a very reliable way to track one’s learning progress because learner flexibility allows one to jump among different contents without obeying rigid sequence. It is very possible that following this way, a learner might miss learning materials unconsciously.

Figure 4.20 No Consistent and Explicit within-course Content Viewing Progress Tracking on edX

Besides the viewing progress, another aspect of learning progress -- assessment progress is nicely tracked in a dedicated page “Progress”. The page not only tracked whether the learner completes assessments, but also reflects one’s performance, comparing to the bar that one needs to pass in order to get a class certificate.
Figure 4.21 Progress Page of a Course on edX is dedicated to Track a Learner's Performance on Assessments

Content Downloading

On edX, videos are downloadable for all the learning sessions, directly from a download link under each video.

Content Sharing and Social Media Involvement

Sharing functions on edX is also limited to sharing information of courses on social media sites (e.g., Linkedin, Facebook, Twitter, and Google+). Share of specific contents within the course or broadcast of one’s learning progress are not supported by the site.
Bookmark or Wish-list Feature

edX doesn’t provide save-for-later feature. Because learners have the flexibility to join any course and decide on whether to complete it or not later without monetary or other penalties (except that the learner doesn’t get a certificate if he/she doesn’t finish the course), register for a course can actually serve the purpose of “bookmarking” the course in one’s course dashboard. However, it neglects the need of users who would like to be reminded of future sections of the same course, comparing to Coursera.

Reward Mechanism

Same as Cousera, edX also offers course certificate upon completing the course on time and scoring higher than certain percentage.

Color Scheme

edX also relies on different shades of grey and blue to create a sense of formal. However, the heavy use of brighter saturation of blue and warmer color of Hibiscus in their logo and some headings create a sense of excitement on top of the formality (Figure 4.22 & Figure 4.23).

Figure 4.22 Color Scheme of edX
4.1.3.3 Udacity

Udacity is a for-profit online learning platform that orients towards vocational-based learning rather than academic disciplines (Chafkin, 2013), comparing to Coursera and edX. Consequently, courses on Udacity are offered not only by universities, but also by industrial organizations (e.g., Google, and Salesforce). This fundamental difference brings a different learning mode: all courses are open enrollment, which means there is no temporal restrictions of a
course and learners can join a course and learn the course totally on their own pace.

*Sign up and Sign in Requirements*

Udacity requires registration in order to join a course. Without signing in, users can browse courses offered and view course trailers. Unpaid users have access to course videos and exercise, and view and manage their learning progress. However, no in-class projects or more dedicated feedbacks and interactions are provided.

*Landing Page after Signing in*

The landing page after signing in on Udacity is still the home page where promotions of the site are shown, instead of one's course dashboard. This decision is highly rooted in the nature of the site, which puts users' continuous discover and buying new courses in the center. Meanwhile, I discovered that there is no dedicated course dashboard page on Udacity, while all enrolled courses can only be accessed individually through a submenu shown over clicking "My Courses" menu item in the global navigation system (as shown in Figure 4.24). This may pose some obstacles for learners who would like to have more information and control over the overall learning profiles of theirs.
As a vocational-based learning site, the information architecture on Udacity is constructed around learners’ interests on areas of training. Learners can choose what courses to learn through (1) browsing course list; or (2) targeting at certain training areas (similar to the idea of “specialization area” on Coursera). Basic unit of this structure is each course as well. The IA is shown in Figure 4.25.
Course Content Structure

Within the basic unit of each course, there are resources and functions organized by a global navigation system placed vertically on the left-hand (as shown in Figure 4.26).

![Global Navigation System of a Course Unit on Udacity](image)

**Figure 4.26** An Example of Global Navigation System of a Course Unit on Udacity

The “Classroom” page is similar to the “courseware” page on edX, where a local navigation system is implemented to index course sections and main-content area is used to display learning materials (i.e., videos). A course on Udacity is composed with several lessons, and each lesson is broken down to several smaller sections that have stand-alone topics. The overall idea is similar to Coursera and edX (Figure 4.27).
Figure 4.27 A Local Navigation System (Index of Course Sections) of a Course Page on Udacity

Different from Coursera and edX, the local navigation on Udacity doesn’t display the overview of course contents, in terms of all lessons and sections under them. Instead, it hides list of lessons in the drop-down menu, and represents sections within a class through a progress bar. Though each section has a stand-alone topic, the list of topics is not shown directly. Learners have to hover over each chunk of the progress bar in order to retrieve the title of that section (Figure 4.28). Based on Nielsen’s Heuristics (Nielsen, 1994), this design violates the heuristic of “recognition rather than recall”, which might hurt learners’ overall learning experience and effectiveness.
This issue is especially serious when there are too many sections within a lesson, in which situation, visualizing these chunks becomes intimidating and remembering which chunk represents which content is impossible (Figure 4.29).

Progress Tracking
Progress tracking on Udacity is similar to the one on Coursera, in a way that viewed sections are marked clearly on the page. A difference (not necessarily improvement) to Coursera is that a section is marked as completed only when the video is viewed completely. In Figure 4.30, blue chunks indicate that those sections have been viewed completely, orange means the current section, while the grey ones are unfinished sections.

![Image of Udacity Progress Tracking](image)

**Figure 4.30 Within Course Progress Tracking Design on Udacity**

To remedy the lack of overview of contents of the whole course, Udacity offers a dedicated progress page to show the overall learning progress (Figure 4.31). However, I found the icons representing learning status hard to interpret, with falsely conveyed affordance (e.g., the orange play icon is actually not clickable). In addition, given the fact that each lesson has multiple sections within it, the overall progress on the level of lessons can only be used to do a quick check on completeness rather than providing detailed learning progress.
Content Downloading

There are no unified downloading contents or functions offered on Udacity. Usually, course instructors list materials with links for downloading in the “materials” page of each course. Depending on courses, downloadable materials vary.

Content Sharing and Social Media Involvement

Sharing functions on Udacity is also limited to sharing information of courses on social media sites (e.g., Linkedin, Facebook, Twitter, and Google+).

Bookmark or Wish-list Feature

Similar to edX, Udacity doesn’t provide save-for-later feature.

Reward Mechanism
As a for-profit platform, Udacity offers certification upon completing course for paid learners. However, for unpaid learners, there is no obvious reward offered by the site to encourage more learning.

*Color Scheme*

Udacity has very similar color strategy as Coursera and edX. It has a range of grey and blue colors as the foundation of the site, meanwhile chooses a bright color (i.e., ochre) as a theme color of the brand (Figure 4.32). Blues and greys are used on most of the course pages, except for the home page (Figure 4.33), where excitements need to be generated through using of bright and thematic color.

![Figure 4.32 Color Scheme of Udacity](image)

![Figure 4.33 The Home Page Design on Udacity, with a Touch of the Bright Theme Coor](image)
Others

As a platform facing industrial professionals, courses on Udacity are assigned with a special attribute, which is the learner level: from beginner to intermediate, to advanced. This attribute is unique in the 3 MOOC sites analyzed in this study, which is corresponding to personas of learners based on their previous experience and proficiency level.

4.1.3.4 Lynda.com

Lynda.com is a for-profit online training platform that provides software and technology courses in multiple categories. Though subscription defrayed by their universities, students can have access to unlimited courses and course materials. My interests in analyzing Lynda.com reside in its significantly larger number of courses and categories, comparing to other online learning platforms.

Sign up and Sign in Requirements

As a for-profit platform, membership is required to take courses on Lynda.com. Without login, users can browse available courses and access several sample sections from each course. The following screenshot (Figure 4.34) shows the landing page (home page) of Lynda.com before signing in. Comparing to Udacity’s strategy of broadcasting testimonials, the home page of Lynda.com lets the overwhelming contents available on the site speak for itself. The “play” buttons on the screen motivate users to take actions.
The landing page after signing in to one’s account is a customized page, combining the learners’ learning profile, and other recommended courses (e.g., new courses list, and “10-minute tips”) that are the same from the home page before logging in (Figure 4.35). This landing page can be viewed as a mix of the version of pure course dashboard on Coursera and edX, and pure site-promotion page on Udacity. Though not a dedicated course dashboard page, this landing page provides sufficient information and affordance to jump-start a returned user to either quickly resume most recent courses or review courses in the playlist.
Information Architecture

Due to the large amount of courses and multiple attributes associated with a course, organization and search of contents are facilitated by hierarchically combining various filtering mechanisms, based on users’ main tasks and objectives. The top-level filters can either be (1) subjects or (2) software, under which the all other filters (e.g., topics, authors, and skill levels) can be imposed. As other 3 sites analyzed above, the basic unit of this structure is each course.

This IA is relatively hierarchical as shown in Figure 4.36.
Course Content Structure

Similar to the 3 sites analyzed above, Lynda.com hosts learning contents and functions under the unit of courses. Within each course, there are learning materials such as videos with transcripts and exercise files, information about the course and the author, and functions such as bookmarking certain contents, FAQs, and links to course list from related subjects, authors, or software. Different from other three sites, there is no within-course global navigation system. Instead, the course page was centered on course videos and index of all course sessions, while other information and functions are organized under a smaller window with tabs. The idea of having an expendable index of course sections together with centered display of course contents is similar to the “video lecture” page on Coursera and “courseware” page on edX. Same as Coursera, this indexing list has titles, time span, and completeness information displayed.
On the other hand, the use of tabs view to host other related information is unique on Lynda.com, enabling learners to stay on the main task (course learning) all the time. This design is interesting comparing to the other three sites:

(1) Comparing to Coursera and edX highlights the difference between academic-learning sites and skill-learning sites. Online learning platforms for academic disciplines such as Coursera and edX often require more instructional materials and activities on top of lecturing (Breslow et al., 2013), whose value is too high to fit into tabs view;

(2) Comparing to Udacity highlights different information hierarchy design in skill-learning sites. On the surface, the difference lies on the length of the course pages: Lynda.com has much longer course pages comparing to Udacity (Figure 4.37). Look more deeply, the layout reflects the central difference on information hierarchy. The design of course pages on Lynda.com places viewing video and navigating through course sections as tasks with highest-priority, which will not be interrupted by any other course activities.
Progress Tracking

Both overall learning progress of all courses and within-course learning progress are easily trackable on Lynda.com. To access overall learning progress of all courses, besides quick view on the landing page, learners can also go to
dedicated course dashboard page. In the tab of “course history”, they can view learning progress as percentage finished, remaining time, and time stamp on last viewed of each course. Expanding a course, learners can see only last visited time of each section (Figure 4.38), which has similar short back as the “progress” page on Udacity mentioned before.

![Course History on Lynda.com](image)

**Figure 4.38 Site-wide Course History on Lynda.com**

Learning progress within a course is readily available on Lynda.com, through similar design as on Coursera (Figure 4.39). The mechanism of marking a video section completed is based on if the video has been clicked, the same as on Coursera. This design can create confusion and user errors if learners left the site before finishing the video. The particular section will be marked as “completed” even it is not. To resolve the issue, Lynda.com offers the function of “mark as unwatched” for learners who would like to remind themselves revisit the
content again. On the contrary, Coursera doesn’t have a similar function (Figure 4.40).

Figure 4.39 In-course Progress Tracking on Coursera (Left) and Lynda.com (Right)

Figure 4.40 "Mark video as unwatched" Function on Lynda.com
Content Downloading

Course videos are not downloadable because of its business model. Exercise files that go with the practice examples in the videos are downloadable for subscribed users.

Content Sharing and Social Media Involvement

Lynda.com allows users to share information and links of courses on social media sites (e.g., Twitter, Facebook, and Google+) or through personal communication channels. On top of that, users can also share their “playlists”, which are collections of interesting courses they saved. Other users with the link can view and save the shared playlist. Sharing personal course list is similar to the idea of sharing ones’ music playlist to achieve collaborative music listening. Researchers have found out that social playlist can facilitate self-expression and build touch points with friends through shared music context (K. Liu & Reimer, 2008). Therefore, sharing course playlists can be expected to have similar social effects, as well as facilitate collaborative learning and discovery. Share of specific learning materials within the course or broadcasting of one’s learning progress is not supported by the site.

Bookmark or Wish-list Feature

There are two levels of “bookmarks” functions on Lynda.com. One is bookmarking courses, the other is bookmarking specific contents within a course. Because Lynda.com hosts large number of courses on site, it becomes necessary for learners to have the options to collect and organize interesting courses for future use. Lynda.com provides customizable playlist functions for
learners. Learners can create, name, describe, manage, and share their course playlists. Playlists are accessible through one’s course dashboard page (Figure 4.41).

Figure 4.41 Customizable and Sharable Playlist on Lynda.com

In addition to bookmark courses, Lynda.com also supports bookmarking individual course section and specific time point in a video. For every bookmark inserted, learners can add name and description for the bookmark. All
bookmarks can be viewed and the corresponding videos can be retrieved in the “bookmark” tab in the learner’s course dashboard page.

**Reward Mechanism**

Upon completing a course, Lynda.com offers a certificate for completion.

**Color Scheme**

Consistent with the other 3 sites analyzed before, Lynda.com uses different shades of grey and blue throughout the site. Selective yellow is used as the major bright element on top of the grey and blue systems, but not extensively.

![Figure 4.42 Color Scheme of Lynda.com](image)

**Others**

Learner level is again found as an important attribute to describe and categorize courses on Lynda.com. Therefore, learner level was identified as an attribute associated with skill-learning platforms to help learners identify courses that better suit their level of prior knowledge.

**4.1.3.5 Design Implications of Competitive Analysis**

Analysis of these four popular online learning platforms presented information on common practice across platforms as well as special design considerations. It was interesting to see the results emerging to confirm some of the usability findings in the cognitive walkthrough study. In this section, a table outlining results of examination on pre-defined criteria will be provided.
4.4), followed by a brief summary and interpretation of findings, and some design implications.

Table 4.4 Summary of Competitive Analysis

<table>
<thead>
<tr>
<th></th>
<th>Coursera</th>
<th>edX</th>
<th>Udacity</th>
<th>Lynda.com</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site Nature</strong></td>
<td>Academic</td>
<td>Academic</td>
<td>Vocational</td>
<td>Vocational</td>
</tr>
<tr>
<td><strong>For-profit</strong></td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Registration Required</strong></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Landing Page after Signing in</strong></td>
<td>Personal Course Dashboard</td>
<td>Personal Course Dashboard</td>
<td>Site Promotion Page</td>
<td>Simplified Course Dashboard + Site Promotion</td>
</tr>
<tr>
<td><strong>Information Architecture</strong></td>
<td>Hierarchical, basic unit: course</td>
<td>Hierarchical, basic unit: course</td>
<td>Hierarchical, basic unit: course</td>
<td>Hierarchical, basic unit: course</td>
</tr>
<tr>
<td><strong>Course Structure</strong></td>
<td>Course Segmentation</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Index of Segmentations</strong></td>
<td>Y</td>
<td>Y</td>
<td>P (partially hidden)</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Meta-data of Segmentations (Title and length of time)</strong></td>
<td>Y</td>
<td>P (title)</td>
<td>N (hidden)</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Video Lectures as Main Materials</strong></td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Discussion</strong></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N (Only FAQ)</td>
</tr>
<tr>
<td><strong>Assessments</strong></td>
<td>Y</td>
<td>Y</td>
<td>P (in-course pop-up quizzes)</td>
<td>N</td>
</tr>
<tr>
<td><strong>Progress Tracking</strong></td>
<td>Overview of All Courses</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Within-course Progress</strong></td>
<td>Y</td>
<td>P (assessment progress)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Time-constrained Course Offering</strong></td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
It is clear that segmenting learning materials in smaller sections and match with stand-alone learning objectives is an established instructional design for online courses. This practice is highly corresponds to the instructional design guidelines reviewed in Chapter 2. Aligning with it, providing an index of all the sections, maximizing learning flexibility, and tracking learning progress are also regularly adopted, despite with slightly uneven usability. The importance of these practices was also confirmed in the Cognitive Walkthrough study, where design gaps were identified as lacking of full indexing and site-wide progress overview.

Furthermore, videos are major media used throughout these platforms. Differences among academic-learning platforms and vocational-education platforms are also observable, though they require further scrutiny to conclude. For instance, temporal constrains on following courses and learners’ performance assessments are valued much higher on academic-learning sites, which simulate the way physical schools are operated. On the other hand, because (1) industry-oriented education has its own time limits in terms of its applicability and popularity, and (2) vocational learning can be less dependent on the implicit knowledge of instructors, vocational learning platforms don’t employ hard deadlines nor do they assign and grade homework.
There are several direct design and research implications provided by this competitive analysis. First, common design norms such as content segmentations, a clear index of segmented sections, providing meta-data of sections, and easy-to-use progress tracking should be designed and implemented. In addition, because the proposed online identity educational platform is closer to vocational education platforms in terms of the nature of the knowledge offered, common practices of Udacity and Lynda.com such as less emphasis on assessments and offering open enrollments without constrained schedules should be adopted. Research-method-wise, the value of conducting thorough competitive analysis based on relevant criteria is fundamental. Many design gaps including missing of site-wide progress tracking, lacking of clear index, and unclear progress-marking mechanisms could have been avoided before conducting usability inspection study. Consequently, money and time could be saved on later design and development stages.

4.1.4 Design Decisions

Combining the findings from the cognitive walkthrough study and competitive analysis, I made several design decisions to move on to the next stage of building a working prototype. Major design decisions with explanations on rationales are listed in Table 4.5, the updated information architecture structure is shown in Figure 4.43.
Table 4.5 Major Design Decisions based on Cognitive Walkthrough and Competitive Analysis

<table>
<thead>
<tr>
<th>Design Decisions</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove the function of Facebook profile analysis.</td>
<td>• Implementation and maintenance cost</td>
</tr>
<tr>
<td></td>
<td>• Not a core content or function of the site</td>
</tr>
<tr>
<td>Redesign of the landing page to learners' course dashboard, which shows overview</td>
<td>• Global understanding of one’s learning profile is desirable based on both Cognitive Walkthrough</td>
</tr>
<tr>
<td>of site contents and learning progress</td>
<td>study and competitive analysis</td>
</tr>
<tr>
<td>Update the mechanism of marking certain content as finished</td>
<td>• Automatically marking might cause undesired confusions or errors on progress tracking as shown in both studies.</td>
</tr>
</tbody>
</table>
Figure 4.43 Updated Information Architecture of The Proposed Platform

Working prototype based on the improved design was coded using HTML5, CSS, and jQuery. HTML5 was used to build the basic structure of the platform. With semantic use of the tags, I made sure site structure was defined naturally with the code. CSS was used to apply style and some visual effects to the structure. The 960grid system ("960 Grid System," n.d.) was used to laid out the underlying grid design of the site. Finally, jQuery was used add the action layer of the site, such as the linkage between an action of pressing the “Mark as Completed” button with the visual effects of showing the checkmark and updating of progress bar, as well as the hovering submenu. The designed progress tracking behaviors were able to function fully. Some screenshots of the working prototype were shown in Figure 4.44. Figure 4.44 (a) shows the newly designed landing page, where learners can immediately understand course structure and
check their learning progress. Figure 4.44 (b) is a subject page (showing a learning section under subject “What”). Learners can manually mark the completion of the section, following which a checkmark will shown besides title and the circled progress bar will be updated to show the overall progress within the subject. This working prototype was evaluated through usability testing study, discussed in section 4.4.

Figure 4.44 Sample Pages of the Working Prototype
4.2 Evaluation Study

Upon building the working prototype, I conducted a usability testing study to evaluate the working prototype. A total of seven first-year engineering or technology students participated in one-on-one usability testing study sessions, resulted in a total of 118 minutes of screen recording, and 32 minutes of audio interview recording.

In the following sections, statistic data about participant demographics was provided. Furthermore, quantitative measurements on task completion, user-reported easiness, satisfaction towards tasks, and overall site usability scale were presented. Qualitative findings were presented from two major perspectives: (1) general system usability issues, and (2) overall site utility as a learning platform.

4.2.1 Participant Demographics

A total of seven participants participated in this study, all of who were first-year college students. Recorded demographic information included: age, gender, and primary academic disciplines.

The average age of participants was 19.28, with only 1 participant aged over 20. Four out of 7 participants were female. Four participants were majored in engineering area (57.14%), while the other 3 were majored in technology area (42.86%).
Table 4.6 Demographics of Participants for the Usability Testing Study

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Gender</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>19</td>
<td>Female</td>
<td>Engineering</td>
</tr>
<tr>
<td>P2</td>
<td>18</td>
<td>Female</td>
<td>Engineering</td>
</tr>
<tr>
<td>P3</td>
<td>23</td>
<td>Female</td>
<td>Technology</td>
</tr>
<tr>
<td>P4</td>
<td>19</td>
<td>Female</td>
<td>Engineering</td>
</tr>
<tr>
<td>P5</td>
<td>19</td>
<td>Male</td>
<td>Technology</td>
</tr>
<tr>
<td>P6</td>
<td>19</td>
<td>Male</td>
<td>Technology</td>
</tr>
<tr>
<td>P7</td>
<td>18</td>
<td>Male</td>
<td>Engineering</td>
</tr>
</tbody>
</table>

4.2.2 Task-level Usability

Each participant attempted at total of seven tasks, each of which was followed by two questions regarding the perceived difficulty of the task and satisfaction towards completing the task. In this section, I reported the task-level usability.

The first thing to look at is the task completion rate, defined as the proportion of participants who successfully completed a task without any help from the facilitator. A binary measure of pass and fail was adopted in this study. Overall, participants were able to successfully finish tasks without helping. The task with lowest completion rate is task 5, which asked participants to navigate from a learning page to the personal course dashboard. More detailed analysis on potential usability issues will be covered in the following sections.
Figure 4.45 Completion Rate by Task

Two questions were administrated immediately after a participant attempted a task in the testing session. The first question asked the perceived difficulty of the task, and the second question asked perceived satisfaction with the experience of accomplishing the task. For both questions, a five-point scale response was adopted. For the question asking task difficulty, number one represents very easy and number five represents very difficult. For the question asking satisfaction, number one represents very unsatisfied and number five represents very satisfied.

Overall, participants perceived all tasks as relatively easy, with an overall average score of 0.43. Among all seven tasks, task 5 is perceived as the most difficult one, with an average score of 1 among seven participants. Participants also expressed high satisfactions towards the process of attempting each task.
The average score for the second questions across all tasks among seven participants was 4.47. None of the tasks received difficulty or satisfaction scores lower than 4 on average.

Figure 4.46 Task Difficulty by Task (1-Very Easy, 5-Very Difficult)

Figure 4.47 Task Satisfaction by Task (1-Very Unsatisfied, 5-Very Satisfied)
4.2.3 General System Usability

The overall system usability was measured through both quantitative and qualitative means. System Usability Scale (SUS) survey was administrated at the end of the testing sessions to provide quantitative measurement, while follow-up interviews gathered participants’ comments regarding the usability of the platform. The sample mean of SUS reported was 88.21, with a standard deviation of 15.39, which was significantly higher than average (Sauro, 2011). Among seven participants, three scored 100 on SUS survey. The interview provided further confirmation on the overall highly rated usability. Participants gave high evaluation specifically on the design of layout, and information structure.

“The site is very clean, interactive, and well put together.” – P1

“Easy to follow.” – P2, P3 & P4

“I like the design and visual aspect of it.” – P5

Despite of overall highly perceived usability, there were several usability issues discovered from the testing. In the following sub-sections, general usability issues were presented and discussed. The results were categorized under four major patterns found through thematic data analysis: (1) site structure and navigation related issues, (2) specific content and function elements, (3) other UI design principles, and (4) discovered system insufficiency. Design implications were discussed under each usability issue reported.
4.2.3.1 Site Structure and Navigation Related Issues

4.2.3.1.1 Difficulty in finding personal course dashboard

A common usability issue arose from participants was the confusion on home page serving the function of course dashboard. In task 5, participants were asked to navigate to their course dashboard to check overall progress. In this design, there were two pathways to arrive at the course dashboard page: (1) by clicking the logo, and (2) by clicking the “course dashboard” item in the dropdown menu of the account name (Figure 4.48). Five out of seven participants were hesitated to click and move their cursor around the page, among whom two were failed to find the dashboard.

![Figure 4.48 Two Pathways to Personal Course Dashboard Page](image)

There are several possible explanations behind this issue. First, even though participants were told to imagine they were already logged in to their personal account and their name is “John Garner” as shown in the account name area. However, this scenario was not emphasized in any way and a participant reported afterwards that she didn’t realize she was supposed to be “John Garner”. Lacking of awareness of this logged-in scenario might cause some confusion since the homepage before logging in should not be able to provide any personal
information such as being one’s course dashboard where his/her learning progress is shown.

“Because that was not my name” – P3

“Oh so I actually signed in here.” – P7

Another reason might be participants were expecting a boundary of “public” and “personal” territory, meaning they expected to have a clear indication of which part is accessible as their personal space. This boundary should be clearly drawn and shown in order to facilitate learners’ information foraging efforts.

Comparing the proposed site with Coursera (Figure 4.49), a global navigation system of the Coursera clearly announces the “public” territory. However, because of the nature of narrowed purpose and limited contents on the proposed site, there is no personalized learning profile as opposed to what the site offers. This structural difference caused lacking of information scent, which negatively impacted users’ information finding performance (Card et al., 2001).

Figure 4.49 A Comparison between Global Navigation System on the Prototype (Left) and Coursera (Right)
4.2.3.1.2 Lacking of current location indication

When asked to navigate to subject “What” page from a learning section in subject “How”, a participant discovered a fundamental deficiency of current navigation system design. There was no obvious visual indication of which subject page the participant was in. Participants could only tell their location through subtler cues such as the title card of the video, or interpretation of the titles of learning sections. Though there was only 1 participant expressed this confusion and concern, I found it a high-priority design issue that needs to be fixed.

4.2.3.2 Content and function elements

Based on the idea of web experience analysis (Vorvoreanu, 2008), participants were asked to comment on specific web elements, which were related to their task experience. The data came from both think-aloud protocols as well as follow-up interviews.

4.2.3.2.1 Controversial “Mark as Completed” button

An interesting discovery was the controversial attitudes towards the “Mark as Completed” button. When asked what elements on the platform facilitates or impeded learner activities, “Mark as Completed” jumped out as the most mentioned element: four out of seven participants proactively commented on the function and attached strong feelings towards it.

Among these four participants, three of them rated this function as the most unique and helpful function. Manually marking content as completed was
perceived as more favorable comparing to automatic marking because: (1) it enhanced learning flexibility, (2) it reduced potential progress errors, and (3) it provides sense of control and confirmation. The only participant who explicitly opposed the idea of manual marking expressed concern that this function might defeat the purpose of learning because users can mark a section as completed without actually learning it.

4.2.3.2.2 Mismatch between visual representation and the function

In task 6, participants were asked to bookmark learning sections that interest them. Three out of seven participants explicitly commented on the use of heart-shape icon to represent bookmarking function. Two of them had “guessed” the function of the icon and one of them failed to complete the task of bookmarking learning sections. They confirmed that they would be more certain if the task was rephrased as “adding sections to the wish list”. Though bookmark and wish list refer to the same function of the platform, matching the visual representation to the mental model users have for the function is vital to eliminate confusion. The finding indicated that we should be very careful when choosing the wording and the visual representation for functions.

4.2.3.3 UI Design

4.2.3.3.1 Affordance

Three participants explicitly reported the affordance of the clickability of the circled navigation system was not obvious (Figure 4.50). After demonstrating to them, they confirmed that it made sense.
“It make sense now, it wasn’t the first thing I thought of.” – P6

Figure 4.50 Unclear Affordance of the Navigation Design

4.2.3.3.2 Accessibility

Design for accessibility is an important aspect to include. Participants suggested including transcripts for the videos, which was intended but not delivered in this working prototype.

4.2.3.4 System Insufficiency

This section lists issues associated with insufficiency of the system, which are non-intentional design and should be fixed technically.

4.2.3.4.1 Overly sensitive hover-over behavior

Participants experienced the overly sensitive hovering behavior when they hovered over the account name trying to access items on the submenu.
4.2.3.4.2 Drop-down menu display issue

In learning pages, the drop-down menu associated with learner account was displayed behind the main content of the page, as shown in Figure 4.51.

![Image of drop-down menu]

Figure 4.51 An Implementation Bug – Unusable Menu

4.2.3.4.3 Video continues when marking as completed

When participants marked a video as completed, the video player did not automatically stop playing the video.

4.2.4 Supportiveness of Learner Activities

Besides general usability of the platform, another focus of the testing was to evaluate if it well supported learner activities as a learning platform.
4.2.4.1 High Perceived Utility

The overall utility of the platform was assessed through both post-session survey and follow-up interview questions. Though formal educational contents were not included and tested in this working prototype, participants perceived high utility of the learning platform based on the information delivered by the site structure. In post-session survey, participants assigned high value for the two questions regarding the utility of the site. For the first statement (part of the SUS survey): “I think that I would like to use this site in the future to learn more about online identity”, four participants rated it as “strongly agree” while the other three rated it as “agree”. The results were the same for statement number twelve: “I will recommend this site to my friends”. In the follow-up interview, when asked if they perceive this site as useful, all participants responded with positive attitudes, regarded this platform as “very useful”, “really helpful and interesting”, and “a good way to get started and dig into it (online self-presentation management)”.

4.2.4.2 Support for Learner Flexibility

Besides overall content structure, participants were also asked about specific features that helped or impeded their learning process. Support for flexible learning emerged from participants’ comments as an outstanding pattern. Several site features including progress tracking, learning section indexing, and video length marked beside each section were mentioned as means to deliver higher flexibility.

“Progress tracking makes it very clear.” – P3
“I have a lot of options to go from place to place; it responds quickly and can keep track of my progress … really helps the learning process out.” – P6

“It covers a lot of ground without taking up a whole lot of time.” – P6

4.2.5 Implications of Usability Testing

Usability testing on the working prototype offered useful design implications for both general websites and online learning platforms. In general, the study reinforced the need for providing clear information architecture and match between UI elements with users’ mental model. Specifically for online learning platforms, it confirmed the value of content segmentation design with content indexing and progress tracking, as well as the importance for designing for learner control and learner flexibility. Though questions stemmed from web experience analysis, it was clear that designing for online learning platforms should include considerations specifically for elements that deliver better learner experience on top of general web usability.

4.3 Chapter Summary

This chapter provided study results on both design stage and evaluation stage. On the design stage, cognitive walkthrough study identified several potential usability issues of the initial prototype, which also ignites the need for a detailed competitive analysis study. Findings from the competitive analysis further confirmed findings from the cognitive walkthrough study, and laid out several common design practices.
Based on both studies on the design stage, design decisions were made to improve the platform, resulting a working prototype. On the evaluation stage, this working prototype was tested through a usability testing study. The usability testing study provided confirmations on the overall well perceived utility and usability of the platform, with participants being fond of the content structure, site layout, and learner flexibility. The usability testing study also helped to discover specific usability issues, which were categorized into four categories and discussed in detail.
CHAPTER 5. DISCUSSIONS

The objective of this study is to build an online learning platform for college students to learn about knowledge, tactics, and resources to manage their online self-presentation. This goal was achieved through the design study, which followed UCD process. Besides the final product built through this design process, I set out to answer the following two research questions, as listed in Section 1.4:

**Research Question 1:**
What are the major design implications for online learning platform design?

**Research Question 2:**
What can be learned from this design study in terms of design and research methods and procedures?

Therefore, there were three major outcomes from this study: (1) An online learning platform designed and implemented following the UCD process; (2) Design implications for other online learning platforms; (3) Lessons learned to inform the improvement of future design studies, in terms of design methods and procedures adopted.
In the following sections, I first present the final product as the first outcome of the study in Section 5.1. The platform was shown with screen shots illustrating how the product was designed following the design guidelines reviewed in Section 2.6, as well as design implications generated from design and evaluation study. Next, in Section 5.2, I discuss design implications for designing online learning platforms, as the second outcome of the study. Finally in Section 5.3, I present lessons learned on the aspects of design methods and procedures, which might be beneficial to other designers or researchers who would like to carry out design studies of this kind.

5.1 Final Product

The final prototype can be accessed through the URL: http://web.ics.purdue.edu/~dong17/. The final prototype was built and improved based on the working prototype tested in the usability testing study. It delivered online self-presentation learning materials through three learning subjects: “learn what”, “learn how”, and “learn more”. Learning materials were segmented into smaller learning sections with stand-alone topics. Both site-level and course-level index of contents were provided, with progress tracking on both levels. Progress marking was realized through a manual marking mechanism. Besides the above features that complied with design guidelines from Section 2.6, which focus on lowering learners' cognitive load and enhancing learner flexibility, new features such as commenting, personal wishlists, and social sharing were also implemented to increase the interactivity of the platform.
5.2 Design Implications for Online Learning Platforms

Design guidelines discovered from both the design and evaluation stage of this study were found to have great overlapping with the original design guidelines as reviewed in Section 2.6. Overlapped items included learning content segmentations, offering clear index to support learner flexibility, design for accessibility, importance of UI design, and design for interactive system. This overlapping positively confirmed the validity of the study to some degree. Except the overlapping part, there were design implications generated from this study that were not covered by the original guidelines. This set of new discoveries could serve as supplements to the original guideline list.

In this section, I review these unique design implications and discuss where they stemmed from and why they should be implemented for online learning platforms.

5.2.1 Progress Tracking: Site-wide and Within-Course

The cognitive walkthrough study, the competitive analysis, and the usability testing study together confirmed the importance of integrating clear progress tracking with the design of content indexing as a mechanism to motivate learning, and facilitate learner flexibility. Especially, the cognitive walkthrough study and competitive analysis study both illustrate the need for deliver progress tracking on both “global” or “site-wide” level and “local” or “within-course” level. Progress tracking can help learners gain better knowledge about their own learning profile, and therefore making informed decision on their
efforts allocation, which ultimately attributes to higher and better-quality learner flexibility.

5.2.2 Completion Marking Mechanism

As the essential element of progress tracking, the mechanism of marking a learning section as completed became a subject to study itself. Through the competitive analysis study, different mechanisms were discovered (Table 5.1).

Table 5.1 Comparison of Completion Marking Mechanism among Four Learning Platforms

<table>
<thead>
<tr>
<th>Platform</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursera</td>
<td>Automatically mark as completed once a section (video) is clicked.</td>
</tr>
<tr>
<td>edX</td>
<td>No progress marking for individual sections at all.</td>
</tr>
<tr>
<td>Udacity</td>
<td>Automatically mark as completed once the end of the section (video) is viewed.</td>
</tr>
<tr>
<td>Lynda.com</td>
<td>Automatically mark as completed once a section (video) is clicked. Can be marked as “uncompleted” through an extra control.</td>
</tr>
</tbody>
</table>

Taken out of edX, which doesn’t have individual section progress marking, there were two mechanisms emerged from these platforms: (1) automatically marking as soon as a video is loaded, adopted by Coursera and Lynda.com, and (2) automatically marking if a video is played to the end, used on Udacity. The first mechanism could easily introduce errors because the flexible learning nature of online learning system (learners could be interrupted and terminated learning sessions at any point). Learners may face the concern and risk having un-learned sections marked as finished. To remedy this drawback, Lynda.com
offered a manual mechanism to mark a section as unviewed. However, this requires users to consciously track their actual learning status in mind, which might not be the case when the interruptions happen in the first place. The second mechanism effectively reduced the chance of this system error by enforcing viewing the end of a video as the completion signal. However, learners may have to manually adjust the video play bar to mark a section as completed if they decide to skip the video.

Despite the different triggering point, both mechanisms are automatic action competed by the system, which reduced the learner burden and learner flexibility at the same time. As learning is a mental activity, whose completion status includes much more than physical completion of learning contents, I argue that designers should take into this implicit mental image into consideration when designing the completion marking action. By offering learners the control on marking a learning section as completed, the design might reduce errors and better comply with the design guideline of enhancing learner flexibility.

I implemented this action through a “Mark as Completed” button in the working prototype, which was perceived as the best element that facilitate learning experience by three out of seven participants in the usability testing study. Only one participant expressed concern on the potential risk of abusing of this function. However, I argue that based on the informal nature of online learning, learner flexibility should be given higher priority than learner obligation. In the end, learners have total freedom on choosing not to enroll in learning certain contents that they have no need to fake their learning progress.
5.2.3 Designing for Academic Learning or Vocational Learning

The discussion on last topic is actually related to the design considerations for academic learning platform and vocational learning platform. Through the competitive analysis study, I discovered that different design emphasis and considerations should be given to learning platforms that offer different learning objectives and paths. For example, platforms that offer academic discipline learning should have stricter schedules and assessments, comparing to platforms that focus on vocational and skill training. Generally, designers might consider offering more learner flexibility in terms of enrollment requirements, learning pace, and options to skip contents for vocational learners.

5.3 Lessons Learned to Improve Methods and Procedures

Besides the learning platform designed and implemented, and new design guidelines for online learning platforms, another contribution of this study resides in the lessons learned in the design process. These lessons either confirmed the value of some research methods and procedures, or suggested improvements and modifications.

In this section, I present three major lessons learned through this design study: (1) value and timing of competitive analysis, and (2) integration of web experience analysis in usability testing protocols.
5.3.1 Value and Timing of Competitive Analysis

The need for a thorough competitive analysis study was neglected when planning for the whole study, and later emerged through findings of cognitive walkthrough study.

Competitive study based on core functions and criteria that comply with the focus of proposed system is extremely valuable, in terms of (1) informing common practice, which saves time and helps avoid obvious design pitfalls; and (2) discovering design debates, which represent design challenges and opportunities.

The first value was verified when the findings of competitive analysis study confirmed design gaps discovered in the cognitive walkthrough study. This means that time and efforts spent on building first prototype and conducting cognitive walkthrough study could be put in better use if these design deficiencies were discovered and eliminated in an earlier design stage.

The second value manifested when several design elements were put on focus after comparing different design solutions on competitor sites. For example, design of progress tracking becomes a focus and opportunity for the proposed system, only after disagrees emerged from this competitive analysis.

To summarize, though I looked through online learning platforms roughly before starting on the initial design of concepts and architectures, the level of scrutiny was far from enough to provide design insights that a thorough competitive analysis can offer. The earlier a designer conducts the competitive
analysis, the better value it gives because time and design efforts can be saved, and potential design niches could generate much more value consequently.

5.3.2 Integration of Web Experience Analysis

A question were added in the post-session interviews in the usability testing study, in the spirit of Web experience analysis (Mihaela Vorvoreanu, 2008): “What functions or elements especially helped or impeded your learning process/experience?”. Web experience analysis adds focuses on specific features or elements on a Website on top of general usability testing, trying to answer what components of the whole Website contribute to certain user experience. This additional question enabled discoveries on platform elements that most successfully or unsuccessfully to deliver good learner experience. For example, in this study, the “Mark as Completed” button was identified as the best-designed feature that realized greater learner control and learner flexibility.

I found this integration of Web experience analysis to an early-stage usability testing especially helpful to verify design decisions, anchor design focus and improve certain design objective. Specifically, in this study, a good learning experience is a design objective that can generate core value of the platform. At this early stage of design, many design decisions were made based on different information source (e.g., user research, preliminary evaluation, and competitive analysis), which were experimental and needed verification. The specific question helped me quickly verify the design idea of having learners marking
section completion manually. The design might need further improvements, but at least the direction was confirmed to be correct.

Integration of Web experience analysis might have less value as moving forward to later design stage, when core features and elements are already verified, and subtler tweaks are required. That being said, I argue the integration of Web experience analysis on early usability testing can provide design insights that are unattainable otherwise.

5.4 Limitations

The study may have been subjected to certain limitations that prohibited ideal design and execution.

One major limitation was the composition of participants in the cognitive walkthrough study. Due to the limited timeframe and limited pool of participants, there were no participant had special training in Web usability and were familiar with the concept and procedures of cognitive walkthrough. In addition, due to limited experience on conducting cognitive walkthrough study myself, the cognitive walkthrough study session was not executed very effectively. Much time were collapsed into discussions on possible design solutions instead of identifying usability issues. The fact that none of the participants had background specially on designing online learning platforms, further reduced the value of design solutions discussed. Overall, the value of this cognitive walkthrough study was not maximized due to these limitations. Reflecting upon this, I suggested more preparation work should be done both on training oneself as an
authoritative facilitator, and training participants to better comply with the focus and procedure of the study.

Another major limitation was caused by my limited programming proficiency in this limited timeframe of study. Some features and functions were not implemented in the working prototype, such as offering transcriptions to address the accessibility design considerations, implementing comments and social sharing functions to enhance interactivity of the platform. Lack of implementations made testing of some designed tasks impossible in the usability testing study, which reduced the value of the study. Furthermore, a major user group – content administrators and course instructors was not included in this research and prototype design. Therefore, the final prototype was not user-friendly for this particular user group. For example, creating and uploading educational contents currently requires writing codes. The cost of using and maintaining the platform thus is very high at this stage.

5.5 Directions for Future Research

This study tapped into a specific area of online learning platform design, focusing on designing and delivering a platform of leaning online self-presentation management. Though with a narrow focus, several new design guidelines were suggested, as well as some implications on improving the design and evaluation procedures. There are many design problems remain unsolved in the area of online learning platform design. For example, high drop-out rate of online learning platforms (Daniel, 2012) still posts questions on whether designs
are really effective on motivating learners and offering good learning experience. Another example is to follow a discovery found in the competitive analysis study in this paper: social sharing is widely enabled in online learning platform design. It is interesting to investigate how exactly those out-of-site social media support affect learners’ learning experience and general user experience towards these learning platforms. Do they merely help the site to draw more traffic or do they actually also help motivate learners and result in less drop-outs? Besides solving universal problems of online learning platform, research can also be done in a narrower venue, such as using this working prototype to study learners’ completion rate and conversion-to-practicing rate longitudinally, in order to measure the effectiveness of such a learning platform and further inform design for online learning platforms.

5.6 Conclusion

This study successfully delivered a working prototype of proposed learning platform through a UCD design process. Contributions of the study are three-fold: besides the actually working product, this study offered new design guidelines for online learning platform design, and improvements on design methods and procedures for similar design studies.
LIST OF REFERENCES
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Appendix A. Post-Task Survey of Usability Testing Study

<table>
<thead>
<tr>
<th>What is the difficulty of this task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Difficult</td>
</tr>
<tr>
<td>Difficult</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Easy</td>
</tr>
<tr>
<td>Very Easy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How satisfied are you with the process in order to accomplish the task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dissatisfied</td>
</tr>
<tr>
<td>Dissatisfied</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Satisfied</td>
</tr>
<tr>
<td>Very Satisfied</td>
</tr>
</tbody>
</table>
## Appendix B. Post-Session Survey of Usability Testing Study

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think that I would like to use this site in the future to learn more about online identity.</td>
<td></td>
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<tr>
<td>I found the site unnecessarily complex.</td>
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<tr>
<td>I think the site was easy to use.</td>
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<tr>
<td>I think that I would need the support of a technical person to be able to use the site.</td>
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<tr>
<td>I found the various functions in the site were well integrated.</td>
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<tr>
<td>I found there was too much inconsistency in this site.</td>
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<tr>
<td>I would imagine that most people would learn to use this site very quickly.</td>
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<td></td>
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</tr>
<tr>
<td>I found the site very cumbersome to use.</td>
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<tr>
<td>I felt very confident using the site.</td>
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</tr>
<tr>
<td>I needed to learn a lot of things before I could get going with this site.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I am satisfied with the visual design of the site.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will recommend this site to my friends.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C. IRB Approvals

To: MIHAELA VORVOREANU
From: JEANNIE DICLEMENTI, Chair
Social Science IRB
Date: 03/03/2014
Committee Action: Approval
IRB Action Date 02/28/2014
IRB Protocol # 1401014428
Study Title Design and evaluation of an e-learning service for online self-presentation education
Expiration Date 02/27/2015

Following review by the Institutional Review Board (IRB), the above-referenced protocol has been approved. This approval permits you to recruit subjects up to the number indicated on the application form and to conduct the research as it is approved. The IRB-stamped and dated consent, assent, and/or information form(s) approved for this protocol are enclosed. Please make copies from these document(s) both for subjects to sign should they choose to enroll in your study and for subjects to keep for their records. Information forms should not be signed. Researchers should keep all consent/assent forms for a period no less than three (3) years following closure of the protocol.

Revisions/Amendments: If you wish to change any aspect of this study, please submit the requested changes to the IRB using the appropriate form. IRB approval must be obtained before implementing any changes unless the change is to remove an immediate hazard to subjects in which case the IRB should be immediately informed following the change.

Continuing Review: It is the Principal Investigator's responsibility to obtain continuing review and approval for this protocol prior to the expiration date noted above. Please allow sufficient time for continued review and approval. No research activity of any sort may continue beyond the expiration date. Failure to receive approval for continuation before the expiration date will result in the approval's expiration date. Data collected following the expiration date is unapproved research and cannot be used for research purposes including reporting or publishing as research data.

Unanticipated Problems/Adverse Events: Researchers must report unanticipated problems and/or adverse events to the IRB. If the problem/adverse event is serious, or is expected but occurs with unexpected severity or frequency, or the problem/even is unanticipated, it must be reported to the IRB within 48 hours of learning of the event and a written report submitted within five (5) business days. All other problems/events should be reported at the time of Continuing Review.

We wish you good luck with your work. Please retain copy of this letter for your records.