Building a Theory of Open Online Collaboration Using System Dynamics Modeling
(Work in Progress)

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Open Online Collaboration
Communities are…

- online communities
- formed by loosely connected groups of people
- using the Internet as a medium for carrying out collaborative projects
- producing and disseminating information products.
Two Examples

- Open Source Software Development Communities
- Instructional Material Development Communities
Literature Places OSS in Online Communities

Markus, Manville and Agres (2000)

Stanojevska and Schmid (2001)
Classifications for Online Communities

- Hagel and Armstrong (1997)
- Stanoevska and Schmid (2001)
Hagel and Armstrong (1997)

... Transaction Communities...

...
Stanoevska and Schmid (2001)

... Task-and-goal-oriented communities

... Design Communities

...
Research Opportunity

Dynamic interactions between the determinants of success have not been fully explored and theorized yet.

No means to test system-wide policies to improve performance.
Research Design
Research Design

- Literature on Online Communities
  - Parallels

- Literature on Open Source Software Development
  - Theoretical Implications
  - Variables, Causal Relationships, Behavior

- Dynamic Feedback Model of a Generic OSS Community
Literature on Online Communities

Literature on Open Source Software Development

Dynamic Feedback Model of a Generic OSS Community

Interviews with K-12 Instructional Material Development Community

Parallels

Variables, Causal Relationships, Behavior

Theoretical Implications

Implications

Research Design
Research Design

Literature on Online Communities

Literature on Open Source Software Development

Dynamic Feedback Model of a Generic OSS Community

Interviews with K-12 Instructional Material Development Community

Dynmic Feedback Framework that Explains OSS and K-12 Communities

Parallels

Theoretical Implications

Implications

Commonalites/ Differences

Variables, Causal Relationships, Behavior

Structure, Behavior
# Theoretical Approaches to the Study of Online Communities

<table>
<thead>
<tr>
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<th>Authors/References</th>
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<tbody>
<tr>
<td><strong>Public Goods</strong></td>
<td>Kollok, 1999; Millen, 2000; Wasko and Teigland, 2002</td>
<td>Hawkins, 2001; Bessen, 2002</td>
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<tr>
<td><strong>Social Informatics</strong></td>
<td>Turoff and Hiltz, 1982; Hiltz, 1986; Preece, 2000</td>
<td>Raymond, 2001; Fogel and Bar, 2001</td>
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</table>
Gift Exchange

- Between parties who have an existing relationship, or are aiming to build an ongoing relationship;

- Not instantaneous - a gift is not necessarily reciprocated by the giving of a ‘counter-gift’ right away.
Applying Gift Economies to OCs

A ‘digital gift’ can be given to a group of people instead of a single individual, with no or a non-significant additional cost;

A gift is not necessarily reciprocated by the beneficiary, but by someone else that takes part in the generalized exchange.
Implications for Online Communities

A relatively larger community would motivate contributors to a greater extent.
Public Goods

“Non-excludable”
(too hard, too costly, or impossible to exclude the non-payers from benefiting),

“Non-rival” consumption
(consumption by an individual does not hinder other individuals’ consumption of the same good).
### Private vs. Public Goods

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(adapted from Bucovetsky, 2001)
Digital Goods as Public Goods

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## Digital Goods as Public Goods

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<td>Open source D.G.</td>
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Two Challenges in Production

- Motivating individuals
- Coordinating motivated individuals
Motivation Factors

- Expectation of generalized reciprocation,
- Reputation (ego, and opportunities),
- Feeling of self-efficacy,
- Benefits to other members of the community (altruism).
Feedback channels may increase motivation.
Visibility would motivate contributors more.
Larger user population may increase motivation.

Larger community would motivate contributors more.
Visibility would motivate contributors more.
Larger contributor population may decrease motivation.
Larger user population may increase motivation.
Feedback channels may increase motivation.
Social Informatics

Design and Use of Information Systems

Social Processes

Social Structure and Relationships
Social Informatics

Design and Use of Information Systems

Social Processes

Social Structure and Relationships
Social Informatics

Design and Use of Information Systems

Social Processes

Social Structure and Relationships
Implications for Online Communities

Software and media have influence on which community rules can be implemented, and to what extent.

Software, media, and community rules have impact on participation, collaboration, and productivity.
Implications for Online Communities

- Low barriers to entry and contribution would increase participation.

- Accessibility and usability of end-products would increase user population.
Generic Behavior of Successful OOCCs
Generic Behavior of Successful OOCCs
Generic Behavior of Unsuccessful OOCCs
Generic Behavior of Unsuccessful OOCCs

Product Functionality

Time
Growth of Fetchmail

Growth of X Windows

From: Michael W. Godfrey, “Understanding Software Evolution”, Software Architecture Group - Department of Computer Science - University of Waterloo
Growth of Linux

From: Michael W. Godfrey, “Understanding Software Evolution”, Software Architecture Group - Department of Computer Science - University of Waterloo
Growth of Perl

Growth of Perl - Size in kbytes

From: www.perldoc.com
Growth of Perl

Growth of Perl - Number of Files

From: www.perldoc.com
Developers

Product Functionality

New Product Functionality Added
Developers

Product Functionality

Overall Attractiveness of Product for Developers

Attractiveness of Product for Developers Due to Functionality

Limit on Product Functionality Ratio

Harvested Functionality

New Product Functionality Added

Product Functionality Adding Efficiency

Potential Developers

New Developers

Developers

Leaving Developers

Production

+ +

- -
Developers

- New Product Functionality

+ Product Functionality

Adding Efficiency

- Attraciveness of Product for Developers Due to Functionality

- Limit on Product Functionality Ratio

Overall Attractiveness of Product for Developers

- Leaving Developers

+ Leaving Acceleration Due to Functionality

+ Potential Developers

+ New Developers

+ Production

- Harvested Functionality Ratio

+ New Product Functionality Added

+ Product Functionality Adding Efficiency

- Leaving Developers

+ Overall Attractiveness of Product for Developers
Harvested Functionality Ratio

Success in Attracting Users

Users

Potential Users

- New Users

+ +

Attractiveness of Product for Users

+ +

Users Acceleration Due to Success in Attracting

+ +

Harvested Functionality Ratio
Harvested Functionality Ratio

Overall Attractiveness of Product for Developers

Success in Attracting Users

Attractiveness of Product for Developers Due to Users

Users Acceleration Due to Success in Attracting

Attractiveness of Product for Users

Potential Users

New Users
Main Indicators

Time (Month)

Developers : 02_base
Users : 02_base
Product Functionality : 02_base
Main Indicators

Developers: 02_base_hi_pot
Users: 02_base_hi_pot
Product Functionality: 02_base_hi_pot
Main Indicators

Time (Month)

Developers: 02_base_very_hi_pot
Users: 02_base_very_hi_pot
Product Functionality: 02_base_very_hi_pot
Graph for Harvested Functionality Ratio

Harvested Functionality Ratio: 02_base
Harvested Functionality Ratio: 02_base_hi_pot
Harvested Functionality Ratio: 02_base_very_hi_pot
References


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