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David W. Wilson

Washington State University, davidwilsonphd@gmail.com

Xiaolin Lin

Washington State University, xiaolin@wsu.edu

Phil Longstreet

Washington State University, plongstreet@wsu.edu

Saonee Sarker

Washington State University, ssarker@wsu.edu

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David W. Wilson

Washington State University
davidwilsonphd@gmail.com

Phil Longstreet

Washington State University
plongstreet@wsu.edu

Xiaolin Lin

Washington State University
xiaolin@wsu.edu

Saonee Sarker

Washington State University
ssarker@wsu.edu

ABSTRACT

The Web 2.0 paradigm has gained substantial momentum in the last decade. The influence of Web 2.0 principles and technologies has fueled an explosion of information and media content on the Web, and individual and corporate adoption of the technologies continues to rise. As the popularity and usefulness of these technologies continue to unfold, there has yet been no concise definition of the term *Web 2.0*, nor a clear understanding of its scope. We synthesize and analyze the extant academic and practitioner-oriented literature on the topic to 1) provide a clear, concise definition of the term Web 2.0, 2) categorize previous literature and uncover opportunities for future research, and 3) formulate a framework and accompanying recommendations to focus future research on the most salient topics. This paper can serve as a clear starting point for future academic research on Web 2.0 and its related principles and technologies.

Keywords

Web 2.0, wikis, blogs, social networking, folksonomies, mashups, syndication

INTRODUCTION

The Web 2.0 paradigm has gained substantial momentum in the last decade, with growth in both individual and corporate adoption of Web 2.0 technologies. As an emergent set of technologies, Web 2.0 has received little attention in the IS literature. As the popularity and usefulness of these technologies continue to crystallize, it would be useful to consider the Web 2.0 paradigm as academics and practitioners have viewed it, both in understanding what Web 2.0 is, and to inform and focus future research on under- and unexplored areas.

This research is motivated by the following factors. First, adoption of Web 2.0 technologies and principles has been accelerating at a surprising rate, especially among businesses (Sutter, 2009). Second, despite this increase in adoption, there has been relatively little academic attention given to the topic. Third, to our knowledge, there has been no attempt to date to formulate a clear and concise definition of the term *Web 2.0*. We address these issues by reviewing prior Web 2.0 literature to 1) provide a clear, concise definition of the term Web 2.0, 2) categorize previous literature and uncover opportunities for future research, and 3) formulate a comprehensive framework and accompanying recommendations to focus future research on the most salient topics.

WEB 2.0 DEFINED

In general, academic researchers have not attempted to define Web 2.0, but have instead focused on studying the nature and impacts of various Web 2.0 technologies, though a few exceptions exist (Kim, Kwok-Bun, Hall, and Gates, 2009; Parameswaran and Whinston, 2007). Practitioners have also added to the academic understanding of Web 2.0 (Raman, 2009b; Sutter, 2009). However, common among this previous research is the tendency to lightly touch on the technologies that represent Web 2.0, without specifically defining the term as a representation of the paradigm. Admittedly, the term *Web 2.0* is difficult to define. Kim et al. (2009) explained a number of reasons for this: 1) Web 2.0 is not enabled by new or revolutionary technologies, 2) understanding of Web 2.0 is varied, and 3) Web 2.0 is a broad topic that encompasses many related concepts. Accordingly, Kim et al. point to a “chasm in the computing and information fields,” which is yet to be filled by a clear, concise definition (p. 658). We attempt to fill this chasm by offering a definition that can be used by academics to build common understanding about the concept.

In attempting to define the term, we acknowledge and agree with Kim et al.'s assessment that the term means different things to different people, and that the above noted difficulties make formulating a single definition useful only insofar as it is used with that limitation in mind. Nevertheless, we feel it necessary to clearly define a concept about which there is so much hype—by academics and practitioners alike—in order to move forward in our understanding and investigation of the subject.

As a descriptor of the Web 2.0 paradigm, the term Web 2.0 is generally attributed to Tim O'Reilly of O'Reilly Media, Inc., who used the term to describe the seeming “turning point for the web” (O'Reilly, 2005) wherein companies surviving the dot-com collapse began using the web *as a platform*, as opposed to creating products and services for use as desktop clients.

Several major themes emerge among Web 2.0 applications. One is their ability to “facilitate collective action and social interaction online” {Parameswaran, 2007 #35, p. 762}. With online social networks such as Facebook and LinkedIn, people are able to stay in contact with their various networks of acquaintances, both for casual social purposes, and for professional networking. Media-sharing sites such as YouTube and Flickr and user-created weblogs have enabled users from around the world to create and share information and media of all types. The shallow learning curve associated with these technologies has sparked a “contribution revolution” {Cook, 2008 #116, p. 60}. Lastly, Web 2.0 advocates “harnessing collective intelligence” and creating services that “get better the more people use them” (O'Reilly and Battele, 2009).

In the IS discipline, scholars have generally taken a sociotechnical (Bostrom and Heinen, 1977) perspective to research, stressing the importance of integrating the technical aspects of systems with the social aspects of the people that use and/or are affected by them (Clegg, 2000; Land, 2000). Thus, a definition of Web 2.0 should follow this same paradigm, particularly given the highly social aspects of the technologies associated therewith. Aggregating previous partial definitions, as well as the above referenced principles and topics, we propose here a definition of the term Web 2.0.

Web 2.0 refers to the second generation of the Web, wherein interoperable, user-centered web applications and services promote social connectedness, media and information sharing, user-created content, and collaboration among individuals and organizations.

Though the list of technologies which fall under the Web 2.0 umbrella tends to vary, we consider those technologies outlined in Table 1 in our review of prior literature that has examined Web 2.0 technologies. This list was populated by considering extant definitional literature and web-based references to technologies which are generally associated with Web 2.0.

RESEARCH METHOD

Our goal was to review all of the pertinent IS literature related to Web 2.0, its application, and the various associated technologies. To do this in a systematic manner, we used the inductive categorization method, following (Dubé and Paré, 2003), as similarly performed in (Ladd, 2010). Our approach included: 1) selecting appropriate publication outlets, 2) finding articles relevant to our study, 3) formulating appropriate categories based on the content of the articles, 4) categorizing the articles into appropriate categories, and 5) analyzing the categorized articles to extract trends and develop recommendations.

Selection of Publication Outlets

We considered publication outlets in each of three categories: academic, crossover, and practitioner. Our selection of publication outlets in each of these categories was guided by two goals: outlet quality and the extent to which the outlet was considered representative of IS research.

Academic Outlets

To determine which academic journals were considered high quality and IS-centric, we consulted recent IS journal rankings literature (Ferratt, Gorman, Kanet, and Salisbury, 2007; Lowry, Romans, and Curtis, 2004). For brevity, we simply state here that, after considering the AIS Senior Scholars eight recommended “excellent” journals (Saunders, Avison, Davis, Eindor, Galletta, Hirschheim, and Straub, 2007), we added several others that were considered highly ranked by the majority of journal rankings papers. After performing our search, two journals were eliminated

| Type | Definition | Sample Reference | Examples |
|---------------------------|--|--------------------------|--------------------------------------|
| Mashups | The “mashing” together of two or more Web services or applications (Sutter, 2009) | (Sutter, 2009) | PadMapper.com, Flickr Maps |
| Information-sharing Sites | Sites whose primary purpose is the sharing of information or media, from videos to photos to articles to bookmarks/links | (Sutter, 2009) | YouTube.com, Flickr.com, del.icio.us |
| Social Networking | Online social networks help users keep in contact and receive updates from their friends, family, and colleagues | (Sutter, 2009) | Facebook.com, Orkut.com |
| Syndication | A service that tracks updates to various sites on the Web, aggregating the various “feeds” for later consumption | (Sun, He, and Leu, 2007) | RSS, Atom |
| Weblogs (Blogs) | A personal Web page or diary, easily updated and generally displayed in reverse chronological order | (Ip and Wagner, 2008) | HuffingtonPost.com, Engadget.com |
| Wikis | A website that anyone can edit | (Kane and Fichman, 2009) | Wikipedia.org, Wikihow.com |

Table 1: Web 2.0 Technologies

(*International Journal of Electronic Commerce* and *Journal of Strategic Information Systems*) because no applicable Web 2.0-related articles were found from their publication histories. The final list of journals selected includes:

Decision Support Systems

European Journal of Information Systems

Information & Management

Information Systems Research

Information Systems Journal

Journal of Information Technology

Journal of Management Information Systems

Journal of the Association for Information Systems

Management Information Systems Quarterly

Crossover Outlets

We also considered “crossover” publication outlets, or outlets that are at the intersection between academia and practice. These outlets publish articles by academics and practitioners that are generally focused on *application* of research to practice. Examining IS journals at the crossover level provides a good view of the progression of academic thought regarding Web 2.0 issues to practical application (and vice versa). There are a number of crossover journals from the IS and other disciplines and we chose the following five:

Communications of the ACM

Communications of the Association for Information Systems

Harvard Business Review

IEEE Software

MIT Sloan Management Review

Practitioner Outlets

We also considered practitioner outlets, which are targeted specifically to practitioners. These outlets publish the most current issues related to practice, and are thus a good representation of what is currently happening in the industry. In selecting practitioner outlets, we found numerous potential journals or magazines that were IS-centric. We chose two magazines that were among the most prominent for our study. To increase comparability of our results across academic, crossover, and practitioner outlets, we excluded all but feature articles of substantial length and content. The outlets chosen to represent the practitioner category are:

CIO Magazine

Computerworld Magazine

Finding Relevant Articles

To find articles related to Web 2.0, we searched academic databases such as EBSCO Business Source Complete and ABI/INFORM ProQuest using keywords ranging from terms related to actual Web 2.0 technologies (e.g., variants of “blog” or “wiki”) to Web 2.0 themes (e.g., “social bookmarking” or “social computing”) to actual names of Web 2.0-based Websites (e.g., “facebook” or “youtube”). The objective was to retrieve all articles in each respective basket of outlets that could possibly be related to Web 2.0. Two authors sifted through the results independently to remove non-applicable articles, resulting in a total of 114 articles: 31 academic, 49 crossover, and 34 practitioner.

ANALYSIS AND RECOMMENDATIONS

Article Categorization

In order to create appropriate categories for the articles we found, two of the authors did an initial sorting of all of the articles, grouping them into like groupings. These initial schemas were compared and reconciled to form a combined, more inclusive categorization scheme, detailed in Table 2. Each of the 114 articles was sorted into appropriate categories. Importantly, multiple categories were allowed for each article. For example, an article related to using online social networks as a marketing tool to build a company’s reputation (de Valck, van Bruggen, and Wierenga, 2009) would be categorized in both the Social Networks category in the Technology meta-category and the Marketing/Reputation category in the Applications meta-category. This categorization strategy produced 229 categorizations with the 114 articles categorized.

Analysis of Distributions and Trends

Categorizing the articles into their appropriate categories gives us the ability to compare and contrast categories in the publishing history of Web 2.0 literature. Table 3 displays the bulk of those comparisons. Categories are arranged down the left most column, organized by meta-category as in Table 2. Then the counts and percentages are listed, including the percentage of articles in the meta-category and the percentage of all articles for each category. The section on the right of the table displays a breakdown of each category by journal type, with the counts and percentages of articles in each meta-category displayed separately for academic, crossover, and practitioner publication outlets for each category.

Analysis by Meta-Category

As shown in Table 3, about half (48%) of the total categorizations were in the Technologies meta-category. This is to be expected since, as noted above, most articles were categorized into both a Technologies category and another category. That the other two meta-categories both received (relatively) large numbers of article categorizations is validating for our method because it indicates that our segregation of applications versus issues was a good conceptual distinction. It is interesting, however, that there are over 64% more articles in the Applications meta-category than in the Issues meta-category (32.3% versus 19.7%, respectively). This difference is largely fueled by a (predictable) focus of the practitioner outlets to publish Applications-related articles, which will be examined in greater detail below.

Analysis by Category

Examining the article distributions by specific categories reveals a few interesting insights. First, comparing the technologies that have been studied, we see a heavy concentration on social networks (30.9%), followed by more general studies including multiple technologies (22.7%), followed by blogs (18.2%), and lastly wikis (12.7%). The

| | Category | Category Description |
|--------------|--|---|
| Applications | Collaboration/Knowledge Management | Use of Web 2.0 technologies in business or other contexts to collaborate or manage knowledge |
| | Customer Networks | Use of Web 2.0 technologies to connect with customers, generally through online social networks |
| | Development | Issues or strategies associated with software development for or using Web 2.0 technologies |
| | Marketing/Reputation | Use of Web 2.0 technologies for marketing, as well as building and/or restoring corporate reputation, including recovering from reputational harm from customer backlash |
| | General/Multiple | General business or other applications of Web 2.0 technologies, including application of several technologies in concert |
| Issues | Motivations to use or accept | Studies examining user motivations to use, accept, contribute to, or generally interact with Web 2.0 technologies |
| | Security/Privacy/Legal | New security, privacy, and legal issues presented by Web 2.0 technologies and their implications for businesses, also personal disclosure by individuals |
| | Structure/Nature of Web 2.0 Technologies | Studies related to the makeup or nature of various Web 2.0 technologies or phenomena, including structural depictions of relationships, theoretical perspectives, analyses of communities, etc. |
| Technology | Blogs | Nature or use of blogs |
| | Mashups | Nature or use of Mashups |
| | Sharing | Social bookmarking/tagging systems as well as other media-sharing technologies like YouTube or Flickr |
| | Social Networks | Online social networks such as Facebook, LinkedIn, MySpace, or Twitter |
| | Syndication | Syndicated Web services and information |
| | Tagging | Nature of use of tagging systems |
| | Wikis | Nature or use of Wikis |
| | General/Multiple | Studies that examine Web 2.0 in general or multiple technologies in concert |

Table 2: Web 2.0 Topic Classification Scheme

other technologies in the Web 2.0 paradigm have received substantially less attention—no more than 6% of studies have looked singularly at mashups, sharing sites, syndication technologies, or tagging. This is somewhat surprising, given the proliferation and rapid adoption of these technologies. However, the more heavily researched areas are those around which much of the Web 2.0 movement (as we have defined it) is centered, namely social connectedness (social networks), user-created content (blogs), and collaboration (wikis), so it is not surprising that these have attracted the largest focus from the research community.

In that same vein, however, a characteristic feature of the Web 2.0 paradigm is associated with open sharing of information, and is exemplified by phenomena such as social bookmarking and media-sharing sites (e.g., YouTube, Flickr). That these information or media-sharing activities have received comparatively little attention is somewhat surprising. There seems to be a lack of research concerning information and media-sharing topics, and this is an opportunity for future investigation. The other areas (mashups, syndication, and tagging) also present possible areas

| | Category | Subcategories | | | Journal Type | | | | | |
|--------------|--|---------------|---------------|------------|--------------|---------------|-----------|---------------|--------------|---------------|
| | | Count | % of Category | % of Total | Academic | | Crossover | | Practitioner | |
| | | | | | Count | % of Category | Count | % of Category | Count | % of Category |
| Applications | Collaboration/Knowledge Management | 25 | 33.8% | 10.9% | 2 | 2.7% | 15 | 20.3% | 8 | 10.8% |
| | Customer Networks | 8 | 10.8% | 3.5% | 4 | 5.4% | 3 | 4.1% | 1 | 1.4% |
| | Development | 5 | 6.8% | 2.2% | 0 | 0.0% | 5 | 6.8% | 0 | 0.0% |
| | Marketing/Reputation | 15 | 20.3% | 6.6% | 5 | 6.8% | 5 | 6.8% | 5 | 6.8% |
| | General/Multiple | 21 | 28.4% | 9.2% | 2 | 2.7% | 7 | 9.5% | 12 | 16.2% |
| Subtotals | | 74 | 100% | 32.3% | 13 | 17.6% | 35 | 47.3% | 26 | 35.1% |
| Issues | Motivations to use or accept | 8 | 17.8% | 3.5% | 5 | 11.1% | 3 | 6.7% | 0 | 0.0% |
| | Security/Privacy/Legal | 10 | 22.2% | 4.4% | 3 | 6.7% | 0 | 0.0% | 7 | 15.6% |
| | Structure/Nature of Web 2.0 Technologies | 27 | 60.0% | 11.8% | 13 | 28.9% | 14 | 31.1% | 0 | 0.0% |
| Subtotals | | 45 | 100% | 19.7% | 21 | 46.7% | 17 | 37.8% | 7 | 15.6% |
| Technology | Blogs | 20 | 18.2% | 8.7% | 6 | 5.5% | 7 | 6.4% | 7 | 6.4% |
| | Mashups | 6 | 5.5% | 2.6% | 2 | 1.8% | 3 | 2.7% | 1 | 0.9% |
| | Sharing | 5 | 4.5% | 2.2% | 1 | 0.9% | 4 | 3.6% | 0 | 0.0% |
| | Social Networks | 34 | 30.9% | 14.8% | 18 | 16.4% | 6 | 5.5% | 10 | 9.1% |
| | Syndication | 4 | 3.6% | 1.7% | 1 | 0.9% | 0 | 0.0% | 3 | 2.7% |
| | Tagging | 2 | 1.8% | 0.9% | 0 | 0.0% | 1 | 0.9% | 1 | 0.9% |
| | Wikis | 14 | 12.7% | 6.1% | 4 | 3.6% | 9 | 8.2% | 1 | 0.9% |
| | General/Multiple | 25 | 22.7% | 10.9% | 0 | 0.0% | 15 | 13.6% | 10 | 9.1% |
| Subtotals | | 110 | 100% | 48.0% | 32 | 29.1% | 45 | 40.9% | 33 | 30.0% |
| Totals | | 229 | | 100% | 66 | 28.8% | 97 | 42.4% | 66 | 28.8% |

Table 3: Distribution of Topics by Subcategory and Journal Type

for further research, but information and media-sharing topics are unique because of their relative importance to the Web 2.0 paradigm.

Focusing our attention now on the meta-categories that are not technology specific, we see a few other areas that have received disproportionate publishing activity. In particular, the study of the structure or nature of Web 2.0 technologies has been the most popular topic, with 11.8% of total categorizations. Closely following, we see collaboration and knowledge management applications (10.9%), and studies regarding application of Web 2.0 from more than one angle (9.2%). Other areas, including motivations to use (3.5%), security, legal, and privacy issues (4.4%), customer networks (3.5%), development (2.2%), and marketing/reputation (6.6%), have received less publication activity.

Two of the areas that have received less focus—customer networks and development—are rather specialized categories than one would not expect to see as popular publication topics. But the other three areas constitute rather large issues or potential avenues for application, and it is surprising that they have not been more central to the discipline's examination of Web 2.0. Motivations to use Web 2.0 technologies, for example, essentially enable the entire paradigm, and this category has received very little research focus. Likewise, use of the social connectedness and broad reach of Web 2.0 technologies (and online social networks in particular) has been seen as a powerful tool for marketing and reputation management for firms (Kiss and Bichler, 2008; Palka, Pousttchi, and Wiedemann, 2009). Despite this, the topic has seen relatively little activity.

Examining publications in academic outlets in terms of specific categories, it is first interesting to note that there has been a strong focus in academic journals on social networks (16.4%), more so than any other category in the Technologies meta-category. Second, academic articles have infrequently examined security/privacy/legal issues as well, contributing just 6.7% to the category. Lastly, academic articles have never examined Web 2.0 technologies in the general/multiple sense (i.e., multiple technologies at once). There are benefits to examining the technologies individually, which is what academics have done in the past, but there are also benefits to examining the technologies together as a Web 2.0 implementation. Opportunities might exist to examine the aggregate of several Web 2.0 technologies in a motivations-to-use context, or perhaps in a general-applications context (which has also received relatively little attention from the academic literature).

Recommendations

Our review and analysis of the literature allowed us to see trends and holes in the research concerning Web 2.0 technologies, issues, and applications. We now present a discussion of the analysis results in the form of several recommendations that future researchers can follow to broaden our understanding of the Web 2.0 movement. Our recommendations focus specifically on those areas in which academics have not yet placed substantial focus. Some recommendations, therefore, are informed by the comparative lack of academic research in areas where practitioner-focused outlets have seen substantial publication activity. Other recommendations are produced from a general lack of research focus, regardless of publication outlet focus.

Recommendation 1: Focus on Underexplored Technologies

Our analysis shows a lack of research (from all outlet types) in the area of information sharing. This includes social bookmarking, media sharing (e.g., Youtube, Flickr), and more general information sharing. Information sharing in an online social network is characterized by “status updates” to allow friends or colleagues to stay connected and updated on the events in each others’ lives. This area presents an exciting opportunity for future research. Some research has approached the topic of personal information sharing in online social networks (Krasnova, Spiekermann, Koroleva, and Hildebrand, 2010; Posey, Lowry, Roberts, and Ellis, 2010; Tow, Dell, and Venable, 2010), but this is an emerging area with many possibilities. For example, what effects does personal use of and online social network have on the individual? What are the social implications for participation (or nonparticipation) in online social networks as they become increasingly ubiquitous, particularly among college students and new entrants into the workforce? Furthermore, there are opportunities to better understand the issues surrounding other sharing platforms, most notably media-sharing services such as Youtube and Flickr. Despite the explosive growth of these services, there has been little academic work done to understand why users share their media with others, what the implications of sharing are, etc. Clearly this is an area of academic opportunity that is just beginning to crystalize.

Though information and media sharing are the most prominent of the underexplored technologies because of their integral part of the Web 2.0 movement, other technologies have also received minimal focus. These include tagging, syndication, and mashups. Some studies have been published in academic outlets that addresses issues and implications of these technologies and their use (Shim and Lee, 2009; Sun et al., 2007), but there remains plenty of opportunity to further expand these areas.

Recommendation 2: Academic Focus on Applications of Web 2.0 Technologies

Our analysis uncovered the unsurprising finding that academic journals have placed less emphasis on applications of Web 2.0 technologies for business and individual use. There exist several opportunities for academic researchers to focus on applications of Web 2.0 technologies, in business and individual contexts.

Specifically, there are three important areas of application in which academics have yet to place much focus. First, Web 2.0 technologies have seen substantial attention from crossover and practitioner outlets in the area of collaboration and knowledge management, but academic journals have been relatively quiet on the topic. Second, academic articles have never focused on development or use of Web 2.0 technologies. This specific application of Web 2.0 could have numerous implications for a strategy concerning Web 2.0 that businesses implement. Third, academic articles have never focused on more than one technology at a time. This is often a logical choice given an article’s scope and length requirements, but there may be value to academic researchers in examining multiple technologies in concert, particularly in a business or individual application context. Additionally, there may be value in examining the organizational effects (e.g., firm performance) of having a Web 2.0-related general strategy (including the application of several Web 2.0 technologies in concert), as advocated in various practitioner and crossover publications (Bonabeau, 2009; Hildreth, 2007; McAfee, 2006; Raman, 2009a).

Recommendation 3: Unexplored Issues Regarding Web 2.0

There has been a keen interest in the practitioner outlets regarding the implications of Web 2.0 in relation to corporate security, individual and information privacy, and legal issues. This is the category with the sharpest contrast in terms of what practitioners see as important (as evidenced by their publication output), and what academics see as important. Academics have, in a few cases, acknowledged the need to understand personal disclosure and privacy in, for example, online social networks (Posey et al., 2010), but there are numerous related and unexplored topics, including workers' tendency to share corporate secrets via Web 2.0 technologies (Brandel, 2007; Collett, 2009), new security measures that are adapted for Web 2.0 technologies in the workplace (Brandel, 2009; Brenner, 2009), and legal issues that need to be accounted for in the face of Web 2.0 capabilities (Hutchins, 2005; Savell, 2007).

Comprehensive Framework for Web 2.0 Research

To further and more clearly focus the opportunities for future research, we now offer a comprehensive framework for Web 2.0 research, displayed in Figure 1. The areas that have received academic attention have been highlighted in green.

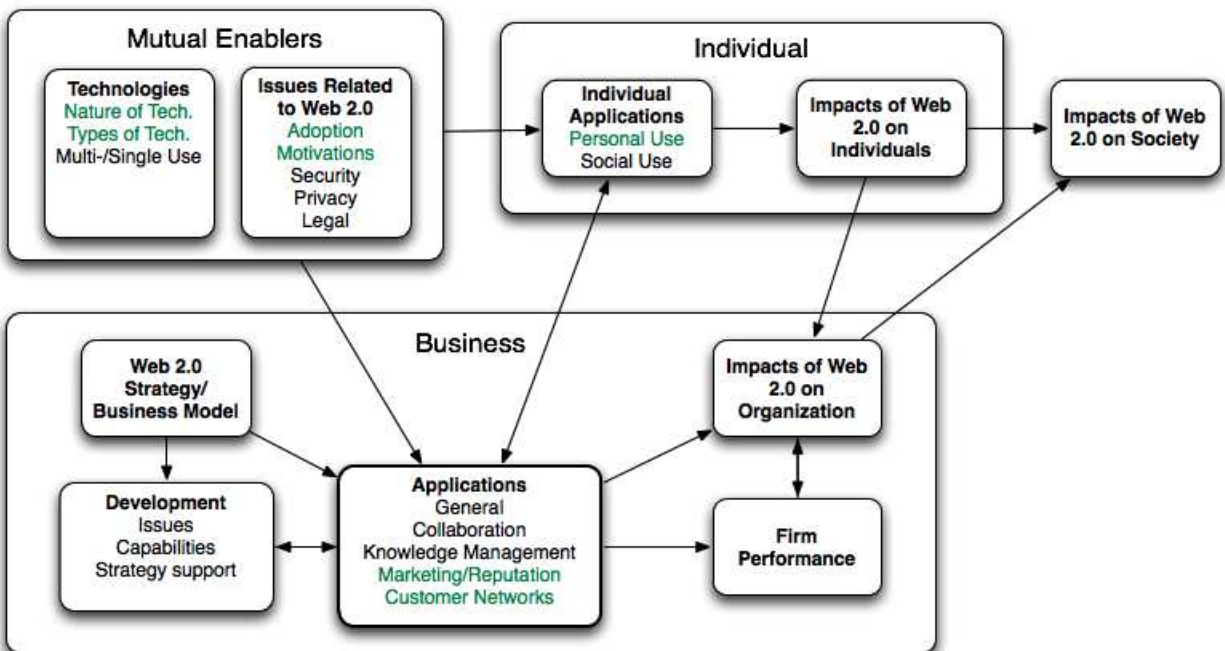


Figure 1: Comprehensive Framework for Web 2.0 Research

As can be seen by the lack of green-colored items in the figure, there are many areas still under-explored. The mutual enablers (technologies and issues) are those areas of research regarding Web 2.0 technologies themselves, together with general issues applicable to both business and individual implementations. These enablers should directly influence business and individual applications of Web 2.0. As individuals and businesses adopt Web 2.0 technologies, this will likely impact the individual, the business, and eventually society in general.

Within the area of business applications, little has been done on business application of Web 2.0 technologies for knowledge management, collaboration, and general application. Moreover, little academic research has been done on Web 2.0 technology development strategies, the issues associated therewith, and the support of corporate Web 2.0 technology strategy using in-house Web 2.0 development. Regarding individual applications of Web 2.0 technology, comprised mostly of social use of Web 2.0 technologies, it might be interesting to investigate the impact of individual applications on business applications, the organization itself, and society.

In addition, little academic work has been done regarding security, privacy, and legal issues related to Web 2.0 technologies. These important areas should heavily influence the business and personal application of Web 2.0 technologies, and should be a key area of academic research in the future.

CONCLUSION

In this paper, we reviewed the extant academic and practitioner-oriented literature for studies regarding the phenomenon of Web 2.0. The purpose of this paper is to first define the term Web 2.0, and then provide some direction for future related research. We find some potential topics that researchers should focus on in the future. Accordingly, this paper will provide guidance for studies on Web 2.0.

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