

Is Bigger Always Better? Toward a Resource-Based Model of Open Source Software Development Communities

(Glen Sagers, FSU MIS, Spring 2007)

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Overview

- Summary of dissertation
 - By chapter
- Analysis
 - System success
 - Systems development and implementation
 - TRA, TAM, UTAUT
 - Other issues
- Follow-up study
 - Changes, improvements, additions

Dissertation summary

- Ch. 1: Introduction
 - Introduced open source software (OSS)
 - No exploration of
 - Sustainment of OSS volunteer communities
 - Their influence on software's success
 - Benefits of volunteering outweigh communication, social loafing issues in OSS communities (?)
 - Dissertation intended to
 - determine how OSS communities are sustained
 - if they are necessary for the success of the software

Dissertation summary

- Ch. 2: Conceptual Model and Theoretical Foundation
 - OSS concept, definition (Open Source Initiative)
 - Free redistribution
 - Free availability of source code
 - Ability to modify and derive new software
 - No discrimination
 - Compare, contrast OSS with commercial software
 - OSS as a “public good”
 - Not used up in consumption
 - Nobody excluded from its use

Dissertation summary

- Ch. 2 (continued)
 - Communities
 - “Groups of individuals who work together to help each other achieve a common purpose”
(Cothrel and Williams, 1999, as cited in Sagers, 2007, p. 12)
 - Social capital: Trust, sense of belonging
 - Life cycle of communities
 - OSS projects
 - (Mostly) volunteer developers, active users, and Web site
 - Codified knowledge
 - Documentation, communication, bug/feature databases
 - Software downloads

Dissertation summary

- Ch. 2 (continued)
 - Prior OSS research
 - Business / advocacy
 - “limited value ... except to illustrate trends” (p. 17)
 - Demographics, motivations
 - “complete analysis” of motivations beyond scope (p. 18)
 - Economics
 - Degree of private economic benefits to individuals, firms
 - Software quality
 - Generally (but not always) higher than commercial software
 - Organization and governance
 - Hierarchies, “onion-like layers,” and/or “social networks” (p. 19)
 - “social norms [used] to induce compliance” by volunteers (p. 19)

Dissertation summary

- Ch. 2 (continued)
 - Resource-based model developed
 - Extension of Butler’s 2001 “Resource-Based Model of Online Social Structures”
 - Figure 3 (p. 31)

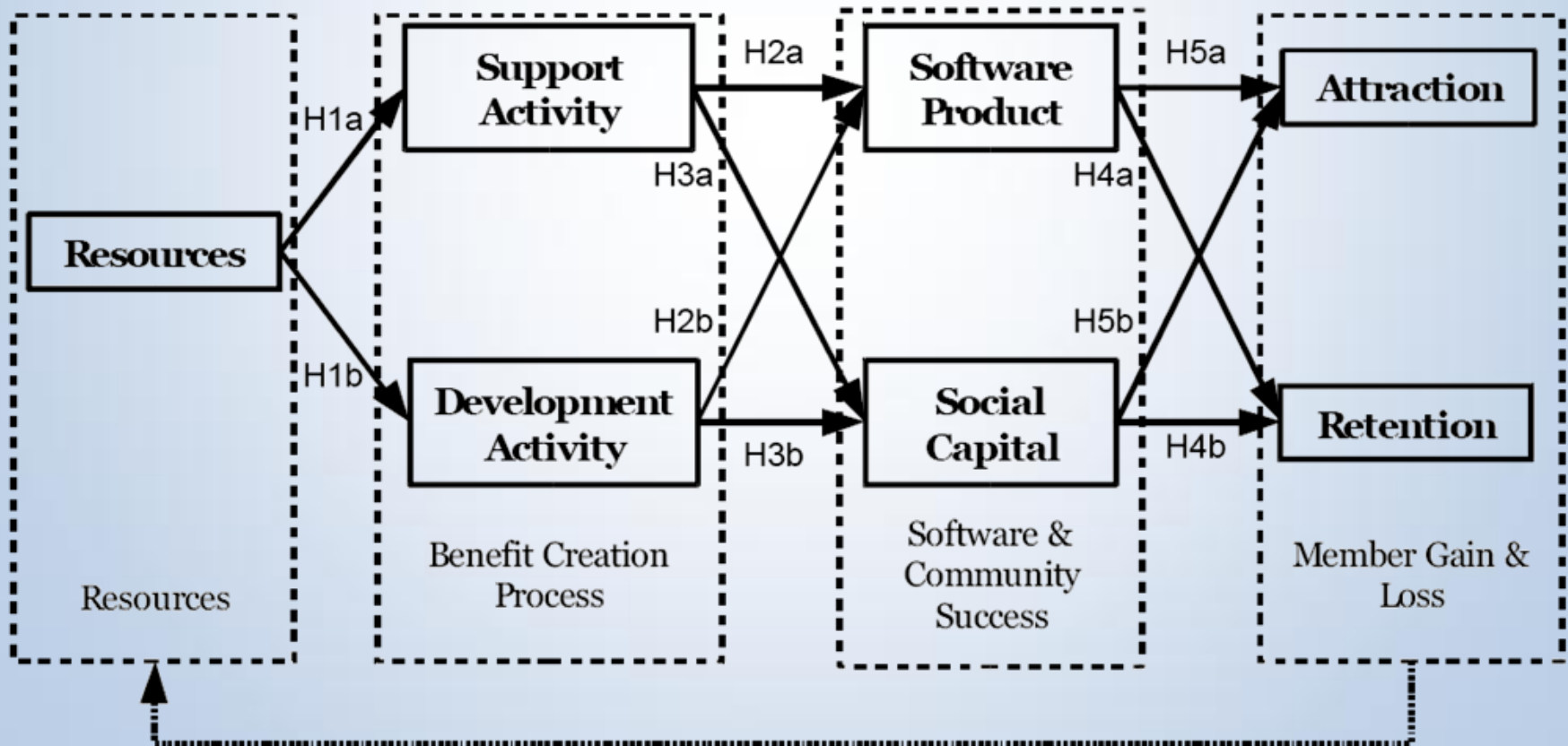


Dissertation summary

- Ch. 3: Research Model and Hypotheses
 - Continued review of literature on
 - resources
 - communication activities
 - Support
 - Development
 - success
 - sustainability
 - Hypotheses
 - ↓ Larger OSS community (high resources)
 - ↓ More support, development communication activities
 - ↓ Greater software success, greater social capital (trust and sense of belonging)
 - Higher retention and attraction rates

Dissertation summary

- Ch. 3 (continued)
 - Research model and hypotheses (Figure 4, p. 42)

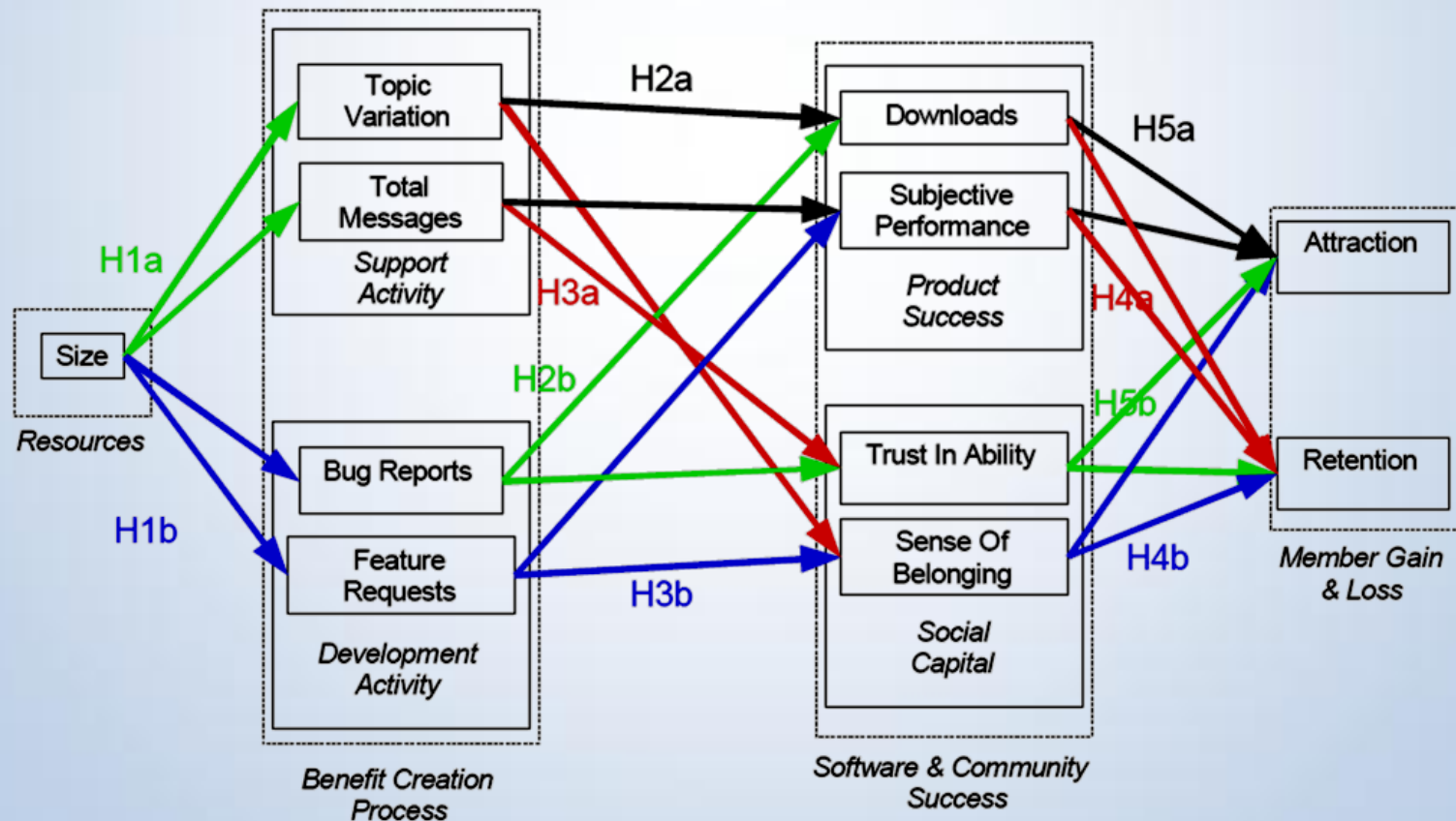


Dissertation summary

- Ch. 4: Methodology
 - Methods used
 - Analysis of Sourceforge project data
 - Survey of project members
 - Sampling
 - 44 Sourceforge-hosted OSS projects
 - Sampling frame: “Top Forum Posts Count” list (100)
 - Selection criteria:
 - Used “Open Discussion” forum
 - Did not use other venues for communication
 - Had at least 10 posts to forum during six-week period

Dissertation summary

- Ch. 4 (continued)
 - Fully specified model (Figure 9, p. 54)



Dissertation summary

- Ch. 4 (continued)
 - Subjective performance
 - Survey
 - “Software performance and utility,” aka **attitude** (Hartwick & Barki, 1994)
 - **Trust** (Jarvenpaa et al., 1998)
 - **Sense of belonging** (Jones et al., 1996)
 - Sourceforge data
 - Changes in development status (e.g. alpha → beta)
 - Timeline (at right)
(rearranged from Figure 10, p. 54)



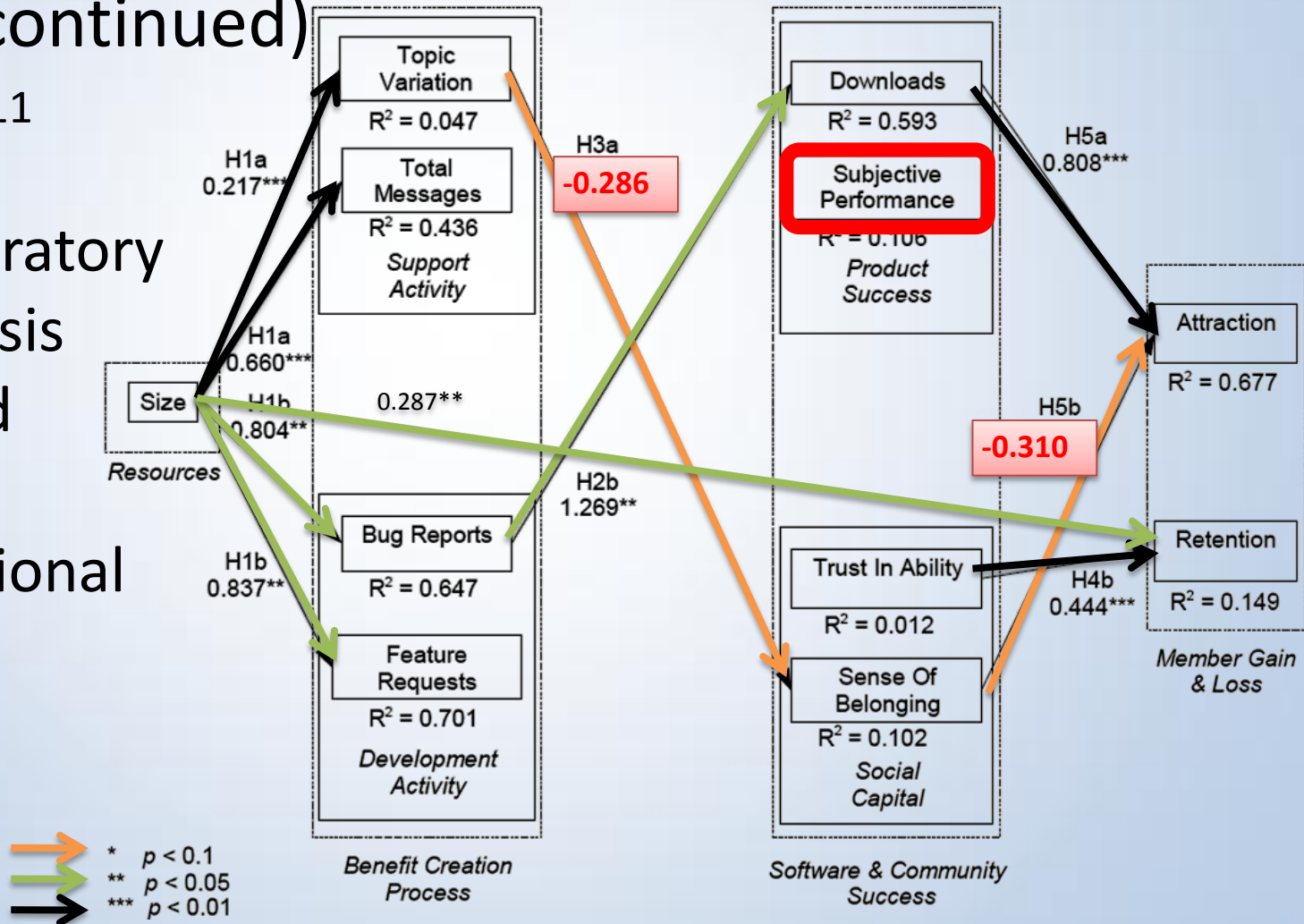
Dissertation summary

- Ch. 5: Analysis and Results
 - 39 projects analyzed
 - 5 moved away from SourceForge during study
 - Survey response rate: 22%
 - Partial least squares (PLS) analysis
 - Had to reduce to two predictors of software success
 - Hartwick & Barki's attitude scale
 - Number of downloads
 - Adequate convergent, inter-item, discriminant validity
 - A few indicators did load above 0.50 cutoff on other factors
 - » This was not mentioned

Dissertation summary

• Ch. 5 (continued)

- Figure 11 (p. 61)
- Exploratory analysis found one additional path



Dissertation summary

- Ch. 6: Discussion
 - Some hypotheses supported, some not
 - Potential reasons discussed, based on findings and literature
 - Reporting bugs, requesting features not enough for individuals to feel software is successful
 - Most volunteers come and go, volunteering only when they are affected by a bug or need a new feature
 - Members may not spread the word, or may not convince others to use the software or join the community
 - Users did not report bugs discussed in forums as often as expected, download software they already used, and/or already felt unsatisfied prior to posting
 - Higher topic diversity led to lack of common interests within the community
 - Survey respondents were users, not developers
 - Communities become closed and do not accept outsiders

Dissertation summary

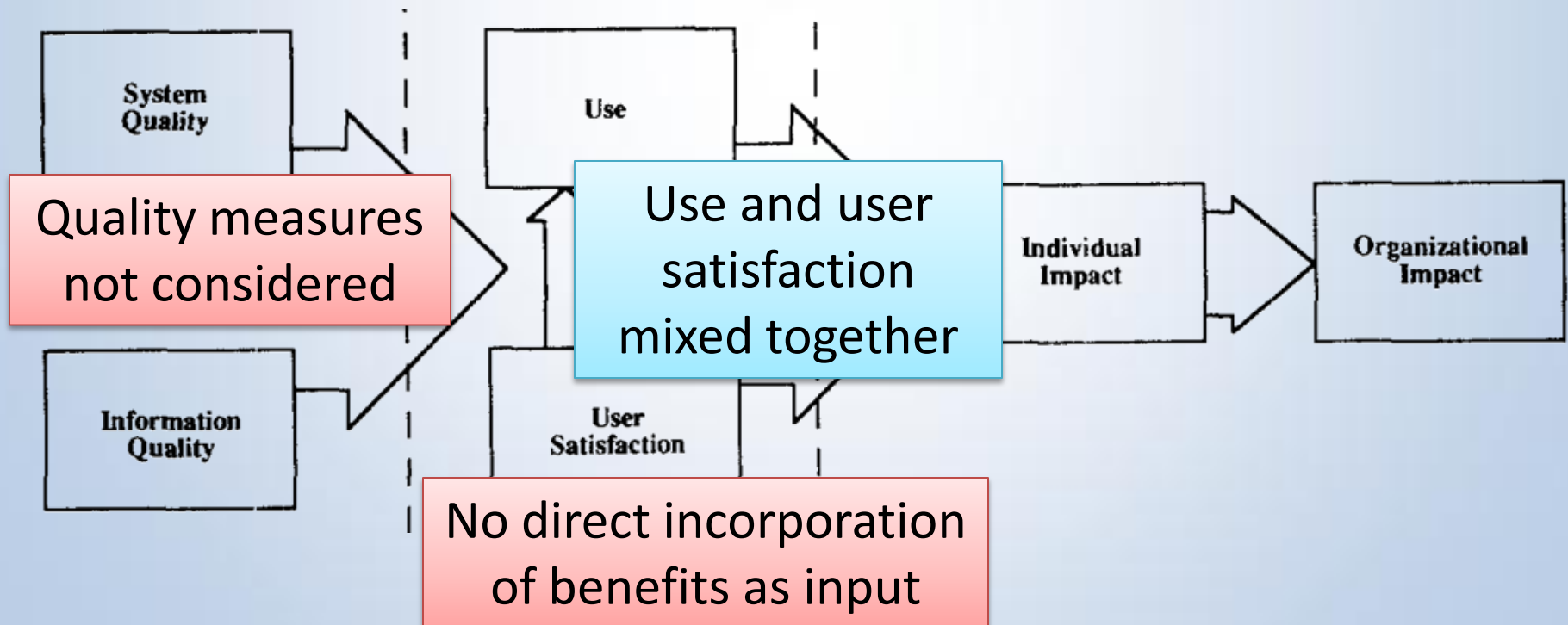
- Ch. 7: Conclusion
 - Limitations discussed
 - Small sample size (generalizability, effect size limits)
 - Limited time period (nine months)
 - Low frequency of data samples
 - Non-response bias possible
 - Data collection limited to a single communication venue
 - Contribution: filled gap, confirmed related findings, extended Butler's theoretical model
 - Future research suggestions
 - Replication with larger sample, different population
 - Longer time period, more frequent data samples
 - Different constructs for software and community success, communication activities

Analysis

- System success
 - DeLone & McLean's (1992) taxonomy
 - Communication activities: **use**
 - Number of downloads: **use**
 - Subjective performance: **user satisfaction** (attitude)
 - Trust and sense of belonging: **individual impact**
 - Do have a social component
 - Attraction and retention rates: **organizational impact**
 - Albeit not strictly performance-based

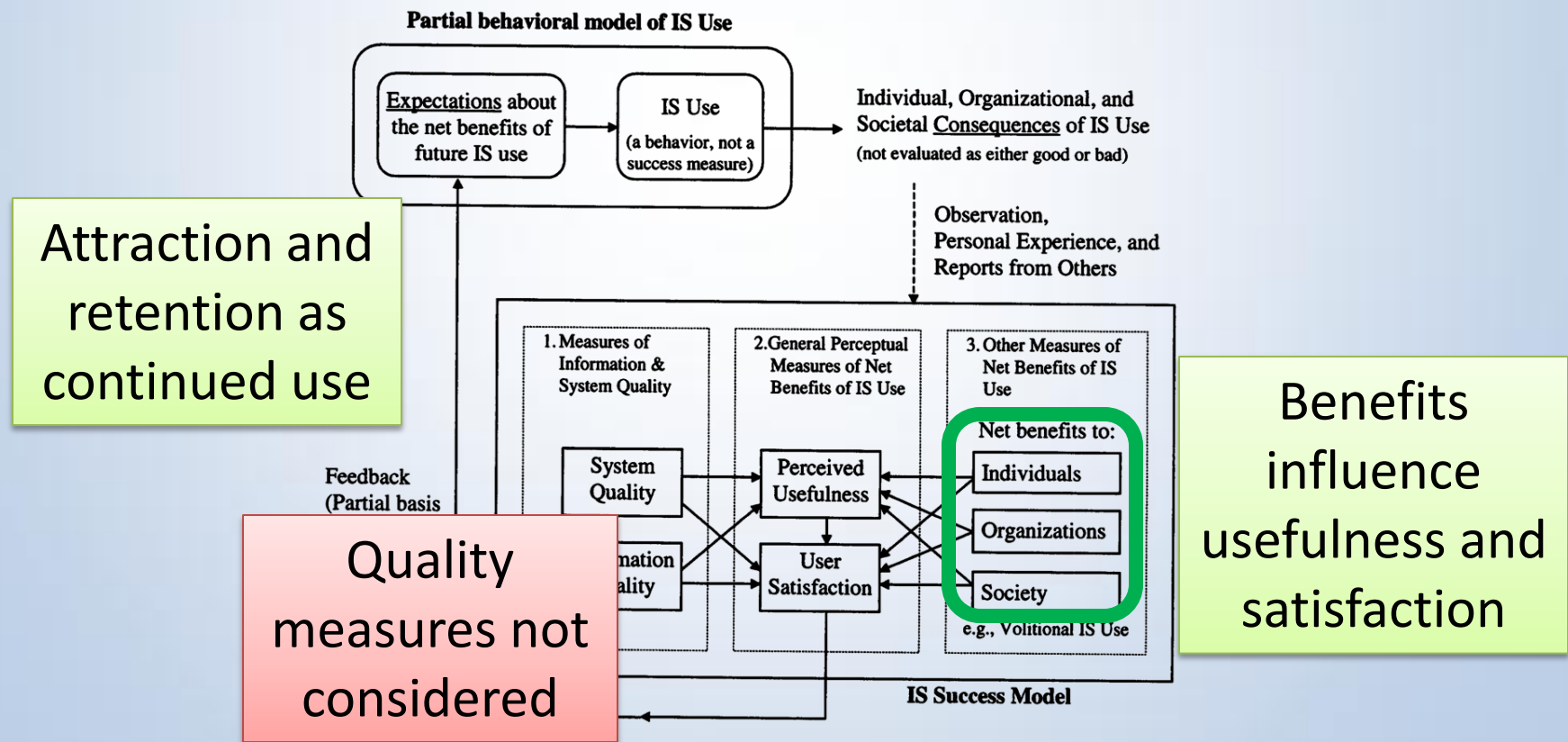
Analysis

- System success (continued)
 - DeLone & McLean's (1992) model vs. Seddon's (1997)



Analysis

- System success (continued)
 - DeLone & McLean's (1992) model vs. Seddon's (1997)



Analysis

- Systems development and implementation
 - Curtis et al. (1988)
 - Confirms Sagers's use of communication activities as a key element of his model
 - Qualitative study of process, rather than quantitative study of success
 - Cooper & Zmud (1990)
 - Adoption and infusion of systems
 - Could follow-up exploring the feedback loop with diffusion of innovation theory
 - Orlikowski (1993)
 - Longitudinal, but qualitative and interpretivist
 - Could follow-up exploring organizational change in context of adopting new tools (i.e. Sourceforge hosting system)
 - Likely a step too far at this point

Analysis

- Systems development and implementation (continued)
 - Hartwick & Barki (1994)
 - Sagers used their attitude scale
 - Findings imply participation in OSS community will lead to
 - greater involvement
 - more positive feelings
 - overall continued use, participation in development
 - However... **attitude scale fell out!**

Analysis

- TRA, TAM, UTAUT
 - Attitude also has fallen out in this literature
 - Unfortunately Sagers does not cite (except briefly)
 - Acceptance certainly should have played a role in success, attraction, retention
 - UTAUT includes social influences, voluntariness, but does not consider longitudinal behavior
 - Follow-up studies should probably consider factors from TAM and UTAUT as measures of product success and satisfaction

Analysis

- Other issues
 - Low importance placed on motivation
 - Despite strong bearing on sustainment of community
 - Study exploring motivations in context of his model would be highly insightful and useful
 - Life cycle could be explored further
 - Projects just beginning or ending / “dying”
 - Minor methodological issues
 - Time period consistency
 - “six weeks” varies by more than seven days
 - Collection of data that isn’t used
 - Number of downloads potentially a poor proxy for use
 - Some indicators loaded above 0.50 on other factors

Follow-up study

- Changes and additions
 - Theoretical framework
 - Draw on Seddon's model in addition to Sagers's model
 - Stronger conception of feedback loop
 - Sampling
 - Larger sample: 100 Sourceforge projects
 - Purposively sample
 - 25 that are just beginning
 - 25 that are ending / dying
 - Randomly sample
 - 50 others (not restricted to a "high activity" list)

Follow-up study

- Changes and additions (continued)
 - Survey measures
 - Different subjective measures of software success
 - Draw from TAM, UTAUT measures of intent, use, satisfaction
 - » Have proven highly valid and reliable
 - Additional questions to measure
 - Visits to the project's Web site
 - Role of respondent
 - » Developer, support, active user, prospective user
 - Motivations
 - Wider scope for communication activities
 - From other forums, listservs as well

Follow-up study

- Additional method: qualitative semi-structured interviews
 - Use to follow up with interesting cases
 - Purposive sampling: 8+ individuals per cycle
 - Individuals interviewed via Skype, phone, or e-mail if necessary
 - Further explore
 - communication activities
 - subjective measures of success
 - motivations for participation and contribution
 - Interview questions based on
 - literature on above topics
 - findings from quantitative methods
 - Take place after each cycle, during data collection for next cycle
 - Interviews continue until saturation of findings reached
 - Additional purposive sampling if required

Follow-up study

- Timeline

- Longer period of study: 500 days

- Frequent data collection

- One cycle every 100 days; five cycles total

- Consistent scheduling to the day for each cycle

- Day 1-25: Size

- Day 26-50: Support and development activities

- Day 51-75: Downloads, survey based on UTAUT for subjective measure of software success, trust and sense of belonging measures for community success

- Day 75: % of bug reports and feature requests closed, changes in development status

- Day 76-100: Attraction and retention

Follow-up study

- Rejected additions
 - Content analysis (quantitative and qualitative) of messages, bug reports, and feature requests
 - Useful, but would likely complicate this proposed study too much
 - Can be included in a second follow-up
 - Qualitative ethnographic research of organizational change in OSS projects and communities
 - Has been some research already here
 - Would be better as separate study
 - Needs further development and careful consideration to be successful



Any questions?

Thank you!