WPI

Naval Information Warfare Center PACIFIC

Acquisition Research Program Presentation:

Correlating a User Experience (UX) System to Product Success

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My Background

- Undergraduate Education
  - B.S. in Structural Engineering from the University of California at San Diego (UCSD)
- Graduate Education
  - M.S. in Manufacturing Leadership from Rochester Institute of Technology (RIT)
  - 54 credits earned toward a Ph.D. in Systems Engineering from WPI
- Professional Certification
  - Production, Quality, Manufacturing (PQM) Level III certified

- Naval Information Warfare Center (NIWC) Pacific (Formerly SPAWAR Systems Center Pacific): January 2011 – Present
  - ND-0830
    - Senior Systems Engineer (January 2015 – present)
    - Installation Requirements Drawings Technical Warrant Holder (January 2012 – May 2020)
    - Environmental Qualification and Testing Engineer (April 2013 – December 2014)
    - Junior Mechanical Engineer (January 2011 – December 2011)
- US Navy: June 2000-June 2006
  - Submariner
    - Navigation Electronics Technician

UX System: Test and Control Setup

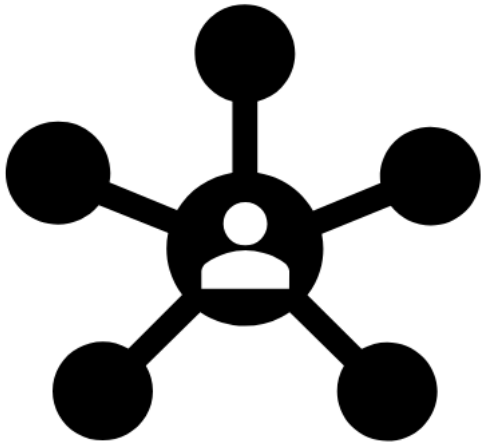
–Test and Control

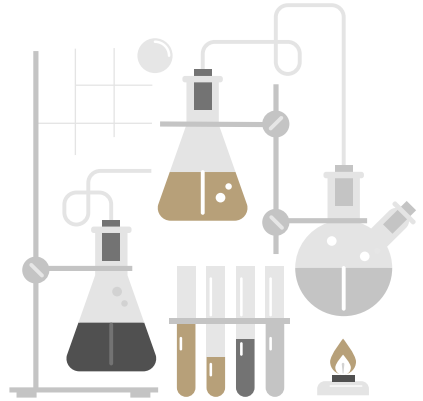
- Independent variable: this will be evaluated by the degree to which a user experience system is considered in an end product.
  - A Likert style scale (0-4) with surveys will be used to perform this evaluation.
- Dependent variable: an appropriate measure of success will be identified for each comparison e.g., revenue, units sold, etc.
  - Via linear interpolation, a global scale (0-10) from which the success for both the test and control products under consideration will be determined.

UX System: Test and Control Validation

- Validation approach
  - Is there a Spearman correlation to my hypothesis?
    - Hypothesis: product development teams are more successful when they identify their products as part of a user experience system which holistically address non-functional requirements.

User Experience System:

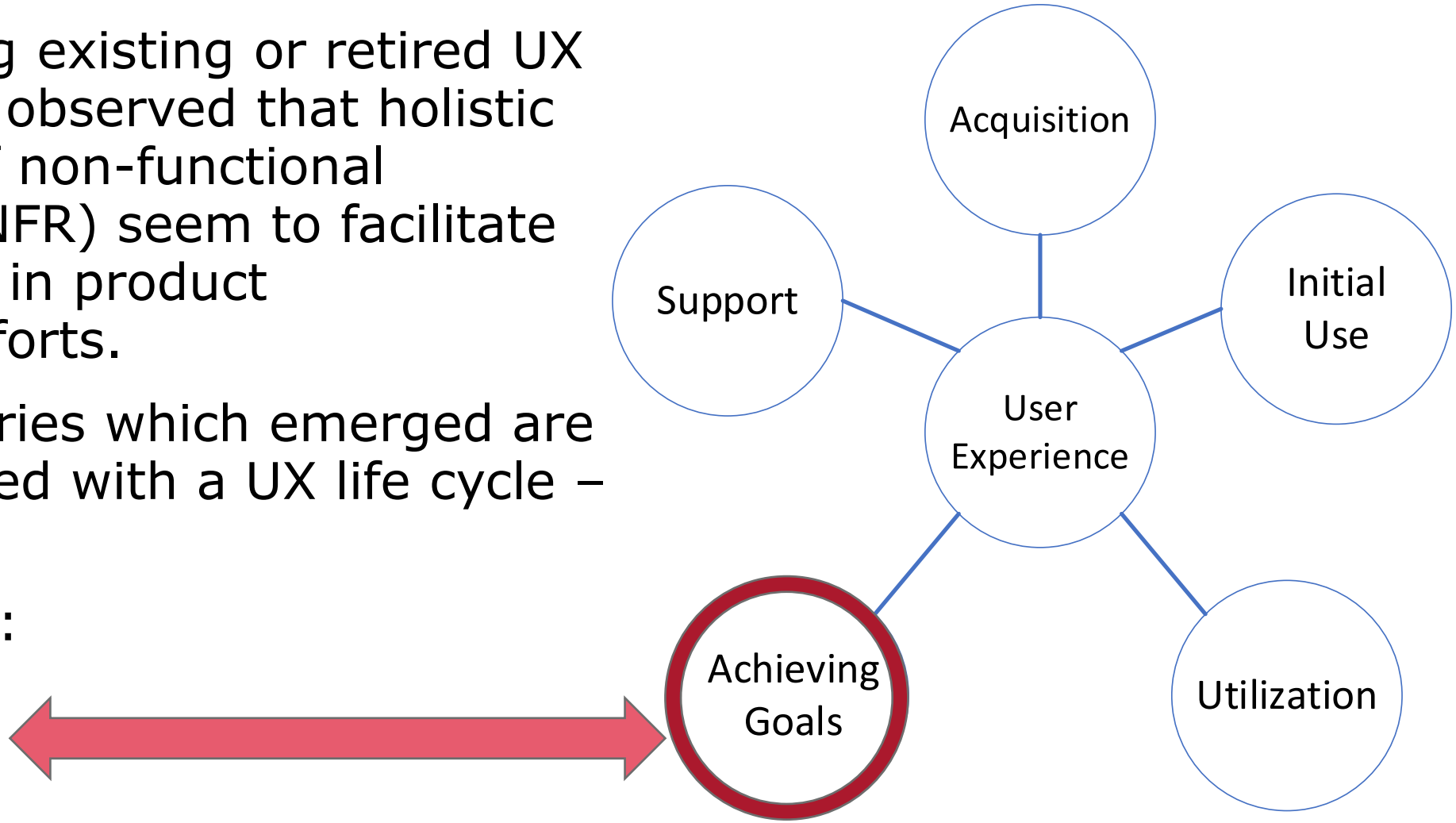




  - Spearman correlation equation
    - $r_s = 1 - \frac{6 \sum d_i^2}{n(n^2-1)}$
      - The closer r equals one, the more positive the correlation.
        - **<u>This would confirm my hypothesis</u>**.
      - The closer r equals negative one, the more negative the correlation.
      - If r equals zero, there is no correlation.

UX Categorization for NFRs

- While identifying existing or retired UX systems, it was observed that holistic consideration of non-functional requirements (NFR) seem to facilitate greater success in product development efforts.
- The NFR categories which emerged are seemingly aligned with a UX life cycle – as shown.
- Achieving Goals:
  - Availability
  - Interoperability
  - Reliability



UX System: Spearman Correlation Analysis

- Spearman correlation with a subjective UX Score:

	UX Score	Success (Global) Score	UX Score (rank)	Success (rank)	d	d^2
1A: iPod	53	9.65	2	2	0	0
1B: Zune	23	0.07	3	4	-1	1
2A: iPhone	55	9.85	1	1	0	0
2B: BlackBerry	20	0.65	4	3	-1	1
$\sum_i d_i^2$						2

$r_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$; $r_s = 1 - \frac{(6)(2)}{4(4^2-1)}$ = 0.8 which implies a positive correlation.

Relevance to DOD

- Placing cost in the forefront, how efficiently can a system – with the attributes important to the warfighter – be acquired?
- Pertaining to training, how can the learning curve needed to operate a warfighting system be minimized without compromising effectiveness?
- When the warfighter is under extreme pressure, how can it be ensured that a warfighting system operates in a usable and safe manner?
- With the number of interconnected systems within the DOD, how can it be ensured that a given system will be available to reliably interoperate with other systems to achieve the warfighter's goals?
- Concerning return on investment, how can warfighting systems achieve longevity via proper support?

Next Steps

Immediate Next Steps

1. Fully identify the statistically relevant set of commercial pairwise comparisons.
2. Create a survey to determine the degree to which a UX system has been implemented in each observation.
3. Obtain objective success data for each observation.
4. Provide the surveys to current graduate students enrolled in a systems thinking class.
5. Evaluate the survey effectiveness.

Intermediate and Long-Term Next Steps

- Intermediate:
  1. Polish surveys and send them to a statistically relevant set of participants.
  2. Complete dissertation.
- Long-term:
  1. If it is found that commercial products which are part of a UX system correlate to success, then translating this insight into DOD applicability will be an emphasis of future research.