
Rivet Counting and Ocean Crossing: Case Examples Illuminating the Fractality of the Theory-Practice Cycle and the Importance of Horizon Expansion

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Abstract

While the “UX” field redefines itself – generalist versus specialist, academic versus practitioner – we often fail to see the importance of the cyclical nature of our endeavors as contributors to an evolving body of both theoretical and practical knowledge. A cycle wholly necessary for progress that involves courage situationally and precision longitudinally. We illustrate this assertion with a historical example: the remarkable “Grand Tour” of the *HMS Challenger* in 1872, as well as case examples drawn from our work illustrating where theory and practice threatened to collide and swamp us, where the practicalities of established approaches and unexpected hurtles threw us into the fractal maelstrom that occurs when the known meets the unknown. We share these experiences and lessons learned in the spirit of *fractality* (a term we will define). These “remixes” illustrate the importance of the theory-practice cycle for progress, and offer tips for breaking the rules.

Introduction

History, and the study of it, is fractal. Philosophies, movements, and events mirror each other over time, recurring periodically and episodically in ways that

tantalize in their symmetry and surprise in their uniqueness. Remix invites us to examine the ways in which two key facets of our field exist seemingly in opposition, yet in truth sustain each other– if we are facile enough to discover it, or fortunate enough to have a hand in perpetuating the cycle. Academic Theory. Business Practice. It's tempting to view Academia as the continent from which practical solutions are exported and see practicality as a ship released from Academia's confining shores to ply the open seas of Commerce. A uni-directional process that begins with theory and ends with practice. This fallacy, that Academia and Practice are somehow separate, or worse, in opposition, belies the cyclical nature of the theory-practice cycle of hypothesis, validation, outcome, iterative introspection, and innovation; impacting the likelihood that innovation occurs. User Experience (UX) Practitioners are among the worst offenders. Our field draws its techniques from myriad other fields, sitting at the crossroads of psychology, cognitive science, market research, human factors engineering, visual design, ergonomics, and others. Faced with a rich supply of approaches, techniques, and established philosophies, our practitioners freely borrow and adapt techniques from one field to accomplish goals in another. Our evolving practices somehow inspire us to freely bastardize, refit and remix Academia's techniques, sometimes ruthlessly, to meet the practical needs of client projects and the moment. Academicians may see this as a travesty of misuse, while Practitioners may see unapplied theories as a wasteful shame. Our snobberies can keep us distant. And too often what Practitioners learn "at sea" may be truly inspiring to those ashore. As History and the study of it shows us recurring fractal patterns, we must remember the nature of our work- that theory and

practice are not opposing ends of a spectrum, but vital steps in a recursive cycle that we forget and rediscover throughout our careers. Fractal. Practical. For fun, let's call this: "fractical." Fracticality, if you will, is surprising, easily missed, and ultimately essential to our progress as a field.

Fracticality is so hard to keep in focus- even the phrase "the field," when used to describe our endeavors is fraught. User needs research, Human Factors, User Experience, Engineering, Usability, User Centered Design, Development, UX, Human Centered Design, and Visual Design. How practitioners of Academia and commerciality view themselves, define their purpose, their passions, their growth– shifts over time. They're shifting now. "Broadening the umbrella" to honor the ways in which our field permeates the fields around it, recognizes that designers, researchers, developers, professors, thought leaders, engineers, managers, and others may justifiably lay claim to what we do and join us on the shore or at sea not as edge cases, or guests, but colleagues. How we define ourselves may seem, pardon the phrase, academic, compared to focusing on what we *do* but to others it may be the thing itself: how can we know what we do if we cannot define who we are?

Defining a field is, itself, an example of the difficulties inherent in maintaining a clear view of fracticality. Surely, one thinks, other fields have found solutions for keeping Theory and Practice in sync. To test this theory, we semi-randomly picked another field to see how its adherents define themselves. We chose "Maritime History." It seemed apropos: Travelling the oceans (practice) and cataloging the importance of those voyages and their impacts (Academia) is a

human endeavor that reaches as far back in recorded history as the late 5th millennium BC. We might expect a field of study so crucial to the rise of civilization would be easy to define. In a practical search of the simplest possible definition of how “Maritime History” defines itself we found Wikipedia’s definition, which includes the following caveat:

“There are a number of approaches to the field, sometimes divided into two broad categories: Traditionalists, who seek to engage a small audience of other academics, and Utilitarian’s who seek to influence policy makers and a wider audience.” (Emphasis ours.) One approach to maritime history has been nicknamed ‘rivet counting’ because of a focus on the minutiae of the vessel. But revisionist scholars are creating new turns in the study of maritime history. This includes a post-1980s turn towards the study of human users of ships (which involves sociology, cultural geography, gender studies and narrative studies), and post-2000 turn towards seeing sea travel as part of the wider history of transport and mobilities.” (1)

Does this sound familiar? In seeking a simple definition of Maritime history we discover the implication that Academia and Practice are at odds even on the shores of one of humankind’s oldest professions. If these two maritime history factions have not found peace, what hope have we in our own field? How might we forgo the tug of war between generalists and specialists? We see in the UX field, through the evolution of “human factors” to encompass not just mechanical engineering and human computer interaction, but a broader range of contributors, a similarly expanded purview that encompasses seemingly disparate fields of study that may have crucial relevance to our work if we recognize them. To provide a practical example: In our UX-related work in healthcare we see an emergent trend

among medical device manufacturers to seek to understand not just the asthma inhaler but the cultural milieu of the patient who holds it, how they store it, how and when they interact with it, and why they choose to use it as part and parcel of their own wellbeing. In the past: a prescription, a stern instruction from a physician, and a small print text-based instruction packet might have been the totality of the medicinal on-boarding process. “Why,” Industry thinks, “would anyone not take medicine as prescribed, perfectly every time, using the devices we’ve given them exactly as prescribed?” This view is an uncanny fractal reflection of how a sea Captain famously described his 1880s-era ship’s lack of safety lines for deckhands by saying: “Safety lines? Why would we need those? It would be stupid to let go!”

Later, somewhere along the line, the im-fractality of this view made its way back to Academia, and today we have safety lines, lifejackets, lifeboats, signage, safety goggles, seatbelts, helmets, and other examples of how broader views lead to more effective solutions. And fewer sailors lost at sea. Hence the importance of “Fractality.”

In our medical device example, the new fractality is opening eyes: In seeking more effective healthcare solutions, we as practitioners and trusted advisors are distinguishing between times when narrow, specialized focus is appropriate (in this example the scientific process of building an asthma inhaler), and times when a holistic view is required to generate optimal solutions that include not just care provision, but care reception (understanding which factors contribute to medicinal adherence beyond a good understanding of ergonomics). And our clients are listening, and

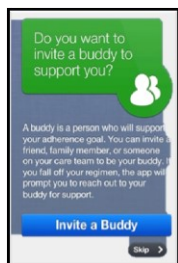
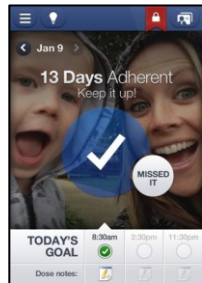


Figure: Screenshots of the Mad*Pow/CDC "Every Dose, Every Day" iOS/Android mobile application

profiting. As we go about our work, bounded by limitations of time, budget and perspective we rediscover and forget, rediscover and forget, that neither academia or practice stand-alone. As we examine theories and products *in vivo* we advance the field but only by expanding the horizons of those who fund and accompany us. Helping our commercial clients to take more holistic views of their products and their clientele is an ongoing endeavor.

Maritime History again provides a fascinating parallel of Theory and Practice joining forces to monumental effect. A nautical reminder of seeing ourselves as contributors to the theory-practice cycle. We will follow it with a question.

On December 21st, 1872 the battle-hardened naval vessel *HMS Challenger* left Portsmouth, England under sail and steam. For fourteen years she had been the pride of the British Royal Navy: a *Pearl*-class corvette and the flagship of the British Australia Station. On this December day she had a wholly unique mission and a new profile. Under the direction of the Royal Society and the University of Edinburgh, she had been remixed: her spars were shortened, all but two of her guns were removed, new quarters and laboratories were added, and, she was outfitted with a dredging platform. Her holds were loaded with ocean floor sampling equipment and unusually: 181 miles of rope.

Challenger was staffed with 237 officers, crew, and scientists. But why so much rope? In 1872 naval explorers and cartographers had charted the ocean's shorelines, but knew next to nothing about its depths. Among countless scientific and chemistry experiments, The *HMS Challenger's* primary goal was to lower rope and equipment into the ocean to discern how deep the

waters went. Specifically, "To investigate the physical conditions of the deep sea in the great ocean basins. . . in regard to depth, temperature, circulation, specific gravity, and penetration of light."

For the next four years the *Challenger* travelled over 68,000 nautical miles around the globe, sounded the Mariana Trench to such a depth that a portion of it was named after her, and collected enough data to fill fifty volumes – that took nineteen years to publish. Now online, in them we see the sailor-scientists' ingenuity in remixing their techniques, equipment, and hypotheses. Literally a textbook example of the theory-practice cycle at its best and by ensuring that knowledge learned *in vivo* returned to inspire additional study, an object lesson in the importance of fractality. The *Challenger's* findings sparked the birth of an entirely new field of study: oceanography. An incalculable effect on countless other fields that still hear the *Challenger's* resonance today.

Our question then, is this: Was the Challenger Expedition an academic exercise, or a practical one? Rivet counting or horizon broadening?

Modern Day Rivet Counting

Rivet counting isn't new. Many of our corporate and government clients engage us to build the ship, not the voyage. Clients often say "We want to build a mobile application because everyone has one and we don't." Turning that opportunity into a worthier pursuit means reaching past user centered design techniques we are familiar with and directly challenging established academic norms. For example: The U.S. Government's Centers for Disease Control and Prevention engaged Mad*Pow to design and develop a mobile application that would improve medicinal adherence among

patients with HIV/AIDS. Patients' medicinal regimens are complex and often during treatment patients experience worsening of their symptoms before they experience perceptible medicinal benefits.

During the traditional user-needs assessment activities, (interviewing physicians and caregivers, conducting data and literature reviews to identify core factors related to successful medicinal adherence), discoveries surprised us: Much of clinical practice "training" for patients appeared to center around assumptions that patients would be perfectly medicinally adherent (take their medicine on time and correctly- always) and persuasion-based instruction. ("If you don't take this, bad things will happen.") Much of the academic literature we encountered regarding medicinal adherence barriers focused on persuasion, a better short-term than long-term technique. For example, a persuasive attempt to give "reward points" becomes increasingly undesirable over time as the effort of maintaining adherence grows and interest in the reward wanes. Instead, "motivation" – educating, informing, and inspiring, is much more effective. The design team went back to basics, identifying successful behavior change techniques and generating a motivation and behavior change framework to support the application product team's decision-making by defining desired behavior changes first, then the activities that gave the application the greatest likelihood of success.

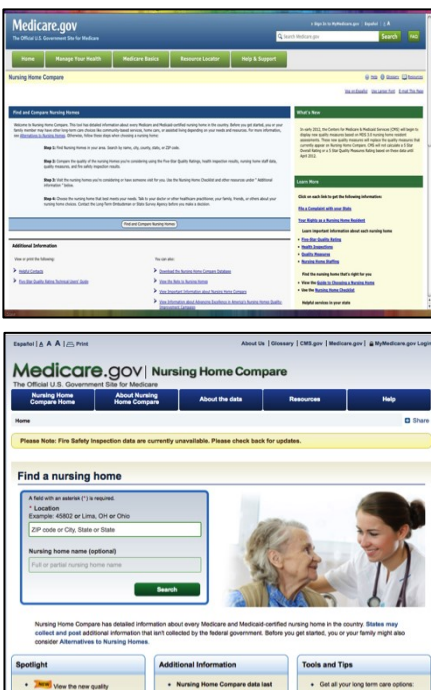
The resulting mobile application, "Every Dose, Every Day" incorporates motivational techniques instead of persuasive ones. It doesn't inspire fear, attempt bribery, or to convince. It strives to educate and inspire through continued use and visible therapeutic outcomes. It doesn't "nag" when encountering non-

adherence and includes motivational opportunities, like the ability to set a loved one's photo as a background, for a visual reminder of why medicinal adherence is and sharing those responses with the CDC leads to insights into patients' mindsets. The visual design is reserved but inviting and the reporting features offer insights into CD4 levels which, though ostensibly imperceptible, indicate that progress is being made. Before release it went through patient piloting to verify its clinical relevance. Successful trials indicate that the time-honored technique of "persuasion" can be powerfully unseated by pairing motivational and educational techniques with good interaction design.

Educational opportunities

Formal educational programs are another arena where theory and practice regularly collide and invite practitioner "remixing." The Bentley University User Experience Center (UXC), a commercial consultancy adjunct to a Human Factors and Information Design (HFID) graduate program, offers graduate students "real world" practicums with commercial companies. The students get to utilize user centered design techniques and companies receive value through design evaluations and user research-based recommendations for product enhancement. These opportunities happen both through the UXC and graduate coursework. It's a near-ideal example of fractality because "theory" is fresh in the students' minds and "practice" exposes them to clients and real-world limitations of time, budget, and understanding. The work students do as cross-team collaborators results in new approaches remixed from old methods and promotes peer-to-peer skills sharing. Students who worked in design help working groups produce engaging reports through clever visualizations. Students with development skills

Case Study: ReMix



The top Figure shows a Landing Page for the Medicare Nursing Home for a “Before” user-needs based improvement comparison. The lower Figure shows the revised Medicare.gov comparison tool page. Note the visual simplicity of the page, use of natural language, and photographic imagery to provide positive emotional engagement.

help demystify engineering’s linear approach to problem-solving in a manner that helps them devise design recommendations that lead to viable technical solutions and approach “unsolvable” problems.

For example: the UX chestnut “How many research participants is enough to support decision making?” One class discovered that focusing recruitment to a single well-defined persona yielded usable findings with fewer participants. Others intuited new data collection techniques when a prototype failed during a study session. While a student with development skills fixed the prototype, another jury-rigged a new approach using Microsoft product reaction cards combined with pictures to elicit feedback that exceeded what otherwise have been the result. Moreover, the students’ post-intervention experiences directly validate (or invalidate) the advice of their instructors and contribute to the quality of instructors’ advice to future students. Fractality leads to innovation in technique and instruction.

Usability of Medicare.gov

For the last 5 years, Bentley UXC has been working on improving the UX of Medicare.gov, which operates under the purview of the U.S. Government Center for Medicare and Medicaid Services (CMS). Among other features, Medicare.gov offers tools to help patients find and compare doctors, hospitals, nursing homes, and services. The UXC’s work on Medicare.gov focused on the Nursing Home Compare tool (NHC) in order to bring it into alignment with the CMS Strategic Objectives: 1 Improve Quality of Care, 2 Reduce harm, 3 Improve mortality rates, and 4 Promote best practices through a focus on families and individuals

Bentley UXC began the project by employing traditional methods for data collection to inform the generation of personas and use-cases. Over 2 years, we collected data from more than 30 participants (in cohorts of 12 or fewer). Critics of our methodology argued that we could not develop adequate personas and design strategy for broad populations with such low numbers. In response we integrated web analytics and contextual inquiries conducted in nursing home settings, using the web analytics to identify areas of interest for the contextual inquires. However, validating personas in this manner became tricky, as interviews elicited powerful emotional responses from participants, necessitating caution. Despite this, interview data supported persona validation and redesign and the resulting website redesign was so well received it became the landing page model for Medicare.gov’s comparison tools. A non-traditional route through “stormy seas” led to success.

Conclusion

The *Challenger’s* sailor-scientists achieved success through science tempered by practicality. As we define ourselves: sailor, scientist, generalist, specialist, academic, practitioner there is value in seeing the fractality of our endeavors – that our evolving body of knowledge is both theoretical and practical. Are we rivet counters or horizon expanders? Can’t we, like the *HMS Challenger*, be both?

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