AN EXPLORATORY STUDY OF VALUES ALIGNMENTS IN A TEACHER PROFESSIONAL DEVELOPMENT DIGITAL BADGE SYSTEM

Sheryl L. Grant

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Information and Library Science.

Chapel Hill
2017

Approved by:

Barbara Wildemuth

Gary Marchionini

Sandra Hughes-Hassell

David Gibson

James Diamond

ABSTRACT

Sheryl L. Grant: An Exploratory Study of Values Alignments in a Teacher Professional Development Digital Badge System
(Under the direction of Barbara Wildemuth)

This exploratory study used case study methods to identify whether value alignments between users and system features could be detected in an online digital badge system and learning environment, and if so, whether those value alignments could be said to affect use of the system. Values are "guiding principles of what people consider important in life" (Cheng & Fleischmann, 2010, n.p.) and are believed to have explanatory power in predicting behaviors and attitudes (Schwartz, 2007). A value sensitive design research method had to be devised anew to address the research questions and is arguably the major contribution of this study. First, a self-report scale (Portrait Values Questionnaire-RR) developed by Schwartz et al. (2012) was used to categorize the pragmatic values of teachers and administrators using the online VIF Learning Center badging into four higher order values*: self-transcendence, conservation, openness to change,* and *self-enhancement*. Statistically significant differences were found between male and female teachers, but not between teachers and administrators, nor between teachers mandated to use the system and those for whom use was optional. Second, the 19 values of Schwartz's revised and refined theory of basic human values were used to assign human values to 11 feature-action pairs identified in the VIF Learning Center's digital platform. Usage of the feature-action pairs was sparse, and data were spread unevenly, suggesting possible data loss or an indication that technical affordances were weak drivers of participation and engagement.

ACKNOWLEDGEMENTS

I had wonderful support while writing this dissertation. I am so grateful to Barbara Wildemuth, my advisor, who literally wrote the book on methods for our field, and gave me the confidence to devise a new method for my own study. Her door was always open and she provided the exact kind of support I needed, from start to finish.

I am so grateful, too, for my committee. When I started this work, few people were familiar with open digital credentialing platforms. It was my good fortune to have David Gibson and James Diamond, distinguished scholars and experts in the areas that thread throughout my research, agree to be on my committee. Their trans-disciplinary feedback and thoughtful questions always made the work feel relevant to real-world applications, and I owe them both a tremendous amount for their contributions and their friendship throughout the process. Sandra Hughes-Hassell and Gary Marchionini provided much-appreciated practical suggestions during the dissertation process and graciously provided invaluable feedback. Information and library science topics can be far-ranging; Gary and Sandra's intellectual curiosity and ability to see important connections made the research that much better.

Cathy Zimmer at UNC's Odum Institute deserves a special mention. She is a true master, and brought a Zen-like calm to statistical consulting; meeting with her to discuss my analyses was a highlight of doing this research.

I have to thank the wonderful staff at VIF International Education for granting me access to their data, for being so generous with their time, and most of all, for their friendship, humor, and moral support. Without them, this research truly would not be possible. In particular, I am

grateful to Julie Keane, who infused her New York can-do attitude into my dissertation-fu; to Mark Otter, whose talent for making good ideas work is what persuaded me to focus on the VIF platform; to Jenny Bao and Tania Tani, two of the loveliest people I have ever met, who were invaluable during data collection and analysis. Lauren Hanford and Arne Plum offered their time and knowledge in more ways than one. Together with Shaun Kellogg, they provided context for the participants, the program, and the database in ways that were invaluable. Lucas Blair of Little Bird Games, and Kerri Lemoie at OpenWorks Group consulted on the platform and are two of the best people on the planet. Just knowing them made everything all better.

I want to thank my wonderful HASTAC family for what can only be considered extreme support: Mandy Dailey and Kaysi Holman, who listened politely for years as I developed my research and who leant their incisive talents to the coding process. These are people you want in a crisis. Demos Orphanides is a world-class listener and a great appreciator of the absurd, two great qualities in a colleague and friend. Anh Nguyen was a mainstay of support and provided an important kind of laid-back impatience about finishing things up and getting on with my life. His willingness to field technical questions about platform design and systems engineering was invaluable. I am grateful to the Digital Media and Learning community of scholars, educators, and researchers for working so diligently to make open digital credential platforms a thing; I became an accidental expert in a brand-new field still defining itself thanks to their efforts. In particular, thank you to Chris Gamrat, a fellow PhD student, who was invaluable for commiseration.

This is where I say a special thank you to two people who mentored me in ways that have no parallel. Cathy N. Davidson counseled, listened, laughed, and when necessary, directed me up and over and through. She is the rare person who can lift a person out of a dark spot and make it

seem like one of life's great lessons. I am certain that I would not be the person I am today without her, and could write pages about the ways she has touched my life, personally and professionally. Thanks to Cathy's leadership, HASTAC has been the best home base for doing scholarly work imaginable, with people I am truly privileged to work alongside.

There are no words to describe David Carr, my professor and dear friend who passed away too soon. He is the kind of teacher who comes along once in a lifetime, and the kind of friend who shows up more often the harder things get. His wisdom, compassion, and humor lifted me out of one quagmire after another, whether professional or personal, large or small, and I will never forget how kind and generous he was with me, whether it was to share a poem, a book, a photo, a story about his life, or that jumbo-size graph paper he insisted would help organize my thoughts. He is responsible for listening to my early ramblings and telling me I was talking about human values, the backbone of this research.

I dedicate this work to David Carr, who was there from the very beginning, who put everything in perspective, and who passed away before I could finish. I miss him every day.

I dedicate this work to my beloved partner and best friend, Chris Manik, who joined me in the last five years of this adventure, and who bore witness to the final writing frenzy that surely must have driven him nuts. He was always there, for everything, and his love and support have been nothing short of amazing.

Last and most, I dedicate this work to my son, Walker Grant Harrison, the joy of my life and reason for everything. I worked on this dissertation around the edges of his life; even so, he lived through every moment of this with me, and put the meaning in all of it. He was shorter than me when I started and now towers above, which is a testament to how long it really took finishing this work. Were it not for his rock-solid belief that I should and could and would finish, this work would be forever on hiatus.

TABLE OF CONTENTS

LIST OF TABLES xii

LIST OF FIGURES xiv

LIST OF ABBREVIATIONS xv

CHAPTER 1: INTRODUCTION 1

Significance of the Study 4

Problem Statement and Research Questions 11

Organization of the Study 12

CHAPTER 2: REVIEW OF RELATED LITERATURE AND RESEARCH 13

Technology-Mediated Social Participation 14

Participation in digital environments 15

Types and degrees of participation 17

Community types and motivations to contribute 20

Morals, values, and motivation 23

Peer feedback and assessment 25

Teacher online professional development and social participation 28

21st Century Learning and Digital Badges: From Authority to Credibility 30

Defining open digital badges 32

From digital badges to open digital badges 34

Wikipedia Barnstars 37

Stack Exchange badges 40

Badges in education 42

Values, Motivation, and Technical Artifacts 45
Schwartz's basic human values and pragmatic values 47
Dimensions of values 50
Values inventories 53
Schwartz's Portrait Values Questionnaire 58
Teacher values 58
Summary of Literature Review 61
CHAPTER 3: METHODS 63
Research Questions 64
Research Design Rationale 65
Rationale for Case Selection 67
Participants and Context 69
Addressing Research Question 1: Users' personal values 76
Scoring the PVQ-RR 79
Scoring for the 19 values in the PVQ-RR 80
Scoring higher order values 82
Addressing Research Question 2: Values enacted in system features 86
Step 1: Identifying features 89
Step 2: Assigning values to features 97
Addressing Research Question 3: Effects of values alignment on system use 101
System use as represented in web logs 102
Locating web log data 104
Analysis of the web log data 106
Summary of Methods 106
CHAPTER 4: FINDINGS 107

Findings for Research Question 1: Users' personal values 107
Characteristics of VIF Learning Center system user survey respondents 108
Comparing higher order values across sub-groups 110
Findings for Research Question 2: Values enacted in system features 112
Overview of the post hoc technical investigation 113
Frequency of values assigned 116
Frequency of higher order values assigned 117
Refining the feature-value pairs 120
Findings for Research Question 3: Effects of values alignment on system use 121
Identifying survey respondents in web log activity 122
Summary of Findings 123
CHAPTER 5: DISCUSSION 125
Discussion of Research Question 1: Users' personal values 127
Survey data quality 127
Comparison of current findings with prior studies on teachers' values 128
Gender 130
Administrators and teachers 131
Summary of Research Question 1 Discussion 131
Discussion of Research Question 2: Values enacted in system features 132
Identifying features: Multiple functions 132
Assigning values to features 135
Coder values and frequency of values 144
Resolving coder disagreements 145
Summary of research question 2 discussion 145

Discussion of Research Question 3: Effects of values alignment on system use 147
Steps to locate missing data 147
Data cleaning 149
Summary of research question 3 discussion 150
Summary of Discussion 151
CHAPTER 6: IMPLICATIONS AND CONCLUSION 153
Implications for value sensitive design methods 155
Pragmatic values 155
Technical investigation 157
Implications for design 158
Conclusion 161
APPENDIX A: RECRUITMENT EMAIL 163
APPENDIX B: PORTRAIT VALUES QUESTIONNAIRE 164
APPENDIX C: FEATURE-VALUES CODING INSTRUCTIONS 166
APPENDIX D: DEFINITIONS & DISTINCTIONS OF 19 VALUES 171
APPENDIX E: STATISTICS & T-TESTS FOR N=536 173
APPENDIX F: T-TESTS OF HIGHER ORDER VALUES 175
APPENDIX G: FREQUENCY AND DISTRIBUTION OF OBSERVATIONS 179
APPENDIX H: FEATURE-VALUE CODING AND COMMENTS 182
REFERENCES 190

LIST OF TABLES

Table 1. Questions to guide values dimensions (Shilton, Kloepfeltzer, and Fleischmann, 2014) 52

Table 2. Critical heuristics for both identifying and checking values (Yetim, 2011) 53

Table 3. Schwartz's 19-Value Inventory (Schwartz et al., 2012) 55

Table 4. Sample of the 19-Value Item PVQ-RR (Schwartz et al., 2012) 78

Table 5. Scoring key for 19 values in the PVQ-RR value scale 79

Table 6. Example PVQ-RR scoring of 19 values for an individual 81

Table 7. Example PVQ-RR higher order scoring for an individual 84

Table 8. VIF Learning Center features identified 95

Table 9. Final set of VIF Learning Center features and categories 96

Table 10. Critical heuristics for identifying and checking pragmatic values (Yetim, 2011) 98

Table 11. An ethogram of feature-tables in the VIF Learning Center 103

Table 12. Revised ethogram with data tables available for web log analysis 105

Table 13. Descriptive statistics: survey respondents, n=342) 108

Table 14. Summary of centered scores for higher-order values (n=342) 109

Table 15. Centered scores for higher-order values by sub-group (n=342) 110

Table 16. Male and female higher values t tests (n=342) 111

Table 17. Administrator and teacher higher values t tests (n=342) 111

Table 18. Mandated-use and optional-use teacher higher values t tests (n=342) 112

Table 19. Feature-value sets and resulting higher-order values 114

Table 20. Frequency of values assigned to features 117

Table 21. Frequency of higher order values assigned 118

Table 22. Final higher order feature-value pairs available for analysis 121

Table 23. Frequency of feature-actions for the cover.upload feature 123

Table 24. Coder comments appended to feature-value pairs 137

Table 25. Context in coder comments 141

Table 26. Frequency of value codes selected by coders 144

LIST OF FIGURES

Figure 1. Schwartz's Value Circumplex (Schwartz et al., 2012)..... 56

Figure 2. VIF Learning Center site architecture 93

LIST OF ABBREVIATIONS

MOOCs	massive open online courses
MRAT	mean rating
NGO	non-governmental organizational
OBI	open badges infrastructure
OED	Oxford English Dictionary
PVQ-RR	Portrait Values Questionnaire
SVI	Schwartz's Values Inventory
VIF	Visiting International Faculty
WCD	worth-centered design

CHAPTER 1: INTRODUCTION

This exploratory study sought to identify whether value alignments between users and system features could be detected in an online digital badge system and learning environment, and if so, whether those value alignments could be said to affect use of the system. As such, an understanding of human values is central to this research. Values are "guiding principles of what people consider important in life" (Cheng & Fleischmann, 2010, n.p.) and are believed to have explanatory power in predicting behaviors and attitudes (Schwartz, 2007). Values can be pragmatic, ethical, or moral. For example, a *pragmatic* value is primarily concerned with solving problems in the material world (e.g., how best to develop a user interface in response to well-defined goals); an *ethical* value considers what is good for one's self (e.g., reflections on what is good for a user's career or well-being); a *moral* value considers what is equally good for all (e.g., whether it is just to discriminate against users based on religious or ethnic backgrounds). This study investigated whether teachers in one particular online learning environment might be more motivated to engage with the system's features that align with their pragmatic values than with those features that did not align. It examined, in particular, how pragmatic values such as *achievement* and *benevolence* were embodied in the properties associated with the system features. In addition, it sought to understand the motivational role of pragmatic values in the teacher's use of the technical system, and whether some types of technology-mediated social features work better in some contexts than in others. While ethical and moral values may follow from, or be entailed by, the pragmatic values addressed, collection of data and a discussion concerning these values were beyond the scope of this study. Similarly, while the relationship

between online learner participation in a digital badge system and learning outcomes is an important area worthy of study, this research limited itself to questions about pragmatic values, motivation, and participation.

The VIF (Visiting International Faculty) Learning Center's online learning system provided a specific instantiated case of a digital badging system, in which micro-credentials were used to motivate and recognize behaviors. VIF's teacher professional development approach is based on a theoretical framework that integrates "technology, pedagogy, and content through a flexible social platform" (VIF Learning Center, 2016, n.p.). This study focused on the *interest-driven* and *sociotechnical* features of the platform, and how these aspects could be leveraged to deepen engagement in the *service* of learning, rather than with the impacts on learning itself. The study is firmly situated within the theories and methods of information sciences, and addresses a clearly defined theoretical gap in which value sensitive design methods are applied to information behaviors in an informal learning environment. Value sensitive design focuses on the way technological innovations are shaped by, and in return shape moral, ethical, or pragmatic values (Friedman & Nissenbaum, 1996; Nissenbaum, 2009). It is derived from a research framework that addresses the multiplicity of values in sociotechnical systems, and claims that a given technology may be more suitable for certain activities; therefore, certain values (and the behaviors and actions that follow) are supported while others are not. Though "learning is implicated in ideas of information behavior and information contexts" and "is implicated in online interaction and collective building" (Anh & Erickson, 2016, p. 81), it is users' motivation to engage with features in an interest-driven, social platform that impelled the research, particularly in the context of a value sensitive design approach.

While there are philosophical arguments about the degree to which values can be manifest in digital features, we can infer that embodied values are associated with the properties of those features (Van de Poel & Kroes, 2014). Researchers argue that technologies can contain embedded values, and are therefore a worthy focus of study (Winner, 1980; Fleischmann, 2014; Friedman, 1997). For example, research has indicated that when the embodied values of digital features are aligned with users' values, rapid adoption and long-term acceptance are more likely to occur (Kujala & Väänänen-Vainio-Mattila, 2009). This study applies the methods of exploratory research (e.g. pattern seeking without hypotheses, flexibility in scope and an openness to expansion or reduction of scope based on early findings and indications, looking at data to see what it seems to say; see (Tukey, 1977)); it involves a mix of methods as part of case study research: a user survey, a technical investigation, and web log analysis. These methods are used to explore whether alignments between teachers' values and the pragmatic values embodied in technological features can be detected in the VIF Learning Center digital badge system, and whether those alignments might foster more user participation.

A digital badging system is a particularly interesting study site for an exploratory study because badges not only *contain* value (as credentials carrying potential currency within a medium of exchange), they also *reflect* values designed into and embodied within the larger sociotechnical system. Open digital badges are relatively new web-enabled features that contain metadata, and are designed to "make specific claims about learning and offer detailed evidence in support of those claims" (Hickey, Ito, Schenke, Tran, Otto, & Chow, 2013, n.p.). Typically, these digital badging systems include many other sociotechnical features of networked technologies designed to increase social participation, discussed in more detail below. As Halavais (2012) writes, badges "can serve as a clear way of expressing what is valued by a

community, they encourage participation by those interested in the badges, [and] they provide the means to identify more closely with the learning experience" (p. 371). Embodied values are also present in other aspects of the badge system, including peer assessment features such as rating, ranking, voting, "liking," and commenting. Evaluating values embodied in badges as well as values associated with the larger feature set that delineates a badge system could conceivably identify alignments between embodied and realized values. The VIF Learning Center teacher professional development platform presents a compelling use-case to examine whether the alignment of human values and values embodied in technical artifacts has explanatory power in digital environments.

Significance of the Study

Digital badging systems designed for learning are a recent innovation, and empirical research on their design and use is limited. Despite this lack of research, a growing number of organizations have built digital badge systems before fully functioning use cases have been deployed and evaluated. Thus, this study is important and needed for several reasons. First, it addresses a clearly defined theoretical gap in which value sensitive design methods are applied to information behaviors in an informal and online learning environment. The study contributes original research about digital badge system design by grounding it in a conceptual framework that ties together research literature on value sensitive design and technology-mediated social participation research from the information sciences. In particular, it clearly defines a set of rigorous methods that can be replicated in other value sensitive design studies, especially post-hoc analyses of pragmatic values in information platforms. Determining whether digital features complement or conflict with the predominant values of users is knowledge that could contribute to a better understanding of information behavior. Specifically, it is useful to examine whether

human values have explanatory power with regard to user participation at the feature level and whether certain conditions can contribute to subsequent long-term adoption of the system.

Digital badge systems, like other sociotechnical systems, express trade-offs in values; thus, design decisions about how they will function are critically important. A post-hoc analysis of value alignments between the features of the system and its users would allow researchers to evaluate how pragmatic decisions and technical choices at the coding and design level influenced possible actions and outcomes, conceivably favoring certain values and behaviors over others. Choices made while designing new technologies can influence the way users engage the system, and potentially affect the way people associate with one another, not only online but in the offline social systems in which they function (Winner, 1980; Nissenbaum, 2009). While this potential is influenced by the explicit and implicit assumptions and human values that developers bring to the design task (Hirschheim & Klein, 1989), it is also potentially influenced by the underlying personal values that drive users' motivations, helping to explain why people voluntarily interact (or do not) with the platform and each other in digital environments.

Second, the significance of this study addresses a trans-disciplinary gap in the study of online learning platforms. Ahn and Erickson (2016) call for researchers to "illuminate the margins between fields and seek to fill in the gaps of respective perspectives" (p.83) between learning sciences and information sciences. This study addresses that gap in part by leveraging research and methods that highlight the role of information structures in the service of learning, particularly in an innovative digital badging system in which credentials are issued. Functioning as credentials, open digital badges are containers that include metadata aligned with standard technical specifications for the purpose of earning, exporting, importing, and collecting badges from different learning contexts so that learners can share them elsewhere. This quality sets them

apart from other types of technology-mediated social participation that tend to tether a person's reputation or credentials to the platforms where they were earned. In comparing traditional badges with these newer digital counterparts, Halavais (2012) writes that traditional badges have "baggage," and that the regimental and hierarchical values they carry with them can conflict with values more commonly associated with online communities and platforms that have become the foundations for many modern digital badge systems. Predating the Internet, badges were used to signal rank and membership within a group, whether literally affixed to a uniform or figuratively evoked to symbolize the status, achievement, reputation, or membership within a social class (Simpson & Weiner, 1989). Traditional badges provided social proof for desired attributes. They functioned as both incentive and reward while signaling key information about the badge owner's identity, and physically owning a badge could indicate whether someone had access to specific privileges and opportunities. Digital badges function in many of the same ways as these precursor badges, and coexist with other online features designed to increase engagement and activity, including profits for commercial sites. As Halavais observed, digital badges "are being used in settings where autonomy and community are emphasized" (2012), despite the potential for latent values that may work at cross-purposes with explicit or implicit community goals. Research from the information sciences can bring forward new insights into online learning environments that are designed to be social and interest-driven, conditions that are becoming more common across 21st century learning platforms, especially as digital badging practices expand.

Similar to other social practices that predate the Internet, our existing systems for credentialing have not stayed current with massive shifts in how we work and learn due to networked technologies. Digital badge systems represent a 21st century shift toward new social

and educational practices, such as use of personal education records (Eisenberg & Fullerton, 2012) to signal our credentials and reputations. Personal education records give learners a greater degree of ownership over the body of electronic evidence that accrues throughout their lifetimes, similar to what open digital badge systems are purportedly designed to do. Open digital badges, however, represent more than evidence of learning; like certificates, degrees, and transcripts, they serve to function as a "medium of exchange that permits activities performed in one institution of the system to be substituted for the same activities as if they had been performed in another" (Green, 1980) and, depending on how they are designed, can represent curricular blocks of learning that are smaller than the course level. As credentialing mechanisms, digital badge systems also have the potential to favor what kind of sociotechnical behaviors are valued, how those behaviors are implemented, and how (or whether) learners are motivated to participate in those behaviors. Since system designers can inadvertently transfer value judgments to specific features or functions during the development phase (Hirschheim & Klein, 1989), enacted values in the system may conflict with the personal values of potential users and inhibit optimal use or limit widespread adoption of the system (Yetim, Widenhoefer & Rohde, 2011). Sociotechnical features can inadvertently curb the pursuit of learning, especially when that learning is optional and situated in social environments such as the communities of practice cultivated in online teacher professional development platforms.

Furthermore, sociotechnical assessment features in information platforms like the VIF Learning Center represent a particularly interesting intersection of study between information and learning sciences. Assessment, a form of evaluation we often equate with school-based examinations, can be defined more broadly as an "integral part of all human learning" that arises whenever social groups seek ways to mentor and police participants (Gee, 2011, p. 13). For

example, in the information sciences, assessment is often associated with reputation systems and peer feedback mechanisms used to increase social participation. With the emergence of digital badge systems, this type of assessment often appears side-by-side with more educative assessment practices that can include self, expert, peer, and algorithmic approaches either in the *service* of learning (i.e., to promote deeper or more social engagement), which is addressed in this study, or to assess the learning itself (i.e., to gauge or aid learner progress), which aligns more with learning science research and objectives. If "assessment is about shaping the direction of society and its members" (Schwartz & Arena, 2013), the values associated with assessment practices are particularly relevant to badge systems, including sociotechnical-based peer feedback (i.e., "upvoting," "liking," rating, ranking, "following," etc.) of the kind found in the VIF Learning Center badge system. Behavior, abilities, skills, or achievements being assessed and recognized in many sociotechnical systems may align with values that can undermine or negatively influence user motivation. Digital badges that are issued in social Q&A sites like StackOverflow.com, knowledge networks like Wikipedia.org, and online gaming platforms such as Xbox 360, involve assessments that range from simple point systems to elaborate algorithms, and are largely designed to promote pro-social behaviors and deeper levels of engagement. These networks and platforms also use badges as incentives and rewards in combination with other types of technology-mediated social participation, such as leaderboards, tagging, and commenting, among other features. While these features may motivate engagement in some communities, they may have the opposite effect in communities with different values, such as benevolence-oriented values in collaborative communities versus achievement-oriented values in competitive environments. As mentioned above, this study sought to investigate whether values

alignments can be detected between users' pragmatic values and the values associated with a feature set in an online learning platform.

Furthermore, the significance of this study contributes knowledge to research on teacher online professional development platforms. As discussed in Chapter 2, while a comprehensive research agenda for online teacher professional development has called for more empirical studies and theory building as the field grows (Dede et al., 2009), research on learner motivation and participation in these environments is limited (Chen & Jang, 2010). Digital badge systems are currently being designed for traditional institutions of learning such as schools and universities, as well as out-of-school learning, workforce learning, and professional development. Some of the most promising work is taking place in teacher professional development platforms (Gamrat et al., 2014; Casilli & Hickey, 2016; Diamond & Gonzalez, 2016), including the teacher professional development digital badging system that is the focus of this study, VIF Education International, which was initially founded as an international teacher exchange program. In the VIF Learning Center online credentialing platform, which piloted in 2013, teachers (both American and international) progress through professional development modules and earn digital badges that represent competencies in global curriculum and instruction by "collaborating with peers" and creating "globally themed lessons" (VIF Education International, 2014, n.p.). Educators that complete 40 hours of professional development are eligible to earn a Global Ready Teacher digital badge designed to be recognized by external stakeholders, including employers and, in some cases, government agencies (i.e., North Carolina State Board of Education's recognition of the Global Educator Digital Badge)[1]. Teachers participate in the VIF professional development platform network with one another through

[1] http://www.dpi.state.nc.us/globaled/actions/item1-2

discussion forums and groups in which they share ideas on how to apply module topics in classrooms and develop lesson plans with global themes. VIF Learning Center also provides an infrastructure for district administrators and state policymakers to identify evidence of global-ready teaching in their schools, and offers Global Gateway professional development badges:

> Digital badging provides a way for teachers to share visual representations of their achievements and opens doors to exciting professional opportunities… Teachers can build digital portfolios complete with badges as they progress through professional development modules and can share their achievements in the VIF community, via social media, and with administrators and district personnel. With Global Gateway PD, proficiency in global education can be demonstrated through a portable badging credential recognized by schools, districts and state and national institutions. (VIF Education International, 2014, n.p.).

The VIF Learning Center makes a compelling study site because teachers can be engaged along a spectrum of participation from fully optional to fully mandatory depending on their institutional affiliations. The VIF Learning Center may be able to foster a sense of community among members who reflect and share values, which could potentially increase participation, an important goal for an organization that intends to scale their system by relying on peer assessment of learning artifacts. Could human values and values alignments influence participation in the platform? According to Schwartz (1992), individuals use personal values as criteria to select and justify actions, and occupations are an important way individuals express those values (Knafo & Sagiv, 2004). Schwartz's theory of personal values, reviewed in Chapter 2, also suggests that there are dominant values associated with different occupations. For example, teaching has been found to be a social occupation in which individuals attribute high importance to values of *benevolence* and low importance to values of *power* and *achievement* (Knafo & Sagiv, 2004). Thus, this study investigated whether teachers are more likely to engage with system features that align with their predominant values.

Last, an exploratory study that addresses emerging technology brings with it both opportunities and challenges that are well served by case study methods, even when researchers have some "*a priori* notions of critical variables and how they will be measured" (Benbasat, Goldstein & Mead, 1987, p. 371), as is the case with this research. The nature of information systems is that they are "characterized by constant technological change and innovation" (Benbasat, Goldstein & Mead, 1987, p. 370) and the boundaries of the phenomena of interest were not entirely evident at the outset of this research. An exploratory mindset and approach is an asset when researching phenomena that can change, a predisposition that became a salient point during the course of this study. As such, knowledge gained from investigating a single case that was susceptible to change provided valuable knowledge for conducting future studies in similar environments. These lessons learned became a major contribution of this research.

Problem Statement and Research Questions

This study aimed to identify value alignments between users and system features in a teacher professional development badge system. Specific objectives were: 1) to identify how value alignments might be detected between teachers and digital features of the VIF Learning Center digital badges system; 2) to investigate the effects of any value alignments on social participation in a digital badging and learning environment; and 3) to identify possible ways to improve the detection of alignments between teachers' human values and the values associated with the system's feature set.

The study aimed to provide evidence to address the following research questions:

RQ1: What are the pragmatic human values (versus ethical and/or moral values) of teachers and administrators using the platform?

RQ2: How can pragmatic human values be ascribed to technical features of the system? What pragmatic values can be ascribed to the features of the platform?

RQ3: How can alignment between personal values and the values embodied in system features be detected? If alignment can be detected, does it positively influence use of particular features?

RQ3a: How does teacher participation vary across contexts? Specifically, can differences in activity levels be detected in contexts where participation is mandatory (i.e., where superintendents or principals mandate participation) versus where participation is optional?

Organization of the Study

This chapter presented the introduction, significance of the study, and statement of the problem. The remainder of the narrative will be divided into five chapters. Chapter 2 contains a comprehensive review of literature and research related to the problem being investigated, including three sub-sections that provide an overview of technology-mediated social participation; digital badges in the context of 21st century learning; and value sensitive design methodology. The methods and procedures used to gather data for the study are presented in Chapter 3, including how cases were selected; different methods of data collection employed; and how the data were analyzed. The results of analyses and findings to emerge from the study are presented in Chapter 4 and discussed in Chapter 5. Chapter 6 contains implication for future research, implications for design, and a conclusion.

CHAPTER 2: REVIEW OF RELATED LITERATURE AND RESEARCH

The alignment of human values in an online teacher professional development digital badge system can be situated within a wider disciplinary conversation about (1) technology-mediated social participation; (2) digital badges designed for 21st century learning; and (3) value sensitive design in sociotechnical platforms. The review of relevant literature below is therefore divided into sections that correspond to these three broad themes.

The first section provides an overview of technology-mediated social participation research that includes: (1) types of sociotechnical platforms and online communities; (2) types of participation in these networks; (3) community types and motivations to contribute; (4) morals and values as motivations to participate; (5) peer assessment and feedback; and (6) teacher online professional development communities. This literature grounds the current study in the context of motivation and human information behaviors in online communities, a broader field of research that can inform our understanding of similar behaviors in online learning platforms.

Badges are an emerging type of technology-mediated social participation that warrant special attention given their multifaceted properties and elevated importance within many online learning platforms. Thus, the second section of the literature review provides a brief overview of digital badges and 21st century learning, including: (1) current trends in education practices; (2) a brief evolution of digital badges; (3) Barnstar badges in the Wikipedia editor community; (4) badges in Stack Exchange communities; and (5) badges in education.

The third section provides an overview of human values research, including discussions of: (1) pragmatic, ethical, and moral values; (2) dimensions of values research; (3) values

inventories; and (4) teachers' values. This last section ties together the specific focus of this study, which is to approach the research questions in the context of pragmatic values and motivation.

Technology-Mediated Social Participation

Digital badge systems are situated within a broader research framework referred to in the literature as technology-mediated social participation, which describes both the social media technologies (i.e., wikis, blogs, forums, social networking, media making and sharing, virtual worlds, etc.) and the participatory and collaborative behaviors supported by those technologies (Shneiderman et al., 2009). Many, if not most, badge systems are built as platforms that combine these social media technologies in one form or another. Badges for learning serve at least three purposes, including the ability to: 1) incentivize learning; 2) map progress and foster discovery; and 3) signal completion with a credential that holds value outside the community (Gibson, Ostashewski, Flintoff, Grant & Knight, 2013). It is the use of badges to incentivize learners to engage in pro-social behavior that has received the most attention in the literature. As described in promotional materials on their website, the VIF Learning Center provides an online community for educators:

> Tailored groups allow community members to interact on more personal levels, and each group has its own focus, photos, videos and events section. Discussion forums allow teachers to initiate conversations relevant to their groups or to take part in discussion threads... Helpful photo and video galleries offer real insights into global classrooms and allow members to share the global initiatives happening in their own classrooms. At the heart of the VIF learning center is a collaborative community of teachers and administrators who share a commitment to bringing global perspectives to their students.[2]

Technology-mediated social participation is particularly relevant to the VIF Learning Center badge system, which depends on voluntary participation from peers in order to scale and foster

[2] https://www.viflearn.com/a-community-of-educators-overview

optimal use of the system. The following section addresses more broadly the literature on technology-mediated social participation, then narrows to discuss more specific research on digital badges within this environment.

Participation in digital environments

Rheingold (1993) first described virtual or online communities as "cultural aggregations that emerge when enough people bump into each other often enough in cyberspace" (p. 57). Lave and Wenger (1991) describe these cultural aggregations as *communities of practice*, which are "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (n.p.). Benkler (2007) describes similar pro-social online behaviors as *commons-based peer production*, a framework "based on social signals and motivations to organize significant productive enterprises" (p. 2). Commons-based peer production and knowledge-sharing platforms like Github, a large open source code-hosting repository with social networking functionality, have heavily influenced the rhetoric around digital badge system design, including the VIF Learning Center. Designing and refining systems that foster pro-social behaviors is a major goal for online communities and commercial enterprises across the web. In 2006, Internet researchers estimated that only 1 percent of people were contributing content, 9 percent were editing, and the rest were consuming what others produced (Nielsen, 2006). Much of the online innovation in the past decade has focused on technology that increases participation, with reading and contributing on one end of the spectrum, to collaborating and leading on the other end (Preece & Shneiderman, 2009). Pirolli (2009) observed that, "The virtual environment is essentially a new niche for social and cognitive adaptation and evolution, because the virtual world has different constraints and affordances" (n.p.). While those constraints and affordances may differ from one sociotechnical system to another, the Holy Grail across the Internet has been to increase productive online

participation, particularly for commercial enterprises seeking to optimize advertising revenue, but also for learning platforms that seek to increase learner engagement, as is the case with many badge systems, including the VIF Learning Center. Digital badge systems, which are one way of making contributions and reputation visible to others, are a product of that quest.

In their *Open Badges* white paper (2011), Mozilla authors depict a badging infrastructure that is indistinguishable from online communities of practice and peer networks, and in fact functions as a sort of meta-community of learners using badges earned across the web to signal aspects of their identity to one another. These authors propose an infrastructure that would allow evidence of peer contributions (i.e., digital badges) to be earned, created, shared, and displayed across multiple contexts:

> …[imagine a] world where your skills and competencies were captured more granularly across many different contexts, were collected and associated with your online identity and could be displayed to key stakeholders to demonstrate your capacities…This evidence could be acquired automatically from your interactions with online content or peers, explicitly sought out through various assessments or based on nominations or endorsements from peers or colleagues. This would allow you to present a more complete picture of your skills and competencies to various audiences, including potential employers, mentors, peers and collaborators (n.p.).

Presenting online evidence of skill and ability to employers predates open digital badges. For example, recruiters seeking talented programmers were using online sites such as Github, Coderwall, and Stack Overflow to gather evidence of technical skills and other valued abilities (Capiluppi, Serebrenik, & Singer, 2013). GitHub's Open Source Report Card was designed to give developers a "global view of their contributions, skills and habits,"[3] and to track activity and display it in a way that others might find useful. In online communities like GitHub and Stack Overflow, developers implemented features designed to increase pro-social participation, a

[3] GitHub Report Card: http://osrc.dfm.io/

fundamental goal for sites that seek to encourage high-quality contributions. As people contribute to these types of online platforms, they build reputation by earning points, badges, or the approval of peers through "likes," voting, rating, commenting, following, ranking and other forms of peer feedback and assessment. As a result, individuals have the ability to build digital reputations directly linked to evidence that others can easily view. In many of these online communities, pro-social participation is both voluntary and fundamental to the success of the platform. Without some kind of peer assessment and engagement with technology-mediated social features, individuals may be less inclined to participate in the community. Conversely, if individuals find that the "rules" of peer assessment and feedback are unclear, onerous, unfair, or conflict with personal goals and values, they may be inclined to abandon the system.

Types and degrees of participation

Even though opportunities to engage in online social participation have increased in the last decade, many sites continue to experience low participation and high attrition rates, including popular learning environments like Coursera, Udacity, edX, and other massive open online courses (MOOCs). High-quality social participation can be difficult to sustain, especially with so many sites competing for users' attention and engagement. In the reader-to-leader framework, one of the more thorough conceptualizations of online participation to date, technology-mediated participation is characterized as reading, contributing, collaborating, and leading (Preece & Shneiderman, 2009), four categories that emphasize intentions, actions, and interactions. Within those categories, more defined actions occur, such as reading content, tagging photos, rating contributions, editing wikis, sharing videos, posting blogs, producing webinars, or developing open-source software, to name a handful of examples. Of these defined actions, teachers in the VIF Learning Center can read content; post and tag videos, photos, and albums; join groups; join group discussions; comment and reply to discussions, posts, photos,

videos, and albums; create and attend events; and vote on the quality of teacher-created learning plans.

Participation in most online communities is not necessarily successive, and may change over time in response to variables such as group size, interface design, individual goals, personality traits, and other possible influences (Preece & Shneiderman, 2009), including personal values, which have been correlated with the Big Five personality traits (Roccas, Sagiv, Schwartz & Knafo, 2014). System designers have therefore experimented with different features to encourage high-quality engagement, such as the use of badges, completion certificates, and a variety of sociotechnical and game-based features including leaderboards, customizable avatars, ranking systems, and different types of peer assessment. The ratio of technology-mediated social participation activities in the VIF Learning Center appears to reflect the norm for other online communities. In other words, a majority of users appears to be present without necessarily interacting with site features, in lieu of performing other activities more easily tracked within the system, such as social contributions (i.e., commenting, replying, "liking," voting, and posting photos or videos), peer collaborations (i.e., joining group discussions, creating or attending events; providing peer assessment on learning artifacts); and leading (i.e., creating groups, moderating discussions). Like other online platforms, VIF Learning Center seeks to increase both the quantity and quality of technology-mediated social participation within the system.

Motivating and sustaining high-quality participation in online communities is a challenge that researchers have sought to address from a variety of different perspectives (Koh et al., 2007; Olivera, Goodman & Tan, 2008). Despite massive collective digital activity across the web, the majority of online contributions tend to originate from a minority of users. Much of the research has focused on a *lack* of participation, otherwise known as lurking or "free riding" (Rafaeli,

Ravid & Soroka, 2004; Schroer & Hertel, 2009; Preece, Nonnecke & Andrews, 2004), a behavior that some researchers describe in less derogatory terms as observing, viewing, listening, and reading. Lurkers have been defined as a "persistent but silent audience" (Rafaeli, Ravid, & Soroka, 2004, p. 2) who may not contribute content but benefit from belonging to an online community, and who may become more participatory over time, given the right motivations.

As different types of social participation have become more commonplace across the web, research has begun to focus on other types of engagement. For example, *contributors* represent a category of individuals that display higher levels of social participation (Bishop, 2007). Wasko and Faraj (2000) defined contributions as voluntary acts of helping others by providing information, a general definition that Preece and Shneiderman (2009) expanded to include tagging photos, rating films, commenting on websites, adding images, rating posts, uploading videos, and other similar actions. Representing even more engaged levels of participation are *collaborators* who often make up a smaller but more productive group. In terms of online social participation, collaboration has been described as engagement in tasks that may last a few minutes (Preece & Shneiderman, 2009), or the creation of information in a wiki or open-source software program over lengthier periods of time. At the top end of the participation scale are *leaders* who distinguish themselves by contributing high volumes of content, mediating disputes, welcoming newcomers, creating new groups, influencing community policies, or taking responsibility for administrative duties (Preece & Shneiderman, 2009). In a system like VIF Learning Center, where collaboration is core to the platform, it is essential that teachers feel inclined to socially participate, not only to achieve their professional development goals, but to also create a scaffold of community engagement that can be sustained over time. If the professional development curriculum is sound but the social participation features are wanting,

teachers may be inclined to look elsewhere to advance learning or, if participation is mandated by their employers, to display only minimal or mandated effort.

While online social participation is thought to increase as a function of time, members do not always move progressively through levels of participation, and may instead jump to more active roles immediately; alternatively, they may decrease participation and abandon the community altogether (Arrasvuori et al., 2008; Porter, 2004; Kim, 2000; Youcheng & Fesenmaier, 2003). Participation is also likely to reflect conditions that Preece (2001) refers to as *people, policies,* and *sociability,* factors that influence modes of engagement in any given community. What motivates teenagers to participate in a file-sharing community will likely differ from teacher's motivation for participation in knowledge-sharing networks, particularly if the former is for recreation and the latter is mandatory. Despite an interest in the influences of context, however, research on what motivates users to participate, contribute, or collaborate in online communities is relatively limited and little is understood (Singh, Jain & Kankanhalli, 2009).

Community types and motivations to contribute

VIF Learning Center teachers are expected to participate in ways that bear similarities to open-source communities, which are themselves an example of commons-based peer production, similar to the community tasked with the development of the open badges infrastructure. In commons-based peer production communities, members tend to be driven by intrinsic motivations such as altruism, the production of social goods, and the desire to freely and voluntarily exchange knowledge (Benkler & Nissenbaum, 2006; Koh et al., 2007). As mentioned above, this is particularly relevant to the VIF Learning Center badge system, which depends on voluntary participation from peers in order to foster optimal use of what is essentially a social platform. Social participation in sites like Wikipedia, another commons-based peer production

platform, functions much like open-source software communities, and may reflect more closely the motivations of pro-social members in learning networks as opposed to consumer-driven sites. In contexts where this more altruistic type of pro-social participation is prevalent, peer production "seems to thrive on volunteerism," according to Benkler and Nissenbaum (2006, p. 403). Similarly, Lai and Turban (2008) argue that members who edit wikis are motivated to serve the common good. Koh et al. (2007) observed that some people sacrifice time and effort to share knowledge when it seems counter to their self-interest to do so, especially when the economic rational action would be to free-ride. Understanding what motivates people to participate in systems like VIF Learning Center and the nature of their contributions is one of the goals of this exploratory study. If teachers are inclined to be more pro-social in altruistic communities (versus, say, more competitive communities), this can influence the nature of the feature set and how the system is designed.

Altruism and competition represent two types of community motivators. In other communities, researchers have found that contributors were motivated by enjoyment, whether as a result of social engagement, entertainment, creativity, or a sense of fun (Lakhani et al., 2005; Jrgen et al., 2005). Providing useful or timely information to others may also increase participation, particularly to provide benefits that outweigh costs in time or money (Koh et al., 2007; Arguello et al., 2006; Butler, 2001). One of the unique features of online social participation is the ability to quickly access what Surowiecki (2004) referred to as the wisdom of crowds, in which collective intelligence can potentially provide more value than the knowledge of a few, a concept Pirolli (2009) refers to in his social information foraging model. Collective intelligence implies more than just useful information, however. It also suggests that members can access a form of knowledge that would not exist without aggregate contributions from the

entire community, which is particularly notable with regard to the VIF Learning Center, where teachers can post globally themed learning plans and receive peer feedback. As Dube, Bouris, and Jacob (2006) observed, "the process of innovation is widely influenced by the capacity of an organization to share tacit knowledge" (p. 70), and this can provide motivation to participate in or contribute to an online community.

Other factors that influence online participation include the size of the community and amount of member traffic, which may signal that resources are abundant and reciprocity is high (Youcheng & Fesenmaier, 2003; Kollock, 1999; Arguello et al., 2006; Koh et al., 2007; Butler, 2001). Participation may also increase as a function of responsiveness, measured by the quickness of a reply, the phrasing of the message, and the language used to communicate (Arguello et al., 2006), an indication that individual behavior and group social dynamics have an effect on members' contributions. Koh et al. (2007) suggest a similar motivation in communities whose members demonstrated higher levels of participation when care for the community superseded self-interest. In communities where knowledge sharing was the primary focus, community management also had a significant influence on social participation (Koh et al., 2007; Andrews et al., 2002; Yoo, Suh & Lee, 2002). In one study, Bourhis and Dube (2010) found that management was critical to increasing and sustaining social participation, although the concept of management tends to be broadly defined to discrete and different behaviors. For example, effective management strategies could range from sending welcome messages to new members (Arguello et al., 2006) to organizing offline activities (Koh et al., 2007), or facilitating the appearance of spontaneity (Bourhis & Dube, 2010). Exploring the motivating role of personal values toward greater or lesser participation in online communities is another approach worthy of study in this regard, and is discussed in more detail in the following section.

Morals, values, and motivation

Of the communities Koh et al. (2007) studied, those who shared knowledge most freely were motivated by moral obligations to help others, and saw their behavior as the "right thing to do" (p. 160). Benkler and Nissenbaum (2006) took this moral perspective one step further, suggesting that members who behaved virtuously created an environment in which peers felt motivated to *replicate* virtuous behaviors, an effect seen in open-source software communities where collaboration is common and monetary rewards are rare. Benkler and Nissenbaum (2006) also found that high levels of collaboration or leadership – participation that tends to be driven by a minority of users in most communities – were more likely to be motivated by intrinsic values rather than extrinsic rewards. Because collaboration and leadership tend to be driven by a minority of users in any given community, this would suggest that intrinsic motivation might vary not only by individuals, but also by community context, as well as types and levels of participation. Indeed, individuals may perform the same behavior for different psychological reasons depending on the context and the technological actions that are possible or valued within that community environment (Zhenhui, Jian, & Chan, 2011). They may also perform the same behavior for different psychological reasons depending on their personal values and the features of the system.

Knowledge reciprocity, or what Kollock (1999) refers to as gift economy, is also an intrinsically motivated behavior that takes place in commons-based peer production. Echoing what Benkler and Nissembaum (2006), above, refer to as the replication of virtuous behavior, participation in this type of collective may transform "individuals from self-seeking and egocentric agents with little sense of obligation to others" (Kollock, 1999, p. 271) into members who display a commitment to the public good. The concept of knowledge as a public good is one that motivates some members to generate, maintain, and exchange information more freely.

"When people consider knowledge a public good, people are motivated to share it with others due to a sense of moral obligation rather than an expectation of return" (Wasko & Faraj, 2000, p. 160). Knowledge as a public good is addressed by a number of researchers (Ardichvili et al., 2003; Benkler & Nissenbaum, 2006; Lai & Turban, 2008; Arguello et al., 2006; Bourhis & Dube, 2010; Hars & Ou, 2002; Huffaker & Lai, 2007) as a basis for what motivates community members to not only participate but to contribute and collaborate as well (Schroer & Hertel, 2009).

In ways that reflect Benkler and Nissenbaum's (2006) replication of virtuous behaviors, researchers Vandenabeele (2007) and Moynihan and Pandey (2007) suggest a process of socialization based on Perry's (2000) theory of public service motivation: "Preferences or values should be endogenous to any theory of motivation; and preferences are learned in social processes" (p. 42). In other words, individuals are both influenced by their values and preferences, and in turn influence the organization or community to which they belong. "Public organizations are not just a means to produce outputs; they are also social institutions in which individuals interact and influence each other in the context of a structured environment," according to Moynihan and Pandey (2007, p. 41). In online communities where learning and knowledge are shared, this suggests that distinct values guide the type of social participation esteemed by its participants. Koh et al. (2007) observed a similar motivation in communities whose members demonstrated higher levels of participation when care for the community superseded self-interest. It should be stated that collective intelligence, altruism, and moral obligation do not preclude the existence of more basic motives such as pleasure, whether as a result of companionship, the enjoyment in creating something together (Benkler & Nissenbaum, 2006), or the satisfaction of helping others (Wasko & Faraj, 2000; Chiu, Hsu, & Wang, 2006).

The current exploratory study contributes knowledge to this area of research, insofar as pragmatic values of teachers and the values associated with system features are examined to see if different levels of participation can be traced to predominant values across groups (i.e., males vs. females; teachers vs. administrators, mandated use vs. optional use) and the context in which those holding particular values engage with particular system features.

Peer feedback and assessment

Peer feedback and assessment is a type of participation that deserves special attention in the technology-mediated social participation literature. Researchers have found that assessment features can be among the most effective ways to increase social participation (Hemetsberger & Pieters, 2001; Kollock, 1999; Huffaker & Lai, 2007). First, though, it is important to define assessment more broadly than how it is typically understood in the context of learning. In the Merriam-Webster dictionary, assessment is defined as an action "to determine the importance, size, or value of" (n.p.). While we often associate assessment with tests, exams, and other forms of evaluations that demonstrate the validity and reliability of learning, assessment is more accurately defined as a fundamental human quality that occurs almost continuously. According to the Oxford English Dictionary, to assess someone is to, “evaluate a person or thing; to estimate the quality, value, or extent of, to gauge or judge” (Simpson & Weiner, 1989, n.p.). New ways of assessing, whether through voting, ranking, commenting, or other forms of online peer feedback (Huffaker & Lai, 2007) have become ubiquitous in recent years; not surprisingly, peer assessment generates a tremendous amount of online activity that may then motivate other kinds of social participation as people seek out personalized feedback. In short, we want to know what others think of us. Using assessment to encourage contributions is of great interest to badge system designers because assessment features may increase higher quality contributions that are relatively easy to count, recognize, and visualize. Assessment can occur through feedback,

recognition, and attribution mechanisms that are part of a system's technical design, and can help a user build reputation and status.

Other kinds of assessment, including information about community size, page views, downloads, and temporal patterns that measure participation have become easy metrics to track, as well as clicking, viewing, tagging, rating, posting, uploading, commenting, editing, and other types of contributions (Preece & Shneiderman, 2009). Not all assessment features are created equal, however. Rating and voting mechanisms may suggest values more commonly associated with competition, for example. Understanding what kinds of values are aligned with assessment features may be even more important than understanding the values aligned with other features because assessment conveys user values in more explicit ways. It is also possible that users can compartmentalize their values depending on the context. For example, users who attribute high importance to values such as benevolence may rate or rank their peers as a type of appreciation, awarding everyone with five stars or up-voting each post regardless of quality, thereby turning a competition-based feature into one that is more altruistic.

The assessment practice of rating and ranking others is also considered one way to build trust and reward users, and is a reciprocal way of recognizing and developing reputation among participants. Reputation, often signaled through login name or profile page, as well as visible signs of user activity (i.e., stars, ranking, bars, leaderboard, etc.), may motivate increased participation (Oreg & Nov, 2008; Ames & Naaman, 2007) by rewarding users with recognition (Farzan et al., 2008). In many communities, displaying users' contributions allows them to be appreciated for high levels of participation, rewards them for the quality of their efforts, and allows the community to vote on the most valuable contributions, which tends to influence greater quality and overall participation (Viégas & Smith, 2004). Messages to users

about their expertise (Ling et al., 2005) or an acknowledgement of shared values (Kuznetsov, 2006) may also be strong motivators of social participation.

The online auction site eBay implemented one of the earliest examples of an online peer-to-peer assessment system when the platform made it possible for buyers to rate sellers. Since then, similar systems have proliferated (Cheng & Vassileva, 2005), including the following examples: peer ratings of reviews and comments (NewYorkTimes.com); voting on the quality of suggestions, questions, and answers (StackOverflow.com, Quora.com); and recommending or endorsing the expertise and merits of colleagues (LinkedIn.com) even with little to no knowledge of someone's abilities. Engaging in peer assessment is its own form of participation and, in systems like Amazon.com, individuals can vote on the quality of comments left by their peers. However, these metrics alone do not fully explain which incentives or features promote greater levels of social participation. HuffingtonPost.com, for example, introduced badges in the social participation platform where readers comment on news stories (Jones & Altadonna, 2012). However, users who displayed badges did not generate more active, engaged threads compared with those who did not have any badges. Instead, it appears that the type of news story had a greater impact on participation than the peer-assessed reputation of commenters. These studies and others like them suggest that it is not the individual features that impact participation so much as the overall design of the system and the individual characteristics of the users, including their goals and motivations to contribute. For the purposes of this exploratory study, technology-mediated social participation research describes the many variables that can influence levels of participation in an online platform, with pragmatic values being among one of those variables.

Teacher online professional development and social participation

Currently, there are many online teacher professional development sites designed in part to motivate "teacher change" or teacher effectiveness, and to deliver high-quality curricula that fit with teachers' busy schedules, especially teachers for whom resources are not locally available (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009). Researchers suggest that an online teacher professional development community must have a set of goals, shared tools and spaces, and a means to create, display, and store artifacts that can then be used by others (Schlager, Fusco, & Schank, 2002). However, little is known about best practices for the design and implementation of these sites, and high attrition rates are a major concern (Reeves & Pedulla, 2011), which speaks, in part, to the technology-mediated social participation research discussed above. While a comprehensive research agenda for online teacher professional development has called for more empirical studies and theory building as the field grows (Dede et al., 2009), research on learner motivation and participation in these environments is limited (Chen & Jang, 2010). A need to understand how educators participate in online teacher professional development and how they create peer communities has led to growing research into the technological structures and affordances of these sites, and how they support the cognitive, affective, and social goals of learners (Ching & Hursh, 2014). Similar to the state of other technology-mediated sites, high rates of social participation cannot be assumed simply because it is technologically possible (Kreijins, Kirschner & Jochems, 2003). As Gunawardena (1995) explains, "the social interactions tend to be unusually complex because of the necessity to mediate group activity in a text-based environment. Failures tend to occur at the social level far more than they do at the technical level" (p. 148).

Researchers have sought to understand what motivates educators to socially engage with online teacher professional development sites. For example, according to Ching and Hursh

(2014), "teachers' attitudes, intents, and confidence are still the most powerful factors that influence technology integration" (p. 73). Others note that a successful online teacher professional development site must optimize empowerment and self-development, and that personalization involving digital badges can serve this purpose (Gamrat, Zimmerman, Dudek & Peck, 2014). Little is known about social participation in online teacher professional sites because prevailing research tends to focus on evaluative studies of program effectiveness, despite a need to "answer questions about whether a program design works well" (Dede et al., 2009, p. 6). As mentioned above, a majority of research focuses on teacher change and teacher effectiveness, which is outside the scope of this research study. However, a mixed-method research study that compared different levels of support in online teacher professional development sites found that higher levels of participation in the program led to greater participant satisfaction (Whitaker, Kinzie, Kraft-Sayre, Mashburn & Pianta, 2007). This exploratory study responds to one of the key challenges facing the field, which is to make use of data streams produced by technology-mediated interactions and to "investigate new questions of interaction, collaboration, and communication," in order to better understand trajectories of learning (Dede et al., 2009, p. 8).

Variables that influence how teachers participate, particularly their individual preferences and human values, may be equally as important as system design. As Oreg and Nov (2008) suggest, "individuals' dispositional orientation corresponds with the types of motivations expressed for contributing" (p. 2059). In other words, personal values are likely to be associated with motivations to contribute. Oreg and Nov (2008) used the Schwartz Value Inventory to investigate how software programmers' personal values determined preferences for different types of rewards such as achievement, skill building, and reputation among those who

contributed to open-source software projects. As mentioned earlier, examining whether pragmatic values can be detected in system features, as well as understanding users' pragmatic values as a source of motivation, may help explain why some types of technology-mediated social participation work in some contexts but not others. Understanding whether value alignments exist between technical features and teacher values, and whether value alignments influence higher rates of participation can contribute useful knowledge to online teacher professional development sites and platforms. This exploratory study presents an opportunity to examine these variables in greater detail, building on the work that Oreg and Nov (2008) initiated, and applying it to the examination of pragmatic values and participation levels among teachers in the VIF Learning Center system.

21st Century Learning and Digital Badges: From Authority to Credibility

Eisenberg and Fullerton (2012) have reflected on education practices that date from the 1970s and projected what changes might subsequently occur in the next 40 years based on current trends. They believe that "the most profound and far-reaching change in education over the next 40 years will be the move from a mass production model focused on teaching to a customized, individualized model focused on learning" (Eisenberg & Fullerton, 2012, p. 105). While advances in information technologies have boosted capacity to process, communicate, retrieve, and store information for both students and teachers, the institutional norms and infrastructure associated with education have not fully adapted to the transformative technological changes that permeate modern life. Eisenberg and Fullerton predict that by 2050, "education on all levels will be radically different from today with a far-reaching shift from education factories aimed at the masses to individual education aimed at meeting the goals and aspirations of individuals" (p. 106). As we move deeper into the 21st century, the role of information infrastructures, platforms, and systems have become more entwined with learning

spaces that present opportunities for new types of engagement and assessment. As Anh and Erickson (2016) claim, "These new informal environments, now well beyond the confines of the formal classroom, teem with different informational triggers" and represent "a myriad of practices, such as informing, socially engaging, networking, and playing" (p. 83).

As a result of changes in technologies being used to teach and learn, the 21st century is also shifting from "issues of authoritativeness to issues of credibility" (Davidson & Goldberg, 2009, p. 27), largely driven by the types of technology-mediated social participation mentioned in the section above. Mozilla, the company responsible for the open-source Firefox browser, and other proponents argue that badges can address issues of credibility for skills learned outside traditional institutions of learning, and provide recognition for granular achievements (2011). In recent years, the delivery of education has diversified because of new technologies, and is no longer dependent on traditional institutions to scaffold learning trajectories, a trend that also dovetails with the growth of competency-based learning and digital badges to validate that learning. The U.S. Dept. of Education defines competency-based learning as "a structure that creates flexibility, and allows students to progress as they demonstrate mastery of academic content, regardless of time, place, or pace of learning" (n.d.; n.p.). According to the Department of Education, competency-based learning is referred to as a "learning revolution" (p. vii) that upends the traditional paradigm of credit hours or "seat time," in favor of the "bundling and unbundling" of skills and knowledge (Voorhees, 2001, p. 9). In the United States, the establishment of the National Skills Standards Board, created under the Goals 2000: Educate America Act of 1994, catalyzed the development of a national system of skill standards and the assessment and certification of those skills. While much of the movement toward competency-based learning can be traced to community colleges, other institutions of learning are beginning

to embrace this pedagogical shift (U.S. Department of Education, 2002), including the VIF Learning Center. The potential to design evidence-based assessments and more flexible learning pathways has made digital badges and the systems designed to issue them particularly relevant to proponents of competency-based learning.

Defining open digital badges

In information systems terms, open digital badges are essentially web-based containers for image files and metadata. In more traditional terms, they are credentials awarded in recognition of a person's skills and achievements. While the word credential is often associated with learning, it is more accurately defined as, "a fact, qualification, achievement, quality, or feature used as a recommendation or form of identification" (Simpson & Weiner, 1989, n.p.). In other words, credentials provide a way to vouch that people are who they say they are, and have the qualities they claim to have (Grant, 2014). Open digital badges are intended to function the same way as traditional credentials, except that they typically exist within or emerge from information infrastructures, platforms, and systems that contain an array of technology-mediated social participation features, including ones mentioned in the section above. Open digital badges are aligned with rhetoric and values that promote transparency and interoperability. This refers to an emerging data exchange infrastructure in which a person can theoretically control how his or her data (via the badge) can be displayed, stored, arranged, viewed, and used. As badges spread, they may become integrated into the type of personal education records described by Eisenberg and Fullerton (2012), in which the "big data" of a student's entire learning experience is processed, organized, parsed, and displayed so it is easier to view and validate.

According to *Open Badges for Lifelong Learning*, a white paper co-authored by the Mozilla Foundation and Peer-to-Peer University, learners experience "a problem in making their knowledge and skills visible and consequential in terms that are recognized by formal

educational institutions and broader career ecosystems" (Mozilla Foundation, 2011, n.p.). These learner composites are intended to reflect how many people acquire career-ready skills and knowledge in the 21st century, whether that learning is assessed through experts, mentors, computer algorithms, or peers, and whether it takes place inside or outside school. The learner composites and their scenarios reflect a world where traditional credentials do not always open doors to opportunities, even when learners may have the skills and achievements to open them. The intended net effect of the open badges infrastructure (OBI) is an emerging medium of exchange in which credentials need not be tethered predominantly to formal learning in schools and universities, and can instead emerge from co-curricular or informal, online learning spaces. Many non-traditional learning institutions are issuing credentials for the first time, including VIF, and their digital badge systems tend to include a suite of technology-mediated social participation features and assessment mechanisms.

Just as there are different types of learning content and programs to deliver that content, there are many types of badge systems, including ones that are combinations of offline and online learning. Perhaps not surprisingly, experimental approaches to badge system design are happening among institutions that historically have never issued credentials (Grant, 2014), including the teacher professional development of the kind offered by the VIF Learning Center. Museums, libraries, professional associations, youth organizations, and workforce development represent only a handful of entities that are designing new digital credentialing systems. These organizations represent a wide range of institutional values, learning content and objectives, pedagogical approaches, assessment practices, and types of learners. As badge system designers consider how to measure what is valued, they make assessment and design decisions that transmit the type of knowledge and values they uphold. VIF Learning Center is among this group

experimenting with credentials, describing digital badges as one of the key components of their professional development approach:

> Advancing through VIF professional development is represented through the awarding of digital badges, which recognizes teachers' professional learning achievements. Each VIF PD module equates to 10 hours of professional development or continued education, which can be easily shared and acknowledged by districts and states (Keane, Otter, Oxley & Lipscomb, p. 227).

According to VIF administrators, their primary challenge was to recognize professional learning accomplishments for international exchange teachers (Keane, Otter, Oxley & Lipscomb). Digital badges offer VIF a way to digitally acknowledge the modules that their exchange teachers complete, and a way for them to digitally share these accomplishments with others.

From digital badges to open digital badges

While *open badges* as web-based portable credentials represent a relatively recent type of technology-mediated social participation, *digital badges* have existed online for over a decade. Wikipedia began issuing digital badges or "Barnstars" to editors as early as 2003. Microsoft's Xbox gaming platform began issuing digital achievement badges to gamers in 2004. Since then, many more knowledge-sharing platforms have used badges as incentives and rewards on their sites (e.g., StackOverflow.com, TopCoder.com, KhanAcademy.org). Often, these platforms include other features of technology-mediated social participation in addition to badges, such as leaderboards, ranking and rating systems, tagging, commenting, "liking," following, and game mechanics designed around storylines, quests and opportunities to advance. However, finding the right balance to motivate meaningful feedback and recognition for different kinds of contributions has proven to be elusive. Badges that work well for programmers who actively contribute to Stack Overflow do not necessarily work effectively in other Stack Exchange environments where the underlying technical system is identical but the community purpose and members' personal values are different (J. Atwood, personal communication, August 20, 2012).

In many badge systems, especially those in which there is peer-to-peer assessment, badges appear to be "socially entangled with the site, and with the process of learning" (Halavais, Kwon, Havener, & Striker, 2014, p. 1613). While an effective sociotechnical platform may seem fairly easy to create, for every Facebook or LinkedIn social media platform, there are hundreds of sites that see little to no activity (Preece & Shneiderman, 2009).

Similar to historical badges, digital badges may represent different values depending on how they are designed in the context of the larger system architecture. Some functions of historical badges are described by Halavais (2012) as: badges of honor, authority, and privilege; badges of achievement, qualification, and experience; and badges of expression and experience. Antin and Churchill (2011) proposed five social-psychological functions for digital badges including *instruction*, *reputation*, *status*, *group identification*, and *goal setting*. Badges designed to emphasize *instruction* inform users about social norms, displaying the system's valued activities to new and veteran users as they become more familiar with the sociotechnical environment. Badges can also convey attributes of *reputation*, either by signaling users' interests and levels of participation or by symbolizing expertise and skills. Achievement badges that are difficult to attain can function as *status* symbols to a group, or represent personal affirmation to an individual. Badges also allow community members to identify each other both inside and outside the *group*. Perhaps most commonly in recreational and commercial sites like Foursquare, badges are used for *goal setting*, as something to strive toward or collect. Badge systems can be designed to emphasize some functions more than others, or combine multiple functions together. In some contexts, different badge functions can complement each other, while in others they can create "social dysfunction" and even "moral confusion" (Halavais, 2012, p. 355). This may be due to the different values associated with the various social-psychological functions described

by Antin and Churchill (2011) and potential conflicts when those values are at odds with each other.

Google News, Huffington Post, and Foursquare are examples of commercial sites that use badges to motivate people to develop certain skills and incentivize them to repeatedly return to the site. Stack Overflow uses badges as part of their points-based reputation system to reward people for "being especially helpful."[4] TopCoder[5] is another reputation system that issues competition-based achievement badges in addition to the "popular ranking system" of the site. Badges also appear in the evaluation practices of cultural production, including music sites Spotify and Indaba Music (Suhr, 2014). Each of these sites has a distinct culture where values and functions associated with digital badges may be out of sync with user values. While there is no empirical research that examines the alignment of badges with user values, Wikpedia and Stack Overflow represent two systems where badges fulfill very different functions and may represent how feature values and system design can be out of alignment with user values. In the VIF Learning Center badge system, there are over 70 badges that correspond to learning modules for different levels of competency categorized by each year of professional development (i.e., Year 1: Global-Ready Developing Teacher; Year 2: Global-Ready Proficient Teacher; Year 3: Global-Ready Accomplished Teacher: Year 4: Global-Ready Distinguished Teacher) according to the different grades taught (i.e., K-5, 6-8, 9-12). The badges are awarded largely independent of the platform's social media features and are instead contingent on successful completion and assessment of the professional development modules. The following section outlines the digital environment in which badges have evolved, including examples of Wikipedia and Stack

[4] Stack Overflow badges: http://stackoverflow.com/help/badges

[5] Top Coder badges: https://community.topcoder.com/studio/help/achievement-badges/badges/

Overflow communities where different approaches to badge system design overlap and diverge from the VIF Learning Center platform.

Wikipedia Barnstars

Wikipedia Barnstars represent a widely implemented peer-based badge system despite their relative obscurity to casual readers of Wikipedia content. In 2003, Wikipedia Barnstar badges were created "to recognize particularly fine contributions to Wikipedia, to let people know that their hard work is seen and appreciated."[6] Researchers have described Barnstars as "an image accompanied by a short and often personalized statement of appreciation for the work of another editor" (Kriplean et al., 2008, p. 49) and as "a community created mechanism for identifying and acknowledging activity of others" that can also "be considered as a specific form of recognition similar to more widely used badges and achievements" (McDonald, Javanmard, & Zachry, 2011, p. 15). Elsewhere, Barnstars are defined as "a community stamp of approval that is awarded to an editor by other editors" (Halfaker, Kittur, Kraut, & Riedl, 2009, n.p.), which differs from the badging practices in the VIF Learning Center, where badges are earned and awarded after completing modules for professional development.

Hundreds of different kinds of Barnstars have now been created by Wikipedia editors, and are displayed on editors' user pages for both serious and more light-hearted achievements. As of 2016, these achievements included a wide range of categories defined by researchers as "wikiwork," or the work that describes activity traces in Wikipedia, including editing, border patrol, administrative, meta-content, collaborative action and disposition, and actions considered as social support (Kriplean, Beschastnikh, & McDonald, 2008, p. 49). Barnstars can also represent specific distinctions, such as the Featured Page Barnstar, a badge awarded to editors

[6] Wikipedia Barnstars: https://secure.wikimedia.org/wikipedia/en/wiki/Wikipedia:Barnstars#

who make significant contributions to articles that become featured on Wikipedia, representing a lengthy process of review that is considered a prestigious reward of its own.

Wikipedia is an example of a distinct culture that has anything but a uniform response to badges, suggesting that pragmatic values may be incongruent across its membership. In a content analysis of Barnstars from 2006, McDonald et al. (2011) counted 14,573 Barnstars given to 4880 editors, and found that roughly a third had received Barnstars, a third had given them, and a third had both given and received at least one. Compared to the more than 15 million registered editors on Wikipedia, of which only a fraction are considered regular contributors, the number of editors who awarded or received Barnstars was negligible. Even fewer were considered active community members as measured by discussion activity and the number of user Talk pages where Barnstars are typically displayed. Thus, Barnstars are more likely to be given and received by experienced editors and administrators who are familiar with community norms and are fluent with the tools and technologies involved in editing Wikipedia.

In another peer-based assessment practice on Wikipedia, Halfaker et al. (2009) observed that despite support for Wikipedia's article rating system, only 5 percent of articles had earned an assessment above "start," the rating for articles that were mostly incomplete. Barnstars appear to experience the same rates of underuse. The Project page titled *Awarding Barnstars* includes a plea for editors to award "one of the chronically underused Barnstars to somebody deserving."[7] There is also evidence that editors do not universally appreciate Barnstars, with some editors being overtly disparaging about their use. Kriplean et al. (2008) noted that "Barnstars seem to carry relatively high value to receivers given their prominence on user pages" (p. 49), but also pointed out important nuances. In addition to amending social slights, recognizing valued work,

[7] http://en.wikipedia.org/wiki/Wikipedia:Award_barnstars

providing encouragement, and fostering competition, Barnstars could also "antagonize a recipient" (p. 49). The Barnstar-free zone Barnstar[8], "used to indicate disinterest or disdain of the whole notion of Barnstar recognition," and the Upside-down Barnstar, "to be awarded unto oneself for whatever absurd or narcissistic reasons one might wish,"[9] speak for themselves.

In one study, editors' contributions to the site increased by 60 percent after they were awarded Barnstars (van de Rijt & Restivo, 2012). However, findings like these are complex. Social participation is rarely uniform, whether in offline or online environments, and designers might be violating community norms if certain badges are associated with different values. For example, "measurement" or "completion" badges can have different effects on motivation and participation (Blair, 2012). Measurement badges function as a form of feedback, giving participants a sense of progress relative to a given task. Different assessment practices might involve measuring participants against themselves, against others, or against a predetermined standard. Completion badges are awarded for completing a task or skill, which can have a positive effect on performance but a negative effect on risk-taking or creativity. Barnstars seem to conflate both measurement (self-improvement) and completion (competition) badges, which may motivate some editors but not others. Those who respond favorably to measurement against their own achievements might ignore peer-awarded badges or cease to participate at all. Thus, if the goal is to increase participation on Wikipedia, awarding more of the wrong kind of badge may not necessarily lead to higher rates of pro-social participation. These observations are relevant to VIF Learning Center because measurement (self-improvement) and completion (competition) badges (or other kinds of peer-based or system assessment mechanisms) reflect

[8] http://en.wikipedia.org/wiki/Wikipedia:Barnstars/Protest

[9] http://en.wikipedia.org/wiki/Wikipedia:Barnstars/Protest

pragmatic values; thus, any form of peer assessment or performance assessment is likely to carry explanatory power that predicts how users respond.

Stack Exchange badges

Stack Overflow, another site that issues badges, is a social Q&A platform with a reputation for being a respected source of expert knowledge and feedback among programmers. While advocates point to Boy Scouts and game achievements as predecessors of open digital badges, Stack Overflow may be a more analogous model because it directly links badge credentials to evidence. After employment recruiters began using the site to find prospective candidates, Stack Overflow spun off Careers 2.0[10], a platform that allows members to display their contributions or reputation alongside other credentials and expertise for potential employers. Barnes & Noble, Google, Amazon, and other highly visible companies are alleged to be among the companies using the site for recruitment. Stack Overflow is the flagship site for Stack Exchange, a network of approximately 125 social Q&A sites currently hosting diverse topics such as English Language & Usage; Chinese Language; Academia; and Buddhism, to name a few. Each site awards badges for: Questions, Answers, Participation, Tags, Moderation, and Other (for tasks like "reading the entire about page"). Each Stack Exchange site has three Tag badges (gold, silver, bronze) that are awarded based on a combination of system metrics and peer voting. For example, a member who posts 20 question tagged "xml" may receive a Bronze Tag badge when peer "up-voting" generates a minimum score of 100 on the site. These more granular subject matter tags can range from hundreds on StackOverflow (e.g., asp.net, bitmap, or drupal 7), to five on English Language & Usage (e.g., etymology, meaning, or word choice). Applying Blair's (2012) description of measurement and completion badges to the site, Stack

[10] http://business.stackoverflow.com/careers/us/

Exchange gives members the opportunity to measure their own achievements against themselves (e.g., accruing points for time on site, and number of contributions), against others (e.g., points earned for peer "up-voting" and comparing badges earned), and against a predetermined standard (i.e., system designated tasks and scores to earn badges).

Stack Overflow is considered an exemplar system by many digital badge advocates, in part because reputation earned on the site has value with employment recruiters outside the community, and also because evidence of expertise is easily traced. On the Careers 2.0 site, members display their most popular answers as a way to demonstrate proof of expertise. As one researcher wrote of badges, "It is one thing to bring educational content and credentialing data to the celebrated speed and ubiquity of the Internet; it is another to establish fruitful connections with systems of economic value and social capital — systems predicated on economies of scarcity and lack rather than instantaneity and plenitude" (Friesen & Wihak, 2013, p. 52). At the time of writing, only a handful of digital badge systems, including Stack Overflow, could argue that a system of economic value existed, and it is not readily apparent what combination of factors can be attributed to this success.

Much of the research on Stack Overflow badges focuses on their motivational effects. Two studies demonstrate that badges effectively incentivize user behavior on the site, although behavior tends to drop off once the badge is achieved (Anderson et al., 2013; Grant & Betts, 2013), and that the placement of badges within the system can have an important effect (Anderson et al., 2013). In a study designed to understand whether members use badges to discover pathways toward expertise, researchers suggest that, "general badges may have a greater community function, while the system's tags represent learning pathways, interests, and opportunities more directly" (Halavais et al., 2014, p. 1612). In personal correspondence with

Jeff Atwood (J.Atwood, personal communication, August 12, 2012) who co-founded Stack Exchange, he noted that some members of other Stack Exchange communities have asked if they can remove badge functionality from their social Q&A sites. It may be that the values of programmers who are active on Stack Overflow are in alignment with the values associated with badges on the site, which tend to be achievement-oriented and competitive, whereas, on other Stack Exchange sites, members may be less motivated by what they perceive as antithetical to their group's values.

VIF Learning Center's digital badges function largely independent of system features that motivate pro-social behaviors, and in that regard do not conflate different kinds of badges (i.e., measurement and completion) with each other. VIF Learning Center currently has a leaderboard of sorts, referred to as the "karma system" by the JomSocial plug-in that runs it; however, this 5-point star system does not influence the earning or awarding of badges, even though it was ostensibly designed to influence social participation. Thus, the digital badges function more like traditional credentials that are awarded for successful completion of learning content, and the karma system is designed to (separately) acknowledge and motivate pro-social behavior.

Badges in education

Of the newly emerging education-based badge systems described in the research literature, a majority focuses on platforms designed to reward or motivate particular types of pro-social participation and engagement. Due to the recent nature of open digital badge system design, very few of these studies focus on the interoperable function of open badges as credentials in technology-mediated environments. Of the badge research conducted between 2011 and 2014, a majority also targets small pilots in college settings among students from technology disciplines such as computer science and engineering. In these systems, badges are often blended with game mechanics and social media features to increase participation and

engagement. In several studies, badges were designed to encourage college students to create and be expressive (Barata et al., 2013) or to recognize time management and carefulness (Haarenen et al., 2014). Other systems rewarded students for taking an exam within a certain timeframe and responding to student work with especially helpful feedback (McDaniel et al., 2012) or for authoring and answering questions (Denny, 2013). One system awarded positive badges to students who commented on blogs and negative badges to those who did not (Verbert et al., 2013). Another system awarded badges for solving exercises with only one attempt, returning exercises early, and completing an exercise round with full points (Hakulinen & Auvinen, 2014). In one study, researchers made badges a proxy for rank instead of representations of certain skills, and used progress bars and storylines to foster healthy competition and exploration toward more specific goals such as increased lecture attendance, class participation, content understanding, problem-solving skills, and general engagement (O'Donovan et al., 2013). Another pilot study used badges as an abstraction of learning analytics data through a visualization dashboard designed to improve collaboration and increase awareness of personal activity (Charleer et al., 2013). While several of these pilots issued OBI-compliant badges, the primary purpose was to generate badges that had local value in the classroom. The secondary purpose was to allow students to share badges with peers.

In systems where badges coexist with game mechanics like leaderboards, progress bars, and storylines, each feature component may have a different effect on motivation. For example, in one study on college students, *masterminds* were more likely to be motivated by badges, whereas *conquerors* were motivated by leaderboards and progress bars, and *seekers* were motivated by storylines (O'Donovan et al., 2013). These student types may also represent different configurations of personal values. Researchers have similarly characterized elementary-

aged students as *badge hunters*, *sharers*, and *dodgers* (Boticki et al., 2014), three categories that bear resemblance to the player types that Jakobbson (2011) identified as part of a two-year ethnographic study on gamers in the Xbox 360 achievement system. *Hunters* care about quantity of badges over quality of contributions, whereas *sharers* care about sharing badges and quality participation, and *dodgers* appear to have no interest in badges at all. In each of these typologies, researchers noted that students can be a combination of the different types, and may drift between them depending on the task or context.

In a study of middle school students using the Computer Science Student Network badge system, researchers found that different badges motivated learners depending on their level of expertise (Abramovich, Schunn & Higashi, 2013). Another study on computer science undergraduates found statistically significant differences in learners' behaviors, but only with some badge types, and responses to the badges varied across two courses (Hakulinen & Auvinen, 2014). A system designed to improve engagement, persistence, and diligence among engineering students found that badges effectively increased attendance, participation, and the number of downloads from the class website (Barata et al., 2013), three goals of the badge system. Students in this class were also encouraged to learn from failure. Instead of a traditional grading system where students began with a maximum grade and had to maintain it, they earned points for each task they completed and worked their way up through the course. Pedagogy is not often explicitly discussed in these studies, even though "technological design and pedagogy have the potential to co-evolve in this new medium" (Bruckman, 2004, n.p.). Badge system designers that want to encourage creativity, innovation, and risk-taking may find that their pedagogical and assessment approaches must evolve along with technical features in order to create the optimal conditions to motivate students. What these studies suggest is that the type of badge, the type of

learner, the design features, and the context in which badges are issued influence motivation in different ways. Examining the values associated with badges in these systems, as well as their alignment with user values, may shed some light on why motivation is not always uniform.

According to VIF, during the first year of implementing the digital badge system, teachers were starting to see the value of digital badges; however, they were still unsure of their professional applications (Keane, Otter, Oxley & Lipscomb, 2016, p. 235). In terms of portability and sharing badges with their networks, teachers were largely unfamiliar with the OBI feature that would allow them to display their credentials across multiple sites and therefore with multiple audiences. Even so, VIF points out that their badging system's biggest success has been its recognition of teachers' learning achievements by school districts and state boards of education. Similar to other emerging badge systems, VIF designed the system to be interoperable between their system and data systems in order to take advantage of the analytics that digital badge systems have the capacity to provide. As they continue to build buy-in for digital badging among educators and administrators, VIF's next goal is to, "make the process more dynamic than just serving as a metric for PD completion" (Keane et al., 2016, p. 236). The aim, then, for VIF, is to increase the pro-social behaviors that drive the learning process for educators, and do more than celebrate professional development accomplishments.

Values, Motivation, and Technical Artifacts

How do values influence motivations to participate in an online badging platform? Values are considered "guiding principles of what people consider important in life" (Cheng & Fleischmann, 2010, n.p.). They can be ethical, moral, and pragmatic, according to Yetim (2011a), who addresses the "plurality of values, norms, goals, and means deliberatively" (p. 134) in different information technology contexts using Habermas' discourse ethics. As Yetim writes:

> Habermas developed his discourse ethics out of his theory of communicative action to clarify the normative basis of human action, communication, and interaction. According to Habermas, for pluralistic societies, which no longer have a single, overarching moral authority, a formal moral theory such as discourse ethics is needed to create the "free spaces" necessary for a pluralism of many different "good lives." Habermas differentiates strictly between "questions of the good life" (i.e., ethical questions) and "questions of justice" (i.e., moral questions), accordingly, between "values" and "norms. Discourse ethics does not provide the right norm that regulates between a diversity of value orientations; rather, it provides a procedure to find the norm. (Yetim, 2011a, p. 137).

As Yetim discusses, discriminating between different types of norms and values is relevant to the current study because it delineates contexts in which goals (and associated values) for user behaviors are well defined (pragmatic), uncertain (ethical), or conflicting (moral) (2011, p.134). While pragmatic, moral, and ethical values are often entwined and may co-exist in practice, a different set of critical heuristics must be applied for each, even when all three types are simultaneously present.

In this study, user behavior goals in the VIF Learning Center design space are considered well defined, which is to increase teacher participation. In pragmatic contexts, the question, "what should we do?" calls for a well-defined goal or purpose and is primarily concerned with solving problems in the material world, such as how best to develop a system or user interface to respond to those goals (Yetim, 2011a, p. 134). Therefore, the purpose of the current study is to examine pragmatic values that pertain to "rational assessments of goals in the light of existing value preferences (Yetim, 2011b, n.p.). These pragmatic values differ from *ethical* values, or the "reflection on what is good for one's self," and are also distinct from *moral* values, or what is considered "equally good for all" (Yetim, 2011b, n.p.). For this reason, applying Schwartz's Values Inventory is an appropriate instrument for this context, given its focus on the explanatory power of values to predict behaviors and attitudes (Schwartz, 2007) in light of well-defined goals. A discussion of Schwartz's basic human values as pragmatic values follows.

Schwartz's basic human values and pragmatic values

Schwartz's basic pragmatic values belong to a motivational continuum that applies to abstract goals, which distinguishes them from norms and attitudes. We use values to evaluate actions, people, and policies, and use them as standards or criteria to guide our behavior. According to Schwartz (2007), pragmatic human values contain the following features:

1. Values are beliefs
2. Values refer to desirable goals
3. Values transcend specific actions and situations
4. Values serve as standards or criteria
5. Values are ordered by importance
6. The relative importance of multiple values guides action

Values are both conceptually and empirically distinct from personality traits, another psychological construct used to understand behavior, and, refer to what people are like, as opposed to what people consider important (Roccas, Sagiv, Schwartz & Knafo, 2014). Additionally, pragmatic values are likely to be better predictors of attitudes and behaviors over which individuals have choice; whereas traits are often better predictors of spontaneous, intuitive, and emotionally driven behaviors over which individuals have little control. Therefore, in situations where individuals have choice, such as socially engaging with optional features in the VIF Learning Center, values represent an appropriate motivational construct for the research questions. What is particularly relevant to this exploratory research is that people's values tend to form an ordered system of value priorities, which creates a hierarchy of characteristics that define them as individuals. This relative ranking of values can furthermore be transposed to a circumplex that delineates complimentary and contrasting values according to proximity, visualized in Figure 1 and discussed in more detail below.

For example, in the VIF Learning Center, pragmatic values (i.e., Schwartz's *power-achievement, stimulation, hedonism, benevolence, conformity* values, etc.) represent human values that influence teachers' motivations to participate. Hypothetically speaking, if teachers are more likely to have high scores for *benevolence* values and the system is designed to be competitive (i.e., reflect *power-achievement* values), we might conclude that teachers will not participate willingly because these pragmatic values tend to conflict. In contrast, ethical and moral values are relevant with regard to other aspects of the system, specifically the potential for a digital badging system to become a mechanism for punitive accountability. As VIF writes from an ethical and moral standpoint, "we want to be vigilant to protect our badging system from serving as a punitive accountability system used against teachers" (Keane, Otter, Oxley & Lipscomb, 2016, p. 236). While these moral and ethical values likely co-exist with pragmatic values, they are beyond the scope of this exploratory study to evaluate basic human values at a more pragmatic level.

Yetim reviews three methodological frameworks used to study pragmatic, moral, and ethical values in relation to information systems, including: (1) participatory design research (value sensitive design); (2) game studies (values at play); and (3) human-computer interaction (worth-centered design). For participatory design research and value sensitive design, the 13 Human Values with Ethical Import inventory (Friedman, Kahn, & Borning, 2006) was devised to evaluate ethical and moral power dynamics between designers of a system and its users, and is seen as a way to "level the playing field between designers and users, by ensuring that designers are sensitive to users' values" (Fleischmann, 2014, p. 29). In game studies and the values at play (VAP) framework, ethical values of game design are investigated (Flanagan, Belman, Nissenbaum, & Diamond, 2007), in the context of social and political values. In human-

computer interaction and worth-centered design (WCD), Cocton (2005) focuses on pragmatic values, determined by appropriateness or adequacy in terms of worth or commercial value to end users (Kujala, & Väänänen-Vainio-Mattila, 2009).

As discussed above, this research focuses on *pragmatic* values and the varying degrees of value alignments between users and technical features, which represents a theoretical gap in the literature. Thus, there are few methodological precedents to address the statement of the problem and research questions. While value sensitive design is the current dominant research approach addressing values in technology and could conceivably be adapted to address pragmatic values, it has been critiqued for focusing on preconceived values instead of "inquiring about the values present in a given context and responding to those values through design" (Yetim, 2011a, p. 136). Addressing this aspect, Fleischmann (2014) refined an approach known as value *driven* design, which emphasizes the intentionality of designing values into technological artifacts through organizational practices, standards, policies, workplace cultures, or professional organizations. Value *sensitive* design, on the other hand, focuses on the way technological innovations are shaped by and in return shape what are often ethical and moral values (Friedman & Nissenbaum, 1996; Nissenbaum, 2009). Friedman et al. (2008) argue that designers must be aware of these values to help ensure that platforms and technologies will be successful. Value driven design seeks to understand the inherent conflicts among stakeholders and resolve them in mutually agreeable ways, similar to value sensitive design (Friedman et al., 2008) but with an emphasis on the resolution of conflicts among stakeholders (Fleischmann, 2013). Value driven design and value sensitive design are two strands of literature that align to what Rokeach (1973) describes, respectively, as *intentional* and *consequential* value categories. While this research is guided by value sensitive design, the purpose is to understand inherent alignment of pragmatic

values with the goal of making recommendations to resolve value conflicts, similar to the focus of value driven design. As an emerging research framework, however, there are no clear methods to do a post-hoc analysis of a technical system, and there are few methodological precedents to address the statement of the problem and research questions. Thus, the values dimension framework described below is useful in defining empirical methods that guided the research.

Dimensions of values

Using the values dimension framework developed by Shilton, Kloepfeltzer, and Fleischmann (2014), this study primarily investigates the *salience* of personal user values and the *enactment* of values as attributes in the VIF Learning Center badge system, and is thus well suited to a framework for critical heuristics developed by Yetim (2011b), designed to aid value sensitive designers of persuasive technologies. The values dimension framework developed by Shilton, Kloepfeltzer, and Fleischmann (2014) discussed below identifies where and how values manifest in sociotechnical systems and which empirical methods are effective in studying them. For example, a priori approaches and intended design require different methods than post-hoc analyses of enacted designs. According to Shilton et al.'s (2014) framework, values dimensions are divided into two main types: *source* (environment, context, or setting of values) and *attributes*, which include the attributes of values themselves. *Sources* represent the first dimension of values, and include three sub-domains: *unit*, *assemblage*, and *agency*. *Unit* represents the continuum between individual and the collective; *assemblage* represents the continuum between what is homogeneous and what is hybrid; and *agency* represents the continuum between objects and subjects. While Shilton et al. (2014) note that different dimensions can be studied with a variety of methods, "each method elicits some dimensions more effectively than others" (p. 267). For example, in the VIF Learning Center badge system, the *unit* sub-domain could include *individual* users of the system or *collective* groups of teachers

compared with administrators. The *assemblage* sub-domain could focus on the *homogeneous* values among teachers using the system, or *hybrid* values of teachers from different countries, including the way different users might engage in social learning platforms. The sub-domain *agency* could apply to values embedded in the badge system (*object*) or among the designers and other stakeholders (*subject*).

Attributes of values, the second dimension of Shilton et al.'s (2014) framework, include the sub-domains of *salience, intention,* and *enactment*. Some values will represent *salience*, the continuum between *peripheral* and *central* values; or, they may represent the continuum of the sub-domain *intention* from *accidental* to *purposive*. Last, values may represent the sub-domain of *enactment*, representing the continuum between *potential* and *performed* (Shilton et al., 2014). As with *source* values, *attributes* may invoke different analysis methods depending on whether *salience, intention,* or *enactment* is the focus of study. In badge systems, there may be a misalignment of values between technical features of the system, assessment practices, and users' values. The *accidental* to *purposive* value continuum for *intention* highlights the degree to which a developer is able to deliberately design values into the sociotechnical system. Similarly, *enactment* is also relevant to early stage design cycles, when human values can be evaluated in terms of latent *potential* or *performed* values (Shilton et al., 2014). To guide classification of different types of studies, Shilton et al. propose a set of questions to assist researchers (Table 1).

Table 1. Questions to guide values dimensions (Shilton, Kloepfeltzer, and Fleischmann, 2014)

Source dimensions:	
Unit	Does a study illuminate the values of individuals, groups, or societies?
Assemblage	Does a study illuminate the values of people, technologies, or blended sociotechnical systems?
Agency	Does a study illuminate the degree to which people, systems, or materials determine their values?
Attributes:	
Salience	Does a study illuminate the degree of importance of various values to stakeholders or systems?
Intention	Does a study illuminate the degree to which participants mean to materialize a value?
Enactment	Does a study illuminate the degree to which values are materialized in a system or setting?

To study the *salience* of personal user values and the *enactment* of values as attributes in the VIF Learning Center badge system, Yetim's (2011b) framework for critical heuristics (Table 2) is useful for guiding the critical assessment of the "comprehensibility of communicated signs, the efficiency, effectiveness, and appropriateness of recommended actions or persuasion strategies, goals, and outcomes" (Yetim, 2011b, n.p.) associated with different features in the system. While the framework can be used to justify goals, values, and actions during the design process, it can also be applied as a post-hoc analytic evaluation of a system already designed (Yetim, 2011b), in addition to using survey and technical investigation methods that are discussed in Chapter 3 below. This is a divergence from the values of ethical import heuristic established as part of the value sensitive design method, which prescribes a set of abstract values during the conceptual stage (Friedman et al., 2008). In contrast, the empirical stage takes precedence so that pragmatic values are discovered in the context of the design space (Le Dantec, Poole & Wyche, 2009), an approach well suited to exploratory research.

Table 2. Critical heuristics for both identifying and checking values (Yetim, 2011)

Goal Value:
Is the value proposed indeed a legitimate value?
How well is the goal G supported by (or at least consistent with) the value?
Are there other goals considered that might conflict with goal G?
Are there alternative goals to promote the same value?
Action-Goal
Is it possible to do action A?
Will the action A bring about the desired goal G?
Are there alternative ways of realizing the same goal?
Action-Value
Does doing action A have a side effect that demotes the value intended?
Does doing action A have a side effect that demotes another value?
Does doing action A preclude another action that would promote some other value?

Values inventories

A values dimension framework helps identify where and how values manifest in sociotechnical systems and suggests effective empirical methods to study them, while critical heuristics guide the discovery of values in the design space. What is needed next is a spectrum of distinct values that reasonably represent basic pragmatic values. These values can be evaluated according to a set of value inventories or scales that provide explicit categories of human values (Cheng & Fleischmann, 2010) initially designed as self-report instruments to measure intrinsic and extrinsic values of individuals in their work environments. Once initial scales were developed, social psychologists endeavored to create more universal human scales that can be applied across cultures. In a review of value scales, Cheng and Fleischmann (2010) evaluated 12 designed to serve different purposes, organizing principles, and applications. For example, the Personal Values Questionnaire, the Managerial Moral Standards, and the Shared Values in Organizations scales focus on organizational and managerial contexts (Cheng & Fleischmann,

2010). Of the 12 reviewed, the Rokeach Value Scale and Schwartz Value Scale were found to have greater applicability to this research and both are briefly reviewed here.

While the Rokeach Value Scale (1973) has been in use for 30 years, it is based on a rational-theoretical approach that raises questions about subjectivity since there is little consensus about the number of values and value types (Cheng & Fleischmann, 2010). For that reason, rational-theoretical approaches have been eclipsed by those that are theoretical-empirical, such as the Schwartz Value Scale, which is an ambitious attempt to identify the universal structures and content of human values (Isommursu et al., 2011). Schwartz's Value Inventory, widely believed to be the most universal and applicable inventory of human values (Fleischmann, 2014), is based on the principle that values are ordered by relative importance within an individual. Furthermore, Schwartz's Value Inventory is the foundational work for Schwartz's revised theory of 19 human values (Table 3) and provides a tool in which pragamatic values are placed within a motivational circle (Figure 1). This theory provides a basis for this research and is discussed below.

Table 3. Schwartz's 19-Value Inventory (Schwartz et al., 2012)

Self-direction-thought	Freedom to cultivate one's own ideas and abilities
Self-direction-action	Freedom to determine one's own actions
Stimulation	Excitement, novelty, and change
Hedonism	Pleasure and sensuous gratification
Achievement	Success according to social standards
Power-dominance	Power through exercising control over people
Power-resources	Power through control of material and social resources
Face	Maintaining one's public image and avoiding humiliation
Security-personal	Safety in one's immediate environment
Security-societal	Safety and security in the wider society
Tradition	Maintaining/preserving cultural, family, and religious traditions
Conformity-rules	Compliance with rules, laws, and formal obligations
Conformity-interpersonal	Avoidance of upsetting or harming other people
Humility	Recognizing one's insignificance in the larger scheme of things
Benevolence-dependability	Being a reliable and trustworthy member of the in-group
Benevolence-caring	Devotion to the welfare of in-group members
Universalism-concern	Commitment to equality, justice, and protection for all people
Universalism-nature	Preservation of the natural environment
Universalism-tolerance	Acceptance/understanding of those who are different from oneself

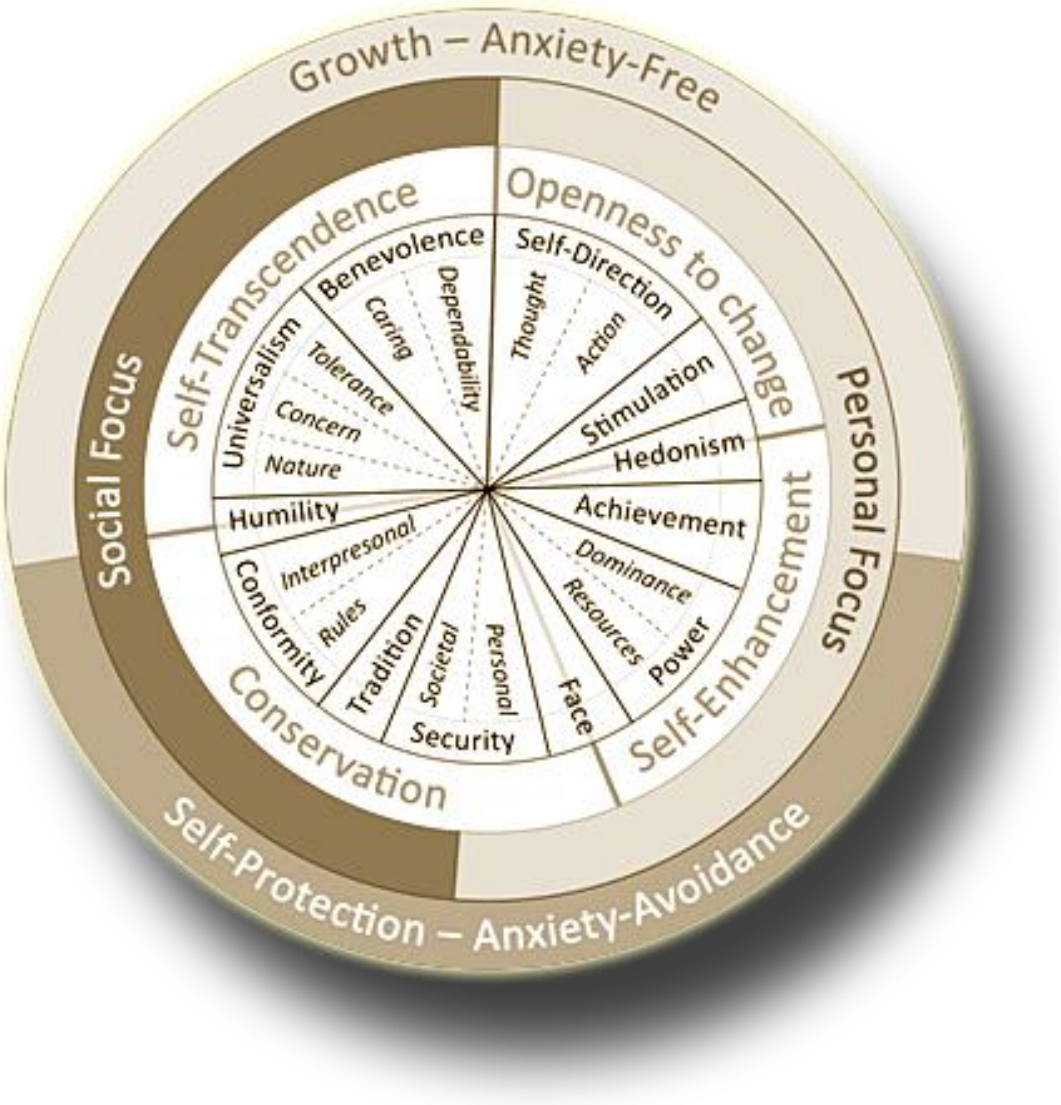


Figure 1. Schwartz's Value Circumplex (Schwartz et al., 2012)

Schwartz's (1992) theory of values has been conceptualized as a circumplex (Figure 1) that represents a motivational continuum of four higher-order values: *self-enhancement, self-direction, openness to change*, and *conservation* that enclose 19 more distinct values. The outermost ring of the circumplex is comprised of values that are concerned with protection of the self (anxiety- avoidance) and those concerned with personal growth or actualization of the self

*(*anxiety-free). The next ring describes values concerned with outcomes for self (personal focus) and outcomes for others (social focus). The third ring can be divided roughly into four quadrants representing higher order values. In the first two quadrants, for the higher order value *self-enhancement* (*achievement, power-dominance* and *power-resources*) and the higher order value *self-transcendence* (*universalism-concern, universalism-nature, universalism-tolerance, benevolence-car*e and *benevolence-dependability*), individuals can experience tension as they pursue their own interests versus concern for others. In the third and fourth quadrants, for the higher order value *openness to change* (*self-direction-thought, self-direction-action, stimulation,* and *hedonism*) and higher order value *conservation* (*security-personal, security-societal, tradition, conformity-rules,* and *conformity-interpersonal*), individuals experience tension when they pursue new ideas in contrast with maintaining the status quo. Among the 19 basic human values, *hedonism* is bifurcated to reflect how it can fall under both the *openness to change* and *self-enhancement* dimensions. *Humility* and *face* can be associated with *conservation* or these values may stand separately on their own.

One of the key benefits of Schwartz's Value Inventory is this pattern of compatibility and conflict that exists between values on the motivational spectrum. Values dimensions that are close together are more likely to be compatible or share similar motivations, whereas values located on opposite sides of the sphere are more likely to conflict or have antagonistic motivations. For example, the *power* values in the *self-enhancement* quadrant are more compatible with *achievement* values, also in the *self-enhancement* quandrant, than the *power* values might be with *benevolence* in the *self-transcendence* quadrant. Conceptualizing values this way also makes it possible to pinpoint where values potentially align between users and technological features. Furthermore, these demarcations allow researchers the option to choose

whether to focus on multiple or singular values while still maintaining the motivational continuum of complementary versus conflicting values.

Schwartz's Portrait Values Questionnaire

The Schwartz (1992) theory of basic human values has led to hundreds of studies during the past two decades, using five different variations of Schwartz's original instrument to measure pragmatic human values (Schwartz et al., 2012). Each of these instruments treats values as distinct entities; however, most do not build upon a central assumption articulated by Schwartz when he initially proposed his original theory. In the original theory, values are said to represent a *continuum* of motivations. Thus, the refined Portrait Values Questionnaire (PVQ-RR), published in 2012, and used in this exploratory study, was developed to further refine the theory that values function as a system of comparable and contrasting motivations, making it suitable for the detection of values alignments between users and value-feature pairs.

Teacher values

Results from the PVQ-RR used in this exploratory study are best interpreted in the context of other research building on Schwartz's initial Values Inventory (SVI), a precursor to the PVQ-RR. Between 1988 and 1992, Schwartz's (1992) early research developed a universal values inventory that focused on grade school teachers because "they play an explicit role in value socialization, they are presumably key carriers of culture, and they are probably close to the broad value consensus in societies rather than at the leading edge of change" (p. 18). Schwartz's initial sample included 200 teachers each from 20 countries, representing 13 different languages and a range of school subjects taught between grades 4 to 10 (Schwartz, 1992). The purpose of this initial survey was to empirically distinguish a set of basic values along a motivational continuum, and to determine how individuals differ in their particular value priorities across cultures. In comparing teachers with students in 14 countries, it was discovered

that teachers attributed more importance than students to *conformity, security, tradition,* and *benevolence* values in almost all countries included in the survey. Students, on the other hand, attributed more importance than teachers to *hedonism, stimulation,* and *self-direction* values (Schwartz, 1992).

As mentioned above, the priorities among values that form an individual's value system and the perceived consequences of participating in behaviors may give rise to strong social or psychological conflict. In terms of teachers, attributing high importance to values such as *universalism* and *benevolence* are reasoned to give rise to strong social or psychological conflict with *achievement* and *power*, which exist on the opposite sides of the motivational circumplex. In effect, what this suggests is that acceptance of others and concern for their welfare interferes with the pursuit of one's own relative success and dominance over others (Schwartz, 1992). We can conjecture, then, that these same values might be reflected in the current study. Furthermore, because values function as a system of priorities that can give rise to conflicts, an individual who scores high on *benevolence* and *conformity* may experience frustration with goals and objectives that promote *stimulation* and *openness to change*.

Building on Schwartz's early research, Knafo and Sagiv (2004) investigated whether there were core values related meaningfully to occupational environments, including teachers. Because occupations are considered an avenue in which people can express their values and attain their goals, Knafo and Sagiv (2004) suggested that individuals align their career choice with their dominant personal values: "Through the dynamic processes of attraction, selection, attrition and socialization, individuals in the same occupation are expected to come to emphasize similar values -- the dominant values in their occupation" (p. 256). Furthermore, individuals working in a certain occupation are likely to become increasingly similar in their values, and

socialization processes like professional development further enforce the values priorities of individuals within an occupation (Knafo & Sagiv, 2004). An aggregate view of values can reflect the dominant values of that occupation, as in the case of teachers. Referencing six vocational environments proposed by Holland (1997), Knafo & Sagiv (2004) suggest that teachers (along with social workers, psychologists, teachers, and counselors) belong to a social environment, which "encourages activities that focus on other people, in order to help, develop, guide and cure, rather than systematic, ordered activities, related to instruments or machines" and that these occupations as a whole exhibit values associated with *benevolence* and *universalism*, which are both associated with Schwartz's higher order value of *self-transcendence*. Thus, enterprising work environments were found to correlate positively with *power* and *achievement* values, and social work environments (i.e., social workers, psychologists, teachers, nurses, counselors) were found to correlate positively with *benevolence* and *universalism* values. According to Knafo and Sagiv (2004), people who belong to social occupations (e.g., teaching) are less likely to value prestige, status, and achievement, and more likely to value the development of new skills compared to other occupations (Knafo & Sagiv, 2004; Super, 1970; Zytowski, 1994).

Using Schwartz's circumplex to identify both compatible and conflicting values, Knafo and Sagiv (2004) found that teaching environments are "compatible with the motivation reflected in *benevolence* and *universalism* values and conflict with the motivation of *power* and *achievement*" (p. 259). Of the different social occupations sampled (i.e., social workers, teachers, psychologists, nurses, counselors), there was variation among the occupations with regard to the degree of *self-direction* versus *tradition* and *security* values. For example, social workers and psychologists attributed more importance to *self-direction* and less importance to *tradition* and *security*, whereas teachers and nurses displayed the exact opposite: more importance to *tradition*

and *security* and less importance to *self-direction*. Thus, even within the social occupations, there are differences in the ranking of importance attributed to values even while sharing overall similarities in predominant higher order values.

Additionally, occupational and work-values research indicates that gender can have an effect on the importance attributed to different values. For example, an occupation like teaching employs a disproportionate number of women in comparison to men; Knafo and Sagiv (2004) note that female adolescents attribute higher importance than males to benevolence values (Knafo & Schwartz, 2004), and as a result they may be attracted to teaching for these reasons. Benevolence values are in turn reinforced during the teaching profession's socialization process. However, it would seem likely that both males and females in the teaching profession attribute higher importance to benevolence than other values, and these values are further reinforced within the profession. These data provide a useful benchmark to compare teacher values in the VIF Learning Center badge system.

Summary of Literature Review

The literature reviewed underscores the emerging nature of research on digital badge systems, as well as other digital features designed to foster technology-mediated social participation, including peer assessment and feedback in online learning platforms. Using badges to incentivize pro-social behaviors has received the most attention in technology-mediated social participation literature, particularly in Stack Overflow and Wikipedia, two of the largest and arguably most successful and long-lasting platforms that involve peer assessment mechanisms and badges in their design. What the literature suggests is that participation is not necessarily successive, and may change over time in response to many variables such as group size, interface design, individual goals, personality traits, and other influences (Preece & Shneiderman, 2009). This study's aim to investigate how to detect the alignment of pragmatic values between users

and their technology-mediated social participation led to a literature overview of pragmatic values (distinct from ethical and moral values) which may provide explanatory power in analyzing complex digital systems like teacher professional development platforms. The theoretical basis of Schwartz's Values Inventory is based on pragmatic values having explanatory powers in predicting a person's preferences, and this makes it a powerful instrument for exploring values in a goal-driven environment where pragmatic values are of interest. These topics set the stage for methodological approaches discussed in the next section that are relevant to the statement of purpose and research questions.

CHAPTER 3: METHODS

This chapter presents a discussion of the specific steps used to explore the detection of values alignment in VIF Learning Center's online teacher professional development digital badge system. The creation of a value sensitive design research method for this study is in itself a major contribution of the research and represents an attempt to fill a theoretical gap in the literature. Instead of emphasizing a prescriptive investigation of values during the conceptual phase of value sensitive design, this study applied a new method to discover values through an empirical post hoc anlysis of the system. The first section describes the research questions and design rationale for a value sensitive design approach and a justification for case study methodology using quantitative and qualitative methods. This first section also describes the participants and context, including VIF Learning Center teachers and administrators in different institutional and organizational configurations (e.g., mandated participation and optional use). The second section is divided into three parts, each corresponding to the three research questions. The first part addresses research question 1, which addresses the human values of teachers and administrators using the platform. This part focuses on collecting survey responses from VIF teachers and administrators, as well as scoring methods used to determine higher order values. The second part, which addresses research question 2, details the methods developed to conduct the technical investigation of pragmatic values. This part focuses on the identification of features and the assigning of values to create a set of feature-value pairs for analysis. Part three addresses research question 3; it references proposed methods and summarizes the problems encountered in preparation for discussion in Chapter 4.

Research Questions

The study explored the detection of value alignments between users and system features in an online teacher professional development badge system. Specific objectives were: 1) to determine how to identify value alignments that may exist between users (i.e., teachers) and the features (i.e., replying, commenting, "friending," etc.) of the platform (VIFLearn.com); and 2) to investigate whether it is possible to detect effects of value alignments on motivation and social participation in a digital badge environment. In pursuing these objectives, it was anticipated that teacher participation would be higher when the values associated with technical features were aligned with teachers' personal values. Thus, this study aimed to answer the following research questions:

RQ1: What are the human values of teachers and administrators using the platform?

RQ2: How can pragmatic human values (versus ethical and/or moral values) be ascribed to technical features of the system? What pragmatic values can be ascribed to the features of the platform?

RQ3: How can alignment between personal values and the values embodied in system features be detected? Does alignment positively influence use of particular features?

RQ3a: How does teacher participation vary across contexts? Specifically, can differences in activity levels be detected in contexts where participation is mandatory (i.e., where superintendents or principals mandate participation) versus where participation is optional?

Research Design Rationale

This research design used case study methods, which is an "appropriate way to research an area in which few previous studies have been carried out" (Benbasat, Goldstein & Mead, 1987, p. 371). In particular, case study methods are "well suited to understanding the interactions between technology-related innovations and organizational contexts" (Darke et al., 1998, p. 274), which are conditions that make this method relevant to the current research. Case study methods are best used to comprehensively understand the phenomenon of interest (Choemprayong & Wildemuth, 2009, p. 53), or when one or two fundamental issues are studied in order to understand the larger system being examined. Case studies are also ideal when a researcher has access to a phenomenon that was previously inaccessible, or for studies where there are multiple units of analysis (Yin, 1994).

Yin (1994) lists six sources of evidence for data collection in a case study protocol: documentation, archival records, interviews, direct observation, participant observation, and physical artifacts. However, a variety of designs and methods of data collection and analysis can be used to accomplish the goals of a particular case study, and not all must be included (Yin, 1994). While many case studies are qualitative, Yin (2003) notes that case studies may involve both quantitative and qualitative data in order to strengthen validity. Value sensitive design, the research framework guiding this exploratory study, encourages multiple methods for empirical investigations (Friedman, Kahn & Borning, 2006), to address the multiplicity of values in sociotechnical systems. Both quantitative and qualitative methods were used to gather data in order to address the research questions in this study. Qualitative data was used to facilitate the technical investigation (i.e., assigning values to technical features of the system), and quantitative data was obtained through self-report scales and data logs. As with other types of research, case study methods must address construct validity, internal validity, external validity,

and reliability (Yin, 1989). Yin (1994) also advocates using multiple sources of evidence to ensure construct validity. Researchers have an ethical obligation to minimize misrepresentation and misunderstanding (Stake, 1995). This includes both the validity of measures selected, and validity in interpretation of the findings.

To ensure validity and increase accuracy, case study research relies on triangulation (Stake, 1995) by confirming the validity of the processes. In case studies, triangulation is accomplished through the use of multiple sources of data (Yin, 1984). This research used investigator triangulation to increase validity during the technical investigation when values were assigned to features of the system. Investigator triangulation occurs when several investigators examine the same phenomenon (Denzin, 1984) to increase confidence in the interpretation.

The strategy of inquiry for this research employed a concurrent mixed method research design to, "converge quantitative and qualitative data in order to provide a comprehensive analysis of the research problem" (Creswell, 2013, p. 66). With this strategy, both quantitative and qualitative data were collected at the same time and integrated in the interpretation (Creswell, 2007). More specifically, user data logs and user self-report survey results were collected at the same time; concurrently, the technical investigation of the VIF Learning Center platform produced the necessary assignment of values to features, after which analysis of the data occurred. While the overarching strategy of inquiry for this proposed research was concurrent, there were logical steps nested within the order of procedures for each of the research questions, many of which were applied in a pilot study that took place during the fall of 2015. These steps are described in detail below, in connection with the research questions they addressed.

Rationale for Case Selection

The conceptual framework of this research is based on the belief that values are "guiding principles of what people consider important in life" (Cheng & Fleischmann, 2010, n.p.) and can have explanatory power in predicting behaviors and attitudes (Schwartz, 2007). Furthermore, there is a presumption that technical properties can "support or hinder human values" (Friedman, Kahn, & Borning, 2008, p. 4), and that a systematic technical investigation allows researchers to pinpoint values that "follow from the properties of the technology" (Friedman, Kahn, & Borning, 2008, p. 351). Value sensitive design, the methodological approach within which this research is situated, claims that a given technology may be more suitable for certain activities; therefore, certain values (and the behaviors and actions that follow) are supported while others are not. Digital badge systems are a compelling site of inquiry because, by design, they strive to be a medium of exchange in which the badge is assumed to both *contain* value and *reflect* what is valued. Therefore, it is incumbent on designers to understand teachers' values and how value alignments influence participation throughout the system.

Evaluating values embodied in technological features helps designers pinpoint where alignments in values may occur, potentially increasing the successful use and adoption of the platform (Fleischmann, 2014). As an example, a lack of understanding about users' values could create a jarring effect if technical features are designed to promote collaboration or innovation among users for whom conformity or maintaining the status quo are core values. "By designing for users' values, along with their needs and other aspects, information technology designers can help ensure that their products will be used and successful in the marketplace" (Fleischmann, 2014, p. 21). Researchers argue that designers can inadvertently transfer values into system design (Miller et al. 2007; Shilton et al., 2014), whether through technical choices (Winner, 1980) or through rules or policies that may influence technical design (Friedman, 1997;

Friedman et al. 2008; Nissenbaum, 2009). Thus, a post-hoc investigation of the platform and an analysis of user values and their web log activity could detect the presence of values alignments that influence participation one way or another.

The VIF Learning Center case was strategically selected for this investigation based on its relevance to the research questions (Choemprayong & Wildemuth, 2009). A teacher online professional development badge system is a particularly relevant site of inquiry in this respect because teachers represent a unique group in terms of human values research. Schwartz's (1992) original research on universal personal values targeted teachers in multiple countries as a basis for theory testing; thus, there is prior research on teacher values with which to compare this study's results. Exploring whether teacher values from this study are comparable to what has been previously reported is a worthy investigation, particularly for contrasting groups who opt to participate in a novel online teacher professional development platform and those for whom participation is mandatory. For example, in reference to values from the Schwartz Value Inventory (1992), a predominance of *openness to change* higher order values (i.e., *stimulation* and *self-direction*) might be expected among teachers who choose to use an innovative platform for purposes of *self-enhancement* (i.e., *achievement* or *power*). Conversely, teachers who participate for mandatory reasons might be expected to present more strongly with *conservation* higher order values (i.e., *security* and *conformity/tradition*), personal values associated with teacher work environments in occupational research (Knafo & Sagiv, 2004). Thus, teachers with access to the VIF Learning Center are the population of interest in this exploratory case study because of values they are likely to exhibit, and the goals manifest in their participation in the VIF badging platform.

Participants and Context

VIF Learning Center is an online teacher professional development and digital badge system that became fully functional in January of 2014, and is built using the open-source Joomla platform with Jomsocial plugins, which make many of the community actions possible (e.g., posting photos, voting, commenting, replying, joining groups, joining group discussions, etc.). VIF Education International is an organization founded in 1987 to "promote the value of international perspectives in education by providing universities with international faculty recruitment, relocation, and support services" (Keane, Otter, Oxley, & Lipscomb, 2016, p. 226). The organization subsequently shifted their focus to K-12 education during the 1990s. Today, according to VIF, the schools and school districts that make up their clientele, "are distinguished by school-wide commitments to building global competence and language acquisition in teachers, students, and administrators, and they endeavor to integrate technology, cultural literacy, and other 21st-century skills into everyday classroom instruction" (Keane et al., 2016, p. 227). The VIF Learning Center currently promotes inquiry-based learning, described as a pedagogy in which students are encouraged to pose and respond to questions, problems, or scenarios, in contrast to pedagogies that emphasize facts and prescribed paths to knowledge (Bell, Urhahne, Schanze & Ploetzner, 2010), which is a relatively progressive pedagogy in comparison to what many teachers were trained to teach. Teachers are also asked to apply real-world relevance to their lesson plans, to deliberately integrate intercultural experiences in classrooms, and to engage in peer review through commenting as well as use of other social media features (i.e., following, "liking," and voting). Each professional development module involves sequenced course work that follows an inquiry-based framework, with lessons aligned to different standards such as Common Core (for teachers in the United States). While some teachers may be familiar with inquiry-based learning, others may not, and the approach could

represent non-traditional values for teachers who are mandated to participate by school administrators. Each inquiry-based professional development module in the VIF Learning Center uses designated stages: ask, investigate, synthesize/create, and reflect/revise. In a case study published to elucidate the VIF Learning Center badge system, Keane, Otter, Oxley, and Lipscomb write that each professional development module is designed to:

1. Build knowledge. Teachers review module content, engage in primary investigations, watch videos, read relevant articles, contribute to wikis, etc.
2. Engage with ideas. Within modules, teachers experiment with, play, utilize, and share various tools and simulations with one another and with students.
3. Collaborate online. Teachers use different technology tools and social media applications, such as Skype or blogging, to collaborate with international classrooms and with other educators in the VIF community.
4. Plan with grade-level teams. Peer collaboration is inherent to VIF's professional development approach as team planning encourages teacher expertise to be shared and builds community across grade levels.
5. Demonstrate new knowledge. Teachers create original, global lesson plans based on module learning and demonstrate implementation of original lessons, new techniques, and global knowledge in their classrooms by submitting evidence, such as student learning products.
6. Reflect and share. Teachers post reflections based on lesson implementation, initiate and participate in themed discussions, and share their original lessons with other educators in the VIF community (Keane, Otter, Oxley, and Lipscomb, 2016, p. 229).

While mandated-use teachers are required to participate in the system, how they participate is not necessarily prescribed and teachers have leeway in terms of how much or how little they engage with their peers and with the social aspects of the system. While technology-mediated social participation may influence deeper engagement, and this engagement could subsequently have an effect on learning outcomes, exploring that relationship is beyond the scope of this study. However, VIF Learning Center's objective to foster greater participation and build an engaged community is within the scope. Keane et al. refer to two additional goals relevant to both the recent redesign of the VIF Learning Center platform and this exploratory study:

1. Foster participation in a vibrant, online community that incorporates the sharing elements of social media platforms such as Facebook and Twitter.
2. Create an online platform robust enough to support a rapidly growing community of educators (Keane et al., 2016, p. 230).

According to VIF International Education administrators, integrating global or cross-cultural concepts into the classroom requires teachers to be open-minded, an approach that is also "critical for teachers' ability to collaborate with diverse peers, and to actively seek out opportunities to experiment with and incorporate new ideas and tools into their classrooms" (Keane et al., 2016, p. 228). This study will explore to what degree teachers reflect values such as open-mindedness, and whether these teachers are more or less likely to be active in the system.

VIF refers to schools that participate in its programs as VIF Global Schools, and various nationalities and countries are represented. The combination of diverse users within a homogenous profession makes these particular teachers and administrators an interesting case that includes multiple sub-groups participating on the platform. Of these groups, some belong to

U.S. school districts where teacher participation is mandated, whereas others, including international groups, allow teachers to opt-in and determine the degree to which they participate. As such, educators participate in the VIF Learning Center for different reasons. An example of organizations that have joined the platform include Pink Elephant, a non-governmental organizational (NGO) that works in Nairobi neighborhoods to train local educators; A+ arts-based schools that advocate for a "whole-school reform model that views the arts as fundamental to teaching and learning in all subjects" (A+ Schools, 2015, n.p.); the NEA foundation, an advocacy group for educators; and Badge Europe, a consortium that works across economic sectors to work with teachers on competency-based education. Most of the U.S. schools that engage with the platform are designated Title I (i.e., the majority of students receive free or reduced lunch), and both urban and rural districts across the country are represented.

Currently, educators from the Houston Independent School District's 28 schools are among teachers who use the platform. In this district, students speak over 150 languages and 92 percent of the school population qualifies for free or reduced lunch. Similarly, Speas Elementary in Winston-Salem, N.C., represents another U.S.-based school where more than 89 percent of all students qualify for free or reduced lunch. Educators from Speas became involved with the VIF Learning Center as part of a school transformation plan to address under-enrollment, low teacher satisfaction, under-performing students and a lack of community involvement and confidence in the school (VIF International Education, 2015). As of September 2015, 456 VIF Global Schools were operating in 78 school districts and 12 U.S. states, with 5266 teachers participating in VIF cultural exchange, global school and/or dual language immersion programs served by the VIF Learning Center's professional development platform (VIF International Education, 2015). VIF reports that there were 17,186 community members affiliated with their program as of September

2015. Teachers had reportedly completed 67,810 hours of professional development and they earned 6,781 badges, including 2,152 year-end badges. Each module represents 10 hours of professional development or continued education learning, and teachers could earn badges for the completion of each module, as well as a year-end badge for successful completion of 4 modules that signal "their growing expertise as global educators, and provide evidence of their participation in professional development to cultivate skills for teaching with global perspectives and using 21st century tools" (Keane et al., 2016, p. 230). Digital badges are triggered after teachers have implemented their lessons, attached artifacts of student learning, and revised lessons based on their classroom implementation experiences. The VIF Learning Center's badging system is not (currently) designed to evaluate the quality of each lesson, and the system does not award badges for pro-social behaviors or to motivate favorable types of participation. Instead, the system awards badges to acknowledge completion of criteria designed to impart the skills and attitudes of a global-ready educator. For that reason, a teacher can earn a badge without engaging any of the value-feature pairs designed to promote pro-social behavior.

In May of 2015, VIF International Education commissioned an external evaluation about participation, impact, and effectiveness of the VIF Learning Center professional development platform (VIF Learn, 2015). Teachers who had logged into the system more than once were eligible to participate in the survey. Out of 4,484 invited to participate, 838 responded. Of those respondents, 748 were classroom teachers and 87 were school administrators (i.e., principals or vice principals) or district administrators (i.e., superintendents, assistant superintendents, human resources administrators). Self-reported user familiarity with different features and frequency of use on the platform (e.g., online modules, lesson plans, resources, implementation tools, social news feed, groups, classroom partnerships, badging, etc.) were reported in the findings that

addressed the following five areas: 1) learning center use; 2) knowledge and skills; 3) integration of global content, project-based inquiry, and technologies; 4) impact on teaching and learning; and, 5) barriers and supports. Website analytics were also collected from the VIF Learning Center's database to analyze user event log data for tracking each participant's engagement with the three main Learning Center components: professional development modules, resource library, and community.

These aggregated data describe different ways that teachers participate in the VIF Learning Center platform. While the report primarily focused on the effectiveness and impact of VIF professional development on teachers, findings most relevant to the current exploratory study include more general use patterns and attitudes, including community engagement and social participation. VIF Learning Center teachers have access to a "dynamic library of expert and teacher-created curriculum resources," and a "social community of more than 17,000 international teachers for support, collaboration, and ongoing professional engagement" (VIF Learn, 2015, n.p.). According to the VIF evaluation report (2015), teachers used the community features less frequently than the library and modules, but often commented on the value of seeing photos and student work others posted, as well as the ability to "connect with teachers globally" and "collaborate with other exchange teachers on lessons" (n.p.). In terms of actual contributions (e.g., posting photos, discussion comments, status updates, etc.), the bulk of community activity involved posting to group discussions and sharing photos.

The various groups mentioned above represent users for whom participation in the system is either mandatory or optional, depending on pre-existing institutional and organizational agreements. Mandated-use versus optional-use participation could be a particularly meaningful distinction in an environment designed to introduce pedagogy that requires open-mindedness.

According to VIF (2015), among the 748 survey respondents who were teachers, the majority (59 percent) reported completing at least some of the modules independently, while a large portion (30 percent) completed them as part of school or district-wide training. Of the teachers surveyed, 64 percent reported that the modules were required by administration, which likely explains higher module completion rates. Teachers also reported that the biggest factor motivating them to contribute to the community were school and district requirements, a desire to make connections with other professionals, and a desire to help others learn from their experience. Teachers also agreed that, while they were more open to experimenting and taking risks with new instructional content (69 percent) and technologies (66 percent), they did face common challenges, including time constraints (VIF Learn, 2015). "A critical consideration for job-embedded professional development programs geared toward educators is the need to balance the everyday demands teachers face in their classrooms with the perpetual expectation for them to develop expertise across content, pedagogy, and new learning" (Keane et al., 2016, p. 228). As noted in VIF's evaluation report (2015), teachers agreed that "pressure to perform test preparation" and "excessive testing leaves little time for additional activities" (n.p.).

Survey respondents were recruited from VIF International Education's member list; potential respondents represented teachers and administrators who were either currently active, or had been active, in a VIF International Education program, and were not necessarily active participants in VIF Learning Center professional development. In order to address research question 3, intended participants of the study included teachers and administrators who *were* active in the VIF Learning Center during the research period between September 2015 and March 2016. However, for exploratory purposes, intended participants included all teachers and administrators in order to determine whether there might be differences in higher order values

between those who were not active during the research period, and those who were. These survey respondents were then organized as a cluster of cases, or collective cases (Stake, 1995), based on the different groups that can be delineated both conceptually and in the data (e.g.., males, females, administrators, teachers, mandated-use, optional-use). By participating in the survey, respondents gave implied consent to conduct further web log analysis on their data (Appendix A).

Addressing Research Question 1: Users' personal values

Research question 1 is: What are the human values of teachers and administrators using the platform? The study used Schwartz's Portrait Values Questionnaire-RR, a self-report scale, to understand teachers' personal values. First, approval of the research site through UNC-Chapel Hill's Institutional Review Board was obtained. An application for written approval was submitted to UNC-Chapel Hill's Institutional Review Board; the forms for the approval process included the following: the research proposal, a recruitment and consent email (Appendix A), and a copy of the Portrait Values Questionnaire-RR (Appendix B).

Understanding users' personal values helps develop systems and features considered relevant and attractive (Kujala & Väänänen-Vainio-Mattila, 2009). To address the research question, the revised Portrait Values Questionnaire (RR) was used, which is a self-report scale based on Schwartz et al.'s (2012) refined theory of basic human values. Social psychology research shows that users have difficulty describing subjective experiences, including the challenge of verbally expressing how one feels, and that they can also encounter recall problems. Because it is not easy for system developers to discuss values with users, and users may struggle to recognize or rank their own values (Kujala & Väänänen-Vainio-Mattila, 2009), self-reported descriptions of personal values are a suitable means to characterize subjective user experience (Isomursu et al., 2011). While self-report measures are not ideal for addressing all human values

dimensions (Shilton et al., 2014), they do help identify pragmatic values that may explain motivations to participate and contribute. Self-reports on indirect measures, such as self-ratings for quantitative data, are also considered a standard research method for studying the effects of motivation.

The Portrait Value Questionnaire (PVQ-RR) is based on the original Schwartz Value Scale (Schwartz, 1992), a reliable instrument used widely in over 60 countries, including the European Social Survey. The PVQ-RR, developed by Schwartz et al. (2012), includes short verbal portraits that can be gender-matched to the respondent, and has been translated into multiple languages. For each verbal portrait, respondents were asked: "How much like you is this person?" Six Likert-scale responses to the PVQ-RR questions are: (1) very much like me, (2) like me, (3) somewhat like me, (4) a little like me, (5) not like me, and (6) not like me at all. A sample of the 57 PVQ-RR items and introductory text are included in Table 4 below (see the full 57-item PVQ-RR in Appendix B). According to Schwartz et al. (2012), the purpose for refining the original 40-item Portrait Values Questionnaire was to provide greater heuristic and explanatory power underpinning the assumption that values form a circular motivational continuum (Figure 1). Because the current research specifically addresses the motivational aspect of values, the refined PVQ-RR was better suited to address the research questions than the previous 40-question version of the PVQ. Furthermore, in human values research, people who have a goal (e.g., conformity) do not necessarily exhibit the trait (e.g., conforming); thus, the PVQ-RR is designed to gauge people's values in relation to goals, aspirations, or wishes rather than how similar someone is to specific traits.

Table 4. Sample of the 19-Value Item PVQ-RR (Schwartz et al., 2012)

Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Click the accompanying circle that shows how much the person in the description is like you.

1. It is important to him to form his views independently.
2. It is important to him that his country is secure and stable.
3. It is important to him to have a good time.
4. It is important to him to avoid upsetting other people.
5. It is important to him that the weak and vulnerable in society be protected.
6. It is important to him that people do what he says they should.
7. It is important to him never to think he deserves more than other people.
8. It is important to him to care for nature.
9. It is important to him that no one should ever shame him.
10. It is important to him always to look for different things to do.

For the purposes of this exploratory study, the PVQ-RR was emailed using Qualtrics survey software to 9,660 VIF Learning Center teachers and administrators between February 4 and February 18, 2016, and 649 completed all 57 questions for a 7 percent response rate. VIF teachers and administrators received a recruitment email (Appendix A) that included a description of the study, a chance to enter a random drawing to win one of 10 $20.00 Amazon gift cards as an incentive, and an option to receive individual results from the survey about their personal values if they chose. The time burden to participate was estimated to be 8 minutes for the PVQ-RR (Schwartz et al., 2012), with an actual average time of 7 minutes and 22 seconds for the current study. Categories were indexed and coded in Qualtrics so that survey respondents could receive immediate feedback upon completion of the survey as a potential direct benefit for participation. Survey respondents received results of their individual questionnaire within 28 days after completing the survey.

This exploratory study is designed to address, in part, usage of VIF Learning Center features; therefore, survey respondents had to meet certain criteria in order that their activity

status could be determined, so that web log analysis could address research question 3. Therefore, this section discusses scoring, as well as steps used to prepare and clean survey data for inclusion or exclusion in later analysis.

Scoring the PVQ-RR

Survey results were cleaned and prepared using a combination of Microsoft Excel for Mac OS, and Tableau 9.2, a data visualization tool. Descriptive statistics were calculated with R Studio for Mac. In preparing the PVQ-RR in Qualtrics, coding was provided so that each of the 57 questions was indexed to one of the 19 value dimensions, including sub-types as delineated in Table 5. For example, questions 1, 23, and 39 are indexed to the value *self-direction-thought*, while questions 17, 32, and 48 are indexed to the value *achievement*. This allowed the mean for each value to be calculated according to its conceptual component in the PVQ-RR, which provides a more accurate representation of each respondent's values (S. Schwartz, personal communication, 2016).

Table 5. Scoring key for 19 values in the PVQ-RR value scale

Value dimension	Items	Value dimension	Items
Self-direction Thought	1,23,39	Tradition	18,33,40
Self-direction Action	16,30,56	Conformity-Rules	15,31,42
Stimulation	10,28,43	Conformity-Interpersonal	4,22,51
Hedonism	3,36,46	Humility	7,38,54
Achievement	17,32,48	Universalism-Nature	8,21,45
Power Dominance	6,29,41	Universalism-Concern	5,37,52
Power Resources	12,20,44	Universalism-Tolerance	14,34,57
Face	9,24,49	Benevolence –Care	11,25,47
Security Personal	13,26,53	Benevolence-Dependability	19,27,55
Security Societal	2,35,50		

Once survey results were collected, it was necessary to make a correction for individual differences because individuals and groups differ in their use of the response scale (Schwartz et al., 2012). The need to make these corrections is based on two important assumptions. One assumption is that the 19 values forming a motivational circle are reasonably comprehensive and representative of values across individuals and cultural groups. A second assumption is that values can be ranked relative to one another. According to Schwartz's basic theory of human values, individuals can be said to rank their value priorities as opposed to having some values but not others. Thus, the PVQ-RR is designed to identify the prioritization of particular values as part of an overall system of those values. As Schwartz writes, to treat the scores as having absolute importance of a single value across individuals or across groups ignores the fact that values function as a system (Schwartz, 1996, 2006). "Our values affect cognition, emotion, and behavior as a result of trade-offs among multiple values that can be simultaneously relevant to a decision or action, and the relevant values often have opposing implications for the decision or action. Thus, the scale correction converts absolute value scores into scores that indicate the relative importance of each value in the value system of the respondent (i.e., the individual's value priorities), and places them on a motivational continuum" (Schwartz, personal communication, January, 2016). Because scoring for the PVQ-RR may differ from other self-report measures, the following section illustrates the method, using an example for clarity.

Scoring for the 19 values in the PVQ-RR

To make scale corrections, Schwartz et al. (2012) recommend computing scores for the 19 values by taking the mean of each item that indexes it. Next, each individual's mean rating (MRAT) was computed across all 57-value items to center it. Scores were centered within each person rather than standardizing because some individuals may discriminate more sharply among their values than others, and standardizing eliminates differences in the extent to which

individuals discriminate among their values. The MRAT was then subtracted from each of the 19 value scores to center the scores of each of the individual's 19 values in relation to their mean rating. The following example illustrates the scoring for an individual's results of the PVQ-RR (Table 6). The sum of total raw scores for all 19 values is 258, and the mean rating (total divided by 57, the total number of questions in the PVQ-RR) is 4.52 (MRAT) for this individual.

Table 6. Example PVQ-RR scoring of 19 values for an individual

19 Values	Sum	Mean	Centered
Self-direction thought	13	4.33	-0.19
Self-direction action	15	5	0.48
Stimulation	14	4.67	0.15
Hedonism	15	5	0.48
Security-personal	15	5	0.48
Security-societal	15	5	0.48
Tradition	13	4.33	-0.19
Conformity-rules	10	3.67	-0.85
Conformity-interpersonal	13	4.33	-0.19
Face	14	4.67	0.15
Humility	15	5	0.48
Achievement	13	4.33	-0.19
Power dominance	15	5	0.48
Power resources	11	3.67	-0.85
Universalism-nature	11	3.67	-0.85
Universalism-concern	14	4.67	0.15
Universalism-tolerance	15	5	0.48
Benevolence-care	12	4	-0.52
Benevolence-dependability	15	5	0.48
Total	258		
MRAT		4.52	

As mentioned above, the score for each of the 19 values corresponds to the three questions associated with that particular value. For example, if a respondent selected Likert-scale number (4) *like me* for question 1; Likert-scale (3) *a little like me* for question 23; and Likert-scale (6) *very much like me* for question 39, the total raw score for that individual's *self-direction*

thought value sums to 13. An individual's lowest possible raw score for each of the 19 values is 3 and the highest is 18; totaled together, the lowest possible raw score for all of the 19 values combined is 57 and the highest is 342.

In the example in Table 6, the mean of the score for *self-direction thought* is 4.33. The MRAT (4.52) subtracted from the mean score (4.33) provides the centered score (-0.19). Therefore, scoring is relative, so that higher scores indicate values to which an individual attributes greater importance, and lower scores indicate values to which an individual attributes less importance. For example, the scores illustrated in Table 6 reflect an individual who attributes less importance to *power-resources, universalism-nature, conformity-rules*, and *benevolence-care*, while attributing greater importance to *self-direction action, hedonism, security-personal, security-societal, humility, power dominance, universalism-tolerance,* and *benevolence-dependability*. These corrected and centered scores can then be combined for scoring higher order values, discussed next.

Scoring higher order values

According to Schwartz et al. (2012), the purpose of further scoring the PVQ-RR's 19 values is to discuss complementary or conflicting motivations according to higher order values, which aligns with the goals of this study. For example, the higher order value, *openness to change*, emphasizes readiness for new ideas, actions, and experiences. It contrasts with the higher order value, *conservation*, which emphasizes self-restriction, order, and avoiding change. The *self-enhancement* higher order value emphasizes pursuing one's own interests, which contrasts with the *self-transcendence* higher order value that emphasizes transcending one's own interests for the sake of others. *Hedonism* (one of the 19 values) shares elements of both the *openness to change* higher order value and the *self-enhancement* higher order value. The innermost circle represents the values so that pursuit of a value on one side of the circle is likely to conflict with

pursuit of the values located on the opposite side of the circle (see Figure 1, above). After scoring survey respondents 19 values, the scores for survey respondents' higher order values were then computed by combining the centered means in the following way, illustrated in Table 7:

- *Openness to change*: Centered means for *self-direction thought, self-direction action, stimulation* and *hedonism* were added together and divided by four to get the *openness to change* mean.
- *Conservation*: Centered means for *security-personal, security-societal, tradition, conformity-rules, conformity-interpersonal, face*, and humility were added together and divided by seven to get the *conservation* mean.
- *Self-enhancement*: Centered means for *achievement, power dominance* and *power resources* were added together and divided by three to get the *self-enhancement* mean.
- *Self-transcendence*: Centered means for *universalism-nature, universalism-concern, universalism-tolerance, benevolence-care*, and *benevolence-dependability* were added together and divided by five to get the *self-transcendence* mean.

Table 7. Example PVQ-RR higher order scoring for an individual

Higher order values	19 values	Centered means	Combined centered means
Openness to change			0.23
	Self-direction thought	-0.19	
	Self-direction action	0.48	
	Stimulation	0.15	
	Hedonism	0.48	
Conservation			0.05
	Security-personal	0.48	
	Security-societal	0.48	
	Tradition	-0.19	
	Conformity-rules	-0.85	
	Conformity-interpersonal	-0.19	
	Face	0.15	
	Humility	0.48	
Self-enhancement			-0.19
	Achievement	-0.19	
	Power dominance	0.48	
	Power resources	-0.85	
Self-transcendence			-0.05
	Universalism-nature	-0.85	
	Universalism-concern	0.15	
	Universalism-tolerance	0.48	
	Benevolence-care	-0.52	
	Benevolence-dependability	0.48	

Thus, as a hypothetical example (under the assumption that these scores are relative to others in the sample), it can be said that this individual attributes greatest importance to the highest order value of *openness to change*, followed by the higher order value of *conservation*. This individual also attributes less importance to the higher order value *self-transcendence*, and the least importance to the higher order value *self-enhancement*, in relation to self, and in relation to others in the survey.

Preparing the sample for analysis

In preparing and cleaning survey respondent data for analysis, several decisions were made. Schwartz recommends following a set of standard criteria to remove respondents who have likely not tried to discriminate among their values, or who have responded in ways suggesting deliberate misrepresentation (Schwartz, personal communication, January, 2016). Respondents who selected the same answer in response to more than 40 of the 57 questions were therefore removed from the data set. For example, selecting the Likert-scale item (3) more than 40 times out of 57 questions indicated a respondent who was not discriminating enough in his or her answer selections. Accordingly, of the original 649 respondents, 30 were removed and 619 remained.

Next, in order to verify whether survey respondents were administrators or teachers (mandated use or optional use) using the VIF Learning Center platform, their Learning Center (LC) user status was cross-checked with unique identifiers that linked survey response data in Microsoft Excel with VIF's Salesforce customer management database using Tableau 9.2. Thus, survey respondents who could not be grouped according to gender and/or activity status (e.g., administrator, teacher, mandated-use, or optional-use) were removed, as well as users labeled as "inactive" in the system. VIF staff postulated that survey respondents who were categorized as inactive in the VIF Salesforce database included a mixture of users who had never been active in the VIF Learning Center, or no longer were, for various (and unverifiable) reasons. The inactive users could conceivably have retired from their teaching or administration positions, or changed employment, or had simply decided not to use the VIF Learning Center. Because the reasons for their inactivity could not be gauged from the data, drawing conclusions about their values could be considered spurious. Examining the LC user status confirmed that of the 619 survey respondents, 83 lacked sufficient data to determine whether they were teachers or administrators.

Therefore, the inactive respondents were excluded from further analysis; of the 619 survey respondents, 536 remained.

The next step involved further crosschecking to identify and remove respondents who had not logged into the VIF Learning Center platform during the research range between September 2015 and March 2016. This was to ensure that respondents met criteria to be included in web log analysis for research question 3; the total number remaining for analysis was therefore winnowed down to 342. Isolating a sub-group that was active during the research range was necessary because teachers are more likely to participate in the VIF Learning Center in parallel with the school year as part of their professional development goals. Developing a research range that began at the start of the school year concurrent with the research study avoided conflating two potential cohorts of teachers who may have been active the previous year and not the current one.

Descriptive statistics for the 342 survey respondents active during the research range are presented in Chapter 4 below, where they are further delineated into subsets that include overall scoring and three specific comparisons: 1) males versus females; 2) administrators versus teachers; and e) mandated-use versus optional-use teachers.

Addressing Research Question 2: Values enacted in system features

Research question 2 is: How can pragmatic values be ascribed to technical features of the system? An underlying assumption of this research is that values can be associated with technical features, or enacted in them. To identify value alignments, it is necessary to assign values to technical features in a systematic way so that use patterns of particular features can be compared with users' pragmatic values. Technical investigations are appropriate for research designed to evaluate the *enactment* dimension of the Values Design Systems Framework (Shilton et al., 2014), which describes the degree to which values are enacted or associated with properties in

the system. “Technical investigations provide systematic ways to evaluate values along the *enactment* dimension within technologies that are already built and in use, when values are potential or performed, but therefore concretized and difficult to alter” (Shilton, et al., 2014, n.p., emphasis in original). Similarly, Yetim (2011c) notes that, “technical investigations focus on how existing technological properties and underlying mechanisms support or hinder human values” (p.1198). Friedman, Kahn and Borning (2008) describe a three-part iterative approach that involves conceptual, empirical, and technical investigations. During the conceptual investigation of this approach, researchers identify stakeholders affected and values implicated in the system, and conceptualizations of specific values are clarified. The empirical investigation uses quantitative and qualitative methods to understand individuals or groups affected by the technology and the context in which these stakeholders interact with the technological artifact. Following the empirical stage, two kinds of technical investigations may take place. The first focuses on existing technological properties and underlying mechanisms that support or hinder human values. The second involves a more proactive approach designed to enact values that were identified in the conceptual investigation. However, no one specific method of technical investigation is prescribed. The exploratory stance in research emphasizes the process of discovery, which in this study is employed as a way to identify values in a system, and requires a method to systematically identify values in a post hoc technical investigation.

While researchers proposed the use of technical investigations as a way to elicit values from technology, the methods for these investigations have not been made explicit (Brey, 2009; Nissenbaum, 2009; Shilton et al., 2014; Albrechtslund, 2007). Therefore, a two-step technical investigation developed for this study is described next. In the first step, features of the system

were identified. In the second step, a systematic approach was used to assign values to the features.

Identifying features and assigning values was accomplished using directed content analysis, a qualitative method that involves an "empirical, methodological controlled analysis of texts within their context of communication, following content analytic rules and step-by-step models, without rash quantification" (Mayring, 2000, p. 2). While the most common sources for content analysis are texts, the method can also be applied to "anything that occurs in sufficient numbers and has reasonably stable meaning for a specific group" (Krippendorff, 2012, p. 35), including features in a technical system. The coding unit in this case was initially guided by a set of images or screenshots of the features, including a description of what the feature did. While this step is similar to photo elicitation, a visual interviewing technique used widely in sociology and anthropology, and used in several value sensitive design case studies (Le Dantec, Poole & Wyche, 2009), there was an important distinction that set it apart from these methods. Values were matched with the 19 value dimensions of the Schwartz Value Inventory instead of emerging from users' own cognitive frameworks. Furthermore, a set of critical heuristics guided the process so that subjects evaluated the values of any given feature more exhaustively, and potentially assigned more than one value to a particular feature. One of the strengths of qualitative content analysis is that it allows units of text (in this case, features) to be assigned to more than one code or category (Tesch, 1990), which is likely with features that can be used in a variety of ways. The following describes the two-step process used to 1) identify and code relevant features in the system; and 2) assign values to those features.

Step 1: Identifying features

The purpose of this step was to identify features of the VIF Learning Center platform. While identifying features in a system may seem like a straightforward task, applying a systematic process is in practice more complex. For example, the VIF Learning Center platform includes functional features such as: uploading a profile photo, uploading other types of photos, uploading videos, joining groups, posting events, "friending" members, voting, commenting, earning badges, and earning "karma" by doing certain activities on the site, among other features. Some features are less visible, albeit critical to how the platform functions for VIF Learning Center users. Other features may interact on the backend with the Joomla content management system as well as Salesforce for customer relationship management. VIF Learning Center developers have activated a feature in Salesforce that allows school principals to receive updates when teachers earn badges, for example. Thus, features can be highly contextual, and their functionality must be clear so that coders can more accurately assign values to them.

Two potential approaches were considered to guide the task of feature identification: affordance theory and reverse engineering. These two approaches highlight the challenges involved in defining the parameters for what constitutes a feature, which is defined in the Oxford English Dictionary (OED) as, "a distinctive or characteristic part of a thing; some part which arrests the attention by its conspicuousness or prominence" (Simpson & Weiner, 1989, n.p.). A specific computing term, "feature-complete," was added to the OED entry in 2013, and is defined as "having all the functionality intended for the final version" (1989, n.p.). We can conclude from these definitions that both prominence *and* functionality are core characteristics of technical features in computer systems. Similarly, the current (2016) Wikipedia entry for "software feature" provides a more technical definition, which describes a feature as, "a distinguishing characteristic of a software item (e.g., performance, portability, or functionality)."

This emphasizes again that features of a technical system involve processes, and are more than static artifacts. This corresponds to theory used in both design studies and human-computer interaction fields as an approach to analyzing artifacts.

Affordance theory (Gibson, 1977) lends additional clarity to the definition of what constitutes a feature. However, while attempts have been made to define affordance in precise analytical terms, the concept is somewhat ambiguous (Hsiao, Hsu & Lee, 2012). According to Norman (1988), "the term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used" (p. 9). Pols (2012) proposes four levels of affordance descriptions that are useful in defining an artifact (i.e., feature) for this exploratory research: 1) how the artifact can be manipulated; 2) what the reliable effects of those manipulations will be; 3) what can be done with the whole artifact (or technical feature) in itself; and 4) what can be done with the whole artifact as a component of a sociotechnical system. The concept of affordance provides a framework to explain how the appearance of features can direct a specific user's action; this shifts the evaluation from functions and its features to intended actions that are enacted in the affordances of an artifact (Gibson, 1977). However, while a system's affordances may be a useful way to define features, there appears to be no relevant framework to guide an applied investigation.

Reverse engineering, while not related to affordance theory per se, is an approach that could aid in the identification of a system's technical features. Reverse engineering for academic or learning purposes is undertaken in order to understand key issues of both successful and unsuccessful design and how to subsequently improve or optimize the design (Chikofsky & Cross, 1990). System parts may be visible in the interface, and design elements can be evaluated, allowing speculation about why some uses are possible and others are denied.

Methods involved in reverse engineering can involve a combined top-down and bottom-up approach, so that high-level architecture, available documentation, source code, mapping models, and other types of information are all evaluated. Similar to definitions of features and affordances above, reverse engineering treats dynamic processes as artifacts, including the interactions between them. In one case study (Asif, 2003), a model of the system was reverse engineered from available documents, including a description of the system's overall function, source code, developer documentation, use-case diagrams, and direct experience using the system. In this reverse engineering case study, feature functionality was defined by both user and developer perspectives. Focusing on both user and developer perspectives recognizes that there are multiple layers of abstraction in a system and, for a post-hoc technical investigation, there may be features at the implementation or structural level that are not visible to the end user, but nevertheless are present, and vice versa (see Chapter 5 for a discussion of these issues). For example, not all peer-based voting systems will be implemented the same way in two different technical systems. Therefore, the identification of features requires an approach that investigates how related processes are implemented, and relies to some extent on context to fully explain the parameters of the feature.

Thus, this research defined a feature as an artifact that can be dynamic, and that is considered distinct, conspicuous, or prominent by learners, as well as the perspectives of others involved in research and design of software systems. Attributes such as structural aspects of the page, graphical elements, or background color were not included. These attributes may influence usability and user motivation; however, they are not treated as features for the purposes of the current research, and are beyond the scope of this exploratory study.

Procedures for identifying features

One concern with the step of identifying features is the reliability of the process. "Any time humans observe phenomena or interpret meaning, there is bias" (Spurgin & Wildemuth, 2009, p. 301). Thus, involving multiple coders in feature identification is optimal. This helps to ensure that the sample includes a less biased representation of all possible features. Six people (four VIF staff: Chief Information Officer, senior researcher, lead developer, and an instructional designer; and two external reviewers: a systems engineer and the principal investigator for the study) participated in this process. The six participants followed a mixture of written and verbal instructions about the purpose of the study and how to define a feature:

> For the purposes of this research, a *feature* is defined as a distinguishing characteristic on the VIF Learning Center platform that is considered both prominent and functional, and involves a dynamic process. For example, "friending," is a feature that is prominently displayed on the site, and allows members to create a functional relationship between members whose activity stream they wish to follow. As you go through the site, generate a list of features that are considered distinct, conspicuous, or prominent, and that can be initiated through the site's interface. This precludes such attributes as structural aspects of the page, graphical elements, or background color, for example.

There were two parts involved in feature identification for this step of the study. The first part involved the collection of feature-identification data from three separate sessions. Once this part was completed and a full feature set was generated, this led to the second part, in which the feature list was refined through peer debriefing.

Part one: Generating an initial list of features

The first part involved three separate sessions to generate a complete feature set. In the first session, four of the VIF staff worked together as one group, while the external systems engineer and the principal researcher worked independently in two separate second and third sessions. In the session involving VIF, four staff members met for a thorough code-mapping session as part of a website redesign, and produced an overview of the system architecture that

they shared for the purposes of identifying features (see Figure 2). Describing the site architecture in this way allowed for the grouping of features, an aspect that made it easier to systematically review potential features during the final stages of identification.

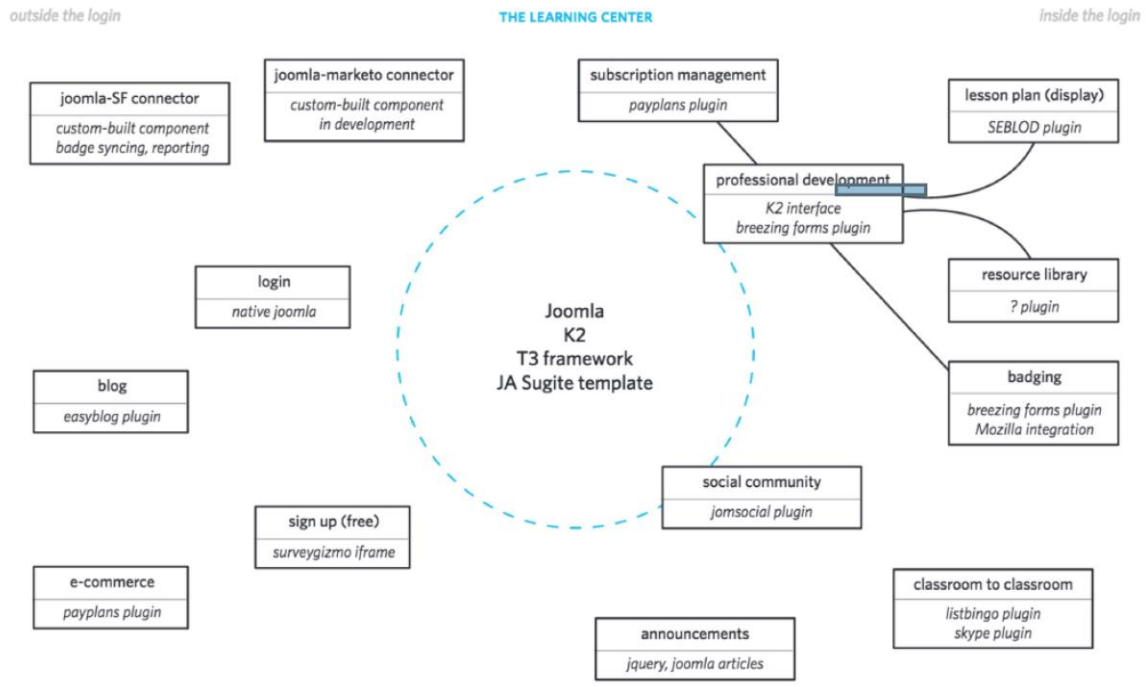


Figure 2. VIF Learning Center site architecture

VIF's preference to collaborate amongst themselves was a decision made in order to make optimal use of their time and, while collaboration was not part of the coding instructions, they produced a thorough set of features that reflected their collective thoughts during a session in which the primary researcher was not present. In the second (and separate) session, a systems engineer unrelated to the platform worked independently to produce a feature set by looking systematically at the public-facing VIF Learning Center website. In yet a third separate session, the principal researcher took the same approach, working independently of all others, to produce

a set of features based on systematically reviewing the site. After three separate lists of features were generated from these three sessions, an aggregated feature list was collated.

The initial feature set generated by VIF Learning Center staff consisted of 43 features. VIF staff also shared two documents that provided additional features. The first was a copy of the "karma points chart and level ranges" which explained in more detail what actions contributed to the JomSocial karma system displayed on the profile page. This information was particularly useful because it aggregated roughly 30 features into the system's point system. VIF administrators filled in the coordinating content that would be counted in the karma rubric point system (e.g., joining a group earned a user 5 points, while leaving the group subtracted 5 points). The second document was a copy of the developer documentation for additional features that were added between May 2013 and November 2014. This, in addition to the contributions from an outside systems engineer who reviewed the site, expanded the feature set to include additional specificity, particularly in the professional development section of the site. The two documents produced a feature set of 27 items, with a total combined count of 70 features available for further analysis (listed in Table 8).

Table 8. VIF Learning Center features identified

social media	wiki/knowledge base	"karma" system
public profile	learning resources	voting
friend invite	publishing	search collection of resources
join groups	share lesson plans	variety
view friends	badge earning	security
view groups	share feedback	contact us
friends list	post a project	request new feature
notifications	site translation	hide activity stream items
photos	filter	reply to comment
videos	log in	customize my page
star rating system	chat	ask community a question
sharing of ideas	sharing	view lesson plans
community feed news	news	subscribe
community feed events	reporting bugs	free trial
privacy settings	count views of profile	create lesson plan
share information	"like" button	edit lesson plan
edit profile	"report" button	attach evidence to lesson plans
status update	email notifications	publish lesson plan
add vanity URL	private messaging	unpublish lesson plan
share location	add attachments	download lesson plan
share emoticon (mood)	post comments	view lesson plan in resource library
add Skype username	PD badges earned	filter lesson plans by tags
add profile cover photo	PD hours completed	view FAQ

The primary researcher then reviewed the three separate lists of features to identify cases of ambiguity and duplications. These were discussed and resolved through member checking. This process involved de-duping features that were similar, and sorting features into meaningful categories (shown in Table 9), before being subjected to peer debriefing with external researchers not otherwise involved in the generation of the feature set (discussed next).

Table 9. Final set of VIF Learning Center features and categories

Profile & community	
Create profile	Upload photo
Customize profile page	Add new group
Edit profile	Add new discussion
Modify cover photo	Leave group
Update privacy	Approve friend request
Upload video	Add photo album
"Like" a comment	Post on group wall
Report a comment	Join group
Post an event	Reply to discussion
Sync Skype account	Post on wall
View groups	Profile status update
View friends	Edit "about me"
View badges	Post photo on wall
Translate the site	Remove friend
Add vanity URL	Upload profile avatar
Share location	Update privacy
Hide activity stream	Reply to messages
Share blog	Send message
Subscribe to blog	Remove wall post
Bookmark blog	Remove photo album
Add emojis	Remote photos
Admin only features	
Add new group	Delete news
Update group	Update event
Upload group avatar	Publish blog
Create group news	Remove group member
Resource Library	
Vote on lesson plan	Print PDF
Download PDF	Submit comment
Classroom partnerships	
Post a project	View statistic
Reply to a project	
Site support	
Reply to topic	Vote on a topic
"Favorite" a topic	View FAQ
Tag a topic	Request new feature
"Upvote" a question	
My lesson plans	
Create lesson plan	Unpublish lesson plan
Edit lesson plan	Download lesson plan
Attach evidence	View lesson plan
Publish lesson plan	Filter lesson plans
Badges	
Earn a badge (module)	Discuss badges
Share badge to backpack	Earn social badges

Part two: Peer debriefing

Where necessary, doubts or concerns about feature identification were discussed and resolved through peer debriefing, which is, " a process of exposing oneself to a disinterested peer in a manner paralleling an analytical session, for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind" (Lincoln & Guba, 1985, p. 308). A software engineer and human-computer interactions expert agreed to participate in the peer-debriefing session. This helped uncover researcher bias and assumptions, and clarified naming conventions and functionality for different features in order to minimize redundancy or ambiguity.

Having identified the complete set of features, the primary researcher reviewed relevant tables in VIF's Joomla MySQL database to locate proper usage. For example, the feature term for "upload photo" became *photo.upload*, and this terminology, as well as a description of what the feature did, was entered into a Google spreadsheet in preparation for having coders assign values to them. Features that were not relevant to the research study were omitted from the spreadsheet with the understanding that their use was limited if teachers were prohibited from accessing or interacting with them (e.g., publish a blog, which only VIF administrators can do on the site, or view classroom statistics, another VIF administrator feature).

Step 2: Assigning values to features

The systematic approach for developing a coding manual to assign values to features was based on two sources. The first source was the coding categories on the 19-dimension Schwartz Value Inventory (Appendix C) using definitions provided in Schwartz's refined theory of basic human values (Schwartz et al., 2012) (Appendix D). Contrary to an inductive process of qualitative content analysis, this research used a pre-existing theory to generate the coding categories, referred to as deductive category application (Mayring, 2000). Using the 19 values

dimensions of Schwartz's refined Values Inventory ensured that the categories were as internally homogeneous and externally heterogeneous as possible (Lincoln & Guba, 1985). The second source for developing the coding manual was a set of critical heuristics (Table 10) initially designed to aid value sensitive designers of persuasive technologies (Yetim, 2011b). While this framework can be used to justify goals, values, and actions during the design process, it can also be applied in a post-hoc analysis. Applying these heuristics provided an assessment of the "comprehensibility of communicated signs, the efficiency, effectiveness, and appropriateness of recommended actions or persuasion strategies, goals, and outcomes" (Yetim, 2011b, p. 3). The purpose of applying critical heuristics was to thoroughly investigate the functional and dynamic aspect of each feature, while also considering the potential for multiple use contexts that could influence which values to assign.

Table 10. Critical heuristics for identifying and checking pragmatic values (Yetim, 2011)

Goal Value
Are there other goals considered that might conflict with the goal?
Are there alternative goals to promote the same value?
How well is the goal supported by (or at least consistent with) the value?
Action-Goal
Will the action bring about the desired goal?
Are there alternative ways of realizing the same goal?
Action-Value
Does doing the action have a side effect that demotes the value intended?
Does doing the action have a side effect that demotes another value?
Does doing the action preclude another action that would promote some other value?

In a pilot study conducted in September of 2015, two coders assigned values to features using the critical heuristics for identifying and checking pragmatic values. Neither coder was involved in the initial features identification process described above. Each coder received a

questionnaire with screenshots of specific features and instructions on how to rate each feature according to the 19 categories of the Schwartz Value Inventory. The first coder was a humanities scholar with web development skills; the second coder was an IT professional and administrator. These coders were involved only in the pilot and not in the full coding process described in more detail below. After selecting a value (or more, when applicable), coders were asked to use the heuristics to check their selection based on possible *goal values*, *action-goals*, and *action-values* associated with each feature (Table 10). During the pilot process, coders commented that the screenshots in the manual were too decontextualized; their preference was to view the features on the website and interact with them directly. These coders also found the critical heuristics to be laborious; thus, they were included in the final coding instructions, yet they were suggested as a guide only and modified to make them more relevant to the vernacular of the current study (see revised coding instructions in Appendix C).

Following the pilot, a lengthier subsequent session was conducted with two coders who were given coding instructions (Appendix C) to guide the process of feature-value assignments. It took roughly three hours for the coders to work through the exercise in the same room while the VIF Learning Center website was projected on a screen and the primary researcher was present. Both coders were employees in institutions of higher education; one coder was an administrator with a J.D. working with Ph.D. students at Duke University. The second coder was an administrator and graduate student with extensive website development expertise. All codes were entered into a spreadsheet that included columns for the feature name, description of the feature, and a URL link to an example of the feature, as well as columns labeled (coder 1): Value 1, Value 2; and (coder 2): Value 3, Value 4; and Comments. Viewing the website throughout the exercise allowed coders to view functionality and ask questions about feature use within the

context of the web page and broader questions about how it functioned in relation to the web site. The coders freely discussed the feature functionality with each other. For example, the coders noted that the feature "status update" might represent different uses that could be difficult to untangle from a motivational perspective. In other words, a user could engage the status update feature for social purposes, or use status update to signal his or her importance in the profession's hierarchy. This functionality would influence which value the coders selected. For example, after referencing the coding instructions (Appendix C), one coder remarked that users were more likely to update their status in order to "support social relations" (which might be associated with the value *benevolence*) than to "avoid negative outcomes for self" (which might be associated with the value *conformity*). This discursive process ensured that as many intended and enacted actions were considered as possible. Because multiple motivations could be associated with a single feature, coders were given the option to assign more than one value. In most, if not all, cases, coders assigned multiple values to each feature, and ranked the values in order of relevance. These steps were repeated with the remaining features. If the feature-value pairs raised particular insights worth noting, the coders entered comments in an adjacent column. These comments are discussed in more detail in Chapter 5 and are available in Appendix H below.

Once coding was completed, the researcher categorized coders' logged values into higher order values (e.g., *self-enhancement* (SE); *self-transcendence* (ST); *openness to change* (OC); and *conservation* (CO)). When there were divergent codes that prevented feature-values from being categorized into the same higher order value, the researcher investigated the feature functionality and value pairings using Yetim's (2011) critical heuristics to gauge whether one higher order value applied more than the other. The output from this stage was a list of features

in one column, and the values associated with them in adjacent columns, with a separate column for the higher order value associated with each feature.

This process concluded the methods used for addressing research question 2; however, additional refinement to the feature-value pairs became necessary during the process of addressing research question 3, discussed next.

Addressing Research Question 3: Effects of values alignment on system use

Research question 3 contains two parts:

> RQ3: How can alignment between personal values and the values embodied in system features be detected? Does alignment positively influence use of particular features?
>
> RQ3a: How does teacher participation vary across contexts? Specifically, can differences in activity levels be detected in contexts where participation is mandatory (i.e., where superintendents or principals mandate participation) versus where participation is optional?

These questions were investigated through collection, preparation, and analysis of data in the VIF Learning Center web log tables. Analyzing the data stored in transactional web logs can yield important insights into the behaviors of online users (Jansen, 2009), and has significant advantages in terms of data preparation and analysis. Jansen (2009) describes transactional web logs as "an electronic record of interactions that have occurred between a system and users of that system" (p. 2). Transaction log analysis is an unobtrusive research method that relies on an analysis of aggregated user data, and permits data collection to occur without directly engaging participants; one way to systematically track data collection is through the use of an ethogram, described in the following section.

System use as represented in web logs

To focus data collection on the features analyzed in the technical investigation, an *ethogram* of trace data was created to determine how features were stored in the system's database. An ethogram is "a taxonomy or index of the behavioral patterns that details the different forms of behavior that a particular user exhibits" (Jansen, 2009. p. 9). An ethogram was created during the pilot study to identify which behaviors were logged in different community action tables in VIF Learning Center's Joomla database (Table 11), and finalized following the technical investigation described above.

Table 11. An ethogram of feature-tables in the VIF Learning Center

Name of data table	Description of feature-action
Album.create	User creates an album
Album.comment	User comments on uploaded albums
Albums.like	User "likes" on any uploaded album
Album.report	User reports an album for abuse
Block.user	Block a user from making contact
Cover.upload	Upload a cover photo on a member profile
Cover.upload.comment	User comments on cover photos
Cover.upload.like	User "likes" on cover photos
Events.attend	Users RSVP to posted events
Event.invite.friend	User invites friend to event
Friend.invite	User request to "friend" another user
Friends.connect	User confirmation to "friend another user
Friend.invite	User extends request to connect to user
Group.discussion.reply.like	User "likes" a group discussion reply
Groups.join	User requests to join a group
Groups.wall.comment	User leaves a comment on a group wall
Groups.wall.like	User "likes" a group
Photo.comment	User comments on a photo
Photo.display	User uploads a photo
Photo.like	User "likes" a photo
Photo.share	User shares a photo with another user
Photos.album.like	User "likes" a photo album
Photos.wall.create.like	User "likes" a photo wall
Profile.create	User creates a profile
Profile.avatar	User creates avatar
Profile.avatar.upload.comment	User comments on profile avatar photo
Profile.avatar.upload.like	User "likes" a profile avatar photo
Profile.comment	User comments on another user's profile
Profile.comment.reply	User replies to a user's profile comment
Profile.status	User posts a status update on profile
Profile.status.like	User "likes" a profile status update
Rate.item	User rates an item
Report.user	User reports abuse from another user
Skype.connect	User sets up a Skype connection

Building an ethogram requires some knowledge of how a particular database is constructed, and which tables are necessary for analysis. VIF Learning Center is built in part with Joomla, a free, open-source content management system that publishes web content and stores data in a MySQL database. Only users who responded to the PVQ-RR had their web log data collected, and only

the tables that catalogued relevant community actions between September 1, 2015 and March 31, 2016 were analyzed.

There were two steps in identifying valid users in the MySQL tables. The first step occurred when addressing research question 1, when the PVQ-RR was emailed to VIF International Education's Salesforce member list. Results from the survey were exported from Qualtrics to a Microsoft Excel spreadsheet, and then cleaned and prepared for analysis with Tableau 9.2. First and last names and email addresses were anonymized and replaced with unique identifiers, and the "community actions" tables were accessed throughTableau and linked to the survey files before being saved as a Tableau Workbook combining both data sources. These data were then exported from Tableau as Microsoft Excel files for further analysis with the open-source statistical analysis program R (in R Studio).

Locating web log data

As will be addressed in more detail in Chapter 5, there were problems with locating web log data in the VIF Learning Center Joomla tables. A preliminary and summary overview of these steps, and related issues, is included here to outline the recursive process undertaken in order to prepare a final set for analysis. For example, in November of 2015, after research was underway but before web log data collection began, an automated upgrade was pushed to the open source JomSocial plugin that VIF Learning Center uses to support the social participation on the site, including the community activities that are the focus of this exploratory study. As a result, a number of JomSocial tables were reconfigured, renamed, and the overall number of tables was aggregated and downsized. The end result of this downsizing led to a set of reduced features and, subsequently, less available web usage data. While an additional set of tables was discovered, including *easy.discuss*, which records site-support questions, and *videos.linking*, the specific purpose of which was not made clear, neither of these tables contained significant

amounts of data. Another new table, *group.discussion*, appeared to have subsumed some of the group discussion functionality of other tables (i.e., *group.discussion.reply.like*, and *group.discussion.reply*). While it could not be determined if this assumption was accurate, there was enough logic present in the naming conventions to suggest the functions were similar. A new table called *photos* also appeared, and was assumed to be the same as *photo.display*, although this could not be confirmed because the updates were not accompanied by sufficient documentation. Thus, the original 32 feature-value pairs and their associated tables were winnowed down during web log data collection. Following the JomSocial update, only nine tables could be located for web log analysis; two others were renamed (i.e., *photos* and *group.discussion*), and two new ones had no values assigned during the feature-value assignment process (*easy.discuss* and *video.linking*) (Table 12).

Table 12. Revised ethogram with data tables available for web log analysis

Data table names for 13 features
Cover.upload
Easy.discuss
Friends.connect
Groups.discussion
Groups.discussion.reply
Groups.join
Groups.wall
Photo.like
Photos
Photos.comment
Profile
Profile.avatar.upload
Video.linking

Analysis of the web log data

The diminished number of tables had a cascading effect that impacted not only data collection, but also data analysis, particularly given the diminished number of survey respondents who did not engage the 13 available feature-value pairs. This analysis is briefly presented in Chapter 4 and discussed at length in Chapter 5.

Summary of Methods

As an exploratory case study, a value sensitive design research method had to be devised anew to address the three research questions. To address the first research question, a self-report scale (Portrait Values Questionnaire-RR) developed by Schwartz et al. (2012) was used to describe the pragmatic values of teachers and administrators using the online VIF Learning Center badging platform. Scoring of survey responses was conducted in order to rank the order of importance that groups attribute to four higher order values*: self-transcendence, conservation, openness to change,* and *self-enhancement*.

Schwartz's theory of basic human values, based on an earlier version of this scale, was devised as a circumplex delineating the continuum of complementary and contrasting values that influence people's motivations (Figure 1), especially in voluntary acts. This set of 19 values was used in methods addressing research question 2, in which two coders assign one or more values to features identified in the VIF Learning Center. This includes the steps taken to identify features and assign values that become feature-value pairs intended for addressing research question 3.

Last, methods to address research question 3 were described. This method involved the creation of an ethogram as a systematic way to index possible feature-actions and cross-reference these actions with features identified. A recursive process to identify these data was described, including the discovery of a discrepancy in the database that hindered further analysis.

CHAPTER 4: FINDINGS

This exploratory study attempts to detect value alignments between users and system features in VIF Learning Center, and to investigate the possibility that value alignments have an effect on teacher usage of particular system features. The study uses both qualitative and quantitative approaches to address the research questions, which were organized in Chapter 3 in the same order followed here: Research question 1, Determining the pragmatic values of teachers; Research question 2, Assigning values to features; and Research question 3, Analyzing web log activity of teacher survey respondents to detect any effect of value alignment on system use.

Findings for Research Question 1: Users' personal values

Research question 1 is: What are the human values of teachers and administrators using the platform? There was a statistically significant difference in scores between males and females for three of the higher order values: *openness to change, self-transcendence,* and *self-enhancement*; males attributed higher importance to each of these values than females. There were no statistically significant differences between teachers and administrators, nor between teachers mandated to use the system and those for whom use was optional. As mentioned in Chapter 3, the survey was circulated to 9,660 VIF Learning Center administrators and teachers; 807 began the survey and 649 individuals completed it, for a response rate of 7 percent. After preparing and cleaning the survey data for analysis, 536 respondents were categorized as "active" in the Salesforce customer relationship management platform. If respondents' roles (e.g., teacher or administrator) could not be determined, or if they were labeled "inactive" in the

database, they were removed from the data set. Of the remaining 536 who met these criteria, only 342 were found to be active during the research period between September 2015 and March 2016. Because the focus of the current study is to describe the higher order values of survey respondents who were actively participating in the VIF Learning Center platform during the research period, only the results of this group (n=342) are discussed in this chapter. Descriptive statistics and t-tests for the larger group of survey respondents (n=536) are included in Appendix E below.

Characteristics of VIF Learning Center system user survey respondents

The following section describes four characteristics of the sample used for analysis of research question 3: gender, occupational role, mandated-use versus optional use of the VIF Learning Center, and higher-order values. Characteristics of the survey respondents are included below in Table 13. As is normative for the teaching profession, there are more females (84%) than males (16%). Similarly, there are more teachers represented (93%) than administrators (7%). Mandated-use teachers made up a larger proportion of active users (68%) than those participating optionally (32%), likely due to wider adoption of the Global Ready teacher professional development program by more schools that required their teachers to complete modules throughout the school year.

Table 13. Descriptive statistics: survey respondents, n=342)

	Male	(% male)	Female	(% female)	Total	(% in each role)
Administrators	8	32%	17	68%	25	7%
Teachers	47	15%	270	85%	317	93%
Mandated-use	36	17%	181	83%	217	68%
Optional-use	11	11%	89	89%	100	32%
TOTAL	55		287		342	

A summary of centered scores for the four higher order values, including means and standard deviations, is presented below (Table 14), and then broken out into sub-groups (Table 15). Highest scores represent values to which the greatest importance is attributed, while lowest scores represent values to which the least importance is attributed. For example, the highest score for all sub-groups is 0.16 for male teachers (n=47) and administrators (n=8), which indicates that these two groups attribute the greatest importance to the higher order value *self-transcendence* (i.e., *universalism-nature, universalism-concern, universalism-tolerance, benevolence-care,* and *benevolence-dependability*). The lowest score for all sub-groups is -0.79 for active female administrators (n=48); this group attributes the least importance to the higher-order value *self-enhancement* (i.e., *power-dominance, power-resources,* and *achievement*) (Table 15). These scores reflect that, as a group, respondents attribute greatest importance to *self-transcendence* values, followed by *openness to change* and *conservation,* and the least importance to *self-enhancement*.

Table 14. Summary of centered scores for higher-order values (n=342)

	Survey respondents (n=342)	
	Mean	SD
Conservation	-0.10	0.68
Openness to change	-0.09	0.59
Self-enhancement	-0.43	0.83
Self-transcendence	-0.05	0.80

Table 15. Centered scores for higher-order values by sub-group (n=342)

	Female			Male		
	Admin	Teacher (o)	Teacher (m)	Admin	Teacher (o)	Teacher (m)
Conservation	-0.43	0.01	-0.07	0.01	-0.07	0.01
Openness to change	-0.29	-0.02	-0.10	-0.02	0.08	0.03
Self-enhancement	-0.79	-0.38	-0.46	-0.21	-0.15	-0.22
Self-transcendence	-0.46	0.04	-0.04	0.16	0.16	0.09

Comparing higher order values across sub-groups

Next, independent-samples t-tests were conducted to compare higher order values across sub-samples: 1) males versus females; 2) administrators versus teachers; and 3) optional-use versus mandatory-use teachers. Additional details, including confidence intervals, for Tables 16, 17, and 18 are included in Appendix F.

Males and females

For males and females, there were significant differences in scores for all of the higher order values except *conservation* (Table 16). Males attributed more importance to *openness to change* and *self-enhancement* more than females did; females valued *self-transcendence* more than males did. Overall, male and female teachers attributed highest importance to *self-transcendence* in the higher order system of values, and attributed the least amount of importance to *self-enhancement.*

Table 16. Male and female higher values t tests (n=342)

	Survey respondents (n=342)				
	Male		Female		
	Mean	SD	Mean	SD	*p*
Conservation	-0.03	0.28	-0.12	0.73	0.135
Openness to change	0.02	0.24	-0.11	0.63	0.009
Self-enhancement	-0.16	0.25	-0.48	0.89	***
Self-transcendence	0.13	0.26	-0.08	0.86	0.001

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

These findings suggest that, while males and females both attribute highest importance to *self-transcendence* and lowest importance to *self-enhancement,* males tended to differ in the statistically significant degree to which they ranked the importance of the values: *openness to change*, *self-enhancement*, and *self-transcendence* were higher versus females.

Administrators and teachers

For the administrator and teacher sub-samples, there were no statistically significant differences in higher order values (Table 17).

Table 17. Administrator and teacher higher values t tests (n=342)

	Survey respondents (n=342)				
	Admin		Teachers		
	Mean	SD	Mean	SD	*p*
Conservation	-0.69	1.41	-0.08	0.66	0.093
Openness to change	-0.41	1.26	-0.09	0.57	0.323
Self-enhancement	-0.94	1.62	-0.46	0.83	0.240
Self-transcendence	-0.62	1.78	-0.05	0.77	0.209

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

Mandated-use and optional-use teachers

For mandated-use teachers and optional-use teachers, there were no statistically significant differences for any of the higher order values (Table 18).

Table 18. Mandated-use and optional-use teacher higher values t tests (n=342)

	Survey respondents (n=342)				
	Mandated		Optional		
	Mean	SD	Mean	SD	*p*
Conservation	-0.09	0.71	-0.05	0.53	0.583
Openness to change	-0.12	0.63	-0.04	0.43	0.257
Self-enhancement	-0.48	0.90	-0.42	0.65	0.556
Self-transcendence	-0.07	0.83	-0.02	0.62	0.557

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Summary of findings

- There was a statistically significant difference in scores between males and females for three of the higher order values: *openness to change, self-transcendence,* and *self-enhancement*. Males attributed higher importance to each of these values than females.
- There was no statistically significant difference between administrators and teachers for any of the higher order values.
- There were no statistically significant differences for any of the higher order values between teachers mandated to use this system and those for whom use was optional.

Findings for Research Question 2: Values enacted in system features

Research question 2 is: How can pragmatic human values be ascribed to technical features of the system? A final set of 11 feature-value pairs were found eligible for use in the final phase of the study; however, 34 initial features were assigned values. Because the method used to produce these findings is considered a major contribution of the study, a thorough

description of the 34 items follows. In summary, the top five values assigned in rank order were: *stimulation* (32), *benevolence-dependability* (21), *achievement* (19), *face* (15), and *benevolence-caring* (12). The following values were not assigned to any of the features: *power-resources*, *tradition*, *humility*, *universalism-concern*, and *universalism-nature*.

An underlying assumption of this research is that values can be associated with technical features, or enacted in them. To identify value alignments, it was necessary to assign values to technical features in a systematic way. As discussed in Chapter 3, one criticism of value sensitive design is that it emphasizes the investigation of values in the conceptual phase, instead of undertaking a systematic process to discover values in the system (Yetim, 2011a; Le Dantec, Poole & Wyche, 2009), which was one objective of this exploratory study. Yet, while researchers propose the use of technical investigations as a viable way to elicit values from technology, methods that could guide the current research were missing or not made explicit. Therefore, a systematic and iterative method to identify values and assign features in a post hoc technical investigation was developed and applied using the 19 values from Schwartz's refined Portrait Values Questionnaire. This section reports on the results of that approach, a three-part process to address the second research question.

Overview of the post hoc technical investigation

During the first two parts, features of the system were defined and identified (as described in Chapter 3) using multiple documentation sources and the final list was refined and entered into a spreadsheet in advance of the feature-value coding process. During the third part, coders assigned values to the features by following instructions in the coding manual (Appendix C) and reading definitions of the 19 values (Appendix D). A revised set of 34 total features was entered into the coding manual and related spreadsheets for each of the two coders to assign values. In Table 19 below, the final results of the coding are displayed, beginning with the

JomSocial database table name of the feature (e.g., "upload photos" was labeled "photo.upload"), and two columns for assigned values per coder (coder 1: V1, V2; coder 2: V3, V4), as well as a column for the four higher-order values (*openness to change*, *conservation*, *self-enhancement*, and *self-transcendence*). Several columns have been removed that were present in the original spreadsheet, including a brief description of what each feature did; a URL linking to one instance of the feature; a column to rank the relative strength of values assigned to features; and a column for comments. These items have been removed for brevity. Comments left by coders are discussed at length in Chapter 5 and included in Appendix H. Coding data in Table 19 indicate whether there was agreement between coders in at least one of the assigned values, in terms of whether the values could be grouped according to the same higher-order value. For example, with the feature "groups.join," coders assigned *self-direction thought*, *power-dominance*, *face*, and *stimulation*. While these four values are all different, the values *self-direction thought* and *stimulation* are both grouped within the higher-order value for *openness to change*. Thus, this particular feature received the *openness to change* designation.

Table 19. Feature-value sets and resulting higher-order values

JomSocial table	Values assigned by Coder 1		Values assigned by Coder 2		Higher order value
album.create	Stimulation	Achievement	Face	Achievement	Self enhancement
album.comment	Stimulation	Benevolence-caring	Achievement	Stimulation	Openness to change
Album.like	Stimulation	Benevolence-care	Achievement	Stimulation	Openness to change
Album.report	Conformity-rules	Benevolence-dependability	Security-personal	Security social	Conservation
Block.user	Security-personal	Power-dominance	Security-personal	Self-direction thought	Conservation
Report.user	Conformity-rules	Conformity-interpersonal	Security-personal	Security social	Conservation
Cover.upload	Face	Self-direction thought	Self-direction thought	Benevolence-dependability	Openness to change

JomSocial table	Values assigned by Coder 1		Values assigned by Coder 2		Higher order value
Cover.upload.comment	Stimulation	Benevolence-care	Benevolence-dependability	Universalism-tolerance	Self transcendence
Cover.upload.like	Stimulation	Benevolence-care	Benevolence-dependability	Universalism-tolerance	Self transcendence
Events.attend	Conformity-rules	Benevolence-dependability	Benevolence-dependability	Face	Self transcendence
Earn badges	Conformity-rules	Achievement	Self-direction action	Stimulation	No agreement
Event.invite.friends	Benevolence-dependability	Benevolence-care	Stimulation	Conformity-rules	No agreement
Create.event	Benevolence-care	Benevolence-dependability	Stimulation	Conformity-rules	No agreement
Friend.invite	Hedonism	Stimulation	Stimulation		Openness to change
Friends.connect	Self-direction action	Stimulation	Conformity-interpersonal	Benevolence-dependability	No agreement
Group.discussion.reply.like	Benevolence-dependability	Stimulation	Achievement	Stimulation	Openness to change
Groups.join	Self-direction thought	Power-dominance	Face	Stimulation	Openness to change
Groups.wall.comment	Benevolence-dependability	Face	Face	Stimulation	Face
Groups.wall.like	Benevolence-care	Benevolence-dependability	Achievement	Stimulation	Openness to change
Photo.comment	Benevolence-care	Benevolence-dependability	Achievement	Stimulation	Openness to change
Photo.display	Face	Stimulation	Face	Achievement	Face
Photo.like	Benevolence-dependability	Benevolence-care	Achievement	Stimulation	Openness to change
Photo.share	Security-personal		Face	Stimulation	No agreement
Photo.album.like	Stimulation	Benevolence-dependability	Achievement	Stimulation	Openness to change
Photos.wall.create.like	Stimulation	Benevolence-dependability	Achievement	Stimulation	Openness to change
Profile.create	Face	Achievement	Face		Face
Profile.avatar	Benevolence-dependability	Face	Face	Benevolence-dependability	Face
Profile.avatar.upload.comment	Benevolence-care	Stimulation	Achievement	Stimulation	Openness to change
Profile.avatar.upload.like	Benevolence-care	Stimulation	Achievement	Stimulation	Self enhancement
Profile.comment	Self-direction thought	Stimulation	Self-direction thought	Achievement	Openness to change
Profile.status + emoticons	Face	Achievement	Self-direction thought	Face	Face
Profile.status.like	Stimulation	Benevolence-care	Achievement	Benevolence-dependability	Self transcendence

JomSocial table	Values assigned by Coder 1		Values assigned by Coder 2		Higher order value
Skype.connect	Self-direction thought	Benevolence-dependability	Stimulation	Face	Openness to change
Rate.item	Benevolence-dependability	Benevolence-care	Achievement	Conformity-interpersonal	No agreement

Frequency of values assigned

Table 21 shows the number of features to which at least one of the coders assigned each value. The top five values assigned in rank order were: stimulation (32), benevolence-dependability (21), achievement (19), face (15), and benevolence-caring (12). Not all values were used in the coding process; the following five were not assigned to any of the features: power-resources, tradition, humility, universalism-concern, and universalism-nature.

Table 20. Frequency of values assigned to features

Value	Description	Number of features to which value was assigned
Stimulation	Excitement, novelty, and change	32
Benevolence-dependability	Being a reliable and trustworthy member of the in-group	21
Achievement	Success according to social standards	19
Face	Maintaining one's image and avoiding humiliation	15
Benevolence-caring	Devotion to the welfare of in-group members	12
Self-direction-thought	Freedom to cultivate one's own ideas and abilities	9
Conformity-rules	Compliance with rules, laws, formal obligations	6
Security-personal	Safety in one's immediate environment	5
Conformity-interpersonal	Avoidance of upsetting or harming other people	4
Power-dominance	Power through control of material/social resources	2
Security-societal	Safety and security in the wider society	2
Self-direction-action	Freedom to determine one's own actions	2
Universalism-tolerance	Acceptance and understanding of those who are different	2
Hedonism	Pleasure and sensuous gratification	1
Tradition	Preserving cultural, family, and religious traditions	0
Power-resources	Power through exercising control over people	0
Humility	Recognizing one's insignificance in the larger scheme of things	0
Universalism-concern	Commitment to equality, justice, and protection for all people	0
Universalism-nature	Preservation of the natural environment	0

Frequency of higher order values assigned

Of the 34 features that were assigned values, there were six cases in which criteria for meeting agreement were not met: event.invite.friends, create.event, earn badges, friends.connect, rate.item, and photo.share. The reasons for why these particular cases might have resulted in no agreement are discussed in greater detail in Chapter 5. Fifteen of the remaining feature-value pairs were designated as *openness to change*, while five were designated *face*, four were designated *self-transcendence*, another four were designated *conservation*, and one was designated *self-enhancement* (Table 21). Three features with no agreement were subsequently

moved to *openness to change* based on coder comments (groups.wall.like, photo.comment, and photo.like); the rationale for this change is discussed in Chapter 5 below.

Table 21. Frequency of higher order values assigned

Higher order value	Values assigned by Coder 1		Values assigned by Coder 2		JomSocial Tables
Openness to change	Stimulation	Benevolence-care	Achievement	Stimulation	album.comment
Openness to change	Stimulation	Benevolence-care	Achievement	Stimulation	album.like
Openness to change	Face	Self-direction thought	Self-direction thought	Benevolence-dependability	cover.upload
Openness to change	Hedonism	Stimulation	Stimulation		friend.invite
Openness to change	Benevolence-dependability	Stimulation	Achievement	Stimulation	group.discussion.reply.like
Openness to change	Self-direction thought	Power-dominance	Face	Stimulation	groups.join
Openness to change	Benevolence-care	Benevolence-dependability	Achievement	Stimulation	groups.wall.like
Openness to change	Benevolence-care	Benevolence-dependability	Achievement	Stimulation	photo.comment
Openness to change	Benevolence-dependability	Benevolence-care	Achievement	Stimulation	photo.like
Openness to change	Stimulation	Benevolence-dependability	Achievement	Stimulation	photo.album.like
Openness to change	Stimulation	Benevolence-dependability	Achievement	Stimulation	photos.wall.create.like
Openness to change	Benevolence-care	Stimulation	Achievement	Stimulation	profile.avatar.upload.comment
Openness to change	Benevolence-care	Stimulation	Achievement	Stimulation	profile.avatar.upload.like
Openness to change	Self-direction thought	Stimulation	Self-direction thought	Achievement	profile.comment
Openness to change	Self-direction thought	Benevolence-dependability	Stimulation	Face	skype.connect
Face	Benevolence-dependability	Face	Face	Stimulation	groups.wall.comment
Face	Face	Stimulation	Face	Achievement	photo.display
Face	Face	Achievement	Face		profile.create
Face	Benevolence-dependability	Face	Face	Benevolence-dependability	profile.avatar
Face	Face	Achievement	Self-direction thought	Face	profile.status + emoticons
Self enhancement	Stimulation	Achievement	Face	Achievement	album.create
Self transcendence	Stimulation	Benevolence-care	Benevolence-dependability	Universalism-tolerance	cover.upload.comment
Self transcendence	Stimulation	Benevolence-care	Benevolence-dependability	Universalism-tolerance	cover.upload.like
Self transcendence	Conformity-rules	Benevolence-dependability	Benevolence-dependability	Face	events.attend

Higher order value	Values assigned by Coder 1		Values assigned by Coder 2		JomSocial Tables
Self transcendence	Stimulation	Benevolence-care	Achievement	Benevolence-dependability	profile.status.like
Conservation	Conformity-rules	Benevolence-dependability	Security-personal	Security social	album.report
Conservation	Security-personal	Power-dominance	Security-personal	Self-direction thought	block.user
Conservation	Conformity-rules	Conformity-interpersonal	Security-personal	Security social	report.user
No agreement	Benevolence-dependability	Benevolence-care	Achievement	Conformity-interpersonal	rate.item
No agreement	Conformity-rules	Achievement	Self-direction action	Stimulation	earn badges
No agreement	Benevolence-dependability	Benevolence-care	Stimulation	Conformity-rules	event.invite.friends
No agreement	Benevolence-care	Benevolence-dependability	Stimulation	Conformity-rules	create.event
No agreement	Self-direction action	Stimulation	Conformity-interpersonal	Benevolence-dependability	friends.connect
No agreement	Security-personal		Face	Stimulation	photo.share

Feature-value pairs that met the criteria for *face* could be bifurcated as either the higher order value *self-enhancement* or as higher order value *conservation*. The *face* value is associated with "maintaining one's public image and avoiding humiliation," according to definitions for the 19 values of the revised Portrait Values Questionnaire. *Face* can be associated with the *self-enhancement* higher order value (e.g., *achievement, power dominance*, and *power resources*), or with the *conservation* higher order value (e.g., *conformity-interpersonal, conformity-rules, tradition, security-societal*, and *security-personal*). For the feature-value pair "profile.avatar," coders both selected *face* and *benevolence-dependability*, which appear on opposite sides of the circumplex, representing contrasting values from a motivational perspective. The decision to move these feature-value pairs into the *conservation* higher order value category is based on how the value *face* is located according to the scoring key for the refined Portrait Values Questionnaire, which states, "*face* may be included in *conservation* if no structural analysis is done." While this is a plausible logic for solving the bifurcation problem, the overarching goal of

categorizing the 19 values into higher order values is to consider motivational conflicts with survey respondents who scored high for complementary or contrasting values in their own results. Thus, it was decided that *face* would remain its own anomalous category distinct from the four higher order values to indicate that this value in particular was bifurcated by the two adjacent higher order values. If *hedonism* or *humility* had arisen in the data, the same logic would apply.

Refining the feature-value pairs

As mentioned in Chapter 3, in the process of preparing the feature-value pairs for web log analysis discussed in the next section, a discrepancy was discovered in the VIF Learning Center JomSocial tables. In an attempt to find data, MySQL queries were conducted to locate any missing tables. However, a small team including the researcher, a VIF Learning Center senior researcher, a VIF Learning Center developer, and an intern with data science expertise exhausted methods to locate these missing data. It was determined that the "karma" rating system, which had initially suggested the existence of other tables, had likely been deprecated by JomSocial developers at some point without documentation to indicate that various tables were no longer functioning. After several weeks of concerted investigation, the effort to locate missing data was abandoned.

To recap, of the original 34 feature-value pairs, only 11 remained; similar features with different table names were renamed (*groups.discussion, group.discussion.reply,* and *photos*), and kept the same values assigned to them by the coders. In addition to the remaining 11, two were new (*easy.discuss* and *videos.linking*), and therefore were not assigned values. In final form, there remained 13 feature-value pairs for analysis (Table 22). Given the resulting lack of diversity in the higher order values, and the number of "no agreement" designations for the feature-value pairs that did exist in the updated tables, the overall set was deemed too limited for

reliable analysis. Implications of these limitations are addressed in the following section and discussed in more detail in Chapter 5.

Table 22. Final higher order feature-value pairs available for analysis

JomSocial table	Values assigned by Coder 1		Values assigned by Coder 2		Higher order value
Cover.upload	Face	Self-direction thought	Self-direction thought	Benevolence-dependability	Openness to change
Groups.join	Self-direction thought	Power-dominance	Face	Stimulation	Openness to change
Photo.comment	Benevolence-care	Benevolence-dependability	Achievement	Stimulation	Openness to change
Photo.like	Benevolence-dependability	Benevolence-care	Achievement	Stimulation	Openness to change
Groups.discussion	Benevolence-dependability	Face	Face	Stimulation	Face
Groups.discussion.reply	Benevolence-dependability	Face	Face	Stimulation	Face
Groups.wall	Benevolence-dependability	Face	Face	Stimulation	Face
Photos	Face	Stimulation	Face	Achievement	Face
Profile.create	Face	Achievement	Face		Face
Profile.avatar	Benevolence-dependability	Face	Face	Benevolence-dependability	Face
Friends.connect	Self-direction action	Stimulation	Conformity-interpersonal	Benevolence-dependability	No agreement
Easy.discuss					No values assigned
Videos.linking					No values assigned

Findings for Research Question 3: Effects of values alignment on system use

Research question 3 has two parts:

1. How can alignment between personal values and the values embodied in system features be detected?

2. How does teacher participation vary across contexts? Specifically, can differences in activity levels be detected in contexts where participation is mandatory (i.e., superintendents or principals mandate participation) versus where participation is optional?

While the intention of research question 3 was to analyze web log activity using multiple linear regression, neither part one nor part two of research question 3 could be addressed due to data quality issues discovered in the JomSocial database. Upon discovering the relatively small size of the dataset and the relative lack of diversity in terms of feature-value pairs representing all four higher order values, further analysis was abandoned. Thus, findings for research question 3 focus not on what was proposed, but on the process of locating data and how those data were distributed. The following sections address the "winnowing" effect that data collection had on the study, beginning with the identification of users who engaged feature-value pairs in the VIF Learning Center, and how those data were distributed.

Identifying survey respondents in web log activity

Research question 3, because it focuses on value alignments between teacher values and their web log activity, focuses on the 342 survey respondents who used the VIF Learning Center between September 2015 and March 2016. Of these teachers and administrators, only 158 engaged the 13 feature-value pairs identified in response to research question 2. These data suggest that more than half the study participants were *not* actively engaging the sociotechnical features of the site. Thus, the decision was made to abandon web log analysis based on the cascading effect of minimal data. If multiple linear regression analysis were to be used, with users' higher order values as predictor values and feature-action usage as continuous dependent variables, there were not enough data for such an approach to be viable. Second, even if there were enough data for regression analysis, the data are skewed such that a small percent of users perform a majority of actions for most of the tables. Logistic regression, in which the dependent variable is transformed from continuous to categorical, was considered but was viable in only one table (groups.discussion.reply).

To illustrate these limitations more clearly, of the 342 survey respondents who were found to be active during the research range, only 982 feature-actions were recorded for 158 users across 13 data tables. In other words, so few users interacted with the features that there were many more users taking *no* action than users doing at least one action. For this reason, an analysis of the viability of the web log data was performed in lieu of the intended multiple linear regression analysis for this exploratory study. Table 23 illustrates an example of the skewed distribution for the value-feature pair in the cover.upload frequency table, representing one of 13 tables that exhibit similar frequency distributions. A complete set of the frequency tables is included in Appendix G.

Table 23. Frequency of feature-actions for the cover.upload feature

Number of actions taken	Number of users	Percent of users
0	132	83.54
1	14	8.86
2	4	2.53
3	3	1.90
4	3	1.90
5	1	0.63
7	1	0.63
Total	158	100.00

Summary of Findings

The main goal of this exploratory study is to identify value alignments between survey respondents and feature-value pairs. Findings for the first research question, which pertains to survey respondents' personal values, suggest that there are statistically significant differences between males and females (i.e., males attributed greater importance to self-transcendence, openness to change, and self-enhancement than females). There were no statistically significant

differences in higher order values for teachers and administrators, nor were there significant differences for teachers mandated to use the system, and those for whom use was optional. For research question 2, a revised set of 34 total features was initially identified for two coders to assign values before being winnowed down to 11. Of the 34 features that were initially assigned values, there were six cases in which criteria for meeting agreement were not met (event.invite.friends, create.event, earn badges, friends.connect, rate.item, and photo.share). Remaining feature-value pairs were designated as openness to change (15); face (5), self-transcendence (4); conservation (4), and self-enhancement (1). Three features with no agreement were subsequently moved to openness to change based on coder comments (groups.wall.like, photo.comment, and photo.like). The top five values assigned in rank order were: stimulation (32), benevolence-dependability (21), achievement (19), face (15), and benevolence-caring (12). The following values were not assigned to any of the features: power-resources, tradition, humility, universalism-concern, and universalism-nature.

Findings for research question 3 appeared to be compromised by a discrepancy found in the data tables leading to subsequent data loss; these issues are discussed in Chapter 5 below. Notwithstanding these issues, usage of the feature-action pairs was sparse, and data were spread unevenly, suggesting that technical affordances were weak drivers of participation and engagement.

CHAPTER 5: DISCUSSION

This exploratory study reflects early stages of emerging research on digital badging systems and the digital features designed to foster technology-mediated social participation in the service of learning that takes place in networked communities. The research design rationale is based in value sensitive design methods, and is anchored by Schwartz's theory of basic human values and the principle that values are ordered by relative importance within an individual, and that this motivational continuum can have explanatory powers. As a study that focuses on pragmatic value alignments between people and feature-value pairs, this research represents an attempt to fill a theoretical gap in the literature. Instead of focusing on preconceived values, the study is an inquiry into the values that can be detected in a system, and implements a new method of post hoc analysis of a system already designed. From a practical perspective, it gives precedence to the empirical stage of value sensitive design, describing how pragmatic values might be discovered in the context of a digital design space, an approach well suited to exploratory research.

Exploratory research is often conducted to acquire new insights into a phenomenon in order to examine a more precise problem, or to address problems that are in a preliminary stage (Babbie, 2007). The goal in exploratory research is to "investigate social phenomena without explicit expectations" (Schutt, 2011, p. 13). At the same time, managing expectations in a data environment, even in one in which the data set is of a manageable size, can demand non-trivial skills and time. As part of exploration, this study was partly contingent on the presence of web log data conducive to analysis in order to address the research questions. It was hoped that in

assigning higher order values of both respondents and system features, we might see digital manifestations of the basic theory of human values as outlined by Schwartz (1992, 1994): "Actions taken in the pursuit of each value type have psychological, practical, and social consequences that may be compatible or may conflict with the pursuit of other value types" (Schwartz, 1994, p. 4).

However, for this particular study, which examined the alignment between users' values and usage patterns in the VIF Learning Center badging platform, insufficient data were discovered. Therefore, no conclusions can be drawn about the motivations to participate among survey respondents based on their pragmatic values. What this study does provide are replicable and feasible steps to explore the research questions in other digital environments, ideally identifying in advance data sets that include sufficient quantity and diversity of data to support analysis. Thus, much of the discussion in this chapter focuses on the processes involved in exploring individual research questions, rather than a discussion that synthesizes findings.

This chapter is divided into four parts, organized as follows. The first part focuses on a discussion of research question 1, which addressed users' personal values, including survey data quality, sample size, and how findings compare to prior research on teacher values. The second part focuses on a discussion of research question 2, which addressed the identification and assignment of values to features, and included a systematic process to build a feature set from multiple sources and the use of triangulation to improve reliability when constructing feature-value pairs among coders. The third part discusses research question 3, which addressed the alignment of users' values and web log usage, and included problems encountered and reflections on the methods used.

Discussion of Research Question 1: Users' personal values

This section discusses issues associated with survey data quality, sample size, and comparisons between findings in the current study and prior studies on teacher values using the Schwartz Values Inventory, including gender and occupation.

Survey data quality

Response rates are often used to evaluate survey data quality (Holbrook, Krosnick, & Pfent, 2007); however, in the current study, sample size has a greater impact on quality. Sample size is a worthy topic of discussion because of the winnowing effect that occurred when survey respondents were linked via unique identifiers to their participation in the VIF Learning Center platform, reducing them to a smaller sample size. For example, 649 initial respondents were, through a process of elimination, winnowed to 158: including only those teachers and administrators who used at least one of the features under study at least once during the research period. For future studies using these methods to gauge values alignments, a viable sample size may be an important consideration to offset any data quality issues that might arise.

In terms of survey response rate in this study, 9,660 VIF teachers and administrators were invited to participate; 649 responded, for a response rate of 7 percent. As Oreg and Nov (2008) comment in their study using an earlier version of the PVQ, low response rates are "typical of web-based, electronically distributed, questionnaires" (p. 2065). As a point of comparison, response rates for other surveys in similar online communities ranged from 20 to 40 percent (Hars & Ou, 2002; Nov, 2007; Wasko & Faraj, 2005); the number of valid responses that researchers used for analysis in these studies was approximately 300 (Wang & Fesenmaier, 2003). In the current study, however, the responses provided by study participants are relatively congruent with results from prior studies on teacher values. These issues are discussed in the following section.

Comparison of current findings with prior studies on teachers' values

Findings from the current study's survey responses can be compared to results of Schwartz's initial Values Inventory research, the foundation for building Schwartz's theory of basic human values that forms the basis for this study. Between 1988 and 1992, Schwartz's original Values Inventory (SVI) survey (1992) was administered to 38 groups of teachers (grades 3-12) and university students. The purpose of Schwartz's initial survey was to empirically distinguish a set of basic values along a motivational continuum, and to determine how individuals differ in their particular value priorities across cultures. It was discovered that teachers attributed greater importance to the higher order value *self-transcendence* and the higher order value *conservation* in almost all countries (Schwartz, 1992). These findings differ from the current study, in which teachers and administrators attribute greater importance to *self-transcendence* and *openness to change*, followed by *conservation* and *self-enhancement*. These differences in the rank order of values may be a result of participation by teachers who are more likely to seek out the kinds of novel experiences that the VIF Learning Center represents. As mentioned above, VIF "endeavors to integrate technology, cultural literacy, and other 21st-century skills into everyday classroom instruction" (Keane et al., 2016, p. 227), and it is speculated that this might appeal to teachers who attribute greater importance to *openness to change* than *conservation* higher order values.

The relationship between values associated with different vocational groups involving the Schwartz Value Inventory has also been a subject of prior study (Knafo & Sagiv, 2004), and these earlier findings, especially those that focus on the teaching profession, can provide a helpful benchmark when comparing results from the current survey. Overall, the teachers surveyed in the current exploratory study reflected prior research on teachers' pragmatic values in several ways. As found by Schwartz in his initial research, teachers attributed highest

importance to *benevolence* values (1992, 1994), which fall within the higher order value of *self-transcendence*. Similarly, Knafo and Sagiv (2004) found that teachers attributed high importance to values such as *benevolence* (higher order value *self-transcendence*) and less importance to values such as *achievement* and *power* (higher order value *self-enhancement*), as reflected in the current study. Knafo and Sagiv (2004) locate teachers in the social occupations (e.g., social workers, psychologists, teachers, nurses), and note that while these groups are more similar in values than other occupations, there are differences of interest to the current study. For example, while the social occupations attribute highest importance to the higher order value *self-transcendence* and least importance to the higher order value *self-enhancement*, there are differences in how the occupations attribute importance to the higher order value *openness to change* and the higher order value *conservation*. According to Knafo and Sagiv (2004), social workers and psychologists tend to rank the importance of their values (highest to lowest) as: *self-transcendence, openness to change, conservation, self-enhancement*; whereas, teachers and nurses tend to rank the importance of their values (highest to lowest) as: *self-transcendence, conservation, openness to change, self-enhancement*. To summarize, social workers and psychologists tend to attribute greater importance to higher order value *openness to change* and less importance to the higher order value *conservation*, which is the inverse of teachers, who attribute greater importance to the higher order value conservation and less importance to the higher order value openness to change. In contrast with the current study, VIF teachers differ from Knafo and Sagiv's teachers, and are more similar to psychologists and social workers in that they attribute greater importance to the higher order value *openness to change* and less importance to *conservation*. Teachers, whether mandated to participate in VIF's online teacher professional development platform or not, also appear to attribute higher importance to the

higher order value *self-transcendence* and less importance to the higher order value *self-enhancement*, the same value priorities shared by teachers as an occupation (Knafo & Sagiv, 2004).

Gender

There were statistically significant and meaningful differences for *self-transcendence, openness to change, and self-enhancement* higher order values between males and females in the sample. While both attributed higher importance to *self-transcendence* higher order values, which are representative values of teaching as an occupation, males attributed significantly higher importance to those values than their female counterparts. In prior studies on teachers' values, males and females both attributed higher importance to *self-transcendence*, which reflects the predominant values of teaching as an occupation. While Knafo and Sagiv (2004) note that females tend to attribute higher importance than males to *self-transcendence* values overall, this study differed in that males attributed higher importance to those values than their female counterparts. It is speculated that there is a self-selection and socialization process in which people choose occupations that reflect their personal values (Knafo & Sagiv, 2004). Thus, it can be conjectured that males are more likely to reflect the predominant values of the profession they select because they pursued an occupation that matches their values, regardless of societal norms based on gender.

Similar to males in other occupations, male survey respondents also attributed higher importance to the higher order value *self-enhancement* than their female counterparts, even though both genders attributed the least amount of importance to *power* and *achievement* values (higher order value *self-enhancement*) overall. This suggests that all things being equal, males were perhaps less conflicted about attributing importance to *power* and *achievement* values in a profession associated predominantly with the higher order value *self-transcendence*. To better

understand the statistically significant difference in importance that males attributed to the higher order value *openness to change* compared to females, further study is needed. Understanding the nature of this difference could be of consequence for a platform that introduces new technologies, a topic addressed in more detail in Chapter 6.

Administrators and teachers

Survey data for this study suggest that there are more similarities than differences between teachers and administrators. However, the gender characteristics of the administrator and teachers are worth noting. For example, a higher percentage of female administrators (68 percent) to males (32 percent) in the sample may reflect a higher concentration of female school administrators working at elementary schools, which tends to employ fewer male administrators than middle and high schools (Goldring, Gray, & Bitterman, 2013). Thus, if the VIF Learning Center platform users were representative of middle and high schools, and if the survey respondents represented these demographics, it is possible that more males would be represented and findings would adjust for gender differences. However, these demographic data were not collected as part of this study and therefore cannot be extrapolated from the findings.

Summary of Research Question 1 Discussion

While this study generated a relatively low survey response rate, it is noteworthy that results were relatively consistent with earlier studies on teachers' personal values. By and large, teachers tend to attribute greatest importance to the higher order value *self-transcendence*, and least importance to the higher order value *self-enhancement*. In this study, males tend to attribute greater importance to *self-transcendence*, *openness to change*, and *self-enhancement* higher order values than their female counterparts. Interestingly, teachers in this study did tend to attribute higher importance to *openness to change* than *conservation* higher order values, which differs from prior studies on teachers' values. This suggests there may be something about teachers who

choose to engage with technology or online learning environments that sets them apart from their peers.

Discussion of Research Question 2: Values enacted in system features

The process of identifying features and assigning values to those features using Schwartz's theory of human values adds knowledge to extant literature, particularly in regards to value sensitive design methods. This section discusses findings encountered during this step of the research.

Identifying features: Multiple functions

One of the criticisms of value sensitive design is that it emphasizes a prescriptive investigation of values in the conceptual phase, instead of discovering values through an empirical post hoc analysis of the system (Yetim, 2011a; Le Dantec, Poole & Wyche, 2009). However, because clear methods did not exist, a discovery protocol had to be devised anew for this study. Despite the extant value sensitive design literature about technical investigations, no known studies made post hoc processes explicit; therefore, a two-step technical investigation protocol was developed. The first step, identifying features in the system, was a recursive process that became entangled with efforts to address research question 3. For discussion purposes, this section addresses the precursor identification of features prior to the problems encountered in building an ethogram. As discovered in this study, taking pains to identify features independent of what might be discoverable in the database ensures rigor and increases what is known about the study's data quality. It also entails a process in which the researcher can become more familiar with the full functionality and context of the features.

As Norman (1988) writes, a feature's affordance refers to how it could possibly be used. While it was relatively straightforward to determine *what* was a feature for the purposes of this study, less effort was spent discussing *how* the feature might be used. This had implications for

assigning values. Because features can be highly contextual, and because some can be used in multiple ways, specifying their *full* functionality should ideally be treated as part of the feature identification step. As an example, the feature friends.invite is, on face value, a way for users to identify others in a known network. However, the feature also makes it possible to contact members through the site. Until someone accepts a friend.invite, there is no default way to make contact with other users. However, the same feature also creates an activity feed showing a user what actions these members have done on the site. A user may engage the friend.invite feature in different ways depending on his or her goals (and knowledge of the feature's functionality). Such ambiguity in a feature's functions influences the pragmatic values that may be assigned to that feature.

This raises questions about the level of specificity necessary for defining a feature. Does it make sense to represent a feature in terms of a single functionality? Or, should each feature be represented in terms of the distinct functions they are capable of performing? If rating an item on the platform raises the raters' reputation ranking (i.e., thereby unlocking privileges), is it better to treat this as its own feature-function item? To better address these questions, part of the identification process could be guided by the four levels of affordance proposed by Pols (2012) to define an artifact: 1) how can the artifact be manipulated; 2) what will be the reliable effects of those manipulations; 3) what can be done with the whole artifact (or technical feature) in itself; and 4) what can be done with the whole artifact as a component of a sociotechnical system. Disambiguating the features in this way could address some of the issues with multiple values coded to a single feature. However, if a feature has several functions, and each function is associated with a value, questions remain about how to align these multiple functions with the personal values of users that engage the feature-function item. It may be viable in some research

studies to investigate a handful of feature-function items and ask users to articulate whether there are specific functions of a feature that they prioritize over others. Alternately, (and discussed below), there may be data mining techniques that can be applied to address the research question.

Feature development and documentation

Also relevant to the discussion about feature identification is the applicability (and degree of thoroughness) of the reverse engineering approach. As mentioned in Chapter 3, reverse engineering methods can involve a combined top-down and bottom-up approach that includes available documentation, source code, mapping models, and other types of information. While the current research made use of multiple sources of documentation, there were other sources that would have helped aid feature identification, including books and online technical support forums. As others have noted, "the information systems area is characterized by constant technological change and innovation" (Benbasat, Goldstein & Mead, 1987, p. 370), which also characterizes a plug-in constantly subjected to upgrades and overhauls. Like many open source software projects, JomSocial developers generate documentation about upgrades and bug fixes. However, because JomSocial is a commercial platform, only paying customers can access this documentation; therefore, this source of information was not consulted for the current research. While it is true that software documentation may lag behind or inaccurately represent what exists, this source of information could provide insight into deprecated features or functionality, or suggest how data related to these features were structured. Similarly, there is a JomSocial book (Boateng & Boateng, 2010) that provides a more complete context for the features, including explanations of functionality that may be obscured for those less familiar with the site. While books can become quickly outdated as upgrades are pushed to the platform, they also provide clues (and evidence) of deprecated features, or explain in detail the different ways that features affect users. This can inform the value assignment step discussed below.

Given the problems locating web log data in this exploratory study, one might conclude that the upfront effort to develop a list of features *before* examining the data tables was wasted. In other words, if the features and their associated trace activity could not be located in the database, then the web log activity could not be analyzed, suggesting that efforts to identify features independent of what might exist in the database were futile. However, the benefit of working from a broad feature set delineated by people with different design backgrounds (e.g., administrator, developer, instructional designer, researcher, systems engineer), as well as multiple sources of documentation, is that it pinpointed issues of data quality. This raises important questions about missing data when conducting a study similar to the current research.

Assigning values to features

Assigning values to features is a highly contextual act that would ideally involve more than two coders, especially given that Schwartz's theory of values was developed for people and not features, and thus calls for a rigorous assignment method when applied to features. The methods used for the current research involved a systematic approach that could be improved upon, particularly during the values assignment phase. A dialogic process occurs when users interact with different features that can be hard to capture in a coding process. Throughout the coding exercise, coders did not discuss the codes they assigned with each other; however, they did discuss various contexts to indicate which codes might constitute a better fit depending on goals and motivations. This can be discerned from the comments section where coders expressed the contextual nature of the codes based on the intent applied to using the feature. Group, photo/album, and comment features (e.g., groups.join, groups.wall.comment, album.create, photo.display, photo.comment, photo.share, cover.upload.comment, photo.album.like, photo.comment) generated a majority of the conditional comments. This is likely because goals change depending on context, and these features are highly contextual; therefore, values are

likely to reflect the goals associated with different contexts as well. As Zhenhui, Jian, and Chan (2011) write, "individuals may perform the same behavior for different psychological reasons depending on the context and the technological actions that are possible or valued within that community environment" (n.p.) To illustrate this point, the following comments indicate the extent to which coders found the *enacted* goals of the features to be conditional based on both context and qualifying motivation (Table 24). For the entire set of comments, see Appendix H.

Table 24. Coder comments appended to feature-value pairs

	Values assigned	Comments
Feature: cover.upload		
Coder 1	*face, self-direction thought*	*Benevolence-dependability*, if adding a full cover profile makes me appear more invested in the community, making me appear more reliable/trustworthy/real. *Self-direction thought* if assuming the cover image represents something important to me/is reflective of my beliefs, etc.
Coder 2	*self-direction thought, benevolence-dependability*	*Face* could also play, but I feel like a cover photo more shows external things that you're related to (rather than just another representation of self). So, it reflects your thoughts and group values more than your own personal self-image.
Feature: friends.connect		
Coder 1	*self-direction action, stimulation*	*Self-direction action*: if freedom to determine your own circle of friends/control others ability to contact you. *Stimulation*: exciting to grow your circle. *Achievement*: higher number of friends might denote well-connected/successful networker, important network node. *Face*: similar, to *achievement*, positions you as an important network node
Coder 2	*conformity-interpersonal, benevolence-dependability*	Also could be *stimulation, benevolence-caring, security-personal*.
Feature: report.user		
Coder 1	*conformity-rules, conformity-interpersonal*	If reporting is an act that protects the community, reflecting a devotion to the group. Adding *universal-caring* because reporting may be an attempt to protect others/rights what I feel is an injustice, etc.
Coder 2	*achievement, stimulation*	This could also be face and *benevolence-dependability*, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.

The conditional comments and variety of values evoked cannot be ignored. They raise the point that if people have a prioritized system of values, then features and their multiple functionalities are likely to represent a system of values, too, especially when specific feature-functionality represents particular goals. In other words, joining a group because it is mandatory represents a different goal than joining a group to impress peers, and these goals are likely to reflect different pragmatic values.

While some feature-value items can be detected in the current study, coders did not assign codes in the comment sections in a consistent way. Instead, comments tended to do one of four things: 1) explain the reasons for first and second choice value codes; 2) list possible other value codes not selected; 3) make reference to other potential values not explicitly listed; or, 4) make no comments. To create feature-function classifications and associated values following a more rigorous method, it is recommended that coders assign however many values might apply to each feature-function item, with explicit instruction to do so at the outset of their coding exercise. An alternate, viable approach to preserve feature-function-value complexity, instead of reducing it to a single representation (i.e., matching a feature-value pair with one higher order value) may be possible through cluster analysis.

Cluster analysis is used to determine clusters of similar objects, or to find groups in data (Romesberg, 2004). A clustering method is essentially a multivariate statistical procedure that attempts to reorganize entities into relatively homogeneous groups (Aldenfer & Blashfield, 1984). In cluster analysis, a data matrix is prepared so that a resemblance coefficient (for either dissimilarity or similarity) can be computed, to identify objects in groups that are similar, and is based on the philosophical assumption that numerical methods can be used to create classifications (Kaufman & Rousseeuw, 1990). Once a resemblance coefficient is computed for

all pairs of objects, a tree is formed to show the degrees of similarity between all pairs. In cluster analysis, estimates depend on the assumptions one is willing to accept (Ritter, 2014); thus, there is often an agreement to neglect some details and not others in terms of what makes objects identical or non-identical (Romesberg, 2004).

Applying cluster analysis to a study similar to the current one would entail reversing the order so that web log data were analyzed first, and analysis of feature-value clusters would follow. The overarching goal of cluster analysis is to form groups in such a way that objects in the same group are similar to each other, and objects in different groups are as dissimilar as possible. Unlike other multivariate methods, cluster analysis involves a set of algorithmic steps that use matrices not for algebraic calculations, but to more readily organize the data; therefore, it is more accurately depicted as a descriptive method for gauging the similarities of objects in a sample (Romesberg, 2004). The process of handling large matrices has become feasible with increased computing power (Aldenfer & Blashfield, 1984) and availability of open-source software. A clustering method would delineate the hierarchy of similarities among all pairs of features, and these similarities could be explored and analyzed according to users, their higher order values, and their web usage of feature-value pairs. As an example, a feature-function item would presumably be more or less similar to groups of users displaying shared characteristics (e.g., teachers, administrators, males, females, mandated users, optional users) and their higher order value attributes. Using this method, we could conceivably investigate the contextual complexity that naturally exists by analyzing clusters, including features that have multiple functions (and therefore multiple values, where applicable) and usage patterns across different groups.

Context, values and coder comments

As mentioned in Chapter 4, for the purposes of this study, coders were able to assign a maximum of two values per feature, and agreement was met when at least two of the 19 values assigned belonged to the same higher-order value. However, in many cases, coder comments indicated that the values would be different depending on context. For example, the following table shows how coders qualify their assigned values for a group, photo, and comment feature based on presumed contexts (Table 25). In the groups.join feature, coder 1 assigned *self-direction thought*, which belongs to the higher order value *openness to change*, and *power-dominance*, which belongs to the higher order value *self-enhancement*. For the same groups.join feature, coder 2 assigned *face*, which belongs to the higher order value *conservation*, and *stimulation*, which belongs to the higher order value *openness to change*. Both coders make comments that qualify their codes contingent on the type of group, or intention for interacting with that feature. In other words, if the group is for personal interest and reflects individual choice, the code might reflect *openness to change* higher order values. If a supervisor or colleague makes joining the group mandatory, the code might reflect *conservation* higher order values. Likewise, if a person joins a group to improve their skills, the code might reflect *self-enhancement* higher order values. Collectively, these comments suggest that there may be other codes not mentioned, depending on context.

Table 25. Context in coder comments

Feature: groups.join		
Coder 1	*self-direction thought, power-dominance*	Depends entirely on type of group (i.e. professional group vs. personal interest)
Coder 2	*face, stimulation*	Depending on the nature of the group, it could also be other values.
Feature: photo.display		
Coder 1	*face, stimulation*	Possibly *hedonism* if you are posting to receive instant gratification from comments from other users. Could also be *achievement* depending on what the photo is (i.e. are they showing off personal achievements?)
Coder 2	*face, achievement*	I also think *stimulation* and *hedonism* could apply because pictures are often fun. And, probably *benevolence-dependability* because some of them will have your friends in them. The curation both creates an image of yourself, and likely shows your in-person social acceptance.
Feature: profile.avatar.upload.comment		
Coder 1	*benevolence-caring, stimulation*	*Stimulation* because I may be responding to someone changing their profile/responding to the novelty of an image. *Benevolence-caring* because commenting shows an investment in another person.
Coder 2	*achievement, stimulation*	Commenting or liking someone else's photo is showing that you approve of them in your social network. So, I think *benevolence-caring* could also play. Plus, it's just fun, which is why *stimulation*.

Similar qualifying comments were made for the feature photo.display. Coder 1 assigned *face,* which can belong to both *conservation* or *self-enhancement* higher order values, and *stimulation* (*openness to change* higher order value). Coder 2 assigned *face* and *achievement* (*self-enhancement* higher order value). Once again, both coders qualified their coding with comments that reflect the importance of context and motivation. For example, coder 1 goes on to say in the comments section that *hedonism* values could apply if the purpose of displaying photos is to receive instant gratification from other users, or *achievement* values if the purpose is

to show off. Coder 2, after assigning 2 values to the feature, introduces 3 new codes in the comment section, including *stimulation (openness to change), hedonism (openness to change*), and *benevolence-dependability (self-transcendence),* depending on whether the pictures are for fun, or whether the purpose of displaying photos is to gain social acceptance from peers.

Similar to groups.join and photo.display, the feature profile.avatar.upload.comment reflects coders' qualifying comments that are dependent on context. Coder 1 assigns *stimulation,* which belongs to the *openness to change* higher order value, and *benevolence-caring,* which belongs to the *self-transcendence* higher order value. These codes were qualified with comments that take into account different intentions. For example, *stimulation* might apply if someone chooses to comment on a new avatar image, or *benevolence-caring* if the intention is to show an investment in the relationship. Coder 2 assigned *stimulation,* and also *achievement,* which belongs to the *self-enhancement* higher order value, and noted in comments that *benevolence-caring,* which belongs to the *self-transcendence* higher order value, could apply if the intended use of the feature was to show some type of affirmation of the relationship within a larger social network.

Collectively, what these comments indicate is that a user's intention and context for using the feature influence the values that might be associated with it. Resolving coding-value disagreements without taking into consideration comments is problematic from an inter-coder reliability perspective. One way to improve this is to isolate the feature functionality as discussed above, so that coders, as much as possible, assign values based on specific functionality. For example, if the feature photo.display can perform three separate functions, it would be listed as three separate feature-functions (which may not be overly prohibitive or onerous using cluster analysis). Another way to improve the process is to review the comments for contextual clues

and identify potential value agreements when intended goals are made explicit. In other words, there could be categories of features that reflect context (e.g., photo.comment), or features that are relatively straightforward in terms of context (e.g., report.user). Group, photos, and comment features appear to be more contextual; for the purpose of future studies, it may be useful to ask coders to assign *all possible* codes recommended and analyze which features appear to reflect multiple higher-order value categories. This could aid in a more accurate identification of features that appear to be highly contextual. Further study is needed to discern whether there are analytical and interpretive approaches (such as cluster analysis) better suited to addressing the contextual richness of features and associated multiplicity in values.

Feature-value agreements when features are similar

Coders did not always apply the same 19 values codes to similar features; however, for the most part, these values codes were represented by the same higher order values. "Liking," for example, was a feature-action appended to the following: groups.wall.like, photo.like, photos.album.like, photos.wall.create.like, profile.avatar.upload.like, profile.status.like, group.discussion.reply.like, cover.upload.like, and albums.like. According to the frequency with which coders assigned values to "like" features (Table 21, above), a third of the time, coder 1 attributed *stimulation* and *benevolence-dependability*; two thirds of the time *stimulation* and *benevolence-caring* were assigned; the last third were assigned *benevolence-caring* and *benevolence-dependability*. For the purposes of this study, the variations were not problematic because *benevolence-dependabilit*y and *benevolence-caring* codes were part of the *self-transcendence* higher order value. In other words, of the codes assigned, 100 percent of the time at least one *self-transcendence* code was assigned to "liking" features. Similarly, coder 2 assigned different codes for "liking," although 80 percent of the time *achievement* and *stimulation* were selected. For the remaining 20 percent, *benevolence-dependability* and

universal-thought were assigned to the features (profile.status.like and cover.upload.like). We can conclude from this that feature-action clusters exist, and can represent the same higher order values, even if there is some variation in the 19 values assigned.

Coder values and frequency of values

Coders bring their own value goals and actions to the task of coding and interpret the features in light of their personal value priorities. Of the values that coders could assign to features, coder 1 selected 10 of the possible 19, and coder 2 selected 12 of the same possible 19 (Table 26). The frequency of particular values in the coding process raises questions about how the pragmatic values of the coders might influence the way they perceive feature-value pairs and the codes they select. For example, coder 1 selected *benevolence-caring* 13 times, while coder 2 did not select it at all. In future research, it may be worth investigating the personal values of the coders using the revised Portrait Values Questionnaire to gauge to what extent coders select codes based on their own hierarchy of values.

Table 26. Frequency of value codes selected by coders

Values	Higher-Order Value	Coder 1 Frequency	Coder 2 Frequency
Stimulation	Openness to change	14	14
Benevolence-caring	Self-transcendence	13	0
Benevolence-dependability	Self-transcendence	11	6
Face	Conservation	6	13
Self-direction thought	Openness to change	5	5
Achievement	Self-enhancement	3	17
Conformity-rules	Conservation	3	2
Security-personal	Conservation	2	3
Power-dominance	Self-enhancement	2	0
Conformity-interpersonal	Conservation	2	2
Hedonism	Openness to change	1	0
Self-direction action	Openness to change	1	0
Security-social	Conservation	0	2
Universalism-thought	Self-transcendence	0	1
Universalism-nature	Self-transcendence	0	0
Universalism-concern	Self-transcendence	0	0
Humility	Conservation	0	0
Tradition	Conservation	0	0
Power-resources	Self-enhancement	0	0

Resolving coder disagreements

As mentioned above, when divergent codes could be resolved by using higher order values, agreement was easy to reach. However, in the instances where no agreement was reached, it could mean that the feature had so many potential and possibly conflicting goals that attribution of one higher order value was not viable, which raises the issue of contextual motivations depending on the intent and the goal of the user. This is particularly interesting in terms of "earn badges," because a feature with multiple values may present unintended conflicts if the goals are not made clear, or if the conflation of goals introduces complementary and contrasting values. For example, if badges can be associated with *conformity-rules* (*conservation*), *achievement* (*self-enhancement*), *self-direction action* (*openness to change*), and *stimulation* (*openness to change*), and a teacher prioritizes *self-transcendence* values like *benevolence-caring*, he or she may interpret the *self-enhancement* value of the badge (*achievement*) and be less motivated to earn, share, or value it. However, if aspects of badge earning are aligned with complementary values, then goals and actions may reflect more adequately the values that motivate teachers to participate and engage. These issues are summarized below and discussed in more detail in Chapter 6.

Summary of research question 2 discussion

Developing a systematic, rigorous method to assign pragmatic values to features is not a trivial task. This study designed, implemented and critiqued a post hoc technical investigation method in which pragmatic values are assigned to features and thereby has made a contribution to existing research on value sensitive design. In the processing of discerning this method, several issues came to light that underscore the importance of systematic feature identification. For example, the reverse engineering approach, while labor intensive, pinpointed issues of data quality, and more importantly missing data, which is a critical finding in any investigation. The

feature identification process also raised questions about a given feature's multiple functions. In refining these methods, it is recommended that researchers determine whether users prioritize one function of a given feature over others, and determine how to handle any trade-offs in the context of a study's goals, whether they are handled during the development of feature-value pairs or retrospectively through cluster analysis.

The process of assigning values to features also made clear several key points. First, it demonstrated that coders bring to the coding process their own values, which may influence how they assign codes. In replication or other future studies, having coders take the revised Portrait Values Questionnaire to determine their rank order of values is recommended to address this finding. Further research that looks more closely at the pragmatic values of coders would help determine more accurately if there was, in fact, a relationship between coders' rank-order values and the values they assigned to features. For example, a sample of coders would take the PVQ-RR to determine the rank order of their values, and this same sample would be asked to assign values to features. If it were found that coders did indeed assign the same values in higher frequencies based on their own values, this would suggest two possibilities. One, that a more representative sample of all values was needed in the coder selection phase; two, that coders reflect the values priorities to better match the survey respondents and target audience. Different studies may have a preference of one over the other depending on the research design and rationale.

Second, the conditional nature of coder comments and variety of values evoked should not be ignored. Rather than take a reductive approach to the complexity and contextual nature of features, it is recommended that cluster analysis or weighted scoring be considered to manage this complexity and look for similarities and dissimilarities. In weighted scoring, the empirical

probability of one coder choosing a designation is the number of times a designation was selected over the total of all selections; which can then be compared to other scorer's probability to give a measure of agreement. For example, in Table 26, the empirical probability of the two coders selecting *stimulation* is 14/63 or .22 for coder 1 and 14/65 or .21 for coder 2. This indicates a high level of agreement that *stimulation* applies to several features in the environment, compared to the designation of *face* (coder 1 = .10 versus coder 2 = .20). The importance of coders' recognition of context, and the prospect of features having multiple functions (and potentially multiple values) may warrant the use of cluster analysis or weighted scoring methods to explore similarities and dissimilarities in feature-function clusters by different groups of users and their web usage patterns.

Discussion of Research Question 3: Effects of values alignment on system use

The usefulness of the feature-value pairs developed for this study could not be determined due to limitations in the quantity and diversity of web log data. The following section describes the steps that were taken to locate web log data, and a discussion of the interactive process of addressing research question 2 in order to fully address research question 3.

Steps to locate missing data

Approaching the feature set with an exploratory yet rigorous method led to the discovery of missing data associated with the JomSocial tables, which is a data quality issue. Data quality can be described according to four dimensions: accuracy (i.e. are the data free of errors?); timeliness (i.e., are the data up-to-date?); consistency (i.e., are the data presented in the same format?); and completeness (i.e., are necessary data missing?) (Wang & Strong, 1996). VIF Learning Center's community actions data, for the purposes of this study, and in particular with regard to the JomSocial plugin, likely experienced what data science researchers refer to as the inverse of the "merge/purge" problem, when duplicate records appear in merged databases

(Maimon & Rokach, 2005, p. 20). Instead of merge/purge, entire data tables were missing or relocated in this study. To locate the data would require decomposing and reassembling the database architecture, a process that would consume more resources and call for more expertise than was available for the present study.

Marketing material for JomSocial claims that data based on community activities can be viewed through a dashboard; however, these dashboard metrics did not appear to correspond to those found (or not found) in the JomSocial database. There were similar discrepancies that were identified in the process of locating data in the JomSocial tables; for brevity, one example that focuses on the five-star karma rating system is discussed here. The rating system is a prominent feature tracking teacher activity in the system, accompanied by a rubric that system administrators can use as an index of related features. The karma rating system is a unique case in that it includes a number of different feature-actions that users can perform in the system, including joining groups, replying to discussions, commenting, and uploading photos, to name a few. However, while the five stars that make up the karma rating system are prominently displayed on users' profiles, underlying types of participation and the associated point system for corresponding actions are obscured to users; only VIF Learning Center administrators can see the rubric used to assign points to community actions of their choosing. This lack of transparency to users makes it difficult to know what, exactly, the karma system represents in terms of its meaning, other than to speculate that it seems to correspond to relative degrees of participation in the system, with more stars representing higher activity levels and fewer stars representing lower activity levels. At the outset of the current study, it was assumed that the karma rating system was pulling data from different community action tables in the JomSocial database. Because the karma rating system represented an aggregation of features, it was not treated as a unique

feature-action during the feature-value coding process. To verify which features were contributing to the karma rating system, the primary researcher created an ethogram of possible community actions and accompanying tables during the fall of 2015 as a preliminary step, discussed next.

Data cleaning

While the features of the VIF Learning Center were being identified, a preliminary investigation of the tables was conducted by the researcher in order to build the ethogram. Independent from and subsequent to this review process, an automated update was pushed to the JomSocial plugin by JomSocial developers, which in effect appears to have altered the relational database architecture, causing a cascading effect that made it difficult to locate data. Even though VIF backs up versions of its platform and made a cloned database available to the researcher, an investigation of back-ups that existed prior to the upgrade showed similar data loss. Thus, while 34 features had been previously identified during a review of the database, only 13 possible feature-actions or trigger events and associated data could be located after the 'update.' Many of the feature-actions that could not be located in the tables appeared to be functional on the site following the upgrade. This suggests that the data for the "missing" features were likely being logged somewhere in the system. MySQL queries to locate missing data tables were conducted; however, they repeatedly failed to bring back results.

As described by researchers who conduct studies on knowledge discovery and data mining, "if some important attributes are missing, then the entire study may fail" (Maimon & Rokach, 2005, p. 3). Unfortunately, as others have noted, problems with "dirty" data are common when preparing them for analysis. As a result, researchers have emphasized the need for improved data quality (Hazen, Boone, Ezell, & Jones-Farmer, 2014, n.p). As data mining and data science become defined areas of study, data cleaning has become an important topic of

research (Maimon & Rokach, 2005). This has bearing on this exploratory research because compromised data quality contributed to an overall winnowing of available data. Therefore, as was the case with the current study, methods used to identify features should be thoroughly recursive and involve multiple sources to verify any discrepancies between features at the graphic user interface level, and how those features are structured in the database. While it is more time and resource intensive to do a technical investigation with multiple people and multiple sources of information, the method used in this exploratory study also provides a more accurate depiction of the system architecture and inconsistencies between what users can do, and what data can be collected and analyzed. Having a healthy respect for dynamic data environments, understanding the nature of system architecture, and employing systematic and rigorous investigations that involve careful data cleaning methods can safeguard against some of the risks of doing similar studies. However, at the end of the day, in complex systems that are changing with processes out of the direct control of the research team, data losses and changes in system functions (e.g. evolution of systems) are not uncommon. For an exploratory study, these kinds of dramatic shifts are not critical failure events, even if the loss of data for a specific part of the analysis causes one opportunity for hypothesis testing to disappear.

Summary of research question 3 discussion

As this study reveals, databases created by interactive online learning environments are not static situations; they are dynamic and susceptible to errors that can be difficult to trace. The current research is situated at the periphery of data science, an emerging research field that involves, among other areas of study, web log analysis of the kind attempted here. As Muresan (2009) describes, web log analysis "provides the means to acquire large quantities of data about patterns of interface usage" (p. 228), and the constraints to gather these data is dictated by the software architecture of the system being investigated. As discussed above, the software

architecture of the JomSocial plugin constrained the quality of data that could be collected for analysis. For other studies of this type, a piloted version of web-based data collection and analysis may be necessary in order to confirm that there are sufficient data upon which to do analysis.

Summary of Discussion

In an exploratory study, the researcher generally has only presumptive knowledge about the phenomena of interest, and inquiry points to important variables for further investigation. Exploratory studies tend to develop new methods more frequently than using existing ones (Boudreau, Gefen & Straub, 2001), as was the case here. This chapter summarizes the discussion of findings for the three research questions, focusing in particular on the process used to identify features and assign values (research question 2), and the more technical issues associated with web log analysis conducted on an active database that is subject to upgrades and related data quality issues (research question 3). No conclusions about the values alignment in the VIF Learning Center can be made; however, several lessons were learned and recommendations emerged. Perhaps most poignant, given the dependency of the study's viability on sufficient web log data, is the recommendation to take steps (and have adequate resources) toward assessing the state of the system's software architecture. Knowing that the environment is dynamic and not static, researchers must be prepared for changes to occur in the database that could prove fatal to aspects of any study and might cause shifts in fundamental questions or in the follow-up needed to more deeply inquire into a particular analysis. A second recommendation is to consider cluster analysis as well as other exploratory methods of analysis that account for the complexity of features, functions, and values as they reflect different user groups and their higher order values.

This exploration of values alignments in digital environments adds valuable knowledge to extant literature on value sensitive design methods, especially as an example of a post hoc technical investigation of pragmatic values.

CHAPTER 6: IMPLICATIONS AND CONCLUSION

This impetus for this study was motivated by the recent development of open digital badging systems emerging at the intersection of information science and educational technologies. Open credentialing platforms thread together a nexus of previously existing technologies that have dramatically changed both social norms and social institutions in other spheres. For those who have both access and skills to use these technologies, a wave of creativity, collaboration, and innovation exists at a scale never experienced before. What was once simply referred to as literacy—the ability to read and write—has expanded to envelop ever more sophisticated 21st century competencies and knowledge. In response, legions of students, workers, and lifelong learners are "upskilling" to acquire the digital literacies and competencies needed to ensure social and economic mobility. Spurred by this new culture of learning, a collaboration of philanthropic organizations, government agencies, and institutions of learning designed and developed a new data-rich open digital credentialing system that borrows principles and practices from the open web. As a result of this innovation, open badges have become a type of short hand that evokes other trends rippling through education and workforce sectors, including 21st century skills and competencies, networked social technologies, and a new culture of reputation that accompanies them. However, open badge systems also evoke the democratizing, open-source ethos that reflects the values and goals embedded in the core principles of the open web itself. In a review of value sensitive design, researchers suggest that these same democratizing, open-source values are propagated in the very same methodology designed to study them:

> Historically, computing has been associated with enabling personal expression and collaboration, with creating opportunities for new forms of community, and with reshaping the world through a new economy of ideas. These commitments have their roots in 1960's U.S. counterculture and underpin the notion that digital technology plays a unique role in embodying and propagating certain values within society. What value sensitive design has done, then, is help enumerate the commitments that quietly inform much of the work in modern computing (Le Dantec, Poole & Wyche, 2009, p. 1142).

This observation is relevant to the current study for several reasons. It reinforces that there are values likely associated with the *intent* of open badging platforms, and it encircles a rationale for using Schwartz's Values Inventory to study pragmatic values instead of the 12 Human Values of Ethical Import that are typically invoked in value sensitive design research. The argument for using Schwartz's Values Inventory is based on the overarching research goal for the current study, which is to explore whether there are alignments between users' pragmatic values and values implicit in system features. In other words, the goal of the current study is not to determine whether the values of a set of features are in alignment with counterculture values, such as personal expression, collaboration, creating new forms of community, or reshaping the world through a new economy of ideas—values that Le Dantec, Poole, and Wyche (2009) associate with computing and digital technology. Instead, the study is about whether there are alignments between users' pragmatic values and the feature-values with which they interact. Counterculture values (that may be present in many badging systems) suggest ones that have more ethical (i.e., reflection on what is good for one's self) or moral (i.e., equally good for all) import—in contrast with pragmatic values (i.e., rational assessments of goals in the light of existing value preferences) (Yetim, 2011b, n.p.).

For this reason, this exploratory study adapted Schwartz's theory of basic human values to a sociotechnical environment. It is a preliminary investigation of value alignments in what some experts consider a disruptive innovation (Carey, 2015) among a user group—specifically

teachers—known to be the standard bearer for society's norms and values. While this case study focuses on values alignments within the VIF Learning Center's online teacher professional development platform, there are implications for future research that addresses value sensitive design methods more generally, as well as studies on sociotechnical platforms and badging systems more specifically. These implications are discussed below.

Implications for value sensitive design methods

This exploratory research addresses two main gaps in the value sensitive design literature. First, it focuses on users' pragmatic values, as opposed to moral or ethical values, which have received more attention in value sensitive design methodology. Second, it presents a rigorous step-by-step process for *discovering* values in features during a technical investigation instead of *preconceiving* them during the conceptual phase. In practice, these two areas of study are tightly coupled; however, they are addressed separately in the following sections.

Pragmatic values

As discussed above in Chapter 2, pragmatic values pertain to "rational assessments of goals in the light of existing value preferences" (Yetim, 2011b, n.p.), and while they may be closely entwined with ethical and moral values, they are distinct from them. Ethical values are the "reflection on what is good for one's self," and moral values are considered what is "equally good for all" (Yetim, 2011b, n.p.). Thus, moral and ethical values presume *goodness,* which is conceptually distinct from *preferences*. The three types of values are often entwined; however, pragmatic values are well suited to research that focuses on users' motivations to contribute and participate in online communities. As Yetim (2011a) discusses, taking a pragmatic approach within value sensitive design methodology is appropriate when research questions are purposive, as opposed to good (ethical) or right (moral). A pragmatic approach is useful when dealing with values "concerning the choice of means in order to achieve the given end effectively" or to

"rationally justify the choices of the means to achieve the goals…in light of accepted value preferences" (Yetim, 2011a, p. 137), as is the case in the current study. As Yetim (2011a) notes, in pragmatic discourse, research is guided by "a deliberation on goals in relation to the desired value and the deliberation of actions in relation to both goals and values" (p.144). However, an adaptation of the methodological approach is needed when the primary research goal focuses on pragmatic values, even when issues of moral and ethical values might be simultaneously present.

In addition to the current study, less than a handful of known studies have focused on pragmatic values as a way to understand user contributions to open-source projects, and only one (Oreg and Nov, 2008) uses Schwartz's Values Inventory to explore contributors' pragmatic values of and their motivations for contributing. However, while Schwartz's values scale is used to survey the pragmatic values of contributors, these same values are not used to label motivations in their study. Instead, the researchers draw on extant literature to characterize the kinds of values likely to exist in open-source communities. This differs from the current study, which applies the same pragmatic values for users as it does for features of the system. Yetim, Widenhoefer and Rohde (2011) also explored users' pragmatic values and motivations to contribute using value sensitive design methodology. They focus on pragmatic values drawn from extant literature (e.g., community, reputation, self development, personal enjoyment, and self benefit). Cocton (2005) also focuses on pragmatic values, although the purpose of that research is to determine worth or commercial value to users (Kujala, & Väänänen-Vainio-Mattila, 2009), and to develop a methodology referred to as worth-centered design. What sets the current research apart from these studies is the use of a rigorous technical investigation process based on Schwartz's Values Inventory (or in this case, Schwartz's revised and refined Portrait Values Questionnaire-RR). Schwartz's Value Inventory is widely believed to be the

most universal and applicable inventory of pragmatic values (Fleischmann, 2014) and presents interesting possibilities for further inquiry and replication, especially for studies that focus on pragmatic values in digital environments.

Technical investigation

While this research is guided by value sensitive design, the purpose is to explore the alignment of pragmatic values of users and features of a system. This situates it more within the goals of value *driven* design, a similar approach that seeks to understand value conflicts or misalignments with an emphasis on the resolution of those conflicts (Fleischmann, 2013). Shilton et al. (2014) point out that different research goals can be studied with a variety of methods, and that "each method elicits some dimensions more effectively than others" (p. 267). The goals of the current study, for example, make it well suited to a post hoc technical investigation, a stage of both value sensitive and value driven design that is not well explicated in the literature.

There are reasons why the procedures used in technical investigations are not made more explicit. Value sensitive design has been critiqued for focusing on preconceived values instead of "inquiring about the values present in a given context and responding to those values" (Yetim, 2011a, p. 136). As others have commented, "What is needed is more prescription in methods that inform value-centered investigations, and less prescription in the kinds of values considered" (Le Dantec, Poole & Wyche, 2009, p. 1142). Because value sensitive design typically begins with the conceptual stage, followed by the empirical stage, the final technical investigation is typically cast in a specific role that diverges from how it was used for this study.

As Yetim, Wiedenheofer and Rhode (2011) write, "technical investigations involve activities in which designers bring to bear state-of-the-art knowledge on design specifications that might be used to realize given values within the context of a design project" (n.p.). In other

words, the purpose of the technical investigation is to proactively design specific values into the system. This differs from the current research, which is intended to evaluate whether alignments occurred, creating a need for a post hoc technical investigation. Yetim (2011b) does offer a framework that can be applied as a post hoc analytic evaluation of a system already designed; however, this framework is limited to a set of critical heuristics to guide inquiry. What was needed was a rigorous method and set of steps that others could replicate and improve for post hoc analysis. The rigor of this method was also needed to guide researchers through a thorough feature identification process. In proactive design studies, it may be less important to identify a full set of features, but in post hoc technical identification analyses, these steps can bring to light any presumed functionality that may not be working correctly, or identify "dirty" data that might obscure whether the system is logging data accurately. Ways in which this technical investigation can be adapted and used for other design spaces and studies are discussed below.

Implications for design

The current study has implications for the design of teacher online professional development platforms. Education is in a period of dramatic change. Few social institutions have had to respond so often and so quickly to changing demands as institutions of learning. With increased expectations and decreasing budgets to fulfill what are often competing needs, teachers are entrusted with the twin goals of preserving norms while simultaneously introducing novel pedagogies and technologies relevant to demands of the 21st century. VIF Learning Center represents a change-driven organization that seeks to align its platform with teachers' and administrators' goals and values, while simultaneously introducing new ideas, new practices, and new technologies. As Dede et al. (2009) note, there are many online teacher professional development sites designed in part to motivate "teacher change," and these platforms must

compete with teachers' busy schedules. Arguably, these platforms must also contend with a tension that manifests in values alignments.

Designing a system that teachers are motivated to use, and that can keep their sustained interest, is a design challenge. Little is known about best practices for the design and implementation of teacher online professional development sites, and high attrition—a problem in many online platforms— is a major concern (Reeves & Pedulla, 2011). While data issues precluded the current study from identifying values alignments between VIF Learning Center users and system values, there is one implication that may be of interest for future research. As Chen and Jang (2010) note, research on learner motivation and participation in these environments is limited and survey data from the current study may point to a useful line of inquiry. As mentioned in Chapter 5, in earlier studies, teachers as an occupation tend to attribute the greatest importance to: *self-transcendence, conservation, openness to change*, and *self-enhancement* higher order values, in that order. In this study, however, the ranking is slightly different, with *openness to change* and *conservation* switched, i.e., the order among study participants is *self-transcendence, openness to change, conservation*, and *self-enhancement*. In light of the importance of *openness to change* as a higher order value presumed to be important for platforms that promote change, this is an item worthy of future study.

To lend further interest in this line of inquiry, consider a result from the current study that fell outside its scope: among the full set of survey respondents (n=536), including those who were designated "inactive" in the VIF Learning Center, there was a (barely) significant statistical difference ($p = .048$) for teachers who attributed greater importance to the *conservation* higher order value than administrators. Because of the relatively low survey response rate, and because of the relatively high *p* value, these findings may or may not be meaningful. In addition, other

known characteristics of the sample (e.g., male versus female, and mandated versus optional-use) do not suggest statistically significant differences for the higher order *conservation* value between groups. However, if we were to treat the differences in the higher order *conservation* value between administrators and teachers as meaningful, this raises questions worth exploring further. For example, the higher order value *conservation* value represents *conformity*, *tradition*, and *security*, and conflicts with values that represent the higher order value *openness to change*, including *stimulation* and *self-direction*. Further research is needed to gauge whether teachers who attribute greater importance to the *openness to change* higher order value are more tolerant of novel ideas and innovative technologies such as badging platforms. Likewise, it is worth investigating if teachers who attribute greater importance to the higher order value *conservation* are more resistant to novel ideas and technologies.

Even though *conservation* is adjacent to *self-transcendence* on the motivational continuum, and thus does not represent a psychological or social conflict with *self-transcendence* per se, this potential difference could have interesting implications for system designers. For example, the feature-value pairs derived from the VIF Learning Center proportionately represented more *openness to change* values than any other of the four higher order values, including the predominant teacher value of *self-transcendence*. While the values assigned to these feature-value pairs is open to debate, conceptually there may be missed opportunities to implement feature-values more similar to *self-transcendence* while de-emphasizing more dissimilar *self-enhancement* values. This would be particularly relevant in a system like the VIF Learning Center platform where pro-social engagement is optional, and particularly relevant if scaling the system depends on that pro-social engagement. When it comes to attracting and sustaining the highly precious time, attention, and engagement of teachers, every design decision

is important. We know from Schwartz's values research that simultaneous pursuit of contrasting values can give rise to strong social and psychological conflict. For example, *universalism* and *benevolence* (higher order value *self-transcendence*) versus *achievement* and *power* (higher order value *self-enhancement*) presumes that acceptance of others and concern for their welfare interferes with the pursuit of one's own relative success and dominance over others. Teachers have been relatively well researched in terms of their values and the role of *self-transcendence* as a prioritized value suggests that motivations will be stronger when these values are manifest and entwined with goals and actions. How to optimize these findings in a way that informs design decisions is one reason this exploratory study looks at whether it is feasible to assign values to features in a badging system and detect values alignments.

Setting aside the inconclusiveness of this exploratory study, it did advance knowledge within value sensitive design research. Yetim (2011a) outlines what he considers preferred standards in value sensitive methodology, including making a distinction between pragmatic, ethical, and moral issues; and providing opportunities to critically reflect on values. Applying Schwartz's Values Inventory to pragmatic values in this research upholds one standard, and devising a way to critically reflect on values alignments in the system post-implementation meets a second standard. Together, both approaches contribute to new discussions about how to uphold these standards in value sensitive design methodology.

Conclusion

The impetus for this study is an exploration of an emerging technology, one with the potential to have far-reaching consequences for people seeking economic and social mobility. Setting aside the possibility that badges will become a consequential currency in a viable credential marketplace, there are urgent questions about the values we perpetuate in new technologies. This study is one approach that considers whether values might be detected in this

new design space, and how an intended group of users might respond to those values at the feature level. The *values* that we design into these badging platforms, whether done inadvertently or not, are consequential even if the *value* of the credentials is not. Motivating people to adapt to changing conditions is perhaps no more significant than among the profession that Schwartz (1992) described as "key carriers of culture" who reflect "the broad value consensus in societies" (p. 18). While this study is not conclusive about values alignments in the VIF Learning Center, exploring these questions is a first step to recognizing that they matter, and further research is warranted if we hope to preserve and perpetuate preferred values in pursuit of new goals.

APPENDIX A: RECRUITMENT EMAIL

Hello <NAME>,

My name is Sheryl Grant and I am a doctoral candidate at UNC-Chapel Hill in North Carolina. I am collaborating with VIF Learn to gather data about how our human values influence the way we interact with features on the platform.

For this reason, we invite you to take part in a scientific cross-cultural study on values and personality (IRB study #15-3043).

By completing the survey linked below, you will determine, in rank order, your personal values immediately upon participating in the survey. It will take roughly 8 minutes or less to complete the survey. You can indicate at the end of the survey if you wish to receive results from the survey.

Participation in the survey implies consent for us to conduct further web log analysis based on your responses, which will be kept strictly confidential and will be aggregated and anonymized prior to reporting to prevent the identification of individual participants.

To show our appreciation for your valuable time, all who complete the survey by Month/Day, 2016 will be entered into a drawing to win 1 of 10 $20 Amazon gift cards.

Follow this link to complete the survey:
Begin the Survey <link>
Or copy and paste the URL below into your Internet browser: <link>
To opt out of future emails, follow this link: <link>

Should you have any questions or concerns about this survey, please contact Sheryl Grant at slgrant@email.unc.edu. Thank you in advance for your feedback and time, and I hope you have a wonderful day!

APPENDIX B: PORTRAIT VALUES QUESTIONNAIRE

Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Put an X in the box to the right that shows how much the person in the description is like you.

1. It is important to him to form his views independently.
2. It is important to him that his country is secure and stable.
3. It is important to him to have a good time.
4. It is important to him to avoid upsetting other people.
5. It is important to him that the weak and vulnerable in society be protected.
6. It is important to him that people do what he says they should.
7. It is important to him never to think he deserves more than other people.
8. It is important to him to care for nature.
9. It is important to him that no one should ever shame him.
10. It is important to him always to look for different things to do.
11. It is important to him to take care of people he is close to.
12. It is important to him to have the power that money can bring.
13. It is very important to him to avoid disease and protect his health.
14. It is important to him to be tolerant toward all kinds of people and groups.
15. It is important to him never to violate rules or regulations.
16. It is important to him to make his own decisions about his life.
17. It is important to him to have ambitions in life.
18. It is important to him to maintain traditional values and ways of thinking.
19. It is important to him that people he knows have full confidence in him.
20. It is important to him to be wealthy.
21. It is important to him to take part in activities to defend nature.
22. It is important to him never to annoy anyone.
23. It is important to him to develop his own opinions.
24. It is important to him to protect his public image.
25. It is very important to him to help the people dear to him.
26. It is important to him to be personally safe and secure.
27. It is important to him to be a dependable and trustworthy friend.
28. It is important to him to form his views independently.
29. It is important to him that his country is secure and stable.
30. It is important to him to have a good time.
31. It is important to him to avoid upsetting other people.
32. It is important to him that the weak and vulnerable in society be protected.
33. It is important to him that people do what he says they should.
34. It is important to him never to think he deserves more than other people.
35. It is important to him to care for nature.
36. It is important to him that no one should ever shame him.
37. It is important to him always to look for different things to do.
38. It is important to him to take care of people he is close to.
39. It is important to him to have the power that money can bring.
40. It is very important to him to avoid disease and protect his health.

41. It is important to him to be tolerant toward all kinds of people and groups.
42. It is important to him never to violate rules or regulations.
43. It is important to him to make his own decisions about his life.
44. It is important to him to have ambitions in life.
45. It is important to him to maintain traditional values and ways of thinking.
46. It is important to him that people he knows have full confidence in him.
47. It is important to him to be wealthy.
48. It is important to him to take part in activities to defend nature.
49. It is important to him never to annoy anyone.
50. It is important to him to develop his own opinions.
51. It is important to him to protect his public image.
52. It is very important to him to help the people dear to him.
53. It is important to him to be personally safe and secure.
54. It is important to him to be a dependable and trustworthy friend.
55. It is important to him to form his views independently.
56. It is important to him that his country is secure and stable.
57. It is important to him to have a good time.

APPENDIX C: FEATURE-VALUES CODING INSTRUCTIONS

Assigning Values to Features: Coding Instructions

For the purposes of this coding exercise, it is assumed that digital *features* can be said to reflect human *values* and the goals that accompany them. You are being asked to assign human values to digital features found in the VIFLearn.com platform.

There are three steps involved in this exercise. In the first step, you will read through a list of 19 values (Table 1), including (if helpful) longer descriptions that help make distinctions between the 19 human values (Table 2), and a values circumplex that describes values in the context of an individual's motivations (Figure 1). In the second step, you will assign values to features using the codes from Table 1. In the third step, you may be asked to debrief with another coder involved in the exercise and/or the researcher. It is estimated that this exercise will take roughly 1.5-2 hours with periodic breaks and time to ask questions and clarify the process.

STEP ONE:

Please read through the 19 values in Table 1 at least before beginning the coding process. Table 2 further defines the distinctions between closely related values to help guide coding. Figure 1 is provided to lend additional context for the values and how they relate to an individual's motivations.

Table 1. *Values and descriptions*

CODE	VALUE	DESCRIPTION
SDT1	Self-direction-thought	Freedom to cultivate one's own ideas and abilities
SDA	Self-direction-action	Freedom to determine one's own actions
ST	Stimulation	Excitement, novelty, and change
HE	Hedonism	Pleasure and sensuous gratification
AC	Achievement	Success according to social standards
POR	Power-resources	Power through exercising control over people
POD	Power-dominance	Power through control of material/social resources
FAC	Face	Maintaining one's image and avoiding humiliation
SEP	Security-personal	Safety in one's immediate environment
SES	Security-societal	Safety and security in the wider society
TR	Tradition	Preserving cultural, family, and religious traditions
COR	Conformity-rules	Compliance with rules, laws, formal obligations
COI	Conformity-interpersonal	Avoidance of upsetting or harming other people
HU	Humility	Recognizing one's insignificance in the larger scheme of things
BED	Benevolence-dependability	Being a reliable and trustworthy member of the in-group
BEC	Benevolence-caring	Devotion to the welfare of in-group members
UNC	Universalism-concern	Commitment to equality, justice, and protection for all people
UNN	Universalism-nature	Preservation of the natural environment
UNT	Universalism-tolerance	Acceptance and understanding of those who are different from oneself

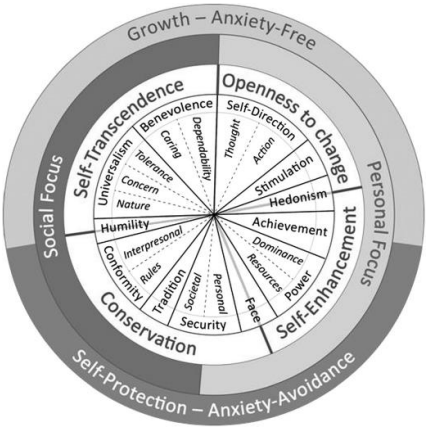


Figure 1. *Schwartz's Value Circumplex (Schwartz et al., 2012)*

Table 2. *Definitions and distinctions between the 19 values:*

Self-direction–thought and self-direction–action. These two values differ in emphases on freedom to cultivate one's ideas and abilities versus to act as one wishes. Self-direction–thought predicts an emphasis on initiative more than self-direction–action does.

Self-direction–action and stimulation. Stimulation values emphasize pursuit of pleasant excitement, novelty, and change. Stimulation is about making sure one's daily life is filled with interesting things.

Stimulation and hedonism. Hedonism values emphasize the pursuit of pleasure and sensuous gratification. Unlike stimulation values, they shun intense arousal in favor of less arousing enjoyment and comfort.

Hedonism and achievement. Achievement is success according to social standards, motivating people to compete and seek admiration for their success. Hedonism values, in contrast, incline people to avoid the stress of competition.

Achievement and power-dominance. Power–dominance values emphasize controlling others and imposing one's will on them. Unlike achievement values, they do not express a desire to be admired for success.

Power-dominance and power-resources. Power–resources emphasize obtaining wealth and material goods. Power–resources values: attributing importance to a high income in choosing a job.

Power-resources and face. Rather than seeking material resources, face values concern protecting one's public image and avoiding humiliation.

Face and security–personal. Rather than seeking to preserve one's reputation, security–personal values emphasize safety for self and dear ones in the immediate environment.
Security–personal and security–societal. Societal security values concern safety and stability in the wider society rather than personal safety.

Security–societal and tradition. Tradition values emphasize maintaining cultural, family, or religious traditions.

Tradition and conformity–rules. Conformity–rules emphasize compliance with rules, laws, and formal obligations. Unlike tradition values, they do not call for family or religious involvement.

Conformity–rules and humility. Humility values emphasize avoiding self-promotion and being satisfied with what one has but not compliance with formal rules.

Conformity–rules and conformity–interpersonal. Both types of conformity values stress compliance. However, conformity–interpersonal values focus on avoiding actions that might upset or harm others rather than on obeying formal rules.

Conformity–interpersonal and humility. Humility values emphasize avoiding self-promotion and being satisfied with what one has.

Humility and universalism–nature. Universalism–nature values emphasize working to preserve the natural environment against threats, an active stance that conflicts with humility. Universalism–nature values emphasize agreeing that voluntary organizations are important in one's life.

Conformity–interpersonal and universalism–nature. Unlike universalism–nature, conformity–interpersonal stresses avoiding negative interpersonal reactions. Conformity–interpersonal concerns personal; universalism–nature concerns the wider world and with following politics.

Universalism–nature and universalism– concern. Universalism– concern values stress commitment to equality and justice.

Universalism– concern and universalism–tolerance. Universalism–tolerance values stress accepting and understanding those with lifestyles and beliefs different from one's own. However, they lack the element of concern for others' welfare central to universalism– concern values.

Universalism–tolerance and benevolence–caring. Benevolence–caring values emphasize devoting oneself to the welfare of in-group members. They focus on the narrow circle of family and friends rather than on the wellbeing of others in the wider society.

Benevolence– caring and benevolence– dependability. Both benevolence subtypes stress promoting in-group members' welfare. They differ in the greater stress of benevolence–caring on devotion to practical and emotional needs and of benevolence–dependability on being reliable when called upon.

Benevolence–dependability and self-direction–thought. Self-direction–thought stresses individual freedom to cultivate own ideas and abilities, family is unlikely to be central. Family may be more central for those who emphasize benevolence–dependability, although friends may be more central for them.

STEP TWO:

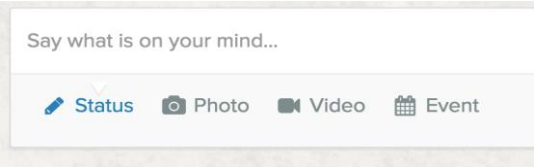
In this step, you are being asked to match values to features using the 19 universal human values listed above (in Table 1). In the spreadsheet provided, you will see the name of each feature, plus a brief description of what the feature does. Adjacent to each feature are two columns labeled "Value 1" and "Value 2." If there is only one value that you would associate with each feature, fill in the cell for Value 1. If there is a second value, fill in Value 2.

After becoming familiar with the 19 human values, and the selected feature, determine which value (or values) represent the best match. To identify and check that specific values are indeed reflected in the feature, please use the following questions (Table 3) to guide you.

Table 3. *Guiding questions (Yetim, 2011)*

Questions for both identifying and checking:
Is it possible to use this feature?
Does using this feature have a side effect that demotes the value intended?
Does using this feature have a side effect that demotes other values?
Does using this feature preclude another action that would promote some other value?
How well is the goal of using this feature consistent with the value?
Are there other goals considered that might conflict with the predominant goal?
Are there alternative goals to promote the same value?
Will using this feature bring about the desired goal (and value)?

Example: The feature being evaluated is "Status," which is located under "My Profile" on the navigation menu (Figure 1). When users of the VIF Learn platform wish to update their status, they click on the "Say what is on your mind…" field below:



Clicking on the word "Status" above brings up the following screen:

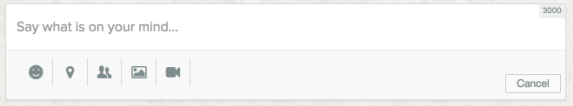


Figure 1. *Sample feature description*

Users can select from 16 emoticons to express their mood, pinpoint their location, set privacy permissions (public, site members, friends, or "only me"), upload a photo, or upload a video. Status updates can be 3000 characters long. Users are not aware that a status update is worth 2 points toward the "karma system," a star-rating system prominently displayed on the Profile page, although some users may quickly intuit that social activity of various kinds on the site increases the number of stars.

In the spreadsheet provided, specify the value or values that you deem most closely associated with the feature in question.

STEP THREE:

In this step, you are encouraged to compare findings and ask questions to clarify how values were selected and their "fit" with different features. You will work together with a second coder and the principal investigator to reach agreement.

APPENDIX D: DEFINITIONS & DISTINCTIONS OF 19 VALUES

Definitions and distinctions between the 19 values of Schwartz's (2012) theory of human values

---

Self-direction–thought and self-direction–action. These two values differ in emphases on freedom to cultivate one's ideas and abilities versus to act as one wishes. Self-direction–thought predicts an emphasis on initiative more than self-direction–action does.

Self-direction–action and stimulation. Stimulation values emphasize pursuit of pleasant excitement, novelty, and change. Stimulation is about making sure one's daily life is filled with interesting things.

Stimulation and hedonism. Hedonism values emphasize the pursuit of pleasure and sensuous gratification. Unlike stimulation values, they shun intense arousal in favor of less arousing enjoyment and comfort.

Hedonism and achievement. Achievement is success according to social standards, motivating people to compete and seek admiration for their success. Hedonism values, in contrast, incline people to avoid the stress of competition.

Achievement and power-dominance. Power–dominance values emphasize controlling others and imposing one's will on them. Unlike achievement values, they do not express a desire to be admired for success.

Power-dominance and power-resources. Power–resources emphasize obtaining wealth and material goods. Power–resources values: attributing importance to a high income in choosing a job.

Power-resources and face. Rather than seeking material resources, face values concern protecting one's public image and avoiding humiliation.

Face and security–personal. Rather than seeking to preserve one's reputation, security–personal values emphasize safety for self and dear ones in the immediate environment.
Security–personal and security–societal. Societal security values concern safety and stability in the wider society rather than personal safety.

Security–societal and tradition. Tradition values emphasize maintaining cultural, family, or religious traditions.

Tradition and conformity–rules. Conformity–rules emphasize compliance with rules, laws, and formal obligations. Unlike tradition values, they do not call for family or religious involvement.

Conformity–rules and humility. Humility values emphasize avoiding self-promotion and being satisfied with what one has but not compliance with formal rules.

Conformity–rules and conformity–interpersonal. Both types of conformity values stress compliance. However, conformity–interpersonal values focus on avoiding actions that might upset or harm others rather than on obeying formal rules.

Conformity–interpersonal and humility. Humility values emphasize avoiding self-promotion and being satisfied with what one has.

Humility and universalism–nature. Universalism–nature values emphasize working to preserve the natural environment against threats, an active stance that conflicts with humility. Universalism–nature values emphasize agreeing that voluntary organizations are important in one's life.

Conformity–interpersonal and universalism–nature. Unlike universalism–nature, conformity–interpersonal stresses avoiding negative interpersonal reactions. Conformity–interpersonal concerns personal; universalism–nature concerns the wider world and with following politics.

Universalism–nature and universalism– concern. Universalism– concern values stress commitment to equality and justice.

Universalism– concern and universalism–tolerance. Universalism–tolerance values stress accepting and understanding those with lifestyles and beliefs different from one's own. However, they lack the element of concern for others' welfare central to universalism– concern values.

Universalism–tolerance and benevolence–caring. Benevolence–caring values emphasize devoting oneself to the welfare of in-group members. They focus on the narrow circle of family and friends rather than on the wellbeing of others in the wider society.

Benevolence– caring and benevolence– dependability. Both benevolence subtypes stress promoting in-group members' welfare. They differ in the greater stress of benevolence–caring on devotion to practical and emotional needs and of benevolence–dependability on being reliable when called upon.

Benevolence–dependability and self-direction–thought. Self-direction–thought stresses individual freedom to cultivate own ideas and abilities, family is unlikely to be central. Family may be more central for those who emphasize benevolence–dependability, although friends may be more central for them.

APPENDIX E: STATISTICS & T-TESTS FOR N=536

Table E-1. Descriptive statistics, survey respondents (all active users, n=536)

	Male	(% male)	Female	(% female)	Total	(% in each role)
Administrators	20	29%	48	71%	68	13%
Teachers	76	16%	392	84%	468	87%
Mandated-use	45	18%	206	82%	251	54%
Optional-use	31	14%	186	86%	217	46%
TOTAL	96		440		536	

Table E-2. Summary of centered scores for higher-order values

	Survey respondents (active) (n=536)	
	Mean	SD
Conservation	-0.08	0.68
Openness to change	-0.07	0.57
Self-enhancement	-0.43	0.79
Self-transcendence	-0.03	0.77

Table E-3. Male and female higher values t tests

	Survey respondents (active) (n=536)					Survey respondents (research range) (n=342)				
	Male		Female			Male		Female		
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
Conservation	-0.01	0.25	-0.10	0.74	0.056	-0.03	0.28	-0.12	0.73	0.135
Openness to change	0.04	0.24	-0.09	0.62	0.001	0.02	0.24	-0.11	0.63	0.009
Self-enhancement	-0.20	0.26	-0.48	0.85	***	-0.16	0.25	-0.48	0.89	***
Self-transcendence	0.12	0.24	-0.06	0.84	***	0.13	0.26	-0.08	0.86	0.001

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Table E-4. Administrator and teacher higher values t tests

	Survey respondents (active) (n=536)					Survey respondents (research range) (n=342)				
	Admin		Teachers			Admin		Teachers		
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
Conservation	-0.33	1.19	-0.03	0.53	0.048	-0.69	1.41	-0.08	0.66	0.093
Openness to change	-0.22	1.01	-0.04	0.47	0.153	-0.41	1.26	-0.09	0.57	0.323
Self-enhancement	-0.63	1.27	-0.39	0.66	0.124	-0.94	1.62	-0.46	0.83	0.240
Self-transcendence	-0.30	1.36	0.02	0.60	0.058	-0.62	1.78	-0.05	0.77	0.209

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Table E-5. Mandated-use and optional-use teacher higher values t tests

	Survey respondents (active) (n=536)					Survey respondents (research range) (n=342)				
	Mandated		Optional			Mandated		Optional		
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
Conservation	-0.06	0.62	0.00	0.38	0.192	-0.09	0.71	-0.05	0.53	0.583
Openness to change	-0.08	0.56	-0.01	0.32	0.099	-0.12	0.63	-0.04	0.43	0.257
Self-enhancement	-0.42	0.79	-0.35	0.48	0.247	-0.48	0.90	-0.42	0.65	0.556
Self-transcendence	-0.02	0.72	0.06	0.43	0.121	-0.07	0.83	-0.02	0.62	0.557

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

APPENDIX F: T-TESTS OF HIGHER ORDER VALUES

Table F-1. Male and female higher values t tests (active)

	Male		Female		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.01	0.25	-0.10	0.74	1.92	469.96	0.056	[-0.002, 0.165]
Openness to Change	0.04	0.24	-0.09	0.62	3.40	410.46	0.001	[0.054, 0.202]
Self-Enhancement	-0.20	0.26	-0.48	0.85	5.87	509.07	***	[0.186, 0.373]
Self-Transcendence	0.12	0.24	-0.06	0.84	3.92	523.97	***	[0.090, 0.272]

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Table F-2. Male and female higher values t tests (research range)

	Male		Female		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.03	0.28	-0.12	0.73	1.50	220.20	0.135	[-0.027, 0.198]
Openness to Change	0.02	0.24	-0.11	0.63	2.64	223.05	0.009	[0.033, 0.227]
Self-Enhancement	-0.16	0.25	-0.48	0.89	5.14	303.56	***	[0.198, 0.444]
Self-Transcendence	0.13	0.26	-0.08	0.86	3.42	292.86	0.001	[0.090, 0.272]

$^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Table F-3. Administrator and teacher higher values t tests (active)

	Administrators		Teachers		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.33	1.19	-0.03	0.53	-2.01	70.84	0.048	[-0.588, -0.003]
Openness to Change	-0.22	1.01	-0.04	0.47	-1.45	71.18	0.153	[-0.225, -0.045]
Self-Enhancement	-0.63	1.27	-0.39	0.66	-1.55	72.43	0.124	[-0.556, 0.069]
Self-Transcendence	-0.30	1.36	0.02	0.60	-1.93	70.88	0.058	[-0.657, 0.011]

Table F-4. Administrator and teachers higher values t tests (research range)

	Administrators		Teachers		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.69	1.41	-0.08	0.66	-1.79	16.44	0.093	[-1.343, 0.113]
Openness to Change	-0.41	1.26	-0.09	0.57	-1.02	16.42	0.323	[-0.965, 0.337]
Self-Enhancement	-0.94	1.62	-0.46	0.83	-1.22	16.53	0.240	[-1.323, 0.356]
Self-Transcendence	-0.62	1.78	- 0.05	0.77	-1.31	16.37	0.209	[-1.491, 0.351]

Table F-5. Mandated-use and optional use teachers higher values t tests (active)

	Mandated-use		Optional-use		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.06	0.62	0.00	0.38	-1.31	422.63	0.192	[-0.155, -0.031]
Openness to Change	-0.08	0.56	-0.01	0.32	-1.65	409.12	0.099	[-0.150, -0.013]
Self-Enhancement	-0.42	0.79	-0.35	0.48	-1.16	420.38	0.247	[-0.186, 0.048]
Self-Transcendence	-0.02	0.72	0.06	0.43	-1.55	416.57	0.121	[-0.190, 0.022]

Table F-6. Mandated and regular teachers higher values t tests (research range*)*

	Mandated Teachers		Regular Teachers		t Tests			
Values	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95%CI
Conservation	-0.09	0.71	-0.05	0.53	-0.55	228.19	0.583	[-0.109, 0.194]
Openness to Change	-0.12	0.63	-0.04	0.43	1.14	242.98	0.257	[-0.054, 0.203]
Self-Enhancement	-0.48	0.90	-0.42	0.65	0.59	233.10	0.556	[-0.133, 0.246]
Self-Transcendence	-0.07	0.83	-0.02	0.62	0.56	226.05	0.577	[-0.127, 0.228]

APPENDIX G: FREQUENCY AND DISTRIBUTION OF OBSERVATIONS

Table G. Frequency of observations across 13 feature-actions

cover.upload	Freq.	Percent
	132	83.54
1	14	8.86
2	4	2.53
3	3	1.90
4	3	1.90
5	1	0.63
7	1	0.63
Total	158	100.00

easy.discuss	Freq.	Percent
	151	95.57
1	4	2.53
2	2	1.27
6	1	0.63
Total	158	100.00

friends.connect	Freq.	Percent
	95	60.13
1	23	14.56
14	2	1.27
15	1	0.63
17	1	0.63
2	9	5.70
21	1	0.63
3	11	6.96
4	7	4.43
5	5	3.16
60	1	0.63
7	1	0.63
9	1	0.63
Total	158	100.00

groups.discussion	Freq.	Percent
	144	91.14
1	3	1.90
10	1	0.63
11	1	0.63
2	3	1.90
22	1	0.63
3	4	2.53
5	1	0.63
Total	158	100.00

groups.discussion.reply	Freq.	Percent
	144	91.14
1	3	1.90
10	1	0.63
11	1	0.63
2	3	1.90
22	1	0.63
3	4	2.53
5	1	0.63
Total	158	100.00

groups.join	Freq.	Percent
	113	71.52
1	41	25.95
2	4	2.53
Total	158	100.00

groups.wall	Freq.	Percent
	131	82.91
1	24	15.19
3	2	1.27
4	1	0.63
Total	158	100.00

photo.like	Freq.	Percent
	154	97.47
1	2	1.27
3	2	1.27
Total	158	100.00

photos	Freq.	Percent
	136	86.08
1	13	8.23
10	1	0,63
13	1	0.63
2	1	0.63
3	1	0.63
4	1	0.63
5	1	0.63
6	1	0.63
7	1	0.63
7	1	0.63
Total	158	100.00

photos.comment	Freq.	Percent
	136	86.08
1	18	11.39
2	2	1.27
31	1	0.63
6	1	0.63
Total	158	100.00

profile	Freq.	Percent
	143	90.51
1	11	6.96
2	1	0.63
4	1	0.63
5	1	0.63
6	1	0.63
Total	158	100.00

profile.avatar.upload	Freq.	Percent
	117	74.05
1	34	21.52
2	5	3.16
3	2	1.27
Total	158	100.00

videos.linking	Freq.	Percent
	156	98.73
2	24	0.63
5	2	0.63
Total	158	100.00

APPENDIX H: FEATURE-VALUE CODING AND COMMENTS

	Values assigned	Comments
Feature: album.create		
Coder 1	*stimulation, achievement*	No comments
Coder 2	*face, achievement*	Also could be stimulation and hedonism because pictures are often fun. The curation both creates an image of yourself, and likely shows your in-person social acceptance.
Feature: album.comment		
Coder 1	*stimulation, benevolence-caring*	Face, if commenting and liking increases my reputation on the site. Benevolence-dependability if I am looking to cultivate a reputation as a dependable member of the group with good insights, etc.
Coder 2	*achievement, stimulation*	This could also be face and benevolence-dependability, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.
Feature: albums.like		
Coder 1	*stimulation, benevolence-caring*	Face, if commenting and liking increases my reputation on the site. Benevolence-dependability if I am looking to cultivate a reputation as a dependable member of the group with good insights, etc.
Coder 2	*achievement, stimulation*	This could also be face and benevolence-dependability, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.
Feature: album.report		
Coder 1	*conformity-rules, conformity-interpersonal*	If reporting is an act that protects the community, reflecting a devotion to the group. Adding universal-caring because reporting may be an attempt to protect others/rights what I feel is an injustice, etc.
Coder 2	*achievement, stimulation*	This could also be face and benevolence-dependability, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.

	Values assigned	Comments

Feature: block.user

Coder 1	*security-personal, power-dominance*	Could add *face* depending on motivations for blocking. Could add *self-direction action* as you are empowered to exercise control over your feed.
Coder 2	*security-personal, self-direction thought*	I think people primarily block each other because of a disagreement that got out of hand. In which case, the person doing the blocking is usually trying to re-establish the network as a safe space for themselves to express their ideas without running into contrary opinions. It could also be conformity-rules or conformity-interpersonal if other people ("friends") are getting upset by the comments appearing on the thread, or if the person's comments somehow break social protocol. Could also be face – controlling the image of yourself as a non-confrontational person.

Feature: report.user

Coder 1	*conformity-rules, conformity-interpersonal*	If reporting is an act that protects the community, reflecting a devotion to the group. Adding *universal-caring* because reporting may be an attempt to protect others/rights what I feel is an injustice, etc.
Coder 2	*achievement, stimulation*	This could also be face and *benevolence-dependability*, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.

Feature: cover.upload

Coder 1	*face, self-direction thought*	*Benevolence-dependability*, if adding a full cover profile makes me appear more invested in the community, making me appear more reliable/trustworthy/real. *Self-direction thought* if assuming the cover image represents something important to me/is reflective of my beliefs, etc.
Coder 2	*self-direction thought, benevolence-dependability*	*Face* could also play, but I feel like a cover photo more shows external things that you're related to (rather than just another representation of self). So, it reflects your thoughts and group values more than your own personal self-image.

	Values assigned	Comments

Feature: cover.upload.comment

Coder 1	*stimulation, benevolence-caring*	Also potentially *benevolence-dependability*
Coder 2	*benevolence-dependability, universal-tolerance*	People may like or comment on a cover photo either to recognize that they are part of the same in-group or show appreciation for another group/interest external to themselves. Also think *achievement* and *stimulation* could play a role.

Feature: cover.upload.like

Coder 1	*stimulation, benevolence-caring*	Adding *benevolence-dependability*.
Coder 2	*benevolence-dependability, universal-thought*	People may like or comment on a cover photo either to recognize that they are part of the same in-group or show appreciation for another group/interest external to themselves. Also think *achievement* and *stimulation* could play a role.

Feature: events.attend

Coder 1	*conformity-rules, benevolence-dependability*	*Conformity-rules* because you are asked to RSVP and are complying with a request. Could also be face if publicly displayed that you are attending. *Benevolence-dependability* because it is an opportunity to showcase that you are plugged in/participating in community events.
Coder 2	*benevolence-dependability, face*	Also conformity-rules. I

Feature: event.invite.friends

Coder 1	*benevolence-dependability, benevolence-caring*	*Benevolence-caring* would depend on motivation for inviting someone (i.e. you think it is in their personal best interest). Could also be *face* if you are cultivating a networking reputation. Possibly *power-dominance*.
Coder 2	*stimulation, conformity-rules*	Friends make events way more enjoyable. So, mostly people invite others to enjoy their company, but there could be a compliance element, i.e. I'm going, so you should too.

Feature: create.event

Coder 1	*benevolence-caring, benevolence-dependability*	Difficult to say, it would depend entirely on the type of event, whether it was required for work, for pleasure, etc. Could be *power-dominance* if event was pushing a specific agenda.
Coder 2	*stimulation, conformity-rules*	It could also be other values depending on the purpose for the event.

	Values assigned	Comments

Feature: earn badges

Coder 1	*conformity-rules, achievement*	If I have to do the work to earn the badge, then *conformity-rules*. If it's because I want to do it and no one is making me (although it might affect my job), then *achievement*.
Coder 2	*self-direction, stimulation*	Earning a badge is a new thing to do, which says *stimulation*. It could also be *self-direction thought* or *self-direction action* (because you have to actually do something to earn the badge).

Feature: friend.invite

Coder 1	*hedonism, stimulation*	Could possibly be security-personal because you are controlling who can contact you.
Coder 2	*stimulation*	No comments.

Feature: friends.connect

Coder 1	*self-direction action, stimulation*	*Self-direction action*, freedom to determine your own circle of friends/control others ability to contact you. *Stimulation*, exciting to grow you circle. Could be *achievement*: higher number of friends might denote well-connected/successful networker, important network node. Or *face*, similar to *achievement*, positions you as an important network node.
Coder 2	*conformity-interpersonal, benevolence-caring*	Could also be *stimulation* or *benevolence-caring*.

Feature: group.discussion.reply.like

Coder 1	*benevolence-dependendability, stimulation*	No comments.
Coder 2	*achievement, stimulation*	Form of approval. It could also be *universalism-thought* depending on the nature of the group.

Feature: groups.join

Coder 1	*self-direction thought, power-dominance*	Depends entirely on type of group (i.e. professional group vs. personal interest)
Coder 2	*face, stimulation*	Depending on the nature of the group, it could also be other values.

Feature: groups.wall.comment

Coder 1	*benevolence-dependability, face*	Or possibly *self-direction thought*.
Coder 2	*face, self-direction thought*	Depending on the nature of the group, it could also be other values.

	Values assigned	Comments

Feature: groups.wall.like

Coder 1	*benevolence-caring, benevolence-dependability*	Possibly *stimulation*.
Coder 2	*achievement, stimulation*	Form of approval. It could also be *universalism-thought* depending on the nature of the group.

Feature: photo.comment

Coder 1	*Benevolence-caring, benevolence-dependability*	Possibly *stimulation* or *hedonism.*
Coder 2	*achievement, stimulation*	Same as for profile photo viewing. Could also be *face* if you are present in the photo, or *benevolence-dependability* if it is someone in your ingroup.

Feature: photo.display

Coder 1	*face, stimulation*	Possibly *hedonism* if you are posting to receive instant gratification from comments from other users. Could also be *achievement* depending on what the photo is (i.e. are they showing off personal achievements?)
Coder 2	*face, achievement*	I also think *stimulation* and *hedonism* could apply because pictures are often fun. And, probably *benevolence-dependability* because some of them will have your friends in them. The curation both creates an image of yourself, and likely shows your in-person social acceptance.

Feature: photo.like

Coder 1	*benevolence-dependability, benevolence-caring*	Possibly *stimulation*, it's hard to say. Depends on what the photo is and the motivation behind liking it (i.e. political statement vs. class project vs. personal image).
Coder 2	*achievement, stimulation*	This could also be *face* and *benevolence-dependability*, because you may be in it or part of a group related to the photo in some way.

Feature: photo.share

Coder 1	*security-personal*	Assuming private: *security-personal*. Choose to share privately to maintain security/privacy. Assuming public: *benevolence-caring, stimulation, hedonism*. Would depend on content of image/motivation behind sharing.
Coder 2	*face, stimulation*	Could be other values depending on the photo itself. This is also difficult because there is no distinction between sending a photo privately and sharing it publicly on their homepage.

	Values assigned	Comments

Feature: photo.album.like

Coder 1	*stimulation, benevolence-dependability*	Possibly *benevolence-caring*.
Coder 2	*achievement, stimulation*	This could also be *face* and *benevolence-dependability*, because often if you're liking or commenting on an album, you are either a part of the album or related to the album in some way.

Feature: profile.create

Coder 1	*face, achievement*	Possibly *benevolence-dependability* (building a more robust profile increase my credibility, making me seem more reliable and trustworthy)
Coder 2	*face*	No comments.

Feature: profile.avatar

Coder 1	*benevolence-dependability, face*	A photo makes me seem more real/trustworthy
Coder 2	*face, benevolence-dependability*	Having a photo implies that you are more invested in the network, and that you are willing to be recognized as part of it. That's why I included *benevolence-dependability*.

Feature: profile.avatar.upload.comment

Coder 1	*benevolence-caring, stimulation*	*Stimulation* because I may be responding to someone changing their profile/responding to the novelty of an image. *Benevolence-caring* because commenting shows an investment in another person.
Coder 2	*achievement, stimulation*	Commenting or liking someone else's photo is showing that you approve of them in your social network. So, I think *benevolence-caring* could also play. Plus, it's just fun, which is why *stimulation*.

Feature: profile.avatar.upload.like

Coder 1	*benevolence-caring, stimulation*	*Stimulation* because I may be responding to someone changing their profile/responding to the novelty of an image. *Benevolence-caring* because commenting shows an investment in another person. And maybe *face* if it displays publicly that I like it (might be used for image building).
Coder 2	*achievement, stimulation*	Commenting or liking someone else's photo is showing that you approve of them in your social network. So, I think *benevolence-caring* could also play. Plus, it's just fun, which is why *stimulation*.

	Values assigned	Comments

Feature: profile.comment

Coder 1	*self-determination thought, stimulation*	It depends on the content being posted and my motivation for response.
Coder 2	*self-determination thought, achievement*	I think maybe *stimulation* as well, because a lot of the "fun" of social networks is in these small interactions.

Feature: profile.status

Coder 1	*face, achievement*	It would depend on the intended audience of my status. I could also see *conformity-rules*, assuming that it was required that I post. If posting to my friends and trying to build a reputation, I could also see *benevolence-dependability*.
Coder 2	*self-determination thought, face*	I also feel like it could be *benevolence-dependability*, depending on the subject matter of the person's comment.

Feature: profile.status.like

Coder 1	*stimulation, benevolence-caring*	No comments.
Coder 2	*achievement, benevolence-dependability*	I also feel like *conformity-rules* might be at play -- if you feel like you *have to* respond (in the case of a superior or colleague that you feel responsible to)

Feature: skype.connect

Coder 1	*self-determination thought, benevolence-dependability*	No comments.
Coder 2	*stimulation, face*	This is motivated by a desire to interact in-person. If there was another value that was about trying to engage socially, I would have used that.

Feature: rate.item

Coder 1	*benevolence-dependability, benevolence, caring*	Could also be *power-dominance*, the ability to skew ratings however you want.
Coder 2	*achievement, conformity-interpersonal*	It could also be stimulation if it's a fun item, or *power-dominance* if you're trying to have power over others. Maybe even *benevolence-caring* if you're trying to encourage someone in your in-group.

Feature: video.display

Coder 1	*self-determination thought, benevolence-dependability*	No comments.
Coder 2	*face, stimulation*	The video may not be about you, but it still shows your interests, reflects your values, and is probably entertaining in some way. Could also be other values depending on the content of the video.

REFERENCES

Abramovich, S., Schunn, C., & Higashi, R. M. (2013). Are badges useful in education?: It depends upon the type of badge and expertise of learner. Educational Technology Research and Development, 61, 217-232.

Ahn, J., & Erickson, I. (2016). Revealing mutually constitutive ties between the information and learning sciences. *The Information Society, 32*(2), 81-84.

Albrechtslund, A. (2007). Ethics and technology design. *Ethics and Information Technology*. 9, pp. 63-72.

Aldenderfer, M. S., & Blashfield, R. K. (1984). *Cluster Analysis* Sage University Papers Series.

Ames, M., & Namaan, M. (2007). Why we tag: Motivations for annotation in mobile and online media. In *Proceedings of Computer Human Interaction (CHI) 2007*. April 28-May 3, 2007 • San Jose, CA, USA.

Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2013). Steering user behavior with badges. In *Proceedings of the 22nd International Conference on World Wide Web*, p.95-106.

Andrews, D., Preece, J., & Turoff, M. (2002). A conceptual framework for demographic groups resistant to online community interaction. *International Journal of Electronic Commerce*. 6:3, 9–24.

Antin, J., & Churchill, E. (2011). Badges in social media: A social psychological perspective. In *Proceedings of CHI 2011*, British Columbia, Canada: ACM.

Ardichvili, A., Page, V., & Wentling, T. (2003). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management*. 7:1, p. 64-77.

Arguello, J., Butler, B., Joyce, E., Kraut, R., Ling, S., Rose, C., Wang, X. (2006). Talk to me: Foundations for successful individual-group interactions in online communities. *CHI 2006 Conference Proceedings*. Montreal, Quebec, Canada. 959-968.

Arrasvuori, J., Lehikoinen, J., Ollila, E., & Uusitalo, S. (2008). A model for understanding online communities. *Proceedings of the IADIS International Conference ICT, Society and Human Beings 2008.*

Asif, N. (2003). Reverse engineering methodology to recover the design artifacts: A case study. In *Software Engineering Research and Practice* (pp. 932-938).

Babbie, Earl. (2007). *The Practice of Social Research*. 11th edition. Belmont CA: Thompson - Wadsworth. p. 87-89.

Barata, G., Gama, S., & Jorge, J. (2013). Engaging engineering students with gamification: An empirical study. In *Proceedings of 5th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES*). Bournemouth Univ, Bournemouth, England. Sept 11-13, 2013.

Bell, T., Urhahne, D., Schanze, S., and Ploetzner, R. 2010. Collaborative inquiry learning: Models, tools, and challenges. *International Journal of Science Education.* 3(1), 349-377.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS quarterly*, 369-386.

Benkler, Y. (2007). Common wisdom: Peer production of educational materials. Paper presented at *Advancing the Effectiveness and Sustainability of Open Education, the 17th Annual Instructional Technology Institute* at Utah State University, September 30, 2005. Retrieved November 5, 2011 from: http://www.benkler.org/Common_Wisdom.pdf

Benkler, Y., Nissenbaum, H. (2006). Commons-based peer production and virtue. *Journal of Political Philosophy*. 14(4), 394–419. Retrieved October 12, 2012 from http://www.nyu.edu/projects/nissenbaum/papers/jopp_235.pdf

Bourhis, A., & Dube, L. (2010). 'Structuring spontaneity': Investigating the impact of management practices on the success of virtual communities of practice. *Journal of Information Science*. 36:2, 175-1993.

Bishop, J. (2007). Increasing participation in online communities: A framework for human-computer interaction. *Computers in Human Behavior*. 23(4), p. 1881-1893.

Blair, L. (2012). Congratulations! Selecting the right in-game achievements. Kapp, K. M. (ed). The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education. John Wiley & Sons.

Botički, I., Seow, P., Looi, C., & Baksa, J. (2014). How can badges be used in seamless mobile learning. In *Proceedings of Bristol Ideas in Mobile Learning 2014 Conference*.

Boudreau, M., Gefen, D., Straub, D. (2001). Validation in information systems research: A state-of-the-art assessment. *MIS Quarterly*, 1-16.

Bruckman, A., (2004). Co-evolution of technological design and pedagogy in an online learning community. *Designing Virtual Communities in the Service of Learning*. Barab, S., Kling, R., & Gray, J. (ed). Cambridge University Press.

Butler, B. (2001). Membership size, communication activity, and sustainability: a resource-based model of online social structures. *Information Systems Research.* 12:4, p. 346-364.

Capiluppi, A., Serebrenik, A., & Singer, L. (2013). Assessing technical candidates on the social web. *Software, IEEE*, 30(1), 45-51.

Carey, K. (2015). The End of College: Creating the Future of Learning and the University of Everywhere. Riverhead Books, New York, NY.

Charleer, S., Klerkx, J., Odriozola, S., Luis, J., & Duval, E. (2013). Improving awareness and reflection through collaborative, interactive visualizations of badges. In *ARTEL13: Proceedings of the 3rd Workshop on Awareness and Reflection in Technology-Enhanced Learning*, 1103, pp. 69-81.

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, *26*(4), 741-752.

Cheng, A., & Fleischmann, K. (2010). Developing a meta-inventory of human values. *Proceedings of the 73rd Annual Meeting of the American Society for Information Science and Technology*, Pittsburgh, PA.

Cheng, R., & Vassileva, J. (2005). User and community adaptive reward mechanisms for sustainable online communities, p. 332-336. In *Artificial Intelligence in Education*, L. C.-K. Looi et al. (Eds.) IOS Press.

Chikofsky, E. & Cross, J. (1990). Reverse engineering and design recovery: A taxonomy". *IEEE Software* **7** (1): 13–17.

Ching, C. C., & Hursh, A. W. (2014). Peer modeling and innovation adoption among teachers in online professional development. *Computers & Education*,*73*, 72-82.

Chiu, C, Hsu, M., & Wang, E. (2006). Understanding knowledge-sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*. 42, p.1872–1888.

Choemprayong, S., & Wildemuth, B. (2009). Case Studies. In B. Wildemuth, eds., *Applications of Social Research Methods to Questions in Information and Library Science*. Libraries Unlimited, London, 51-61.

Creswell, J., & Clark, V. (2007). Designing and conducting mixed methods research. Sage Publications.

Creswell, J. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Christensen, C., Horn, M., & Johnson, C. (2011). *Disrupting Class, Expanded Edition: How to Disruptive Innovation Will Change the Way the World Learns*. New York, NY: McGraw-Hill.

Darke, P., Shanks, G., & Broadbent, M. (1998). Successfully completing case study research: Combining rigour, relevance and pragmatism. *Information Systems Journal*, 8(4), 273-289.

Davidson, C. & Goldberg, D. (2009). *The Future of Learning Institutions in a Digital Age*. The John D. and Catherine T. MacArthur Foundation Reports on Digital Media and Learning. MIT Press. Cambridge, Massachusetts.

Dede, C., Ketelhut, D., Whitehouse, P., Breit, L, & McCloskey, E. (2009). A research agenda for online professional development. *Journal of Teacher Education*, 60 , pp. 8–19.

Denny, P. (2013, April). The effect of virtual achievements on student engagement. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 763-772. ACM.

Denzin, N. (1984). *The Research Act*. Englewood Cliffs, NJ: Prentice Hall.

Diamond, J., & Gonzalez, P. C. (2016). Digital badges for professional development: Teachers' perceptions of the value of a new credentialing currency. In *Foundation of Digital Badges and Micro-Credentials* (pp. 391-409). Springer International Publishing.

Dube, L., Bourhis, A., & Jacob, R. (2006). Towards a typology of virtual communities of practice. *Interdisciplinary Journal of Information, Knowledge, and Management*. 1(2), p. 145-166.

Eisenberg, M. B., & Fullerton, S. P. (2012). ED and INFO 2052: Oh, the places you'll go!. *Information Services and Use*, *32*(3), 103-115.

Farzan, R., DiMicco, J., Millen, D., Brownholtz, B., Geyer, W., & Dugan, C. (2008). Results from deploying a participation incentive mechanism within the enterprise. In *Proceedings of Computer Human Interaction CHI 2008*, April 5-10, 2008, Florence, Italy.

Flanagan, M., Nissenbaum, H., Belman, J., & Diamond, J. (2007). A method for discovering values in digital games. *In Situated Play, Proceedings of DiGRA 2007 Conference*.

Fleischmann, K. (2014). *Information and Human Values*. In Synthesis Lectures on Information Concepts, Retrieval, and Services #31. Morgan & Claypool.

Fleischmann, K. (2013). Information and human values. In *Synthesis Lectures on Information Concepts, Retrieval, and Services*, 5:5.

Fleischmann, K. R., & Wallace, W. A. (2006). Ethical implications of values embedded in computational models: An exploratory study. *Proceedings of the American Society for Information Science and Technology*, *43*(1), 1-16.

Friedman, B (1997). *Human Values and the Design of Computer Technology*. Cambridge University Press. Cambridge: United Kingdom.

Friedman, B. & Nissenbaum, H. (1996). Bias in computer systems. *ACM Transactions on Information Systems,* July 1996, 330-347.

Friedman, B., & Nissenbaum, H. (1993, April). Discerning bias in computer systems. In *INTERACT'93 and CHI'93 Conference Companion on Human Factors in Computing Systems* (pp. 141-142). ACM.

Friedman, B., & Kahn, P. (2002). Human values, ethics, and design. In The Human-Computer Handbook, p. 1177-1201.

Friedman, B., Kahn, P., & Borning, A. (2006). Value sensitive design and information systems. Zhang, P. & Galletta, D. (eds). In *Human Computer Interaction and Management Systems: Foundations*.

Friedman, B., Kahn, P., & Borning, A. (2008). Value sensitive design and information ethics. In Einar Himma, K. & Tavani, H. (eds)., *The Handbook of Information and Computer Ethics*. John Wiley & Sons.

Gamrat, C., Zimmerman, H. T., Dudek, J., & Peck, K. (2014). Personalized workplace learning: An exploratory study on digital badging within a teacher professional development program. British Journal of Educational Technology.

Gee, J. (2011). Human action and social groups as the natural home of assessment: Thoughts on 21st century learning and assessment. Valerie J. Shute, Betsy J. Becker (Eds). *Innovative Assessments for the 21st Century: Supporting Educational Needs*. Springer, NY.

Gibson, D., Ostashewski, N., Flintoff, K., Grant, S., & Knight, E. (2013). Digital badges in education. Education and Information Technologies, 1-8.

Gibson, J. (1977). The theory of affordances. In Shaw, R., & Bransford, J. (eds.), *Perceiving, Acting, and Knowing: Toward an Ecological Psychology*. Hillsdale, NJ: Erlbaum, 67-82.

Goldring, R., Gray, L., and Bitterman, A. (2013). Characteristics of Public and Private Elementary and Secondary School Teachers in the United States: Results From the 2011–12 Schools and Staffing Survey (NCES 2013-314). U.S. Department of Education.Washington, DC: National Center for Education Statistics. Retrieved [date] from http://nces.ed.gov/pubsearch.

Grant, S. (2014). What Counts as Learning? New Opportunities for Open Digital Badges. *Digital Media and Learning Research Hub*.

Grant, S. & Betts, B. (2013). Encouraging user behaviour with achievements: An empirical study. In *Proceedings of Mining Software Repositories (MSR), 2013 10th IEEE Working Conference*, (pp. 65-68). IEEE.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International journal of educational telecommunications*, *1*(2), 147-166.

Hakulinen, L., & Auvinen T. (2014). The effect of gamification on students with different achievement goal orientations. In *Proceedings of the Conference on Learning and Teaching in Computing and Engineering (LaTiCE),* Kuching, Malaysia, 2014.

Halavais, A. (2012). A genealogy of badges: Inherited meaning and monstrous moral hybrids." *Information, Communication, and Society*. 15:3: 354-373.

Halavais, A., Kwon, K., Havener, S., & Striker, J. (2014). Badges of friendship: Social influence and badge acquisition on Stack Overflow. In *Proceedings of HICSS 47*, Hawaii, January 6-9.

Halfaker, A., Kittur, A., Kraut, R. & Riedl, J. (2009). A jury of your peers: Quality, experience and ownership in Wikipedia. In *ACM WikiSym*, Orlando, Florida, October 2009.

Hars, A., & Ou, S. (2002). Working for free: Motivations of participating in open source projects. *International Journal of Electronic Commerce*. Vol. 6:3, p. 25-38.

Hemetsberger, A., & Rieters. R. (2001). When consumers produce on the Internet: An inquiry into motivational sources of contribution to joint-innovation. In *Proceedings of the Fourth International Research Seminar on Marketing Communications and Consumer Behavior*. 274-291.

Hickey, D., Ito, R., Schenke, K., Tran, C., Otto, N., & Chow, C. (2013). Badges design principles documentation project. Interim Report for the MacArthur Foundation. Retrieved December 3, 2013 from https://www.dropbox.com/s/xroc8u97qcee97x/DPD-interim-report-v3.pdf

Himma, K. E., & Tavani, H. T. (Eds.). (2008). *The handbook of information and computer ethics*. John Wiley & Sons.

Hirschheim, R. & Klein, H. (1989). Four paradigms of information system development. *Communications of the ACM*, Vol. 32, 10, 1199-1216.

Holland. J.L. (1997). Making vocational choice: A theory of vocational personalities and work environments (3rd ed). Boston: Psychological Assessment Resources INC.

Hsiao, S., Hsu, C., Lee, Y. (2012). An online affordance evaluation model for product design. *Design Studies*. 33:2, p. 126-159.

Huffaker, D., & Lai, J. (2007). Motivating expertise-sharing in online communities: Altruism or self-interest? *Computer Science*. *IBM Research Report*. Retrieved April 2, 2014 from http://www.davehuffaker.com/papers/HuffakerLai2006-Expertise-sharinginOnlineCommunities.pdf

Introna, L.D. (2007). Maintaining the reversibility of foldings: making the ethics (politics) of information technology visible. *Ethics and Information Technology, 9*, 11-25.

Isomursu, M., Ervasti, M., Kinnula, M., & Isomursu, P. (2011). Understanding human values in adopting new technology: A case study and methodological discussion. *International Journal of Human-Computer Studies*, 69(4), 183-200.

Jansen, B. J. (2009). Understanding user-web interactions via web analytics. *Synthesis Lectures on Information Concepts, Retrieval, and Services*, *1*(1), 1-102.

Jones, J., & Altadonna, N. (2012, February). We don't need no stinkin'badges: Examining the social role of badges in the Huffington Post. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work* (pp. 249-252). ACM.

Jrgen, B., Wolfram, S., & Schrader, P. (2005). Intrinsic motivation in open source software development. *Technical Report, EconWPA.*

Kaufman, L., & Rousseeuw, P. J. (2009). *Finding Groups in Data: An Introduction to Cluster Analysis*. John Wiley & Sons.

Keane, J., Otter, M., Oxley, T. & Lipscomb, L. (2016). VIF International Education: Global-ready teacher badging. *Digital Badges in Education: Trends, Issues, and Cases*, 226.

Kim, A. (2000). *Community Building on the Web: Secret Strategies for Successful Online Communities*. Berkeley, CA: Peachpit Press.

Knafo, A., & Sagiv, L. (2004). Values and work environment: Mapping 3 occupations. *European Journal of Psychology of Education*, *19*(3), 255-273.

Koh, B., Kim, Y., Butler, B., & Bock, G. (2007). Encouraging participation in virtual communities. *Communications of the ACM*. 50(2), 69-82.

Kollock, P. (1999). The economies of on-line cooperation: gifts, and public goods in cyberspace. In: Smith, M., Kollock, P. (Eds.), *Communities in Cyberspace*. Routledge, London, p. 220-239.

Kreijns, K., Kirschner, P., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Computers in human behavior*, *19*(3), 335-353.

Kriplean, T., Beschastnikh, I., & McDonald, D. (2008). Articulations of wikiwork: Uncovering valued work in Wikipedia through Barnstars. In *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work*, 47-56, San Diego, CA, USA. ACM.

Krippendorff, K. (2012). *Content Analysis: An Introduction to Its Methodology*. Thousand Oaks, CA: Sage.

Kujala, S., & Väänänen-Vainio-Mattila, K. (2009). Value of information systems and products: Understanding the users' perspective and values. *Journal of Information Technology Theory and Application* (JITTA), 9(4), 4.

Kuznetsov, S. (2006). Motivations of contributors to Wikipedia. *ACM SIGCAS Computers and Society*, 36(2), 1.

Lai, L., & Turban, E. (2008). Group formation and operations in the Web 2.0 environment and social networks. *Group Decision and Negotiation*. 17(5), p. 387-402.

Lakhani, K., Wolf, R., Feller, J., Fitzgerald, B., & Hissam, S. (2005). Why hackers do what they do: Understanding motivation and effort in free/open source software projects. In *Perspectives on Free and Open Source Software*, pp. 3-22. Cambridge, Mass: MIT Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. [E-reader version]. Cambridge university press.

Lázaro, M., & Marcos, E. (2006). An approach to the integration of qualitative and quantitative research methods in software engineering research. In *Proceedings of PhiSE*, pp.757-764.

Le Dantec, C., Poole, E., & Wyche, S. (2009). Values as lived experience: Evolving value sensitive design in support of value discovery. In *Proceedings of the CHI 2009 Conference on Human Factors in Computing Systems*. New York: ACM Press, pp. 1141-1150. Boston, MA, USA, April 4 - 9, 2009.

Lincoln, Y., & Guba, E., (1985). *Naturalistic Inquiry*. Beverly Hills, CA. Sage.

Lindeman, M., & Verkasalo, M. (2005). Measuring values with the short Schwartz's value survey. *Journal of Personality Assessment*, 85(2), 170-178.

Ling, K., Beenen, G., Ludford, P., Wang, X., Chang, K., Cosley, D., Frankowski, D., Terveen, L., Rahid, A., Resnick, P., & Kraut, R. (2005). Using social psychology to motivate contributions to online communities. *Journal of Computer Mediated Communication*, (10) 4, Article 10.

Mayring, P. (2000). Qualitative content analysis. *Qualitative Social Research*, 1(2).

McCrae R., & Costa, P. (1990). *Personality in adulthood*. New York: Guilford.

McDaniel, R., Lindgren, R., & Friskics, J. (2012, October). Using badges for shaping interactions in online learning environments. In *Professional Communication Conference (IPCC), 2012 IEEE International* (pp. 1-4). IEEE.

McDonald, D., Javanmardi, S., & Zachry, M. (2011). Finding patterns in behavioral observations by automatically labeling forms of Wikiwork in Barnstars. In proceedings of WikiSym, October 2011.

Miller, J., Friedman, B., Jancke, G., & Gill, B. (2007). Value tensions in design: the value sensitive design, development, and appropriation of a corporation's groupware system. In *Proceedings of the 2007 International ACM Conference on Supporting Group Work* (pp. 281-290). ACM.

Moynihan, D., & Pandey, S. (2007). The role of organizations in fostering public service motivation. *Public Administration Review*, 67(1), 40-53.

Mozilla Foundation and Peer 2 Peer University, in collaboration with The MacArthur Foundation (2011). *Open badges for lifelong learning*. Retrieved from: https://wiki.mozilla.org/images/b/b1/OpenBadges-Working-Paper_092011.pdf

Muresan, G. (2009). An integrated approach to interaction design and log analysis. In Jansen, B. (Ed.). Handbook of research on web log analysis. IGI Global.

Nielsen, J. (2006). Participation inequality: Encouraging more users to contribute. *Jakob Nielsen's Alertbox* from October 9, 2006. Retrieved August 12, 2011 from http://www.useit.com/alertbox/participation_inequality.html

Nissenbaum, H. (2009). *Privacy in context: Technology, policy, and the integrity of social life*. Stanford Law Books, Stanford, CA.

Norman, D. (1988). *The Psychology of Everday Things*. Basic Books. New York, NY.

Nov, O. (2007). What motivates Wikipedians? *Communications of ACM*, 50(11), 60-64.

O'Donovan, S., Gain, J., Marais, P. (2013). A case study in the gamification of a university level games development course. In *Proceedings of the South African Institute for Computer Scientists and Information Technologists Conference*, pp. 242–251.

Olivera, F., Goodman, P., & Tan, S. (2008). Contribution behavior in distributed environments. *MIS Quarterly*. 32(1), p. 23-42.

Olneck, M. (2012). *Insurgent Credentials: A Challenge to Established Institutions of Higher Education*. Paper presented to "Education in a New Society: The Growing Interpenetration of Education in Modern Life" at Radcliffe Institute for Advanced Study, Harvard University, Cambridge, Massachusetts, April 26-27, 2012.

Oreg, S. & Nov, O. (2008). Exploring motivations for contributing to open source initiatives: The roles of contribution context and personal values. *Computers in Human Behavio*r, 24, 2055-2073.

Perry, J. (2000). Bringing society in: Toward a theory of public service motivation. *Journal of Public Administration Research and Theory*. 10(2), p. 471-490.

Pirolli, P. (2009). An elementary social information foraging model. In *Proceedings of CHI*. Boston, Massachusetts. 605-614.

Pols, A. (2012). Characterising affordances: The descriptions of affordances model. *Design Studies*, 33:2, p. 113-125.

Porter, C. (2004). A typology of virtual communities: A multi-disciplinary foundation for future research. *Journal of Computer-Mediated Communication*. 10(1). Retrieved April 3, 2010 from http://jcmc.indiana.edu.libproxy.lib.unc.edu/vol10/issue1/porter.html

Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Behaviour & Information Technology*. 20(5), 347-356.

Preece, J., Nonnecke, B., & Andrews, D. (2004). The top five reasons for lurking: Improving community experiences for everyone. *Computers in Human Behavior*. 20(2), 201-223.

Preece, J., & Shneiderman, B. (2009). Reader-to-Leader Framework: Motivating technology-mediated social participation. *AIS Transactions on Human-Computer*. 1(1), 13-32.

Rafaeli, S., Raban, D., & Ravid, G. (2005). Social and economic incentives in Google Answers. In *GROUP05 - Sustaining Community: The Role and Design of Incentive Mechanisms in Online Systems Workshop*, Sanibel Island, FL.

Reeves, T., & Pedulla, J. (2011). Predictors of teacher satisfaction with online professional development: evidence from the USA's e- Learning for Educators initiative. *Professional Development in Education*, *37*(4), 591-611.

Rheingold, H. (1993). *Virtual Communities*. Retrieved April 2, 2010 from http://www.rheingold.com/vc/book/index.html

Ritter, G. (2014). *Robust cluster analysis and variable selection*. CRC Press.

Romesburg, C. (2004). *Cluster analysis for researchers*. Lifetime Learning Publications.

Roccas, S., Sagiv, L., Schwartz, S. H., & Knafo, A. (2002). The big five personality factors and personal values. *Personality and social psychology bulletin*, *28*(6), 789-801.

Rokeach, M. (1973). *The Nature of Human Values*. The Free Press: New York, NY.

Schlager, M., Fusco, J., Shank, P. (2002). Evolution of an online education community of practice. In K.A. Renninger, W. Shumar (Eds.), Building Virtual Communities: Learning and Change in Cyberspace, Cambridge University Press, Cambridge, UK (2002), pp. 129–158.

Schroer, J., & Hertel, G. (2009). Voluntary engagement in an open Web-based encyclopedia: Wikipedians and why they do it. *Media Psychology*, 12, 96-120.

Schutt, R. K. (2011). *Investigating the social world: The process and practice of research*. Pine Forge Press.

Schwartz, S.H., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., Ramos, A., Verkasalo, M., Lönnqvist, J.-E., Demirutku, K., Dirilen-Gumus, O., & Konty, M. (2012). Refining the theory of basic individual values. *Journal of Personality and Social Psychology*, 103, 663-688.

Schwartz, S. (1992). Universals in the content and structure of values: Theory and empirical tests in 20 countries. In M. Zanna, ed., *Advances in Experimental Social Psychology*. Academic Press, New York, 1–65.

Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values?. Journal of social issues, 50(4), 19-45.

Schwartz S., Melech, G., Lehrnami, A., Burgess, S., Harris, M., Owens, V. (2001). Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology*, 32:519-42.

Schwartz, S. (2003). A proposal for measuring value orientations across nations. Questionnaire Package of the European Social Survey, 259-290.

Schwartz, S. (2005). Human values. *European Social Survey Education Net*.

Schwartz, S. (2007). Value orientations: Measurement, antecedents and consequences across nations. In R. Jowell, C. Roberts, C. Fitzgerald and G. Eva, (eds). *Measuring attitudes cross-nationally: Lessons from the European Social Survey*. Sage Publications, London, 169–203.

Schwartz, S., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., ... & Konty, M. (2012). Refining the theory of basic individual values. *Journal of personality and social psychology*, *103*(4), 663.

Shepard, L. (2000). The role of assessment in a learning culture. *Educational researcher*, 4-14.

Shilton, K., Koepfler, J. & Fleischmann, K. (2014). How to see values in social computing: Methods for studying values dimensions. *Computer Supported Collaborative Work*. February 15–18, 2014, Baltimore, MD, USA.

Simpson, J., and Weiner, E. “assess, n.” Def. 5. (1989). *The Oxford English Dictionary.* Oxford University Press. Retrieved September 2013.

Simpson, J., and Weiner, E. “badge, n.” (1989). Def. 1b. *The Oxford English Dictionary.* Oxford University Press. Retrieved October 2013.

Simpson, J., and Weiner, E. “credential, n.” Def. 3b. (1989). *The Oxford English Dictionary.* Oxford University Press. Retrieved September 2013.

Simpson, J., and Weiner, E. “feature, n.” Def. 4. (1989). *The Oxford English Dictionary.* Oxford University Press. Retrieved March 2015.

Singh, V., Jain, R., & Kankanhalli. (2009). Motivating contributors in social media networks. In *Proceedings of the first SIGMM workshop on social media: International Multimedia Conference*. Beijing, China. p. 11-18.

Spurk, D., Abele, A. E., & Volmer, J. (2014). The Career Satisfaction Scale in Context A Test for Measurement Invariance Across Four Occupational Groups. *Journal of Career Assessment*, 1069072714535019.

Stake, R. E. (1995). *The Art of Case Study Research*. Sage.

Super, D. (1970). Work Values Inventory. Boston, MA: Houghton Mifflin

Surowiecki, J. (2004). *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*. Doubleday, New York: NY USA.

U.S. Department of Education, National Center for Education Statistics. (2002). *Defining and Assessing Learning: Exploring Competency-Based Initiatives, NCES 2002-159*. Prepared by Jones, E., Voorhees, R. & Paulson, K. for the Council of the National Postsecondary Education Cooperative Working Group on Competency-Based Initiatives. Washington, DC.

U.S. Department of Education. (n.d.) Competency-based learning or personalized learning. *ED.gov*. Retrieved September 6, 2014 from http://www.ed.gov/oii-news/competency-based-learning-or-personalized-learning.

Van de Poel, I., & Kroes, P. (2014). Can Technology Embody Values?. In *The Moral Status of Technical Artefacts* (pp. 103-124). Springer Netherlands.

van de Rijt, A. & Restivo, M. (2012). Experimental study of informal rewards in peer production. *PLoS ONE*, 7(3). Retrieved March 29, 2012 from http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0034358

Vandenabeele, W. (2007). Toward a public administration theory of public service motivation: An institutional approach. *Public Management Review*. 545-556.

Verbert, K., Govaerts, S., Duval, E., Santos, J., Van Assche, F., Parra, G., & Klerkx, J. (2013). Learning dashboards: an overview and future research opportunities. *Personal and Ubiquitous Computing*, 1-16.

Viegas, F. & Smith, M. (2004). Newsgroup crowds and AuthorLines: Visualizing the activity of individuals in conversational cyberspaces. In *Proceedings of the 37th Annual Hawaii International Conference on System Sciences, 2004.* Jan. 5-8, 2004.

VIF Education International. (2014). *Global Gateway: A Friday Institute Effectiveness Survey.* Retrieved May 8, 2015 from https://www.viflearn.com/index.php/year-in-review

Voorhees, R. A. (2001). Competency-based learning models: A necessary future. *New Directions for Institutional Research*, (110), 5-13.

Wang, Y., & Fesenmaier, D. R. (2003). Assessing motivation of contribution in online communities: An empirical investigation of an online travel community. *Electronic Markets*, 13(1), 33-45.

Wang, R., & Strong, D. (1996). Beyond accuracy: What data quality means to data consumers. Journal of Management Information Systems, 12(4), 5-33.

Wasko, M. & Faraj, S. (2000). It's what one does: Why people participate and help others in electronic communities of practice. *Journal of Strategic Information Systems*. 9(2-3), 155-173.

Winner, L. (1980). Do artifacts have politics? In MacKenzie, D., & Wajcman, J. (eds.), *The Social Shaping of Technology*. Open University Press, 28-40.

Winner, L. (1993). Upon opening the black box and finding it empty: Social constructivism and the philosophy of technology. *Science, Technology, and Human Values*, 18:3, pp. 362–78.

Yetim, F. (2011a). Bringing discourse ethics to value sensitive design: Pathways toward a deliberative future. *AIS Transactions* on Human-Computer Interaction (3) 2, pp. 133-155.

Yetim, F. (2011b). A set of critical heuristics for value sensitive designers and users of persuasive systems. In *Proceedings of the European Conference on Information Systems (ECIS)*. Paper 185.

Yetim, F. (2011c). Focusing on values in information systems development: A critical review of three methodological frameworks. *Wirtschaftinformatik Proceedings 2011*. Paper 53.

Yetim, F., Wiedenhoefer, T., & Rohde, M. (2011). Designing for motivation: Focusing on motivational values in two case studies (pp. 255-268). *Social Informatics*. Springer Berlin Heidelberg.

Yin, R. (1984). *Case Study Research: Design and Methods* (1st ed.). Beverly Hills, CA: Sage Publishing.

Yin, R. (1989). *Case Study Research: Design and Methods* (Rev. ed.). Newbury Park, CA: Sage Publishing.

Yin, R. (1993). *Applications of Case Study Research*. Newbury Park, CA: Sage Publishing.

Yin, R. (1994). *Case Study Research: Design and Methods* (2nd ed.). Thousand Oaks, CA: Sage Publishing

Yin, R. (2003). *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.

Yoo, W., Suh, K., & Lee, M. (2002). Exploring the factors enhancing member participation in online communities. *Journal of Global Information Management*. 10(3), 55-71.

Youcheng, W., & Fesenmeier, D. (2003). Assessing motivation of contribution in online communities: An empirical investigation of an online travel community. *Electronic Markets.* 13(1), 33-45.

Zhang, Y., & Wildemuth, B. (2009). Qualitative analysis of content. In B. Wildemuth, eds., *Applications of Social Research Methods to Questions in Information and Library Science*. Libraries Unlimited, London, 308-319.

Zhenhui, J., Jiang, J., & Chan, H. (2011). The influence of sociotechnological mechanisms on individual motivation toward knowledge contribution in problem-solving virtual communities. IEEE. 152-167.

Zytowski, D. G. (1994). A super contribution to vocational theory: Work values. The Career Development Quarterly, 43, 25–31.