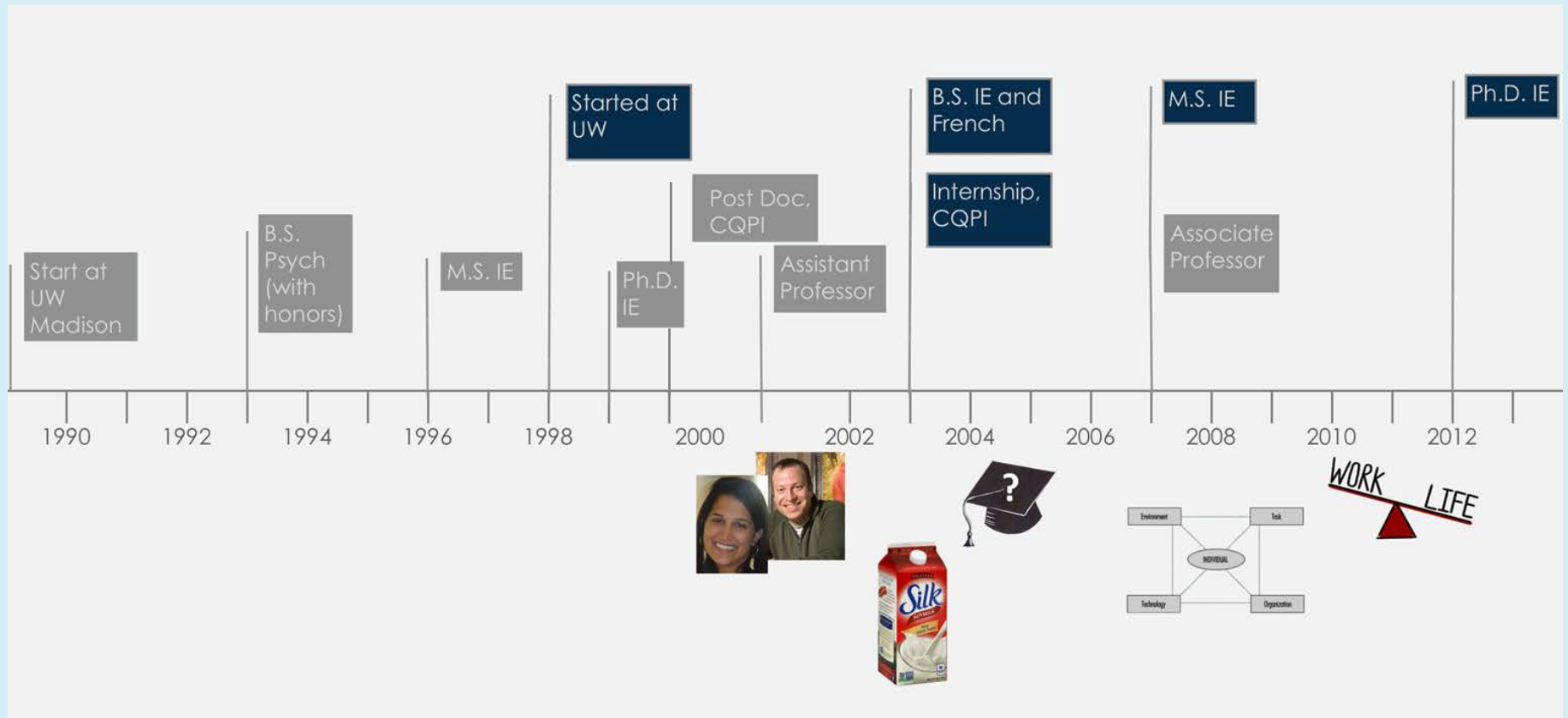


# **RULE #1: LIFE'S TOO SHORT TO WORK WITH A\$\$HOLES...OR BENTZI'S COLLABORATIONS AND IMPACT**

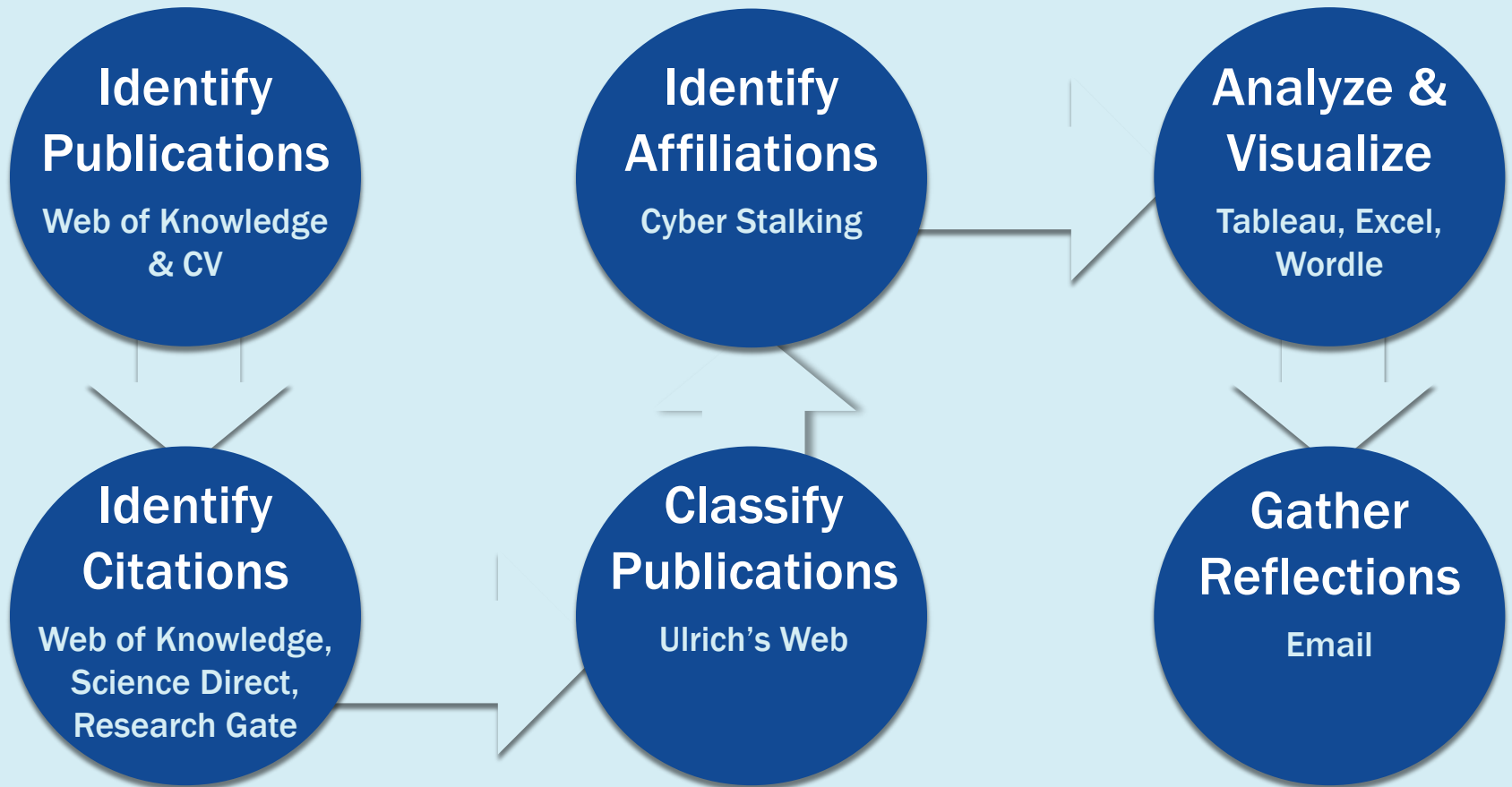
**I owe a beer to Rich Holden, Joy Rivera, and Edmond Ramly**

**Rupa Valdez, PhD  
University of  
Virginia**

# Bentzi and I both spent too much time at Wisconsin...



**We conducted a bibliometric analysis to capture Bentzi's collaborations and impact.**



**Bentzi published consistently in engineering, but primarily in the medical sciences later in his career.**

**Journal Domain**

- Medical Sciences
- Engineering
- Psychology
- Occupational Health and Safety
- Technology
- Public Health and Safety
- Sociology
- Business and Economics
- Health Facilities and Administration
- Agriculture
- Pharmacy and Pharmacology
- Biology
- Philosophy
- Transportation

2000

2004

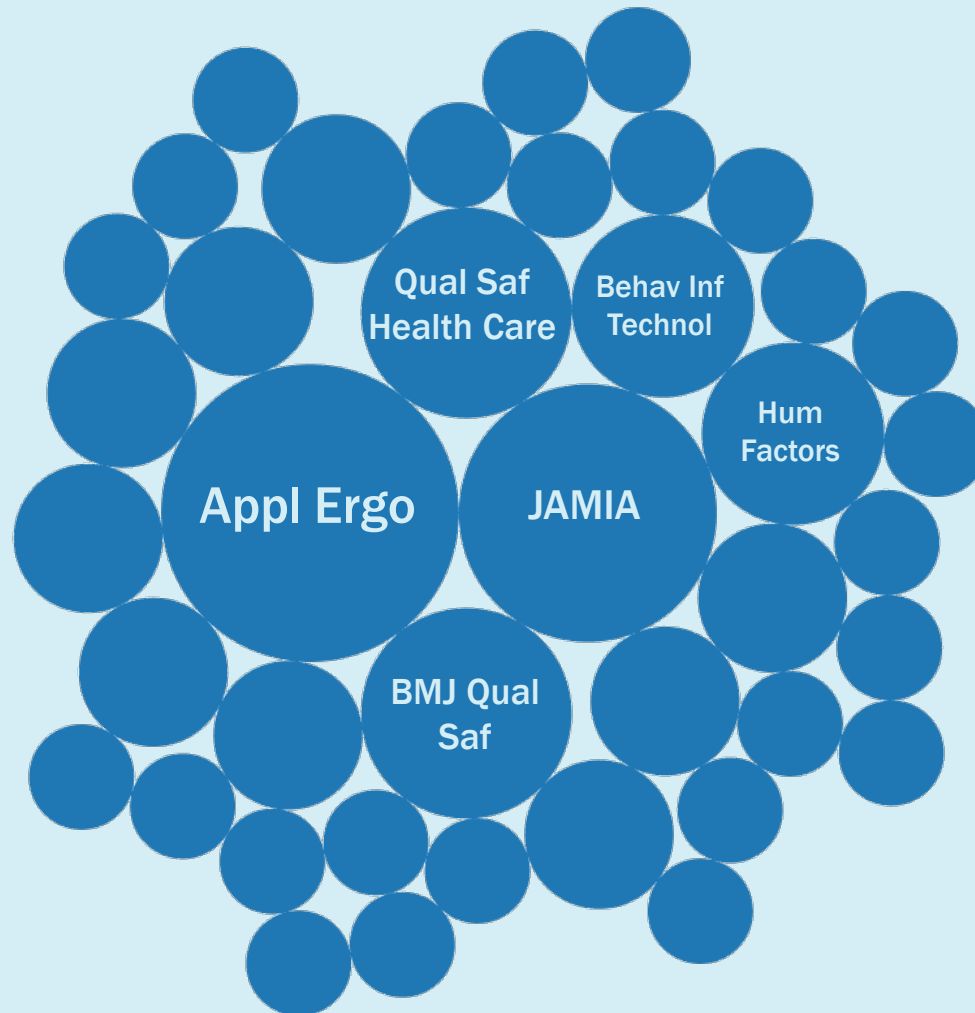
Year

2008

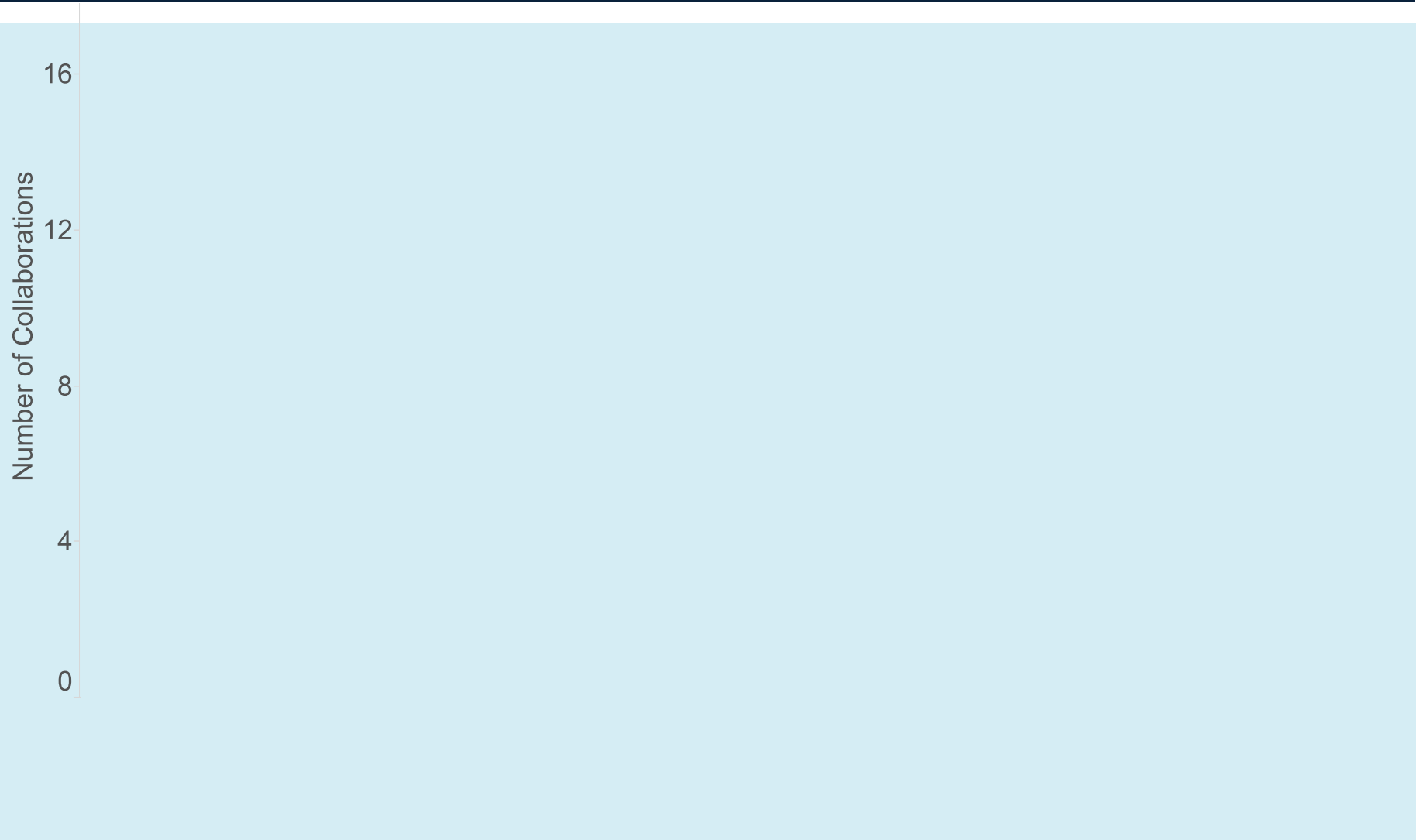
2012

2016

Bentzi published in 40 journals, with a focus on human factors, informatics, and quality improvement.



**Bentzi collaborated on publications with 113  
different people!**



# Richard Holden, PhD

I remember explicitly working to replicate the way he thought. I would try composing ideas the way he did, particularly incorporating theory and elements from different fields. He often lamented the lack of theory in human factors and healthcare research and our first papers together were on adding theory to understand medical incident reporting. We also worked on several reviews and conceptual models together, pulling together ideas and finding ways to communicate them across disciplinary boundaries. Of course today I try to do the same, but I'm not sure anyone compares to the way Bentzi could speak to a group of industrial engineers, medical students, nurses, physicians, pharmacists, administrators, or industry people with equal clarity.



# John Beasley, MD

Bentzi patiently taught me some of the basics of ISyE, and listened intently when I explained what was happening during the clinical encounter. He also felt strongly that the work we did should have more impact than just publications and more grants and was active in working with organizations. He gave hope that we could have a scientific approach to how we do our work – what has come to be called the “Basic Science of Primary Care.”



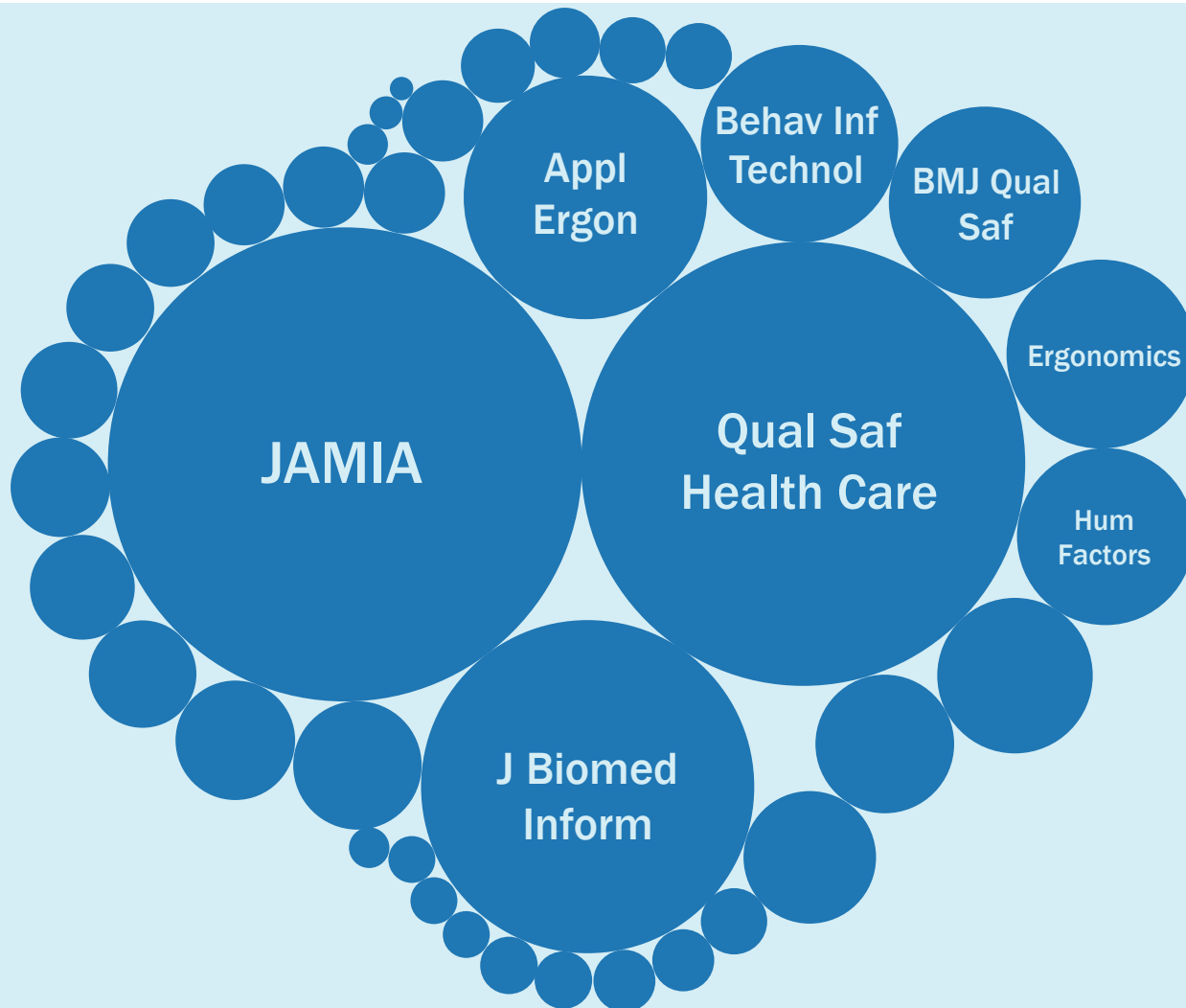


# Roger Brown, PhD

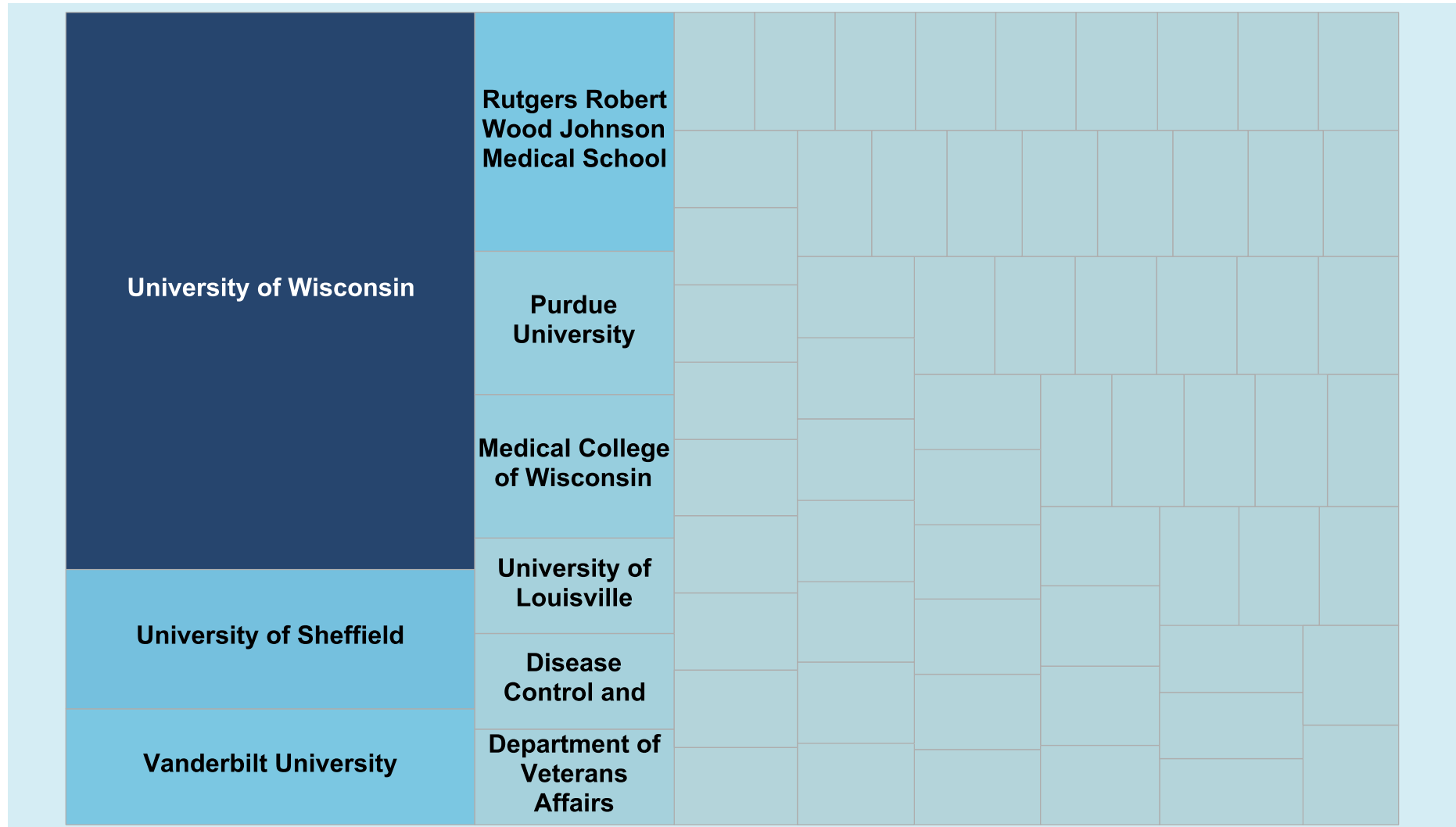


Bentzi would come over to my office and we would brain storm ideas of design and measurement. He was always interested in how we can better measure things. I think he liked this environment, because we could “push the envelope” on thinking about human factors and the healthcare system. I miss our talks.

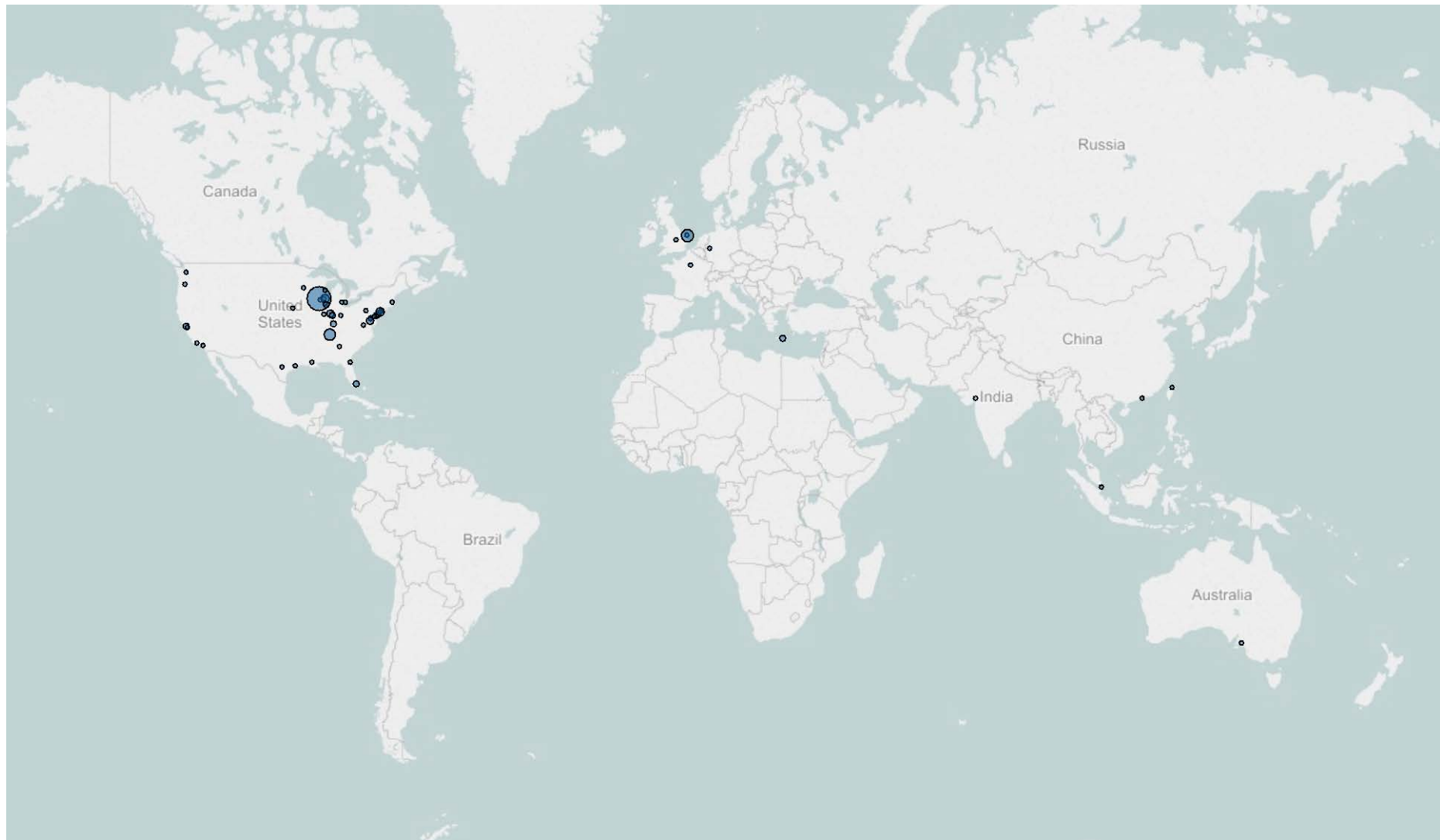
Bentzi's most cited work has been published in informatics and quality improvement journals.



# Bentzi's collaborators are now at 71 institutions...



...they work in 11 countries...



**...and in the United States his collaborators are in 23 states and Washington D.C.**





# Bentzi's third most cited first-authored paper was...,

## SAFETY BY DESIGN

### A human factors engineering paradigm for patient safety: designing to support the performance of the healthcare professional

B-T Karsh, R J Holden, S J Alper, C K L Or

Qual Saf Health Care 2006;15(Suppl 1):i59-i65. doi: 10.1136/qshc.2005.015974

The goal of improving patient safety has led to a number of paradigms for directing improvement efforts. The main paradigms to date have focused on reducing injuries, reducing errors, or improving evidence based practice. In this paper a human factors engineering paradigm is proposed that focuses on designing systems to improve the performance of healthcare professionals and to reduce hazards. Both goals are necessary, but neither is sufficient to improve safety. We suggest that the road to patient and employee safety runs through the healthcare professional who delivers care. To that end, several arguments are provided to show that designing healthcare delivery systems to support healthcare professional performance and hazard reduction should yield significant patient safety benefits. The concepts of human performance and hazard reduction are explained.

*same time incorporating lessons learned from any errors that do occur*<sup>9</sup>. The paradigm promotes eliminating errors by designing better healthcare systems.

In a paper presenting the second paradigm, Layde *et al*<sup>10</sup> argued that because error and harm are not always linked, patient safety efforts should focus on the reduction of patient injuries. Errors that do not lead to harm—often called near misses or near hits—may occur when (a) luck is involved, such as when an erroneous medication is administered, but the patient suffers no adverse effects; (b) the error is not clinically significant enough to cause harm, such as when a minor overdose of a low risk medication is administered; or (c) the error is caught before harm can be done, such as when a pharmacist catches a physician prescription error. The authors argue that, since a proportion of errors does not result in patient harm, not all errors are worth trying to eliminate. Instead, they

his second most cited first-authored paper was...

Viewpoint paper

## Health information technology: fallacies and sober realities

Ben-Tzion Karsh,<sup>1</sup> Matthew B Weinger,<sup>2,3</sup> Patricia A Abbott,<sup>4,5</sup> Robert L Wears<sup>6,7</sup>

<sup>1</sup>Department of Industrial and Systems Engineering and Systems Engineering Initiative for Patient Safety, University of Wisconsin, Madison, Wisconsin, USA

<sup>2</sup>Center for Perioperative Research in Quality, Vanderbilt University School of Medicine, Nashville, Tennessee, USA

<sup>3</sup>Geriatrics Research, Education, and Clinical Center, VA Tennessee Valley Healthcare System, Nashville, Tennessee, USA

<sup>4</sup>Division of Health Sciences Informatics, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA

<sup>5</sup>Department of Health Systems and Outcomes, Johns Hopkins University School of Nursing, Baltimore, Maryland, USA

<sup>6</sup>Department of Emergency Medicine, University of Florida, Jacksonville, Florida, USA

### ABSTRACT

Current research suggests that the rate of adoption of health information technology (HIT) is low, and that HIT may not have the touted beneficial effects on quality of care or costs. The twin issues of the failure of HIT adoption and of HIT efficacy stem primarily from a series of fallacies about HIT. We discuss 12 HIT fallacies and their implications for design and implementation. These fallacies must be understood and addressed for HIT to yield better results. Foundational cognitive and human factors engineering research and development are essential to better inform HIT development, deployment, and use.

### INTRODUCTION

Current research demonstrates that health information technology (HIT) can improve patient safety and healthcare quality, in certain circumstances.<sup>1–6</sup> At the same time, other research shows else HIT adoption rates are low.<sup>7–10</sup> and else HIT

reliable complex physical systems (eg, bridges, buildings, cars), but it took more than a century to understand and mitigate the myriad of hazards of these systems. In contrast, we cannot yet design and deploy complex software systems that are on time, within budget, meet the specified requirements, satisfy their users, are reliable (bug free and available), maintainable, and safe.<sup>11–15</sup> Edsger Dijkstra, a recognized leader in software engineering, lamented that:

... most of our systems are much more complicated than can be considered healthy, and are too messy and chaotic to be used in comfort and confidence. The average customer of the computing industry has been served so poorly that he expects his system to crash all the time, and we witness a massive worldwide distribution of bug-ridden software for which we should be deeply ashamed.<sup>16</sup>

There are two additional reasons why HIT failures are particularly problematic. First, they are often opaque to users and system managers alike; it



and his *most* cited first-authored paper was...

## DEVELOPING RESEARCH AND PRACTICE

### Beyond usability: designing effective technology implementation systems to promote patient safety

B-T Karsh

Qual Saf Health Care 2004;13:388-394. doi: 10.1136/qshc.2004.010322

Evidence is emerging that certain technologies such as computerized provider order entry may reduce the likelihood of patient harm. However, many technologies that should reduce medical errors have been abandoned because of problems with their design, their impact on workflow, and general dissatisfaction with them by end users. Patient safety researchers have therefore looked to human factors engineering for guidance on how to design technologies to be usable (easy to use) and useful (improving job performance, efficiency, and/or quality). While this is a necessary step towards improving the likelihood of end user satisfaction, it is still not sufficient. Human factors engineering research has shown that the manner in which technologies are implemented also needs

hospitals were considering implementing bar coding technology.<sup>11</sup> With the pace of technology implementations likely to accelerate, it is imperative that healthcare delivery organizations understand how to maximize the potential benefits of patient safety technologies.

Human factors engineering science—which includes the study of technology design and evaluation—has shown that, for technology to be used effectively (that is, in the intended manner), it must be usable (that is, easy to use) by the potential end users.<sup>12-15</sup> Among patient safety scientists and practitioners, technology usability is becoming accepted as a necessary component of design to ensure that new technologies are used effectively; this is clear from the number of recent publications on the topic in the healthcare literature.<sup>16-20</sup>

While there is clear evidence that, for technol-

# The ideas presented in these papers continue to be influential...



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## Applied Ergonomics

journal homepage: [www.elsevier.com/locate/apergo](http://www.elsevier.com/locate/apergo)



Review article

### Work system barriers to patient, provider, and caregiver use of personal health records: A systematic review



Morgan J. Thompson <sup>a</sup>, Jeremiah D. Reilly <sup>b</sup>, Rupa S. Valdez <sup>b,\*</sup>

<sup>a</sup> Psychology Department, The College of William and Mary, Williamsburg, VA 23187, USA

<sup>b</sup> Department of Public Health Sciences, University of Virginia, P.O. Box 800717, Hospital West Complex, Charlottesville, VA 22908, USA

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#### ABSTRACT

**Objectives:** This review applied a human factors/ergonomics (HF/E) paradigm to assess individual, work system/unit, organization, and external environment factors generating barriers to patient, provider, and informal caregiver personal health record (PHR) use.

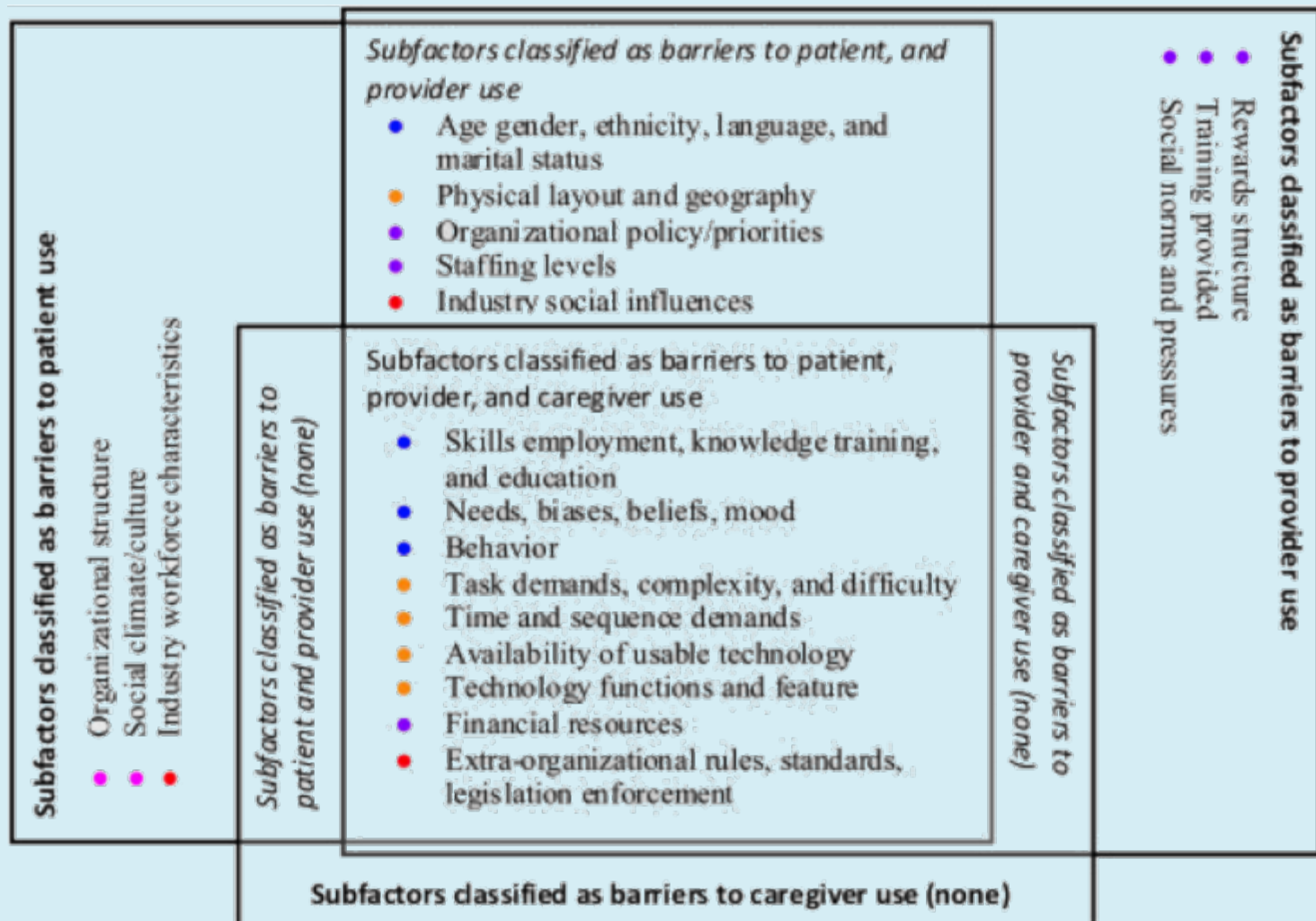
**Methods:** The literature search was conducted using five electronic databases for the timeframe January 2000 to October 2013, resulting in 4865 citations. Two authors independently coded included articles ( $n = 60$ ).

**Results:** Fifty-five, ten and five articles reported barriers to patient, provider and caregiver PHR use, respectively. Barriers centered around 20 subfactors. The most frequently noted were *needs, biases, beliefs, and mood* ( $n = 35$ ) and *technology functions and features* ( $n = 32$ ).

**Conclusions:** The HF/E paradigm was effective in framing the assessment of factors creating barriers to PHR use. Design efforts should address literacy, interoperability, access to health information, and secure messaging. A deeper understanding of the interactions between work systems and the role of organization and external environment factors is required.

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...shaping work at the intersection of ISYE and health care in ways that he may not have expected.



## Bentzi's work continues to influence the next generation of scholars.



One of my first projects after starting at UVa was a systematic review of the barriers to PHR use using Karsh's framework to classify barriers. At that time, I had no idea how my thinking would evolve. Although I am no longer in the field, in my day to day life and in my new research I see examples of Karsh's framework. Currently I am focusing on child development of antisocial behavior looking at how individual (e.g., personality, brain development), physical (location factors - temperature, commotion), organization (e.g., neighborhood, school), external (e.g., early intervention programs - head start; health insurance - access to therapy) level factors influence this development. To watch my interests evolve and to be able to apply a framework from one field into a new field has been a very rewarding experience.

Morgan  
Thompson



# Bentzi's work continues to influence the next generation of scholars.

Working with this framework has given me a heightened awareness of the contextual factors which impact a user's experience with an intervention. As a Westerner who has formed individualistic biases toward using personal traits as an explanation for behavior, the Bentzi framework has been instrumental in developing appreciation for the influence of task, organizational, and external factors. As a prospective psychologist, this experience has given me a more robust understanding the role of *context* in explaining/predicting/altering human thought and behavior while restricting my assumptions made in the absence of context.

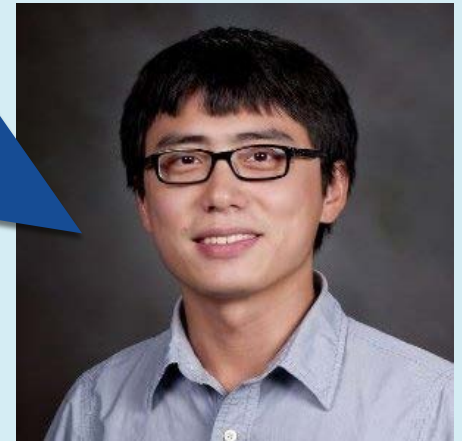


Jeremiah Reilly

# Bentzi's work continues to influence the next generation of scholars.

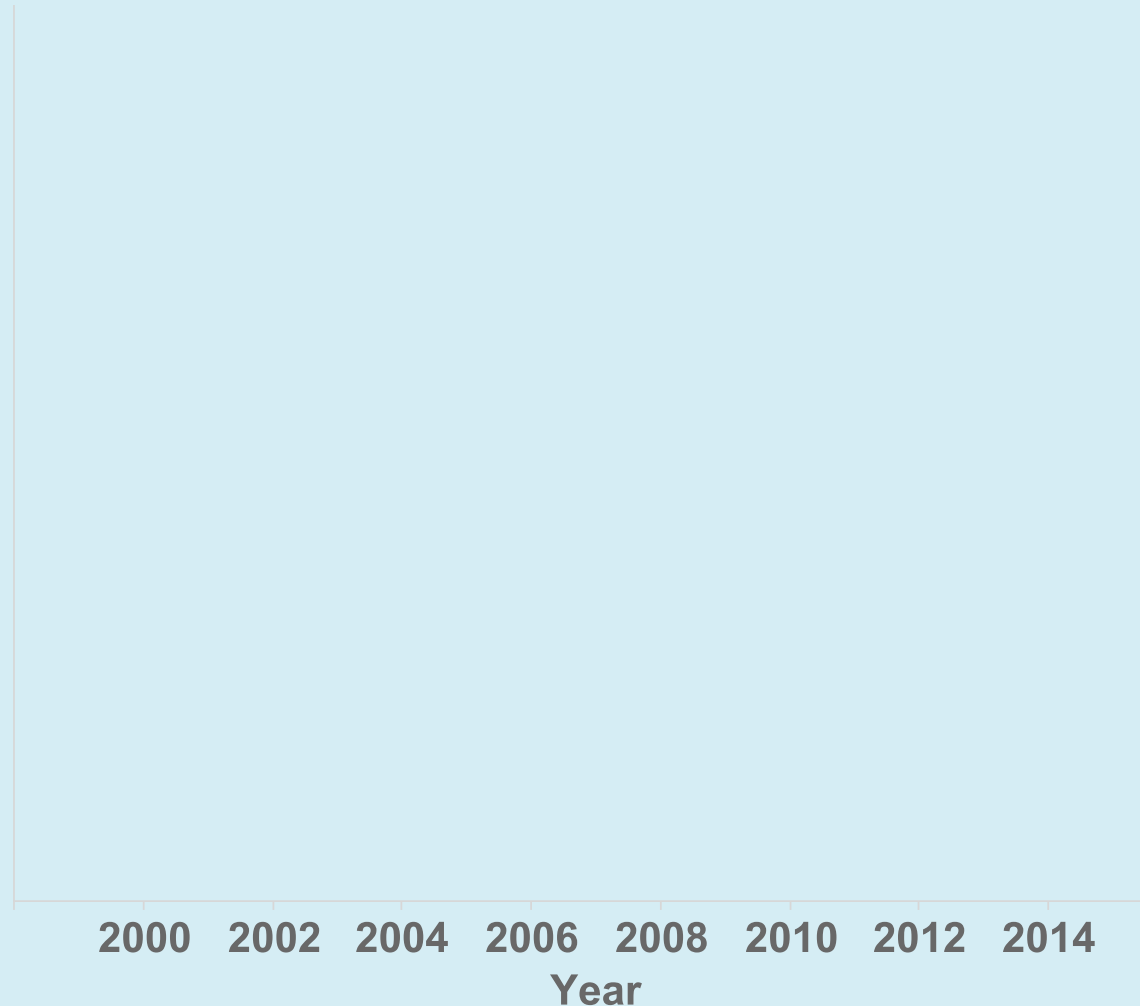
When I just started PhD study, I read Karsh's paper and learnt how to analyze a complex work system. His work stimulated my interests in macroergonomics, and guided me solving various human factors problems from a systems perspective.

My advisor, Dr. Karsh's student, truly carried his spirit of inheritance and convinced me of the profound influence an advisor can have on a student's belief and faith.

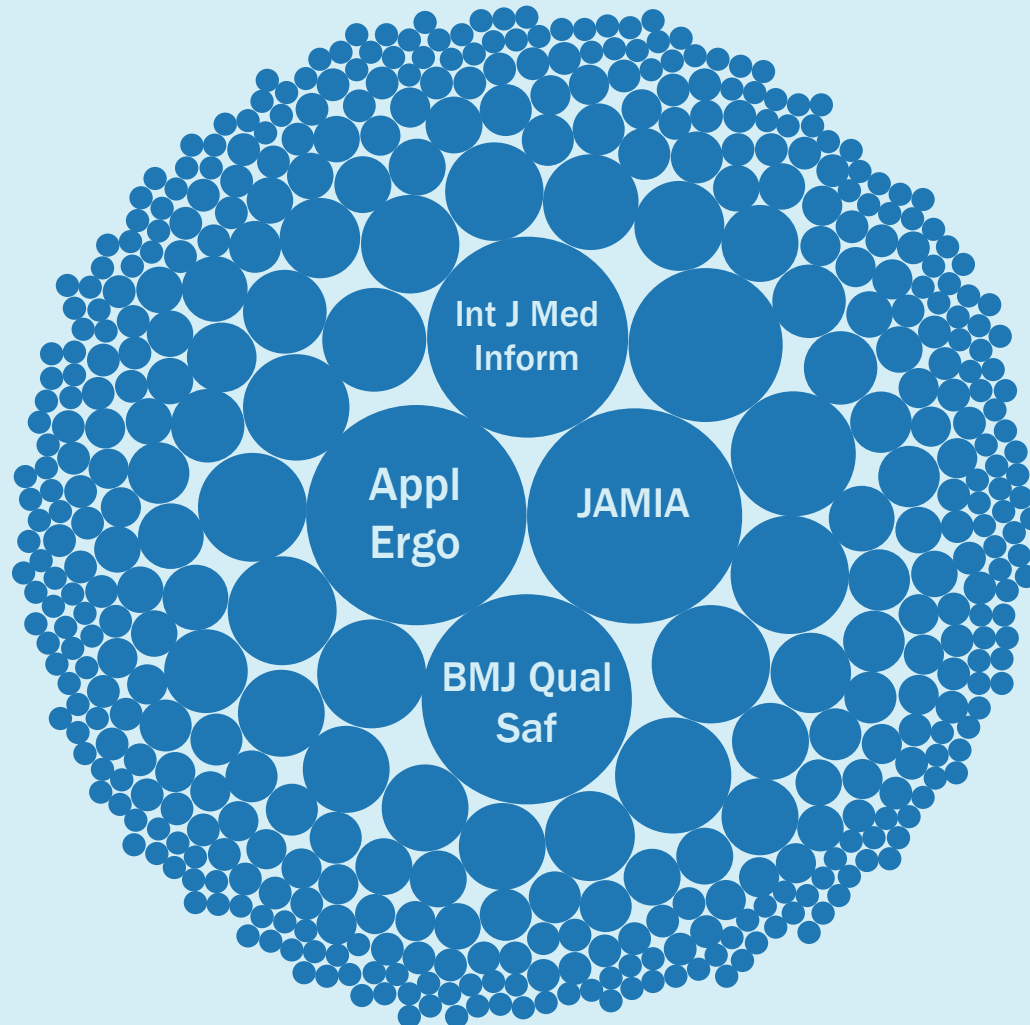


**Yushi Yang**

**Bentzi's work has been cited increasingly over the years (there are already over 50 citations of Bentzi's work in 2016!)**



Bentzi's work has been cited more than 1500 times  
in over 400 different journals!





# Natalie Abts, M.S.



I think of Bentzi most often when I have a question of ethics in my work...Bentzi used to say a good test to could tell if you're making the right decision is if you would be comfortable with it being displayed on the front page of the newspaper. My test is if I think Bentzi would be proud of my decision. If the answer is no, then I know it's not the right decision to make.

# Calvin Or, Ph.D.

During my PhD study with Bentzi, I learned a lot of things from him that impacted me and my thinking a lot. There were too many to list here. To put it in a nutshell, what I learned from Bentzi was that, for both work and personal life, he treated students with fairness; he spent a lot of time and energy in coaching us; he was always positive to students and things; he was always supportive and encouraging; and he was always willing to listen. Bentzi also gave me an impression that he was energetic and always wanted to do something that could fix some real-world problems and move the world forward. I believe Bentzi is one of the few best mentors and Professors in the field.



# Joy Rivera, Ph.D.

Bentzi was really good at making his students feel like his equal collaborators, even while he was actively mentoring us. He would take time to listen to our ideas, challenge us through open dialogue, provide us with constructive feedback, and support us as we stumbled through our thinking. He also gave each of us opportunities to lead on papers and projects, which helped to build our confidence and independence as we moved through our academic careers.

Bentzi was also really great at entering a healthcare organization and being able to connect with people at all different levels. He could teach anyone about human factors, get them excited about the topic, get them to buy-into systems thinking and be a good contact or future collaborator. Bentzi never directly taught us how to do this. I think partly because he didn't even know how good he was at it. But by watching him we learned and now that I'm working in a healthcare organization I get to apply his technique every day.



# Jaime Stone, M.S.

Working with Bentzi during my Masters and then as an Associate Researcher has had a lasting impression on my life and on my career at UW. His mentorship and friendship helped me to be a better researcher, mentor to others, and person. I often think of the collaborative work we did with others, and how I now use that as an example to form new collaborative relationships. As a mentor, he taught me how to better listen to others and share my experiences with people I've come to mentor. He also helped me to find my strengths and share those strengths with others and to focus on the important things in life.



# Sam Alper, Ph.D.

[Bentzi was] someone who would sit by your side, observe, take notes, and do everything in his power to understand a situation to make sure that he could support you. Who that "you" was didn't seem to matter. If you look into his work, talk to the people he worked with, you'll find his driving motive was to help people – patients, healthcare professionals, his students, or pretty much anyone who asked.



I couldn't have done this without the amazing  
people you see below.



Dibora Haile, Jaime Bears, Cristalle Madray, Preston Claiborne, and Claire Wellbeloved-Stone