Organizational Adoption of Web 2.0 Technologies: An Empirical Analysis

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ABSTRACT
Although firms are recognizing the business benefits of Web 2.0 technologies, there is little research examining their use in the organizational context. Drawing on the Innovation Diffusion theory and Technological-Organizational-Environmental framework, we present and empirically test a theoretical model of factors associated with adoption of Web 2.0 technologies in business. We find that the organization’s ‘perceived usefulness’ and importance to open standards are positively associated with the degree of adoption of Web 2.0 technologies while ‘perceived challenges’ is negatively associated with adoption. Further, large firms have a higher degree of adoption. Finally, firms in highly knowledge-intensive and innovation-intensive industries have a higher degree of adoption. Our results suggest that in addition to perceived benefits and challenges, open standards, firm size and industry characteristics play pivotal roles in Web 2.0 adoption. This study can help researchers and practitioners understand what motivates firms to adopt such technology platforms.

Keywords
Web 2.0, Enterprise 2.0, Social Computing.

INTRODUCTION
The Internet era has seen the emergence of the Web as a platform in the consumer space. A set of emerging technology platforms, Web 2.0 technologies, has revolutionized the way people communicate on the Internet. While there are multiple perspectives of what constitutes Web 2.0, in this paper, we refer to Web 2.0 technologies as “the second generation of internet based services - such as wikis, blogs, social networking, and social bookmarking tools - that emphasize online collaboration and sharing among users” (O’Reilly, 2005). More recent academic literature has defined Web 2.0 as “a collection of open-source, interactive and user-controlled online applications expanding the experiences, knowledge and market power of the users as participants in business and social processes” (Constantinides and Fountain, 2008). Web 2.0 platforms are essentially services that are built upon technologies and open standards that underpin the Internet. These technologies are different from traditional enterprise technologies in that they are interactive, dynamic, unstructured and provide more control to users (Parameswaran and Whinston, 2007b).

Web 2.0 technologies are increasingly used in businesses for benefits such as productivity and increased collaboration (Kane and Fichman 2009; McAfee, 2006). IBM, for example, reported large savings through productivity gains from social software tagging (Shah, 2008). Wachovia deployed social tools enabling employees better connect with each other (McDougall, 2008).

Despite potential benefits and growing business use of Web 2.0 technologies, businesses are not yet fully convinced of their value. Apprehensions include concerns such as overload of information (Parameswaran and Whinston, 2007a) and unclear business benefits (Lai and Turban, 2008). However, there is a paucity of empirical research on the adoption patterns and business benefits of Web 2.0, which have been primarily anecdotal (Cook, 2008; McAfee, 2006). The main objective of this study is to improve understanding of the factors associated with the differential adoption of Web 2.0 technologies in the business context. We examine technological, organizational and environmental factors and their relationship with organizational adoption of Web 2.0 technologies.

The contributions of this article are twofold. First, unlike anecdotal evidence and case studies in single organizations, this study examines driving factors behind adoption of Web 2.0 technologies using data collected from multiple firms, thereby facilitating better generalizability of conclusions than case studies. Second, to our knowledge, ours is the first study that develops and empirically validates a model of organizational adoption of Web 2.0 technologies, a major set of Web-enabled innovations with a capacity to change the nature of work (Cook, 2008).
LITERATURE OVERVIEW (ABBREVIATED)\(^1\)

Parameswaran and Whinston (2007a, 2007b) provide a good overview of social computing and portray new opportunities for related research. McAfee (2006) introduced the term ‘Enterprise 2.0’ to refer to the use of Web 2.0 technologies in business and identified six characteristics (search, links, authoring, tagging, extensions and signals) which make them different from other technologies. Wikis have been espoused to improve customer-centricity (Wagner and Majchrzak, 2006) and facilitate the research process (Kane and Fichman, 2009). Web 2.0 technologies harness the power of the crowd (Lai and Turban, 2008; Majchrzak et al. 2009) and have been recognized to be one “trend of the future organizational computing” which can have a significant impact on organizations (Fun and Wagner, 2008, pg. 248).

THEORY AND HYPOTHESES

We use two theoretical bases to frame our hypotheses. First, the Technology-Organization–Environment (TOE) framework (DePietro, Wiarda and Fleischer, 1990) states that technological characteristics, organizational characteristics and environmental characteristics affect adoption of innovations by influencing the ability of the firm to institutionalize processes and the extent of opportunities for using the innovation (Swanson, 1994). Second, according to the Theory of Innovation Diffusion (Rogers, 1996), the core factors affecting innovation diffusion include relative advantage, compatibility, complexity, observability and trial ability.

We integrate these two theoretical perspectives and apply them to the context of Web 2.0 technologies in business. First, we examine technological characteristics of Web 2.0, exemplified by the organization’s perception of its usefulness (relative advantage), challenges (complexity) and compatibility (open standards) and their relation to adoption. Next, we examine the organizational characteristic of size as a predictor of adoption. Finally, we examine the industry characteristics of the firm’s environment – knowledge intensity, competitive intensity and innovation intensity - and their relationship with adoption.

While the implementation and maintenance costs of Web 2.0 applications may be relatively low, the benefits are largely intangible (Lai and Turban, 2008). How useful these technologies are perceived by the adopting organization assumes greater importance especially since these technologies are largely new and relatively unproven in business. Hence,

**H1: The organization’s ‘Perceived Usefulness’ of Web 2.0 technologies is positively associated with the degree of organizational adoption of Web 2.0 technologies.**

Since Web 2.0 technologies are relatively new and it is hard to show quantitative returns on investments (Lai and Turban, 2008), internal and external barriers may hinder their adoption. The lack of expertise in these technologies due to limited internal resources in implementing them is also a hindrance to adoption. Firms may perceive considerable risk due to the relatively low information security of blogs, wikis and other Web 2.0 technologies (Parameswaran and Whinston, 2007b). There have been concerns raised by practitioners (Bowles, 2008) such as fears of loss of control of communication within the organization. These concerns may prevent firms from adopting Web 2.0 technologies more broadly. Hence,

**H2: The organization’s ‘Perceived challenges’ of Web 2.0 technologies is negatively associated with the degree of organizational adoption of Web 2.0 technologies.**

Many Web 2.0 technologies make use of existing services through open interfaces and can connect to channels and systems already in place in the firm (McAfee, 2006). For example, mashups connected to backend systems can enhance the capabilities of the sales force. Hence, the synergy that Web 2.0 technologies form with the firm’s technology architecture is likely to influence whether the firm adopts them. Open standards can facilitate this synergy by connecting Web 2.0 technologies to other systems. Firms that can incorporate Web 2.0 technologies into existing workflows through open standards are more likely to adopt them.

Web 2.0 technologies are based on transparency whereby firms provide users greater access to applications and content. In the Open Source Systems literature, perceived importance to standards compliance, interoperability and interconnectivity have been identified as drivers of Open Source Systems adoption (Chau and Tam, 1997). The concept of openness in Web 2.0 goes beyond the open source software idea (of opening up code to developers) to opening up content production to users and exposing data for re-use and combination. Hence,

**H3: The extent of importance to Open Standards for the organization is positively associated with the degree of organizational adoption of Web 2.0 technologies.**

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\(^1\) Significantly abbreviated to comply with the length restrictions of AMCIS 2010.
In prior research, the direction and strength of the relationship between firm size and Information Technology (IT) innovation adoption have been ambiguous and found to depend on the type of innovation (Lee and Xia, 2006; Ramamurthy, Sen and Sinha, 2008). On one hand, large firms have economies of scale, slack resources, and an ability to bear adoption risks (Kimberly and Evanesco, 1981). On the other hand, small firms are more flexible and receptive towards innovations (Frambach and Schaeilivaert, 2002).

With regard to Web 2.0 technologies in particular, the relationship between organization size and adoption is an empirical one as the direction can go both ways. On one hand, small organizations are arguably more flexible with higher capacity to adapt from traditional hierarchies to an Enterprise 2.0 culture (McAfee, 2006). However, we contend that large organizations are more likely to adopt Web 2.0 for two reasons. First, many Web 2.0 technologies thrive on network effects (McAfee, 2006). The utility of a social network, for example, will be higher if more users are on the network. Second, large firms can benefit more from process innovations (Gilbert, 2006) such as Web 2.0 technologies. For example, social networks help employees in large organizations find the right individual or group. In small organizations, the business need for social networks may be less since employees are more likely to know each other. Thus, Web 2.0 technologies make large firms more “searchable, analyzable and navigable”, overcoming some “dysfunctions of corporate scale” (McAfee, 2006, pg. 26). Hence,

*H4: Organization Size is positively associated with the degree of organizational adoption of Web 2.0 technologies.*

The need for adopting IT innovations may vary across industries due to their levels of inherent knowledge intensity (Porter, 1991). The collaborative features of Web 2.0 can facilitate knowledge-intensive work by enabling employees to better communicate and share knowledge. Wikis, blogs and social tagging assist in storing, retrieving and building knowledge dynamically (Bicknell, 2008) and can thus facilitate knowledge management. Technologies such as wikis can serve as platforms for facilitating knowledge work as in Dresdner Kleinwort Wasserstein (McAfee 2006). Firms in knowledge intensive industries are more likely to adopt Web 2.0 to take advantage of these capabilities. Hence,

*H5: Industry knowledge intensity is positively associated with the degree of organizational adoption of Web 2.0 technologies.*

Robertson and Gatignon (1986) propose that competitive effects in the technology consumer's industry and within the technology supplier's industry impact the rate and level of diffusion of technology innovations. Competition serves as a trigger for firms to adopt efficient processes (Porter, 1991) and innovations and to search for alternative technologies (Majumdar and Venkataraman, 1993).

Higher competition may drive firms to gain operational efficiencies and advantages through Web 2.0. Web 2.0 technologies can be an effective alternative way to share competitive and market intelligence internally, allowing firms to better track industry developments and to keep abreast with the activities of competitors². Hence,

*H6: Industry competitive intensity is positively associated with the degree of organizational adoption of Web 2.0 technologies.*

Web 2.0 technologies platforms facilitate flexible communication and collaboration by providing the ability to harness unstructured information sources such as conversations and opinions (Cash, Earl and Morison, 2008). Blogs can enable generation of new ideas and immediate feedback from peers. Using social networks, users can see what areas their colleagues specialize in and find areas of expertise where they can collaborate to build innovations. These examples suggest that Web 2.0 can help in facilitating collective wisdom that is useful in generating and propagating new ideas (McAfee and Brynjolfsson, 2008) thus reducing time-to-market of new products and services through improved access to expertise. In industries where there is a greater need for innovation, firms will sense greater opportunities to apply these technologies fruitfully for innovation. Hence,

*H7: Industry innovation intensity is positively associated with the degree of organizational adoption of Web 2.0 technologies.*

² In a McKinsey Quarterly (2008) survey, 60% of corporate respondents see Web 2.0 as a driver of competitive advantage.
METHODOLOGY

Dataset
Data are from a survey conducted by InformationWeek Magazine in 2007 (Related survey questions are in Appendix A). InformationWeek surveys are considered a reliable source of data and have been used in prior academic studies (Mithas, Krishnan and Fornell, 2005). The respondents comprised of senior IT managers, General Corporate managers and Senior Consultants. The dataset originally contained 253 firms. After dropping incomplete observations and outliers based on Cook’s distances per procedures in Long and Freese (2003), the final sample consists of 195 firms across industries (Appendix B).

Variables

Dependent Variable
Degree of adoption of Web 2.0 technologies (AdoptionDegree): This 4-level ordinal variable indicates the degree of the organization’s adoption of Web 2.0 technologies. (1 = Skeptical, 2 = Willing but wary, 3 = Fully engaged with IT’s support, 4 = Wide-open experimentation with or without IT’s support). The assessment by a single respondent of organizational adoption of IT has been used in prior research (Igbaria, Parasuraman and Baroudi, 1996). This dependent variable is similar to the ‘Intention to adopt’ measure used to study IT adoption (Chwelos, Benbasat and Dexter, 2001). The significant positive correlation (coefficient of correlation = 0.46, p<0.001) between the degree of adoption and actual usage of Web 2.0 technologies in the firm\(^3\) provides confidence in the use of AdoptionDegree as a reliable measure of adoption.

Independent Variables

Perceived Usefulness of Web 2.0 technologies (PercUseful): Respondents rated each of 13 Web 2.0 technologies on a scale of 1 to 5 (5 being the most useful) as to how useful that technology might be in making the company’s employees more effective. We computed the average of each respondent’s rating across the technologies. We then standardized this average and assigned an ordinal score based on the standardized value (z). The score is 0 if z < -1.5, 1 if -1.5 < z < -0.5, 2 if -0.5 < z < 0.5, 3 if 0.5 < z < 1.5, 4 if z > 1.5. This standardization approach is similar in principle to that used in prior research (Bharadwaj, Bharadwaj and Bendoly, 2007; Bresnahan, Brynjolfsson and Hitt, 2002; Hitt and Brynjolfsson, 1997) to construct summative indices. Using the identical measure as Bresnahan et al. (2002) and Hitt and Brynjolfsson (1997) gave similar results. This index is, intuitively, formative because increase in perceived usefulness for Web 2.0 technologies does not imply an increase in every technology forming the index. Since the index is formative, it need not be subject to tests of internal consistency of reflective indices (Petter, Straub and Rai, 2007).

Perceived Challenges of Web 2.0 Technologies (PercChallenges): This 6-item summative index represents the number of challenges the organization faces in adopting Web 2.0 technologies. It includes ‘ROI hard to prove, getting partners and customers to use similar collaboration tools, integrating with legacy technologies, lack of expertise, employees prefer consumer tools and security’. The index is again, intuitively, formative.

Importance to Open Standards (OpenStandards): This measures how important open standards are to the organization, ranging from 1 to 5 (1 = ‘Not at all important’ and 5 = ‘Extremely important’).

Organization Size (Size): This is the organization size in terms of number of employees. Using Sales Revenue gave similar results.

Industry Knowledge Intensity (KnowledgeInt): This binary variable indicates whether the firm’s industry is classified as a high knowledge-intensity industry. We use the firm’s industry-level education profile to proxy the knowledge intensity in the firm (Becker and Chiswick, 1966; Coff, 1999). Following Tafti, Mithas and Krishnan (2007), we developed this measure using two separate data sets from the Bureau of Labor Statistics (BLS) : 1) The most recent (May 2005) Occupational Employment and Wage Estimates at the 3-digit NAICS industry level, which contains data on the proportion of wages accounted for by each BLS occupation in each industry, and 2) The most recent (2004) Occupational Employment and Job Opening/Worker Characteristics Data on education levels of employees in each BLS occupation. We classified an industry as high knowledge-intensive if at least 50% of workers in that industry belong to the 3 highest BLS categories of education.

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\(^3\) We do not use the direct measure of usage since AdoptionDegree was a better fit in our empirical model specification.
Industry Competitive Intensity (ConcRatio): Competitive intensity of a firm’s industry is measured using the 4-firm concentration ratio (Scherer, 1980) data provided by the U.S. Census Bureau at the most detailed NAICS level for the most recently available year (2002).

Industry Innovation Intensity (InnovationInt): We use the ratio of the number of R&D scientists and engineers to the total industry domestic employment. These statistics are provided by the National Science Foundation at the industry level for the year 2005. This measure has been used in prior research as an indicator of scientific innovative activity and effort in an industry (Allen, 2001; Brehm and Saving, 1967). Due to the low-cost, collaborative nature of Web 2.0 technologies, this measure of innovation intensity in terms of human resources devoted to R&D (Gambino and Gartenberg, 1979) is more appropriate for this study than a measure that reflects the cost of R&D activities (implied by expenditure measures). This is consistent with the need to use variables tailored to the specificity of the innovation being studied (Chau and Tam, 1997).

Control Variables

IT Capital Intensity (ITCapitalInt): IT intensive firms may be more likely to adopt Web 2.0 technologies. Since we do not have firm-level data on IT Capital, we control for IT Capital Intensity of the firm’s primary 3-digit NAICS industry. Prior research (Schilling and Phelps, 2007) has used industry-level control variables when firm-level variables are unavailable. ITCapitalInt is the ratio of IT investment to total fixed asset investment and is collected from the Bureau of Economic Analysis (BEA) at the industry level. IT investment is the sum of investments in computers and peripheral equipment, software, and communications equipment. BEA provided these figures at varying levels of aggregation across NAICS codes. As in Tafti et al. (2007), we matched each firm’s primary NAICS industry classification to the most detailed NAICS classification provided by BEA.

Industry sector (Mfg): It is possible that service industries have greater need for knowledge sharing and so may be more likely to adopt. To control for such effects, this indicator variable represents whether the firm’s offering is primarily a good or a service (1 = Manufacturing, 0 = Services) (Mithas et al., 2005).

Empirical Model

Since the dependent variable is ordinal, we use the cross-sectional ordered logistic regression model (Greene, 2003):

\[
\text{Logit (Adoption Degree)} = \beta_0 + \beta_1 \text{Perceived Usefulness} + \beta_2 \text{Perceived Challenges} + \beta_3 \text{Open Standards} + \beta_4 \text{Size} + \beta_5 \text{Knowledge Intensity} + \beta_6 \text{ConcRatio} + \beta_7 \text{InnovationInt} + \beta_8 \text{IT Capital Intensity} + \beta_9 \text{Mfg} + \varepsilon
\]

RESULTS

The descriptive statistics and results are in Table 1 and Table 2 respectively.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>N = 195. * indicates significance at α = 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Adoption</td>
<td>2.36</td>
<td>0.87</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>2.02</td>
<td>1.03</td>
<td>0</td>
<td>4</td>
<td>0.42*</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Perceived Challenges</td>
<td>2.78</td>
<td>1.36</td>
<td>0</td>
<td>6</td>
<td>-0.24* -0.18*</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Imp. To Open Standards</td>
<td>3.26</td>
<td>1.08</td>
<td>1</td>
<td>5</td>
<td>0.28* 0.21*</td>
<td>-0.06</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Organisation Size</td>
<td>5.93</td>
<td>1.28</td>
<td>2</td>
<td>7</td>
<td>0.22* 0.05</td>
<td>0.06  0.07</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Knowledge Intensity</td>
<td>0.68</td>
<td>0.47</td>
<td>0</td>
<td>1</td>
<td>0.27* 0.21*</td>
<td>-0.2* 0.02</td>
<td>0.19</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Concentration Ratio</td>
<td>31.77</td>
<td>21.95</td>
<td>3.98</td>
<td>95.36</td>
<td>-0.05 -0.03</td>
<td>-0.06 -0.01</td>
<td>0.16</td>
<td>-0.08</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Innovation Intensity</td>
<td>9.06</td>
<td>8.45</td>
<td>0.60</td>
<td>33.10</td>
<td>0.28* 0.18*</td>
<td>-0.15* 0.12</td>
<td>0.06  0.22</td>
<td>0.12</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>IT Capital Intensity</td>
<td>0.51</td>
<td>0.20</td>
<td>0.10</td>
<td>0.96</td>
<td>0.16* 0.16*</td>
<td>-0.19* 0.03</td>
<td>0.11  0.27</td>
<td>-0.04</td>
<td>0.21*</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.19</td>
<td>0.39</td>
<td>0</td>
<td>1</td>
<td>0.01 -0.01</td>
<td>0.00  0.01</td>
<td>0.10  -0.23</td>
<td>0.42*</td>
<td>0.31*</td>
<td>-0.34*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Likelihood Ratio Chi-square of 82.39 (p = 0.0000) rejects the null hypothesis that the coefficients are jointly zero. A specification test (linktest) for the ordinal logistic model confirms that meaningful predictors are chosen and there is no specification error (Long and Freese, 2003). A test of the proportionality of odds assumption indicated that this assumption is not violated (p=0.11).


5 Ordered probit gave similar results.
We find that all hypotheses except H6 are supported. The estimates give quantitative insights into effect sizes. For example, holding other variables at their means, the odds of a higher degree of adoption increase 50.4% with every unit increase in ‘Importance to Open Standards’. Figure 1 shows the variation of the predicted probability of adoption degree with ‘Importance to Open Standards’ when KnowledgeInt and Mfg are kept at meaningful values of 1 and 0 respectively and all other variables are kept constant at their means. As shown, the probabilities of firms being at the two higher (lower) levels of adoption increase (decrease) as ‘Importance to Open Standards’ increases. For example, when open standards are ‘extremely important’, the predicted probability of being at the highest level of adoption (‘Wide-open experimentation’) is 14.84% compared to only 3.3% when open standards are ‘not at all important’.

| Table 2: Parameter Estimates (DV: Degree of Web 2.0 Adoption) |
|-----------------|------------------|------------------|
|                  | Ordered Logit     | Ordered Probit    |
| Perceived Usefulness | 0.699***         | 0.401***         |
|                   | (4.595)           | (4.68)           |
| Perceived Challenges | -0.286***        | -0.168***        |
|                   | (-2.619)          | (-2.627)         |
| Importance to Open Standards | 0.408***        | 0.244***        |
|                   | (2.976)           | (3.126)          |
| Organization Size | 0.404***         | 0.285***         |
|                   | (8.421)           | (8.515)          |
| Knowledge Intensity | 0.302**          | 0.5**           |
|                   | (2.171)           | (2.107)          |
| Concentration Ratio | -0.01            | -0.006          |
|                   | (-1.304)          | (-1.374)         |
| Innovation Intensity | 0.046**         | 0.028**         |
|                   | (2.397)           | (2.594)          |
| IT Capital Intensity | -1.611           | -0.775          |
|                   | (-1.394)          | (-1.348)         |
| Manufacturing     | -0.116           | -0.073          |
|                   | (-0.252)          | (-0.273)         |
| Log Likelihood    | -203.14          | -202.13         |
| Probability Ratio | 82.59            | 84.43           |
| Prob > Chi-Sqr    | 0.0000           | 0.0000          |
| McKelvey and Zavoina Pseudo R-square | 0.379 | 0.407 |
| Observations (N)  | 195              | 195             |
| t-statistics in parentheses. |                  |                  |
| Significant at *10%, **5% and ***1% level for Chi-Square tests |                  |                  |

Robustness Checks

We checked for multicollinearity by running an OLS regression of the model (Long and Freese, 2003). The mean (maximum) Variance Inflation Factor was 1.41(2.13) which are within suggested limits (Greene, 2003), indicating that multicollinearity is not an issue. The Breusch-Pagan test (p=0.13) and White’s test (p=0.67) failed to reject the null of constant variance indicating that heteroskedasticity is not a serious problem.
Results of two-tailed t-tests overcame the potential concern of systematic differences in responses of IT and non-IT respondents (Table 3).

<table>
<thead>
<tr>
<th>Variable</th>
<th>IT-respondents (n=130)</th>
<th>Non-IT respondents (n=65)</th>
<th>Mean</th>
<th>S.D.</th>
<th>Mean</th>
<th>S.D.</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adoption strategy</td>
<td></td>
<td></td>
<td>2.39</td>
<td>0.87</td>
<td>2.29</td>
<td>0.88</td>
<td>0.45</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td></td>
<td></td>
<td>2.02</td>
<td>0.98</td>
<td>2.03</td>
<td>1.13</td>
<td>0.96</td>
</tr>
<tr>
<td>Perceived Challenges</td>
<td></td>
<td></td>
<td>2.71</td>
<td>1.34</td>
<td>2.91</td>
<td>1.19</td>
<td>0.35</td>
</tr>
<tr>
<td>Importance to Open Standards</td>
<td></td>
<td></td>
<td>3.26</td>
<td>1.1</td>
<td>3.25</td>
<td>1.05</td>
<td>0.52</td>
</tr>
<tr>
<td>Organization Size</td>
<td></td>
<td></td>
<td>5.98</td>
<td>1.29</td>
<td>5.83</td>
<td>1.26</td>
<td>0.43</td>
</tr>
</tbody>
</table>

The Harman’s one-factor test (Podsakoff and Organ, 1986) produced four principal components together accounting for 66.67% of the total variance. The first component accounted for only 23.61% of the variance. Hence there was no general factor accounting for over 50% of the variation, suggesting that common-method bias is not a significant problem.

**DISCUSSION AND IMPLICATIONS**

Consistent with our hypotheses, perceived usefulness and perceived challenges are strongly associated with the degree of adoption of Web 2.0 technologies. This suggests that there are differences in the way firms perceive Web 2.0 technologies in their contexts and these perceptions are associated with the extent of adoption. The significance of open standards suggests the need for inter-operability of these platforms with other existing enterprise systems in the IT infrastructure to better leverage the benefits of Web 2.0 technologies.

The significance of firm size supports the argument that Web 2.0 technologies platforms are subject to network effects and more useful in larger organizations which benefit more from process innovations (Gilbert, 2006). Support of H5 and H7 (industry hypotheses) suggest a greater fit between the technologies and organizational tasks in these environments.

H6 is not supported. One plausible explanation can be traced to our measure of competitive intensity. In the digital age, the boundaries between industries are blurring and consequently, the 4-firm concentration ratio, despite being a commonly used measure of industry concentration, may not be adequately capturing the effects of competition. Nevertheless, this should be further tested by future research, possibly using more refined measures. Notably, the coefficient of IT Capital is insignificant, consistent with the fact that Web 2.0 technologies are relatively inexpensive (Lai and Turban, 2008) and suggestive that, unlike other technologies, their adoption may not be driven by IT departments but rather by employees at the grassroots level (Wagner and Majchrzak, 2006).

Our results demonstrate the organizational, technological and environmental characteristics associated with adoption of Web 2.0 technologies, an emerging class of collaborative IT platforms. The higher adoption in larger firms suggests the possibility that these technologies may help in reversing the commonly held belief that information in a larger organization is more difficult to find (McAfee, 2006). The role of Open Standards suggests synergies between Web 2.0 and other enterprise software, which can open up avenues for future research to examine potential complementarities. Adoption drivers such as Open Standards and Industry innovation intensity may be peculiar to Web 2.0 as opposed to other enterprise technologies. Organizations may need to make fundamental changes before they perceive benefits from Web 2.0. Organizational culture represents one such key change (McAfee, 2006). Managers may also need to overcome challenges by adapting their security, risk management and governance policies to meet new operational and business requirements brought about by Web 2.0.

**LIMITATIONS AND FUTURE RESEARCH SUGGESTIONS**

First, this is arguably a study of early business adoption of Web 2.0. Second, like many empirical studies using secondary sources, data availability constraints limited the range of variables for analysis, though the choice of variables was guided by prior research and theory. Third, the cross-sectional analysis allows inference of association and not causality. Fourth, though the sample was randomly selected by InformationWeek, it is not a pure random sample; this limits the full generalizability of results.

Future research can investigate the business benefits of Web 2.0, which have been largely anecdotal. Other promising research areas include the role of employees in Web 2.0 and the interplay between Web 2.0 and corporate culture (McAfee, 2006).
CONCLUSION

In this paper, we examined the importance of technological, organizational and environment characteristics as predictors of the business adoption of Web 2.0 technologies. To the best of our knowledge, this study is the first to empirically examine factors associated with adoption of these platforms in business. Our research is also a step towards responding to the call of Parameswaran and Whinston (2007b, pg. 777) towards “interpreting and guiding” the trend of social computing “into fully realizing its potential”. This study contributes to the IT innovations adoption literature by empirically validating a model of contextual factors associated with adoption of a specific class of technologies. The social side of IT research is gaining in importance (Sidorova, Evangelopoulos, Valacich and Ramakrishnan, 2008) and this study examined some of the driving factors behind firms’ move towards a more collaborative social enterprise.

ACKNOWLEDGEMENTS

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APPENDIX

Appendix A: Relevant Survey Questions

1) How would you characterize your company's strategy for using Web 2.0 technologies?
   - Skeptical: they don't provide much value.
   - Willing but wary: we're considering some use, but central IT must approve.
   - Fully engaged: IT is actively working with business units to put such tools to greater use
   - Wide-open experimentation: Encourage employees to try them, with or without IT department’s blessing

2) On a scale of 1-5 (5 being most useful), rate the following tools on how useful they might be in helping your company's employees be more effective?
   - Wikis, Blogs among employees
   - Blogs with partners or customers
   - RSS feeds
   - Ajax-powered web portals
   - Mash-ups
   - Instant messaging
   - Integrating search tools
   - Unified communications
   - Presence awareness
   - Click-to-call
   - Business social networks
   - Collaborative content

3) Which of the following are biggest challenges to adopting enterprise Web 2.0 technologies? (Choose ALL that apply)
   - ROI hard to prove
   - Getting partners and customers to use similar collaboration tools
   - Integrating with legacy technologies
   - Lack of expertise
   - Employees prefer consumer tools
   - Security

4) How important are open standards to the organization?
   - Not at all important
   - A little important
   - Somewhat important
   - Very important
   - Extremely important

5) What is the size of your organization (number of employees)?
   - Under 50
   - 50 to 99
   - 100 to 499
   - 500 to 999
   - 1000 to 4999
   - 5000 to 9999
   - 10000 or more

Appendix B: Sample Industry Details

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<th>Industry Type</th>
<th>Freq</th>
<th>Percent</th>
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<td>1.03</td>
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<tr>
<td>Administrative and Support and Waste Management</td>
<td>7</td>
<td>4.59</td>
</tr>
<tr>
<td>Arts, Entertainment and Recreation</td>
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<tr>
<td>Educational Services</td>
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<td>10.94</td>
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<tr>
<td>Finance and Insurance</td>
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<td>14.04</td>
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<tr>
<td>Health Care and Social Assistance</td>
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<td>7.18</td>
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<td>Information</td>
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<td>18.97</td>
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<tr>
<td>Manufacturing</td>
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<td>22.86</td>
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<tr>
<td>Other Services (except public Administration)</td>
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<td>Professional, Scientific and Technical Services</td>
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REFERENCES


