Aspects of User Motivation in Social Tagging Systems

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Introduction

Social Tagging systems allow users the annotation of resources with terms - so called “tags” - to enable better organization, retrieval and sharing of resources.
Motivation

• **Observations:**
  - Large number of diverse users behaving in different ways are found within social tagging systems
  - Usefulness of tags for different tasks like e.g. semantic extraction or item recommendation has already been verified by previous research

• **Hypothesis:**
  - User behavior (and the underlying motivation) has influence on the utility of tags in social tagging systems
The road ahead...

1. Terminology and related work
2. Two types of tagging motivation
3. Measures for detection and their evaluation
4. Variety of motivation in tagging systems
5. Influence of motivation on utility in social tagging systems
• RQ1 - What kinds of tagging motivation can be identified in social tagging systems?
• RQ2 - Is it possible to measure tagging motivation automatically?
• RQ3 - How does tagging motivation vary within and across systems?
• RQ4 - What effects does tagging motivation have on tasks like social classification and semantic extraction?
The structure of social tagging systems consists of:
- Set of users \( u \in U \)
- Set of tags \( t \in T \)
- Set of resources \( r \in R \)
- The ternary relation \( Y \subseteq U \times T \times R \)
  - its elements are called tag assignments

**Folksonomy** [Hotho2006] - Tuple \( F := (U, T, R, Y) \)

**Personomy** - reduction of the folksonomy to one user (denoted \( F_u \))
State of the Art - Related Work

<table>
<thead>
<tr>
<th>Authors</th>
<th>Categories of Tagging Motivation</th>
<th>Detection</th>
<th>Evidence</th>
<th>Reasoning</th>
<th>Systems investigated</th>
<th># of users per user</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammond et al. 2005 [5]</td>
<td>Self/self, self/others, others/self, others/others</td>
<td>Expert judgment</td>
<td>Observation</td>
<td>Inductive</td>
<td>9 different tagging systems</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Golder et al. 2006 [4]</td>
<td>What it is about, what it is, who owns it, refining categories, identifying qualities, self reference, task organizing</td>
<td>Expert judgment</td>
<td>Dataset</td>
<td>Inductive</td>
<td>Delicious</td>
<td>229</td>
<td>300 (average)</td>
</tr>
<tr>
<td>Marlow et al. 2006 [14]</td>
<td>Organizational, social, [and refinements]</td>
<td>Expert judgment</td>
<td>N/A</td>
<td>Deductive</td>
<td>Flickr</td>
<td>10 (25,000)</td>
<td>100 (minimum)</td>
</tr>
<tr>
<td>Xu et al. 2006 [21]</td>
<td>Content-based, context-based, attribute-based, subjective, organizational</td>
<td>Expert judgment</td>
<td>N/A</td>
<td>Deductive</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Sen et al. 2006 [18]</td>
<td>Self-expression, organizing, learning, finding, decision support</td>
<td>Expert judgment</td>
<td>Prior experience</td>
<td>Deductive</td>
<td>MovieLens</td>
<td>635 (3,366)</td>
<td>N/A</td>
</tr>
<tr>
<td>Wash et al. 2007 [20]</td>
<td>Later retrieval, sharing, social recognition, [and others]</td>
<td>Expert judgment</td>
<td>Interviews (semistruct.)</td>
<td>Inductive</td>
<td>Delicious</td>
<td>12</td>
<td>950 (average)</td>
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<tr>
<td>Ames et al. 2007 [1]</td>
<td>Self/organization, self/communication, social/organization, social/communication</td>
<td>Expert judgment</td>
<td>Interviews (in-depth)</td>
<td>Inductive</td>
<td>Flickr, ZoneTag</td>
<td>13</td>
<td>N/A</td>
</tr>
<tr>
<td>Nov et al. 2009 [16]</td>
<td>enjoyment, commitment, self development,</td>
<td>Expert judgment</td>
<td>Survey (email)</td>
<td>Deductive</td>
<td>Flickr (PRO)</td>
<td>422</td>
<td>2,848.5</td>
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</table>

This work introduces quantitative analysis of tagging behavior in order to shed light on the underlying user motivation.
A differentiation of tagging motivation

Categorizers

Describers


Strohmaier, Markus; Körner, Christian and Kern, Roman (2010).
## Terminology and related work

**Two types of tagging motivation**

- **Measures for detection and their evaluation**
- **Variety of motivation in tagging**

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<th>Describers</th>
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### Categorizers and Describers

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**Influence**

- **Change of vocabulary**
  - costly vs. cheap
- **Size of vocabulary**
  - limited vs. open
- **Tags**
  - subjective vs. objective
- **Tag reuse**
  - frequent vs. rare
- **Tag purpose**
  - mimic taxonomy vs. descriptive labels
Measuring tagging behavior to get insight into motivation

Introduction of measures:

- Language independent
- Content agnostic
- Evaluate user behavior of single user (as opposed to the complete folksonomy)
  - no comparison to complete folksonomy necessary
- Inspect the pragmatics of tags and not contained semantics

Examples of some measures

• Tag - Resource Ratio
  – Ratio of tags to resources

• Tags per Post Ratio
  – Ratio of tag assignments to resources
  – “How many tags are on average used for annotation?”

• Orphan Ratio
  – Percentage of infrequently used tags
  – “How often does a user re-use her tags?”

• Tag/Title Intersection Ratio
  – Percentage of tags occurring in the title
  – “How likely does a user choose tags that are contained in the title of the resource?”

The higher each measure is for a user the more likely she is exhibiting description behavior.
Evaluation of introduced measures

- Qualitative
  - Assessment by human subjects
    Task: Identify if user is categorizer or describer

- Quantitative
  - “Recommender” Evaluation - to measure the effectiveness of the proposed measures
Variety of tagging motivation within and across systems

• To investigate this a number of different datasets were crawled/used:
  • Delicious
  • Flickr
  • Diigo
  • MovieLens
  • and others...

• As reference datasets:
  • ESP Game Snapshot - for descriptive behavior
  • Flickr Sets - exhibiting extreme categorization behavior

Strohmaier, Markus; Körner, Christian and Kern, Roman (2010).
Influence of motivation on utility in social tagging systems

- Emergent semantics in folksonomies
- Social classification
Evaluating influence on semantic extraction / 1

“How does tagging motivation affect emergent semantics in social tagging systems?”

• Used method for discovering synonyms in folksonomies using *tag context vectors*
  • vectors containing co-occurrence of other tags
  • by computing cosine similarity between all vectors it is possible to identify most similar tags

Körner, Christian; Benz, Dominik; Strohmaier, Markus; Hotho, Andreas and Stumme, Gerd (2010).
Stop Thinking, Start Tagging - Tag Semantics Emerge From Collaborative Verbosity. In
Proceedings of the 19th International World Wide Web Conference (WWW 2010), Raleigh, NC,
USA. ACM.
Evaluating influence on semantic extraction / 2

• Ranked by measures we created sub-folksonomies starting with extreme user types and subsequently adding more describers (or categorizers)
• Computed similar tags (synonyms) based on each subset using tag context
• Evaluate semantic quality of similar tags by measuring the average Jiang-Conrath distance [Jiang1997]

Intuition:
The lower the average JC distance, the better the semantics in the system.
Evaluating influence on semantic extraction / 3

- Lower JCN = better semantics
- Performance worse than random baseline
- Including more describers
- Globally best performing configuration - removal of top 10% describers (potential spammers)
Evaluating influence on semantic extraction / 4

Lower JCN = Better semantics

Better than random baseline

40% of describers outperform complete dataset

Best performance with trr measure at 70%

Describers better suited for emergent semantics in social tagging systems

Including more categorizers

 TU Graz – Knowledge Management Institute

Christian Körner
Tagging motivation and social classification

• Classifying books from GoodReads and LibraryThings into
  • Dewey Decimal and
  • Library of Congress Classification

  schemes using tags only

• Measured performance of two user groups and descriptivity of tags by considering meta data.

• Results:
  – Describers resemble descriptive data better
  – Descriptive tags (used by describers) are inferior to non-descriptive tags (created by categorizers) for the task of classification

Zubiaga, Arkaitz; Körner, Christian and Strohmaier, Markus (2011).
Contribution of this work

• The differentiation between two types of tagging motivation - categorizers and describers (Research Question 1)

• Introduction of quantitative measures to distinguish between categorizers and describers with the associated evaluation (Research Question 2)

• Investigation how tagging motivation varies within and across different social tagging systems (Research Question 3)

• Experiments that evaluate how categorizing and describing behavior affects tasks such as social classification and the emergence of semantics in social tagging systems (Research Question 4)
Promising directions of future work

- Investigate bias of existing user interface mechanisms on tagging behavior

- Analyzing impact the type of the annotated resources have on tagging behavior

- The relation of tagging behavior and navigability in social tagging systems
Conclusion

- Influence of motivation on utility in social tagging systems
- Variety of motivation in tagging systems
- Measures for detection and their evaluation
- Two types of tagging motivation
- Terminology and related work
Thank You For Your Attention

Tagging motivation has an influence on structures in folksonomies