

Wiki Deployment in Corporate Settings



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Successful mass collaboration projects—such as open source software development and participatory journalism—have captured the public imagination. These collaborative projects have demonstrated the feasibility of many individuals coming together to create valuable outcomes despite the apparent lack of central coordination or control [9], [14], [15].

Lately, a new type of software application—the wiki—has enabled mass collaboration. Wiki (the word is derived from the Hawaiian-language word for *fast*), is a web-based tool for collaborative authoring of hypertext [7], [17]. In some ways, wikis are similar to discussion forums and blogs. However, unlike prior technologies where users' postings are appended, in wikis each user edits the previous version of the page, so that the most recent version reflects the cumulative contributions of all authors. In addition, wikis provide administrative utilities such as allowing users to maintain a history of changes and to revert pages to previous versions.

Wikis have already had a profound impact on the Internet. Wikipedia,¹ an online encyclopedia built on wiki technology, is experiencing remarkable success; it has become one of the ten most popular web sites, and there is evidence suggesting that the quality of its articles is high [3]. As the flagship of wiki technology, the Wikipedia site has become the most successful mass

collaboration project to date, demonstrating that many volunteers can collaboratively produce quality knowledge products.

Wikis are not restricted to Wikipedia, and numerous other wikis exist on the Internet. Wiki is a generic application that can be enhanced in various ways. For example, Wikipedia has added extensive features to allow for quality control (e.g., blocking vandals and allowing users to receive alerts for changes made to articles of their choice) and to resolve conflicts of opinions (e.g., mediation and arbitration committees).

Our research question concerns the usefulness of wikis in corporate settings. The answer to this question is not clear. On one hand, business firms are aware of the impact wikis have had on the Internet, and perceive wikis as an up-and-coming technology [6] for supporting collaborative work. On the other hand, the fundamental principles underlying wikis—openness, non-attribution,² egalitarianism, and decentralized control—run in contrast to traditional command-and-control management.

To stress this point, the success of mass collaboration projects (and specifically wikis and Wikipedia) has been attributed to the “wisdom of the crowds,” that is, to the sheer size and diversity of the user population [1]. In corporate settings, on the other hand, collaborative tools are often used to support relatively small and homogeneous groups. Furthermore, Internet wikis are characterized by an emphasis on shared values and voluntary participation—an environment that is substantially different from corporate settings. In short, while wiki emerges as a powerful collaborative technology, there are some important factors that raise questions about its appli-

¹<http://wikipedia.org>.

²Typically, wikis hide pages' authors, and a wiki page is not associated with any one specific author.

cability to corporate environments. Traditional corporate document management is based on content management systems, such as Xythos³ or Documentum,⁴ which emphasize collaboration around document usage, and **not** around document creation.

To date, little information is available regarding wikis' usage in corporate settings [4], [9]. Our objectives were to examine the actual use of wikis in a business setting, to identify factors driving user participation, and to assess the extent to which wikis provide value to both individuals and the organization.

Wikis: Users, Involvement, and Success

Most research to date has studied wikis in the public domain, focusing on Wikipedia [5], [13]. Data regarding public wikis' growth and success, as well as user motivations, can serve as a baseline to which corporate wiki metrics could be compared.

While wikis proliferate on the Internet, most of the data available is related to Wikipedia.⁵ Wikipedia has experienced explosive growth. As of March 2009 Wikipedia has approximately 2 779 000 articles in the English language alone (and versions in over twenty other languages), with 9 224 932 registered users.⁶ Public wikis usually attract users with diverse backgrounds. Wikipedia allows anyone to edit an entry, but the majority of content is contributed by a relatively small number of users. Despite the apparent risks associated with the open peer-based model [2],⁷ Wikipedia content quality is comparable to that of print encyclopedias, notably Encyclopedia Britannica [3].

³<http://www.xythos.com/business/index.html>.

⁴<http://canada.emc.com/products/family/documentum-family.htm>.

⁵For a list of Wikipedia-related studies, see http://en.wikipedia.org/wiki/Academic_studies_of_Wikipedia.

⁶This number includes users who have made at least ten edits. For Wikipedia statistics, see <http://en.wikipedia.org/wiki/Special:Statistics>.

The most extensive data regarding Wikipedia authors comes from a study of German Wikipedia [12]. This study shows that a core set of authors adds content during both work and leisure time, contributing an average of 11.5 hours each per week (2 during work, and 9.5 during leisure time). According to this study, the authors indicate that they are generally satisfied with their involvement in Wikipedia, with average satisfaction level is close to 80%.

What drives people to participate in mass collaboration projects, such as open source software development or Wikipedia, despite the lack of monetary incentives? Studies [11], [12], show that the key drivers are:

- enjoyment,
- learning new skills,
- social pressure, and
- personal benefits.

In corporate environments, wikis are used for a variety of purposes—from portals, to project management and knowledge-base creation [4], [9], [16]. Details regarding corporate wiki adoption, beyond anecdotal evidence, are very limited. Several studies report on the use of a specific wiki application, but do not include empirical data regarding wiki adoption at large, user profiles, or their motivations. Two examples are:

- a) Wagner and Majchrzak [16], who describe in detail two cases of corporate wiki applications (a newspaper publisher and a large software development firm), and
- b) Hasan and Pfaff [4], who list four cases where wikis are used as knowledge management tools (at an educational institution, a government institution, a national standards

⁷For a comprehensive discussion of the limitations of the Wikipedia model (hosted on Wikipedia), please refer to http://en.wikipedia.org/wiki/Criticism_of_Wikipedia.

Enjoyment is the main driver for corporate wiki participation in this early adoption period.

organization, and a large multinational corporation).

The most useful information to date regarding corporate wiki usage comes from a small survey, which recruited volunteers (186 respondents) at a wiki-related conference [9]. Survey respondents came from a diverse set of firms, of various sizes (from 100 to 10 000 employees), indicating that wiki deployment is not restricted to a specific class of firms. Wikis were employed to support a variety of tasks (e.g., project management, e-learning, communities of practice) and were used by various departments (e.g., software development, marketing, R&D, technical support, and professional services). The lengths of time various Wikis' in that survey had been in existence was 12-24 months. Wikis were reported to be a sustainable part of collaborative work processes, rather than a fad. Wikis regularly attract users, and the average wiki had 37 users (12 active authors, and 25 "lurkers"). An analysis of users' motivation revealed that users are primarily driven by making work easier and helping the organization achieve its goals, while social reputation did not seem to be an important motivational factor.

Key Questions Unanswered

While existing studies, and specifically the work of Majchrzak *et al.* [9], are an important first step towards understanding of corporate wiki usage, they leave some key questions unanswered. First, the extent of wiki adoption (in terms of the number of wiki instances, number of wiki users, and growth rates) within firms is not known. Second, key facts regarding the profile of corporate wiki users,

such as the time spent on wikis and the distribution between organizational units, are not available. Third, there is no indication of whether motivational factors that were found to play an important role in public wikis—such as learning new skills—play a role in corporate settings. Finally, to date, we have no information regarding the success of corporate wiki projects, in terms of user satisfaction, impact on job, and impact on the organization.

Empirical Study of Wiki Deployment

In order to gain a better understanding of corporate wiki usage, we conducted an in-depth empirical study in one large organization. Since wiki adoption is still at inception stages, few organizations have extensive experience with wikis. The firm chosen as the subject of our study was IBM, a global organization that designs hardware, develops software, and engages in professional services. IBM has over 350 000 employees and a large user base of early adopters. Wikis at IBM are managed as a "wiki farm," where administration is central and each employee can instantaneously create his or her own wiki application.

After posting messages to the early adopters and wiki user communities, we launched a web survey in December 2006. The survey was open for 8 weeks. Out of the 1205 users who accessed the survey web site, 919 completed the survey, describing their experiences with 486 distinct wikis (capturing the experience of 5% of all wiki applications). Each subject was asked to rate on a 5-point Likert scale statements regarding their wiki activity. We complemented the survey

with a series of interviews with the central administration unit for collaborative information technology (IT) that is responsible for the wikis at IBM, in order to learn about the specific applications of the company's wiki technology.

IBM's Wikis

It is difficult to compare IBM's wiki farm against wikis in the public domain. However, to provide some baseline for assessing wiki adoption growth rates within IBM, we compare it against Wikipedia. In order to "level the playing field," we consider full wiki operation for both Wikipedia and IBM only after reaching 5000 wiki pages. Wikipedia was opened to the public on January 2001, and reached 5000 pages by September of that year. Wikis were introduced in IBM in 2004, and after an experimentation period, a new wiki architecture was launched on November 2005. All data provided here refer to the more recent wiki architecture, which became fully operational (i.e., reached 5000 pages) on December 2005.

Our analysis reveals rapid rates of growth, comparable to the growth rates experienced by Wikipedia. After sixteen months of full operation, IBM had an active user base of: 18 000 active wiki users, 9385 distinct wiki applications, totaling roughly 142 000 pages (which went through 920 000 revisions). In comparison, Wikipedia after 16 months of active operation, on December 2002, had 94 000 pages, which went through 570 000 page revisions. Fig. 1 compares usage levels at IBM against those of Wikipedia.

After 16 months of full operation Wikipedia had 94 000 wiki pages, while IBM—after a comparable period of operation—had 142 000 wiki pages. The trends of growth are illustrated in Fig. 2. For the month of December 2006, IBM wikis attracted 218 thousand

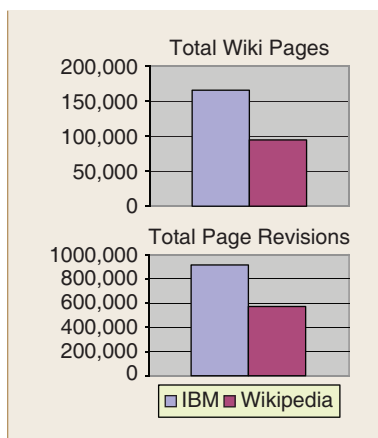


Fig. 1. Comparing wiki usage for IBM and Wikipedia in the first 16 months of active operation (December 2005 through March 2007 for IBM, and September 2001 through December 2002 for Wikipedia).

visitors (111 thousand unique IPs), and on an average day 44 000 wiki page views were recorded.

The 919 users came from all organizational units, with over 42% from the software development units, 26 from services, and the rest from administration, IT, Operations, Sales and Distribution, as described in Table I.

Respondents generally described themselves as proficient wiki users (68% proficient or very proficient; only 7% not proficient) and as early adopters. Over 65% were strong early adopters, who like technology for technology's sake, regularly try out alpha and beta product versions, and have high tolerance for system failures; 30% were moderate early adopters, who like new technologies, but prefer them to be well-tested and robust; and less than 5% did not describe themselves as early adopters.

Despite the large number of employees who use wikis, usage levels—as reported by survey respondents—are still relatively low. Close to 50% of the respondents use wikis on a daily basis, roughly 35% on a weekly basis, and the rest less frequently. Employees spend on average only 1-3 hours per week using wikis, and 80%

of users spend fewer than 3 hours per week. These figures are similar for both writing and reading tasks. The weekly time spent using wikis is detailed in Table II.

It should be noted that these figures are substantially lower than the engagement time reported for German Wikipedia (11.5 hours per week) [12], perhaps because of a sample bias in that study, which sampled only the set of core Wikipedia authors.

Wiki is a very flexible technology, and wikis are used at IBM for various tasks—from use as a simple web portal to more complex applications, such as content generation (e.g., creating a product manual or FAQ database), project management, and an application to support communities of practice. Wagner [17] compares wikis against alternative “conversational” tools, and our interviews with wikis’ central administration workers revealed that indeed wikis have some key advantages for supporting collaborative work:

- Wikis provide the ability to jointly create knowledge-based products (whereas in discussion forums there is no mechanism to aggregate the various postings);
- Wikis allow for multiple people to voice their opin-

ions in a democratic manner (where as Blogs carry mostly the voice of a single individual);

- Wiki participation is open to all IBM employees, allowing them to collaborate across functional and geographic borders; and
- Wiki technology is very flexible, and could be used for various tasks.

What are the drivers for wiki usage at IBM? As described in Table II, we found evidence for the key motivational factors discussed in the open source (e.g., [11]) and wiki (e.g., [9], [2]) literatures: *direct benefits, social pressure, learning new skills, and enjoyment*. *Enjoyment* is the main driver for wiki participation in IBM, while—consistent with the findings of [9]—*social pressure* does not seem to play a significant role in this corporate setting.

An ANOVA analysis revealed significant variations in motivations between users of different wiki proficiency levels, as described in Table III. For all motivational factors except *social pressure*, users who were more proficient in technology usage reported higher motivation (results of an ANOVA analysis show statistical significance

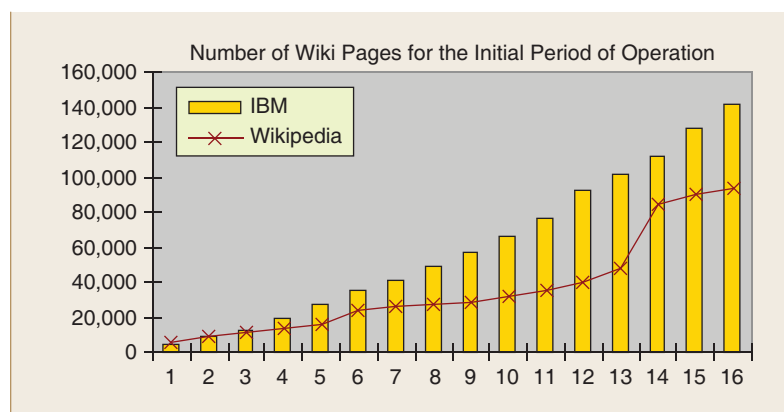


Fig. 2. Comparing the activity levels for IBM and Wikipedia in the first 16 months of active operation (December 2005 through March 2007 for IBM, and September 2001 through December 2002 for Wikipedia).

Table I
Wiki Users by Organizational Unit.

Department	Percent of users
Services	26.2
Operations	5.0
Sales and Distribution	8.1
Software Development	42.1
IT	12.6
Administration	6.0

at $P < 0.0001$), as illustrated in Fig. 3.

Wikis at IBM seem to provide value to both individuals and the organizations. We assessed three types of outputs: *satisfaction*, *impact on job*, and *organizational impact*, measured as follows. *Satisfaction* was measured by satisfaction with wiki functions and features, ease of use, and overall satisfaction. *Impact on job* was measured by effectiveness at supporting work, importance of wikis for performing one's job, and enhancing one's job productivity. *Organizational impact* was measured

by the extent to which wikis add business value to IBM. As described in Table IV, respondents saw substantial business value for wikis (on average 4.5/5). Respondents also saw personal benefits from wikis (but to a lesser extent), both in terms of satisfaction and impact on one's job. An ANOVA analysis revealed statistically significant differences between users of distinct proficiency levels, for all success measures. The more proficient the respondents were with wikis, the higher their perception of wikis' business value was.

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Factors in Wiki Success

An analysis of our findings reveals that wikis have proven relevant for IBM. Wikis have been picked up primarily by early adopters and proficient IT users, and the average time spent on wikis is still relatively low (far below the engagement levels observed for German Wikipedia). These findings suggest that

corporate wiki use at IBM is still in the experimentation stage.

Wiki is a generic technology that could be applied in various ways. An internal analysis conducted by IBM based on a sample of 2200 users (independent of our survey), revealed that the two most popular applications of wikis are a) as a document repository (approximately 35%), and b) as a collaboration tool, substituting for existing tools such as Lotus TeamRoom (approximately 30%). An additional popular wiki application is website development (15%), and the remaining 20% represent various other applications (e.g., event preparation).

The motivational factors driving wiki participation in corporate settings seem similar to the motivations of open source and Wikipedia users. Enjoyment is the main driver for corporate wiki participation in this early adoption period, while—consistent with the findings of [9]—social pressure does not play as large a role in corporate environments. The role of enjoyment as a key motivational factor is somewhat counterintuitive, as corporate adoption of IT is often driven by clear value and direct benefits. Motivation levels were correlated with wiki proficiency levels, suggesting that as users become more proficient in using wikis, the motivation for wiki adoption—and consequently usage levels—will increase.

Table II
Weekly Time Spent Authoring and Reading Wikis.

Weekly Wiki Time	Reading	Authoring
Less than 1 hour	38.1%	43.7%
1-3 hours	42.0%	37.1%
4-6 hours	13.8%	12.2%
7-9 hours	3.2%	3.6%
10 hours or more	2.9%	3.4%

Table III
Motivations by Proficiency Levels. (F and P Statistics Relate to Differences Between Proficiency Categories.)

Motivations (means; /5)	All users	Proficiency			Difference between Proficiency Levels	
		Not Proficient (7.4%)	Medium (24.2%)	Proficient (68.4%)	F	Significance
Direct benefits	3.54	2.90	3.37	3.66	20.5	$P < 0.0001$
Social Pressure	2.73	2.70	2.77	2.71	0.2	Insignificant
Learning new skills	3.77	3.30	3.67	3.85	9.2	$P < 0.001$
Enjoyment	4.06	3.11	3.86	4.23	44.3	$P < 0.0001$

IBM users perceive wikis to be highly valuable, both in terms of impact on their job and organizational benefits. Satisfaction levels, however, are somewhat lower; interviews with wiki central administration suggest that this may be due to technical difficulties and “growing pains” of IBM wiki infrastructure. We expect that satisfaction levels will increase once the technology stabilizes.

Our investigation of wiki deployment within an IT-proficient organization, provides a view from the frontier of the wiki adoption cycle, and this view is quite remarkable. Wiki adoption growth rates within IBM are higher than any other web based collaboration tools, and within 16 months of full operation, on March 2007, a third of IBM employees were registered wiki users. The wiki adoption rate is extraordinary, especially when considering that adoption was not mandated by management, as often the case with IT deployment, but rather picked up voluntarily.

A limitation of this study is a sample bias concern (i.e., the risk that the data collected does not

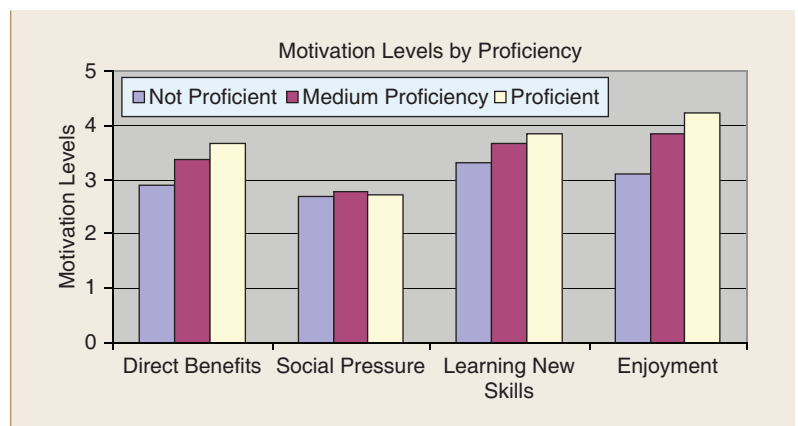


Fig. 3. Motivations for wiki usage (on a 5-point Likert scale), by proficiency level.

represent the entire IBM wiki user population). In order to address this issue, we conducted an analysis of subjects’ responses. We found a large variance in the various measures, indicating that the sample bias concern may not be serious.

What are the underlying reasons for wikis’ success at IBM? Our interpretation of the survey results suggest that both organizational and technical factors play a role. First, wiki is a flexible technology that could be adapted to various tasks: collaborative content authoring

(e.g., Wikipedia), a collaboration tool (as indicated by comments in our survey, e.g., “wikis are proving a real benefit to team collaboration”), or a simple web portal. Wikis are easy to use, and most respondents described themselves as proficient wiki users, despite the newness of the technology. The wiki features that IBMers find most attractive are: change control (i.e., maintenance of revision history and easy restoration of old versions), support for document sharing, and the web-based interface that allows access to content without the need to install a

Table IV
Wikis Success (on a 5-point Likert Scale), Overall and by Proficiency Level (“%” Represent the Percentage of the Subjects at Each Proficiency Level.) Results of an ANOVA analysis (F Value and Statistical Significance) Reported on Right.

Wikis Success (means; /5)	All users	Proficiency			Difference between Proficiency Levels	
		Not Proficient (7.4%)	Medium (24.2%)	Proficient (68.4%)	F	Significance
Satisfaction						
Functionality	3.91	2.74	3.86	4.05	68.0	$P < 0.0001$
Ease of Use	3.82	2.54	3.66	4.02	71.4	$P < 0.0001$
Overall	3.65	2.64	3.64	3.76	40.6	$P < 0.0001$
Impact on Job						
Effective at supporting work	4.14	3.28	3.87	4.29	34.8	$P < 0.0001$
Important part of performing job	4.15	3.09	3.97	4.32	59.0	$P < 0.0001$
Enhances productivity	4.04	2.94	3.87	4.21	52.3	$P < 0.0001$
Organizational Impact						
Adds business value	4.47	3.79	4.30	4.61	42.5	$P < 0.0001$

Wikis empower employees and provide them with significant autonomy and freedom to express their views.

desk-side application. Second, IBM wikis are being used for cross-geographical and cross-organizational collaboration,⁸ and wikis' accessibility contribute to this global collaboration. Nevertheless, access to each specific wiki instance is controlled by the employee who originated that instance ("wiki owner").

Third, wikis empower employees and provide them with significant autonomy and freedom to express their views. Wiki technology's automatic publishing feature allows users to voice their opinions without the need for prior approval. In addition, IBM's deployment of wikis was entirely bottom-up (i.e., it was not mandated by management), thus reinforcing autonomy in wiki usage. As a result, users' participation is driven primarily by intrinsic motivations, contributing to user satisfaction. Fourth, the barriers to adopting wiki technology are very low. Wikis are easy to use and require little training. In addition, IBM's central wiki administration has provided high-quality support for their wiki users, addressing reliability concerns.⁹ Moreover, IBM currently does not charge for wiki support (although this practice may change in the long run). Finally, wiki adoption at IBM could be seen as part of a larger adoption of Web 2.0 and social computing tools. In recent years IBM has promoted a series of Web 2.0 tools, and wikis' success is part of the larger success of social computing at IBM [10].

Although our analysis was restricted to a single organization (IBM), we do believe that this study's findings could generalize to other corporate settings, and that IBM wiki experiences depict

the future of corporate wiki adoption at large. IBM runs close to ten thousand distinct wiki applications, used by most organizational units, in different countries, and by people with different profiles. Wikis provide some important enhancements over existing collaborative tools. Usage in such diverse settings within IBM and the unique features of wiki technology (namely collaborative editing, openness, democracy, and flexibility), suggest that other organizations will find wikis useful. While wikis initially gained prominence in the public domain—e.g., Wikipedia and collaborative book authoring (*A Million Penguins*¹⁰ and *We Are Smarter than Me*¹¹ [8])—business organizations are now discovering the power of wikis in aggregating the powerful collective intelligence of employees and customers [9], [14], [15]. IBM is quick to embrace new technologies that provide value. Less innovative organizations may be slower at adopting new technologies, but are expected to follow with wiki adoption, once they become aware of wikis' benefits.

⁸A few of the relevant comments survey respondents have made are: "... The [wiki] function is absolutely essential. Within Service Delivery, a tool which would allow delivery technicians to GLOBALLY maintain a single delivery database would be worth its weight in gold!!"; "The Wiki allows me to communicate information to a WW [world wide] Team of over 100 people."; and "We have a global project with 40+ developers and 6 locations. The wiki is our key collaboration tool."

⁹Survey comments indicate that reliability concerns must be addressed before wikis can be utilized for mission-critical tasks, e.g., "Wiki is become more mission critical for our development more than ever. It has to be available 24x7 for our distributed team to be successful."

¹⁰*A Million Penguins*; <http://www.amillionpenguins.com/wiki/index.php/About>.

¹¹*We Are Smarter than Me*; <http://www.wearsmarter.org/Home/tabid/1575/Default.aspx>.

This study enhances our understanding of corporate wiki usage; still, further research is warranted in order to better understand: a) specific settings in which wikis thrive, b) organizational strategies and incentive schemes that encourage wiki participation and success, and c) possible modifications and enhancements to wiki technology that contribute to wiki usage and success.

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LETTER

Unhappiness with Spring 2009 Issue of *T&S*

Dear Editor,

As a former long-time editor of *T&S*, I always pick up each issue with pleasant hope. But the Spring, 2009, issue left me disappointed – nay, dejected. From the President's message, to Finley Shapiro's brief letter, to the book review, everything seemed fine. Then ... crash! The first article, "You've Been Disarmed. Have a nice day!" left me in deep anguish that a publication, which is still my connection to IEEE and to my many SSIT friends from the early days, could publish such trash. And similarly for the remaining articles.

Almost every sentence in that first article can be torn apart as meaningless. Here's one: "LOAC is a means by which humankind endeavors to reduce the damage caused by warmaking. Our ability to wage war is heavily constrained by legal and political concerns."

My immediate response was: rubbish, what has this author been smoking? Getting down to details, how does that square with the "shock and awe" visited upon Iraq by the Bush regime in this decade under the pretense of "Weapons of Mass Destruction," known by all to be a complete fabrication. As to Vietnam, the author says: "Casualties, whether civilian or soldier, now had a face." Those who lived in that era, and others who are not blinded by propaganda, know this

to be nothing but fabrication. "Body count" was the operational order – and 3 million Vietnamese paid the price! Why? Why? The author calls this "The living-room war." What has he been smoking? Those not in Vietnam were in the streets protesting.

Earlier, the Vietnamese, fighting against their French colonizers, decisively defeated them in 1954 at Dien Bien Phu. At the Geneva Conference held at the end of that struggle, the U.S. was not a participant but an "observer" who agreed to be bound by the result. That turned out to be a lie.

From the very first, the U.S. worked single-mindedly to subvert the Geneva Agreements. It imported into the southern part of Vietnam, Ngo Dinh Diem, a former Vietnamese who had skipped the war of liberation against France, spending those years under the protection of Cardinal Frances Spellman of New York. Diem became the unelected leader of what was labeled the Republic of South Vietnam, installed by his U.S. overseers. The Geneva agreements were subverted by the U.S. The rest is history: 59 000 U.S. soldiers and 3 million Vietnamese dead. "Living-room war" indeed!

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