The Archie
Human Factors and Applied Cognition
Spring 2014 Newsletter

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A Letter from the Editor

First let me begin by apologizing for the tardiness of the current newsletter. A confluence of unexpected events conspired against me to delay publication.

During my tenure as editor I’ve tried to make changes to both streamline the publication process of the newsletter and increase student interest in its content. All the while trying not to derail the newsletter from its original purpose of providing Alumni with an up-to-date view of ARCH Lab goings-on. To continue with this mission the newsletter and staff will undergo two changes for future publications. First the newsletter will be split into two publications. The current format will be accompanied by a more frequently updated blog hosted on the HFAC website. The ‘printed’ newsletter will continue to feature introductions of new students along with updates on past graduates, and interviews with faculty. It will also host pictorial depictions of ARCH Lab events and recent publications. The blog will take over hosting student editorials and expand to host pilot data and experimental or personal findings that have no other publication outlet. We also plan to host a ‘True’ “Where are they now” page with a comprehensive list of past grads along with pictures, GMU anecdotes and current biographical information.

The second major change to the current newsletter entails an expansion of the editorial staff. Given my ambitions for the newsletter, I am in need of help. I have received help from David Revilla in the past and Bridget Lewis for the current publication. Bridget has kindly volunteered to come on as a graphical editor, and content editor when needed. I will be continuing as a content editor, and supervising editor. We plan to recruit one to two new students preferably PhD or highly motivated masters students to act as junior editors, responsible for content solicitations and initial editing. We also plan to create a chain of editorial progression in order to facilitate and maintain the newsletter as a high quality publication for alumni and students in the future.

Ryan McKendrick
2013-2014 HFES Student Group Executive Board

President: Melissa Smith
Vice President: Melissa Scheldrup
Treasurer: Ivonne Figueroa
Secretary: Eric Blumberg
First Year Liaison: Cyrus Foroughi
Communications Chair: Dani Barragan
CHI President: Raul Ramirez
Newsletter Editor: Ryan McKendrick
Daniela Barragan
Daniela Barragan is a Masters student. She received her BA from California State University, Fullerton. She is currently working with Dr. Carryl Baldwin as part of the Auditory Research Group and Mason Transportation Institute. She was attracted to George Mason based on the current research the labs are performing, the distinguished and reputable faculty; and the prospective of future government employment opportunities. She is currently interested in cognition, perception, memory and transportation.

Alix Dorfman
Alix Dorfman is a Masters student. She received a BA in psychology from Cornell University and is currently working with Dr. Rob Youmans. She attended a Human Factors & Ergonomics Society Annual Meeting to learn more about the field prior to applying to graduate school. There she met friendly and enthusiastic HFAC GMU students who spoke highly of both the faculty and strength of the program. After visiting the campus, she felt it was clear that the George Mason academic community was the right one for her! She is currently working as a User Experience Intern at Perceptronics Solutions. She is currently interested in the physical and cognitive components of Human Factors that contribute to smarter design.

Cyrus Foroughi
Cyrus Foroughi is a doctoral student working with Dr. Debbie Boehm-Davis. He was interested in George Mason because it was local, and has a very strong human factors program. This past summer he worked on a grant for the Johns Hopkins Applied Physics Lab's "SIRIUS Program." The goal of which was to create serious games to train participants and measure their proficiency for recognizing and mitigating the cognitive biases. He is currently interested in human performance measurement and training of expertise.
Ari Mandell

Ari Mandell is a doctoral student. She received a BA in psychology from the University of Virginia and is currently working with Dr. Tyler Shaw. She decided to attend George Mason because she was impressed by the Human Factors and Applied Cognition program’s collaborative environment. She is currently a teaching assistant. She previously worked as a research assistant, assistant coordinator, and head coordinator at the Virginia Cognitive Aging Lab for the last three years while attending UVA. She is broadly interested in human factors/cognitive science but is currently focusing on using transcranial doppler sonography and its research applications for vigilance and mental workload.

Kaitlyn Marinaccio

Kaitlyn Marinaccio is a Masters student. She received a BS in Psychology and BA in Anthropology at State University of New York at Oneonta. She is currently working with Dr. Raja Parasuraman. She was attracted to George Mason because of its great location and excellent human factors and cognition program. She is currently employed by the Office of Student Scholarship, Creative Activities, and Research as a Graduate Professional Assistant. Her current interests include medical human factors, and cognitive neuroscience with specific focus on studying attention, multitasking, reasoning and decision making.

Molly Martini

Molly Martini is a doctoral student. She received a BA in psychology from the University of Oregon and is currently working with Dr. Robert Youmans. She was attracted to George Mason because of the faculty, students, and current research. Her research interests include decision-making, multitasking, individual differences, dynamic visual displays, and usability.
Kyleigh Purks
Kyleigh Purks is a Masters student. She received her BS in Psychology and BA in English Non-Fiction Writing from George Mason University. She is currently working with Dr. Raja Parasuraman. She decided to attend George Mason because of the HFAC program's strong reputation and interesting research, as well as its proximity to D.C. Her interested include human-computer interaction, the progression of neuroergonomics, interaction with artificial intelligence, automation of driving, and computer training systems.

James Urbano
James Urbano is a Masters student. He received a BA in Psychology from Temple University and is currently working with Dr. Eva Wiese in the Social Robotics Lab. He was attracted to George Mason University because the teachers and current students are energetic and pro-active within the Human Factors community. He feels that special care is taken to ensure that each student has a voice and is supported in their specific academic interests. His current research interests include social robotics as well as space exploration and the integration of human factors research into spacecraft design.

James Villacci
James Villacci is a Masters student. He received a BA in psychology from Hofstra University and is currently working with Dr. Raja Parasuraman and Dr. Eva Wiese. His current interests include attention, vigilance, usability, decision making, social robotics and human computer interaction.
2013-2014 Highlights
New Student Orientation and Happy Hour
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Editorials

But Wait, There’s More! UX and Human Factors

An editorial by James Parker

After two years at GMU, I still have trouble telling people what human factors is. When asked, I often rant about the different types of research and projects human factors professionals do, only to find the conversation derailed into a mess of examples. In human factors "We work to reduce human error and make technologies easier to use", but I can't help but feel that this is only a half truth. When considering the larger goal of making technologies "easier to use", human factors is only a piece of the puzzle. For example Usability, Information Architecture, Interaction Design, User Experience Design, all share the same goal of making technology easier to use, with the potential additions of making products engaging, useful, and even appealing. I cannot help but ask, where does human factors really fit on the spectrum of "user experience"?

Science! Usability! UX....and uh, design! Right?

The combination of Information Architecture, Usability, Human Computer Interaction, and the many types of UI design typically fall under the umbrella construct of "User Experience". Jakob Nielson defines user experience as "encompassing all aspects of the end-user’s interaction with the company, its services, and its products"(Nielson and Norman 2013). Human factors is generally thought of as a big part of the behavioral science behind what UX is trying to achieve, however it is the combination of the different fields under UX together that is the strength of UX. In short, human factors is a contributing piece to a much larger puzzle. So how much is it contributing?

Personally I see human factors as standalone research field with branches of influence in usability, human-computer interaction (HCI), Information Architecture and various design areas. Each of these subsequent fields are deeply interconnected, but each has different goals. HCI is oriented toward the design of systems, where IA is mainly involved in system content management. Usability research typically involves the assessment and improvement of designs to reduce error while improving the user’s experience, where design disciplines such as interaction design focus on maximizing the pleasure of using products with engaging interactions and aesthetics.

Drawing the battle lines

Within industry human factors only makes up a fraction of the UX umbrella. The best example of this fact comes from a recent report published by the Nielson Norman group on the state of the UX field (2013). As shown in Figure 1, only about 4% of UX practitioners have a masters degree in human factors. While the bachelors degree statistics are higher (9% coming from psychology). It turns out that the number of human factors degrees in UX is lower than the number of degrees in library and information science and is tied with the number of English degrees. I found this fact slightly disturbing, for surely we bring more to the table than English majors?
Breaking it down

The Nielson and Norman User Experience Careers (2013) report surveyed 963 respondents to self-report the most useful subjects in UX and found the most useful subjects to be HTML/CSS and computer programming, alongside web-design, HCI and writing. Additionally design skills such as experience with design tools like illustrator, fireworks, snagit, photoshop and axure, interpersonal skill for interviewing users, and business skills for selling ideas to stakeholders were consistently rated as highly important to the UX field. Research skills were also rated as highly important, although skills specific to human factors and statistics fell near the 50th percentile.

While the enormous range of degrees in the UX field makes 4% look better, the evidence is still strong enough to suggest that human factors is not the all-encompassing approach to making products better. It seems shockingly low considering the importance of the scientific approach to human behavior human factors brings. Given the numbers, one might ask whether or not the science is as important as design skills in the UX field.

A Little History

In the 90’s Steve Jobs infamously fired Don Norman and most of the usability practitioners at Apple. In the following years, Apple introduced a number of innovative products such as the ipod, iphone, and ipad, to enormous success. Apple products today are still regarded as some of the best examples of usable products with innovative design, although Apple is notably quiet about its process towards creating these products. What testing is done? Are Apple products examples of creative thinking trumping careful science to make a better product?

In a now famous innovation quote, Henry Ford once said "If I had asked people what they wanted, they would have told me faster horses." The quote reflects a pervasive idea in the design space where talking to users doesn't always make a better product. It is the creative approach to design which drives great product ideas. Steve Jobs echoed this sentiment when he told Business week in a 1998 interview on the iMac "It's really hard to design products by focus groups. A lot of times people don't know what they want until you show it to them." I won't speculate on Apple's usability process, but the hype surrounding their products and the attitudes of Steve Jobs toward usability certainly muddy the water when it comes to the importance of research and testing in product development.

Many companies usability test, but the scientific validity of these evaluations is questionable. Applying the science of human factors is much easier to argue the in the design of complex systems, where error can not only cost millions in damage but result in loss of life. Mobile applications, video games, websites, computer operating systems, represent a different environment and it is harder to justify the scientific approach where it is less clear what the cost might be.

Science Wins

At the risk of being inflammatory, my personal belief is that science is important; very important in fact and the Nielson and Norman report agrees. The results show that most respondents rated analytics skills with data as more important than the design skills mentioned previously. Results also indicated
that psychology was the most important topic subjects wished they had studied, coming in as #2 behind HCI. Many UX practitioners need to have quantitative skills to assess data to support design decisions and make future considerations. UX superstars like Don Norman, Jeff Sauro, Charles Mauro among others all got their start in cognitive science and human factors. In fact, what often makes GMU alumni stand out in industry is their strong quantitative skills, research methods, and analysis work, regardless of whether they move into UX, usability, human factors or another design discipline.

**Industry Mismatches**

It should be obvious then to those working in industry why evaluating products, usability testing, and user research integration into the design and development cycle is crucial to a product's success. Results can help inform designers on what needs fixing, changing, in addition to how users respond to designs, so anyone who wants to be competitive in industry should logically have a solid foundation in this practice to make better products.

Yet the state of the UX field is mixed and there are many who claim "user centered" titles without any real understanding of users or how they behave. While growing, human factors and the scientific influence doesn't yet reach far enough to convince the hodgepodge of fields that make up the UX movement that the science is crucial for success. It falls to us to convince them, and from personal experience that can sometimes feel like beating your head against a wall. It is difficult to argue the merits of data to someone who has never taken statistics, let alone had a product tested during design. At the advice of professors here in our program, your best bet for convincing those ignorant of the value of science is to just do it. Sometimes it is better to ask for forgiveness than for permission.

**The Point**

By learning more about where human factors stands in the grand scheme of making technologies "user centered", human factors practitioners stand to gain knowledge toward better integrating their craft. It is clear that there are problems with arguing for scientific testing and evaluation in non-life threatening contexts, both from the Nielsen and Norman (2013) and from experiences in the field. It's also clear that science isn't everything, and human factors practitioners who desire to actually design and implement systems may need to expand their skill sets beyond that of research. Human factors itself is a diverse field, but when it comes to creating products which prevent error, engage users, and keep them coming back, there is much more to the world of UX than just human factors. As a result students need to equip themselves with the knowledge of what is, and what isn't human factors. Knowledge of the various fields which make up this vast space of making products more user friendly not only empowers us GMU students entering the job market, but can help those searching to find their niche of interests. Additionally, human factors stands to gain...
much by learning more about the other parts of user experience in an effort to better integrate itself when designing and evaluating systems.

References


Applied Psychology Questions in a World of the Quantified Self

An editorial by Dan Gartenberg

Quantified Self (QS) is self-improvement through personalized behavior change. With computers becoming increasingly involved in every facet of our lives, it has become easier and easier for people to track themselves. The growth of ubiquitous computing and the QS movement means that doctors, psychologists, and coaches can work with the individual to improve various aspects of people’s lives. This will involve working with individual data, using longitudinal data collected repeatedly over long periods of time, and new approaches of behavior change. A world of the Quantified Self will put applied psychologists at the forefront of answering the key questions that this community will pose on how to most effectively impact behavior change through self-tracking.

The Quantified Self (QS) began in 2007 as a grassroots movement in San Francisco and has blossomed to over 100 cities around the world. The format of the QS encourages the discussion of self-quantification projects via answering questions such as: “What did you do?”, “How did you do it?”, and “What information did you gain?” QS believes that by answering these questions with massive amounts of individualized longitudinal data it can change the way in which companies, and governments provide products and services for individuals.

How can individual difference data be used?
Gaining knowledge in individual differences and skills is asset of Quantified Self data. Companies like Carney Labs based in DC, are working towards tailoring the education programs of schools by taking into account the student’s goals and current knowledge of the subject matter. As a result, personalized and optimized educational programs can be developed. This model can also be applied to improve other behaviors, such as workout regimens, job training, and health recommendations.

Preventative healthcare recommendations can be improved by promoting the communication of individual difference data – but also enhanced skill identification and training. For example, Dr. Raja Parasuraman recently identified a set of alleles that are associated with better performance on certain cognitive tasks. This can be used to identify attributes of potential workers in order to optimize worker performance, what applied psychologists refer to as neuroergonomics.

Genetic models of the individual are starting to be offered at prices commensurate with use by the general public. Various small companies such as 23andme provide cheap genetic tests on important markers, and 1eq, a local DC company, combines genetic data with behavioral data to provide health feedback to individuals. These technologies are great for engaging people in their health and promote preventative healthcare. However, when it comes to interpreting this complicated data various issues often arise; (please enumerate the issues you had in mind). Applied psychologists and neurologists can be of assistance to fostering proactive...
communications between these companies and the individuals who use their services.

**How can longitudinal data be used?**
Along with individual differences, QS also involves the collection of large amounts of data acquired continuously over time. This can be used to fine-tune an individual’s behavior by enhancing their abilities both inside and outside work. Enhancement can be accomplished via improvements in cognitive training, increased exercise and improved diet, all of which can affect cognitive performance when it matters.

Our own Dr. Patrick McKnight, stats professor and endurance athlete, presented his training regime to climb Mount Everest at QS conference held in DC. Dr. McKnight discussed the importance of training that replicates the altitude at which he will be climbing – i.e. hypoxia training. Dr. McKnight went on to describe a workout regime developed with individualized data in order to ensure his safe arrival on the Peak of Mount Everest (see Figure 1)

Over the past five years, I have used longitudinal data to develop software to help optimize my fatigue and alertness system. Sleep need and the circadian component of sleep vary largely between individuals, yet are relatively consistent within an individual. Through better understanding of an individual’s fatigue and alertness system – peak physical performance and dangerous levels of drowsiness can be indentified. A better understanding of sleep can be attained using some of the iPhone apps that I have created that track sleep by measuring body movement and track alertness using a simple reaction time game (see Figure 2 and also the apps Proactive Sleep Alarm Clock, Mind Metrics, and Reaction Time). This can help the scheduling of workout regimes, scheduling of worker hours, and the preventions of fatal errors.

![Figure 1: Left – Dr. Patrick McKnight presenting at the Quantified Self DC meetup, and Right – a graph of Patrick’s training regime over a 45 week period.](image-url)
change. For example, data regarding a blood test can be presented in a number ways that emphasize various aspects of the test, such as the scores for the test, the norms within a population, and the meaning of the score from a doctor’s perspective. Knowing how to present data in order to promote positive behavioral change can be difficult, with too much or too complicated data resulting in disengaged users and simple data analyses often obfuscate what the data is really saying about the user. Effective communication between a medical professional and the individual tracker is a hurdle for the QS movement, which can be addressed with better user interface design and improved education to both the user and the medical professional.

These issues can be related to the breakdown of different types of behavioral feedback. Youmans and Stone (2005) describe how behavioral feedback can be characterized as cognitive information or task information. Cognitive information is feedback related to what the individual is doing, while task information relates to what is optimal for the given behavior. For example, cognitive information is knowing that you are sleeping 6 hours a night and task information is knowing that you should be sleeping 7 hours a night. Different behaviors, such as sleep, can be more impacted by cognitive information, since cognitive information related to sleep is often difficult to obtain (the individual is unconscious).

An area ripe for future psychology research is the deconstruction of types of feedback most effective for improving specific behaviors. Human factors can also play a role in improving the products and software used by members of the Quantified Self movement. When these tools can present individual difference data and longitudinal data effectively—the opportunity for improvements to healthcare, education, and individual performance are vast.

Join the QS movement!
The QS movement is continuing to grow, one of the foundations of its future strength is the sheer amount of individualized data that members collect. The more QS members the more power the movement will have towards influencing social and scientific change.

Meetings are held all around the DC area, they offer a great opportunity for individuals to participate in in the movement, network, learn about the newest gadgets and self-tracking approaches.

www.meetup.com/DC-Quantified-Self/
Where Are They Now? Checking in With Recent Graduates

Devon Kelley

I graduated from GMU in May 2013 and am working for Humanproof a human factors consulting startup. On the job I provide program support for the Human Factors Division at the Federal Aviation Administration, specifically regarding the NextGen Air Traffic Control and Technical Operations research program.

While at Mason I worked under Dr. Debbie Boehm-Davis supporting flight deck Data Communication projects funded through the FAA. Ironically I still get to work in the same office as our sponsors, Dan Herschler and Tom McClay. The difference now is that I work on the air traffic control side rather than flight deck research.

While providing program support I don’t actively conduct human factors research. Which, is kind of a bummer, but I knew that about the job upfront. Yet, the great thing about program support though is that I get to experience the business and project management side of human factors. In this position I am able to see how research is initiated and gains traction. Although I’m not currently conducting research, the job requires human factors knowledge and to the ability to write up out-year research plans, project briefings, and budget documentation.

I have had the opportunity to do usability work for the US Coast Guard and Homeland Security. The work was very exciting and my experience from task analysis and usability at Mason was definitely a plus. I was required to do an Operational Sequence Diagram, and user testing, indeed I referenced Kirwan & Ainsworth a lot. My time as a member of the ARCH Lab was great, and I feel that the experience I gained there has been very beneficial in my current work environment.

John J. Payne

I currently work for Perceptronics Solutions Inc., the company is composed of a small group of researchers, engineers, developers and designers located in Falls Church, Virginia. Masters students seeking to gain real-world application knowledge prior to graduation, I highly recommend an internship. I did one and it really gave me a leg up. Complimentary to an internship, I also feel that being a member of the ARCH Lab has afforded me a number of unique opportunities, which in turn helped me find a job that I truly enjoying going to everyday.

At Perceptronics, I am a Lead User Experience Designer and have the good fortune to be involved in a wide range of development and design projects relating to a variety of applications. Such projects have included, Unmanned Arial Vehicle simulation and testing tools, social media prediction methods and visualization techniques, and trust calibration measurement development; to name a few. Much of my day revolves around interface wireframing and prototyping, as well as requirements documentation for those mockups. While the work is fast paced and demanding, it is equally rewarding seeing your designs come to life as tools for a large base of users.

HFAC coursework I’ve found the most influential were seminars in task analysis, user testing and statistics (611 & 612)...yes, statistics may be infuriating at times, but it is invaluable when conducting research; this does not purely pertain to your course work, as some may assume. If your interests lie in the UX Design consulting industry, it would be an unfortunate oversight to forgo soaking up as much as you possibly can from these courses.
Publications, Proceedings, Presentations, and Awards

Journal publications


**Conference proceedings**


**Posters**


**Patents**


Gartenberg, D. & Gerashchenko., L. Assessment of sleep stages by using actigraphy and sensory stimulation (December 1, 2013). Provisional Patent # 6,191,0418.
Grants


Summer 2014: **Raja Parasuraman** Sponsor of **Brian Falcone**, National Science Foundation Fellowship, East Asia and Pacific Summer Institutes (EAPSI) Program, Brian Falcone, $5,000.