Insights from Web 3.0: Is it Time for a New Scientific Publishing Methodology?

Markus Schatten, Mirko Maleković

University of Zagreb

Faculty of Organization and Informatics

Pavlinska 2, 42000 Varaždin, Croatia

{markus.schatten, mirko.malekovic}@foi.hr

Abstract. *Scientific publishing almost hasn't changed for the last few centuries. Conferences and Journals are the only two ways to publish scientific information. On the other hand publishing technology has advanced from ordinary typography and it is ironic that scientific institutions, which should be the primers in using advanced technologies, still use traditional (often black and white) paper publishing. Today's Web interfaces to journals act mainly as digital archives of non-digital papers. Technology allows us to use multimedia systems, software applications, social and semantic web facilities that could tremendously improve publishing quality and allow for more scientific interaction. In order to show some of the possibilities of these new technologies, the TaOPis-system will be presented.*

Keywords. Web 3.0, scientific publishing, semantic wiki, taopis

1 Introduction

ᴛaOPĪs is a social semantic web application or Web 3.0 for self-organizing communities providing suitable tools like semantic wiki systems, forums, blogs, ranking mechanisms, content filtering, tagging etc. [3, 5, 6]. The system has been used for almost three years for various purposes, but most projects deal with knowledge management due to the fact that the system is used in a knowledge management course at the Faculty of organization and informatics. Especially its semantic wiki subsystem is of special interest since it accumulates metainformation which is of great importance to finding relevant information.

It shall be shown that a semantic wiki system (provided with some additional functionality based on social network analysis) can be used for a scientific publishing system that is self-organizing and facilitates the autopoiesis of the scientific social system.

2 Web 3.0 & ᴛaOPĪs

Through the development of the World Wide Web as well as the OpenSource paradigm a lot of new information technologies were introduced that are of great interest to knowledge management [7]. Such technologies are often hidden under the term Web 2.0 as well as the social web, even if there is no clear agreement of what technologies build up Web 2.0. Figure 1 gives a short resume of these technologies.

Figure 1: A Mindmap of the Web 2.0 Concept (by Markus Angermeier)

On the other hand there is the semantic web movement which main aims include the creation of machine readable data that will allow for automated search and reasoning through the use of intelligent agents. The main idea is to provide structured semantic web ontologies written in some formalized language like OWL (the Web Ontology Language) based on description logic or $\mathcal{F}$LORA-2 based on frame logic.

By merging these two perspectives one obtains social semantic web applications, often denoted with Web 3.0. Such application shall make it possible to take advantage of a "collective intelligence" of the social system surrounding web applications in terms of autopoietically generated metadata [4].

As mentioned previously ᴛaOPĪs has a semantic wiki subsystem[1] that is based on frame logic [2], and particularly uses the $\mathcal{F}$LORA-2 reasoning engine [8] to allow its users to query the dynamically

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[1] Please refer to [3, 5, 6] for an introduction to ᴛaOPĪs architecture

created knowledge base. ⊤λOPĪꙅ uses a syntax entitled ni**K**ɭɑꙅ that comprises the possibility to cast dynamic queries inside any wiki page. It allows users to create semantic linkages between pages as well as to tag these pages using attribute-value tags. Special attributes are used to enhance possible semantics (like class, subclass, rule etc.). Such additional tags allow the creation of metainformation in an object-oriented manner. The ⊤λOPĪꙅ systems and likewise its ni**K**ɭɑꙅ syntax is work in progress that is aimed on a wide range of users. At its current version the system is still not enough user-friendly to achieve the stated goals. The main idea of hiding complex semantic technologies in the background of the system and providing users with easy-to-use graphical query builders is still to be implemented.

A semantic wiki on ⊤λOPĪꙅ consists basically of an extensible set of wiki pages describing some particular content. Pages are considered to be objects having their corresponding classes, attributes as well as relations to other objects. Relations to other object are implemented through hyperlinks.

⊤λOPĪꙅ uses social network analysis to identify the most trustworthy users by using a special metric, the so called eigenvector centrality [1]. This information is used to annotate metadata, and thus provides us with a flexible way to find relevant information.

3 A Prototype for Autopoiesis Facilitating Scientific Publishing

Scientific publishing is a possible application area of semantic wikis. The process of reviewing submissions to respective conferences and journals (which mostly are double-blind review) could be established in an autopoiesis facilitating environment using semantic wiki systems.

A semantic wiki system could be used to create a scientific publishing system. Any article would be published immediately after submission and would then undergo a continuous review process. Any user could review any encountered article, suggest improvements, add keywords, point out related research etc. Additionally authors could provide contemporary multimedia content like video, animations, interactive application examples or even recorded presentations.

The use of a formal semantic system could allow for better search and retrieval of scientific content. For example references could be formalized and thus citation indexes could be easier automatically computed. User provided meta data could be used by intelligent agents to identify breakthrough research.

On the other hand to ensure scientific seriousness, meta data and reviews would be rated depending on a social network analysis subsystem. Social network analysis could also be used to identify most prominent scientists.

As an example a prototype entitled "Journal of Publish or Perish" will be shown. Figure 2 shows the front page of the scientific journal wiki.
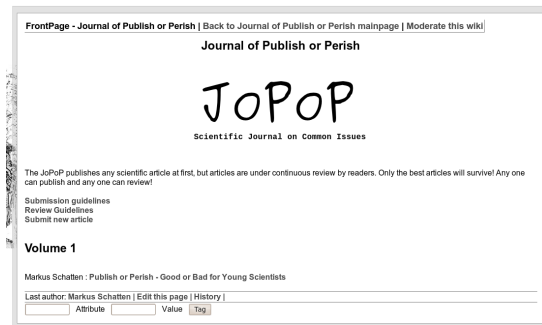
Figure 2: Frontpage of JoPoP

The following listing shows the ni**K**ɭɑꙅ code used to generate this frontpage. This example is to show haw fast and simple one can publish an article in ni**K**ɭɑꙅ by relying on wiki technology. Note the query used to generate the table of content for the first volume.

```
[center]
[h1]Journal of Publish or Perish[/h1]
[img=http://add.com/logo_jopop.png]
[/center]

The JoPoP publishes any scientific
article at first, but articles
are under continuous review by
readers. Only the best articles
will survive! Any one can publish
and any one can review!

[link=
Guidelines>Submission guidelines]

[link=
Review Guidelines>Review Guidelines]

[link=
Enter title>Submit new article]

[h1]Volume 1[/h1]
[query
  ?_:paper[
    author−>?_aut,
    title−>?t,
    url−>?url,
    volume−>1
  ],
  ?_aut:person[
    name−>?name,
    surname−>?surname
  ].
]
?name ?surname : [link=?url>?t]
[/query]
```

By clicking on the *submit new article* link a po-

tential author can format his manuscript as any wiki page, as shown on the following figure 3. As soon as the author submits his manuscript, it is immediately accessible to all other Internet users. The author can add various keywords, but other meta information as well.
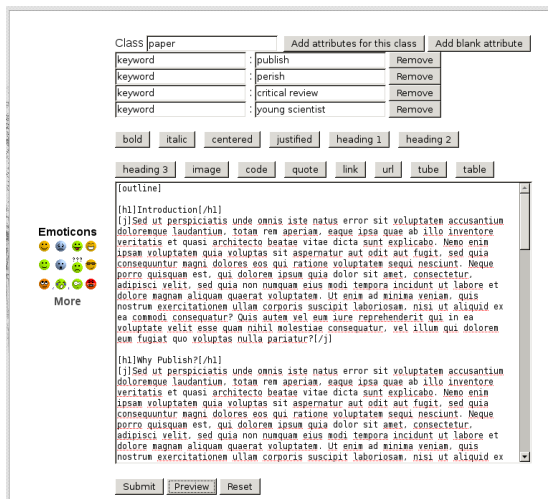

Figure 3: Submitting a new manuscript

This example manuscript would look similar to the following figure 4.

Figure 4: A manuscript on JoPoP

Due to the possibilities of niKlas (or any other wiki language) the author can add multimedia content at will. Figure 5 shows an example where a YouTube movie was included into to the manuscript as a figure by using the following niKlas code:

```
[center]
[tube]o9698TqtY4A[/tube]
[b]Figure 1.[/b]
What happens to young scientists
when they cannot publish
[/center]
```

It would be convenient to implement some automatic mechanism for figure and section numbering. Due to the page inclusion mechanism of niKlas it would be possible to externalize multimedia content and provide it with additional meta information.

The semantic wiki can also be used to automatically generate references similar to LATEX and BiBteX. For example if references are objects (wiki
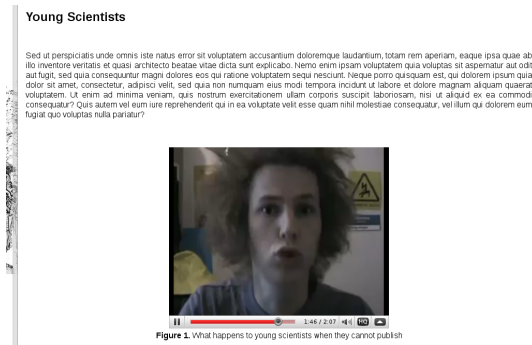
Figure 5: Multimedia on JoPoP manuscript

Figure 6: Tags on a sample bibliographic entry

pages) of their own, tagged similar to BiBteX entries as shown on figure 6, and likewise if references in some paper are given with the following niKlas code:

```
[link=ZugajSchatten2005>citation]
```

where ZugajSchatten2005 is the title of the reference, than the following query would yield the list of references for a given paper with hyperlinks to the entry.

```
[query
  ?-[
    title ->'Publish or Perish -
        Good or Bad for Young
        Scientists',
    citation ->?_b
  ],
  ?_b:bibentry[
    authors ->?a,
    year ->?y,
    entry_title ->?t,
    publisher ->?p,
    address ->?d
  ],
  sort(?a,asc). ]
[b]?a[/b] (?y) [i]?t[/i], ?p, ?d.
[/query]
```

On our imaginary paper the result of this query would look similar to the following figure 7

References

Kifer, M., Lausen, G., and Wu, J. (1995) *Logical Foundations of Object-Oriented and Frame-Based Languages.*

Žugaj, Miroslav and Schatten, Markus (2005) *Arhitektura suvremenih organizacija.*

Figure 7: References generated by a query

If the wiki is used only as a bibliographic database, then the following query could be interesting to LaTeX users:

```
[query
  ?_:book[
    title −>?r,
    authors−>?a,
    entry_title −>?t,
    year−>?y,
    publisher −>?p,
    address−>?d
  ],
  sort(?a,asc).
]
@book{ ?r,
  title = "?t",
  author = "?a",
  publisher = "?p",
  address = "?d",
  year = "?y"
}
[/query]
```

The result of this query is shown in the following listing, and is a list of all books on a system in BiBtex format. Similar queries could be constructed to list all other types of bibliographic entries.

```
@book{ ZugajSchatten2005,
  title = "Arhitektura suvremenih
          organizacija",
  author = "Zugaj, Miroslav and
          Schatten, Markus",
  publisher = "Tonimir",
  address = "Varazdinske toplice",
  year = "2005"
}
```

The amalgamation facility of niKlas could be the means of using one bibliographic semantic wiki through various semantic wiki journals. For example if we assume that the bibliographic wiki is entitled "BibWiki" then the previous query for bibliography creation would be slightly modified to yield the proper results:

```
[query
  ?_[
    title −>'Publish or Perish −
            Good or Bad for
            Young Scientists ',
    citation −>?_b
  ],
  ?_b:bibentry[
    authors−>?a,
    year−>?y,
```

```
    entry_title −>?t,
    publisher −>?p,
    address−>?d
  ],
  sort(?a,asc).  ]
[amalgamate
  "Journal of Publish or Perish"
  "BibWiki"
]s
[b]?a[/b] (?y) [i]?t[/i], ?p, ?d.
[/query]
```

Any person could add reviews on any paper. If we establish a procedure that any review has to have a link to the paper it reviews entitled **on**, and if all reviews have to be tagged as shown on figure 8.

Figure 8: A tagged review

Then a query like the following could be used on any paper to list the reviews of the paper.

```
[h1]Reviews[/h1]
[center]
[table]
[b]Reviewer[/b]
  &&significance
  &&originality
  &&quality
  &&clarity
  &&relevance##
[query
  ?_:review[
    on−>?_pap,
    significance −>?s,
    originality −>?o,
    quality −>?q,
    clarity −>?c,
    relevance −>?r,
    author−>?_aut,
    url−>?url
  ],
  ?_pap:paper[
    title −>'Publish or Perish −
            Good or Bad for
            Young Scientists '
  ],
  ?_aut:person[
    name−>?name,
    surname−>?lname
```

```
   ].
]
[link=?url>?name ?lname]
  &&?s
  &&?o
  &&?q
  &&?c
  &&?r##
[/query]
[/table]
[/center]
```

The result of such a query would be similar to the one shown on figure 9.

Reviews

Reviewer	significance	originality	quality	clarity	relevance
Markus Schatten	3	2	4	5	5

Figure 9: List of query generated reviews

By using more complex queries with aggregate functions average grades could be calculated. Such queries can become quite cumbersome due to the fact that all tags are stored as strings, and need to be converted to numbers. The following is an example of calculating the average quality grade:

```
[query
  ?avg = average{
    ?_q |
      ?_[ quality ->?_s ],
      name(?_s ,?_x)@_prolog ,
      number_codes(?_q ,?_x)@_prolog
  }.
]
?avg
[/query]
```

On the other hand the annotation mechanism could be used as well in order to find only those reviews or articles that are relevant to a certain degree. As an example the following query would yield only reviews with trust-level higher that 0.5.

```
[h1]Reviews[/h1]
[center]
[table]
[b]Reviewer[/b]
  &&significance
  &&originality
  &&quality
  &&clarity
  &&relevance##
[query
  ?_:review [
    on->?_pap ,
    significance ->?s ,
    originality ->?o,
    quality ->?q,
    clarity ->?c ,
    relevance ->?r ,
```

```
    author ->?_aut ,
    url ->?url
  ],
  ?_pap:paper[
    title ->'Publish or Perish -
        Good or Bad for
        Young Scientists '
  ],
  ?_aut:person[
    name->?name ,
    surname->?lname
  ].
]
[probability > 0.5]
[link=?url>?name ?lname]
  &&?s
  &&?o
  &&?q
  &&?c
  &&?r##
[/query]
[/table]
[/center]
```

Such a query would filter out all lowly trusted reviewers, and could be used as a filter for published or perished articles. Only papers that would survive in a rigorous continuous scientific review process would stay published, while those that would accumulate bad reviews would perish and be filtered out by the query's probability constraint. This is in a way similar to OpenSource software development. Only software which is able to continuously adapt to the needs of their users survives in its own complex environment. Thus wiki pages, which are by definition changeable and adaptable, seem to be a good way to allow scientists to refine their work according to reviewers demands.

4   Conclusion

Science advances from minute to minute, but technologies do so as well. Herein a possible alternative scientific publishing methodology using state of the art technology was introduced. We strongly believe that there are more efficient ways to publish scientific information than traditional black and white paper publishing, and systems to support them should be developed and put into use.

In order to achieve a shift in perspective we need a movement from citations to hyperlinks, from volumes to sites, from paper to Web, from small cliques to collective intelligence. The world is moving faster every day and journal review and publishing times aren't acceptable any more. The Blogosphere is taking the lead in Web publishing, and thus scientific workers should follow this trend. Online social networks reflect the state of the public mind, which is why traditional scientific institutions should abandon old-fashion practices and get networked in terms of publishing.

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