Why should Indian businesses transition to Enterprise 2.0?

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Abstract

Purpose – *This study aims at examining the factors governing business benefits of moving to Enterprise 2.0. Web 2.0 has been around for more than a decade, and has been exploited by a lot of business organizations for improving their operations and profitability. However, the success rate has not been uniform.*

Design/methodology/approach – *Is there a pattern behind this successful adoption has been a matter of curiosity for most top management personnel. This paper goes into analyzing what factors govern this movement from Enterprise 1.0 to Enterprise 2.0 and uses structured equation modeling to predict the possibilities.*

Findings – *It concludes by demonstrating that business benefits to the organization are significantly linked to the usage of Web 2.0 tools.*

Research limitations/implications – *The paper has been done in India, and the authors expect that similar studies around the world will result in similar results.*

Practical implications – *Results of this paper emphasize the strong correlation between the use of Web 1.0 and Web 2.0 tools with business benefits obtained in terms of improved productivity of resources used and a higher level of information quality leading to better decision-making. Thus, transition to the Enterprise 2.0 state should be strived by all business organizations.*

Originality/value – *This is an original work of the authors.*

Keywords *India, Change management, Statistical analysis, Worldwide web, Information society*

Paper type *Research paper*

Introduction

In the 1960s, computers changed the way we do business for ever. The next major leap was the introduction of the Internet for business purposes in the late 1990s. This so called "read only" Web 1.0 led to an incredible amount of information availability which could be searched by the use of "search engines". From this stage of static Web sites came the next major revolution when Web 2.0 brought with it new possibilities and new ways of doing business, often questioning established principles of business and evolving new business models (including the concept of Enterprise 2.0).

This era brought with it the possibility of consumers participating in creating Web content, and we saw the emergence of the social Web or in simple terms the "read-write" Web. Enterprise 2.0 environments facilitate sharing of ideas with business partners through the use of blogs, wikis and social networking sites, which in turn leads to improved collaboration and shared knowledge resulting usually into shorter product life cycles. Because most markets today are global and competition is thus tougher, it results in a more challenging business environment on the Web than was possible before. Nowadays, the usage of social media tools has become a necessity for organizations to improve the efficiency of organizational processes.

The term "Web 2.0" has been around for more than a decade, and it focuses on the interactivity associated with user-generated content and interoperability on the World Wide

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Web. The term Web 2.0 was initially used by Dale Dougherty in O'Reilly Media and CMP Web 2.0 and later gained popularity when Tim O'Reilly and Dale Dougherty made it the central focus at the O'Reilly Media Web 2.0 Conference held in late 2004. Enterprise 2.0 refers to any enterprise which proficiently uses Web 2.0 tools and services such as tagging, ratings, networking, Really Simple Syndication (RSS) and sharing in their day-to-day business. The term "Enterprise 2.0" was coined by Andrew McAfee of Harvard Business School in an article in the spring 2006 issue of the Sloan Management Review. His interpretation of Enterprise 2.0 was more limited in the sense that it expected the organization to make use of Web 2.0 technologies, such as wikis and blogs, essentially inside the corporate intranet.

This rising importance of Web 2.0 tools and techniques in enriching business productivity and profitability leads to some important questions like: Are there any factors that influence the successful incorporation of these tools in business? Are there any factors which influence the adoption of these tools by employees? What separates successful organizations from not so successful ones? What could be the means of accelerating this acceptance of Web 2.0 tools in a business situation?

Barnes *et al.* (2012) have reported a study based on a qualitative case study methodology using semi-structured interviews with the owner-managers of 12 UK-based small companies in the business services sector who are early adopters of Web 2.0 technologies. They talk about benefits from the use of Web 2.0 being categorized as lifestyle benefits, internal operational efficiency, enhanced capability, external communications and enhanced service offerings. The major limitation of this study is that a small number of firms of similar size, sector and location were studied, which limits generalizability.

However, as is noticeable from the previous research, it is mostly focused on either problems of tools adoption or on the peculiarities of the use of certain technologies. Assessing the factors that can influence Indian businesses taking this leap of faith is the primary objective of this research, and it helps explain how adoption of Enterprise 2.0 tools (such as wikis, blogs, micro blogs, social networks, tagging and social bookmarking) address the barriers to knowledge sharing within organizations and improve its performance and profitability through collaboration. It also attempts to describe a model for predicting the success rate of the adoption of these new tools.

Literature review

Let us start by clarifying the conceptual differences between some similar terms that have come about in common use in recent times.

Web 2.0 and Enterprise 2.0

At a conceptual level, the difference between Web 2.0 and Enterprise 2.0 is that the term "Web 2.0 technologies" pertains to their use by the public at large working on the shared Internet and may be driven by curiosity, whereas "Enterprise 2.0" refers to the use of the same technologies within companies and with partners on the intranet and between companies on the extranet and with business interest being paramount. In other words, Enterprise 2.0 is not just Web 2.0, but Enterprise 2.0 is "Web 2.0 in companies serving a business interest" (McAfee, 2006). The business use of these tools has always been of interest to see if it really helps grow the top line and the bottom line. McKinsey conducted a survey of about 1,700 executives across industries and functional areas in 2009 (McKinsey & Company, 2009), and found that most users of Web 2.0 applications are enjoining benefits such as increased knowledge sharing.

Web 2.0 "technologies are used on organizations' intranet and extranets". Enterprise 2.0 aims to help employees, customers and suppliers collaborate, share and organize information via Web 2.0 technologies. Enterprise 2.0 refers to the "the use of emergent social software platforms within companies, or between companies and their partners or

customers" (McAfee, 2006). The term Internet 2.0 emerged in 2004 to define a brand new Internet technology, and should not be confused with the terms Web 2.0 and Enterprise 2.0. Dale Dougherty coined the term during a team discussion concerning future Internet conferences (O'Reilly, 2005). A lot of people have a point of view that it conveys the impression of a new version of the World Wide Web (Wigand, 2007).

Enterprise 2.0 presupposes that an organization will achieve its goals by sharing knowledge with others, and use learning and consensus building by adopting the use of social media-based technology in an effective manner. Enterprise 2.0 is examined in an effort to understand its social and organizational impacts and the change it has brought to organizations. The features of Web 2.0 technology and how its application has transformed the working of organizations are discussed in this paper. The impacts on collaborative and communication segment, knowledge management, rapid application development, training, customer relationship management, innovation and the financial impact have been described.

Similar studies attempted in the recent past

A variety of studies have been done in this field. The learning organization has brought out a special issue (Vol. 21 No. 1, 2014) intending to identify the salient criteria that management practitioners must address to assist in the implementation of Web 2.0 technologies in the work place. The research presented in the special issue provided an important academic contribution toward an area that is, at present, underresearched, namely, whether there is a structured approach that can be universally applied by organizations when internally implementing Web 2.0 technologies into their work place. It points out that currently, there is a lack of empirical research in this topic (Saldanha and Krishnan, 2012, Holtzblatt *et al.*, 2010; Baxter *et al.*, 2011; Denyer *et al.*, 2011). In addition, a further intention of this special issue was to explore whether a universal systematic approach toward implementing Web 2.0 technologies might be applicable to organizations regardless of industry discipline, culture or size.

Some researchers agree that there is a shift in the methods of interaction online than were currently available, and that it has made possible new generations of services or applications online. These forms of applications are designed to supply Internet users with the ability to publish and share data and ideas. Thus, the Web 2.0 phenomenon may well be outlined as a brand new generation of Internet applications that allows people to collaborate and share data online (Tapiador *et al.*, 2006; Wigand, 2007). In contrast to the earlier prevalent static sites, Web 2.0 is a lot more dynamic, permitting users to contribute to content online and to support Web-based communities of users.

Businesses have been adopting the use of Web 2.0 in regular business transaction in an increasing manner year-on-year. While initially introduction of Web 2.0 tools was primarily to enhance work productivity, reduce cost and increase innovation rates (Bughin, 2008), now it is becoming a part of the new business processes. There are a wide variety of Web 2.0 technologies available, but to restrict oneself to typical business situations, the focus of this study has been to cover the most common Web 2.0 technologies in the business environment like blogs, wikis and social networking based on the global online survey conducted by McKinsey (2009). This annual survey conducted by them has been pointing to increased interest in almost all organizations toward the use of such tools. Successful adoption of Web 2.0 technologies by businesses has led to the emergence of Enterprise 2.0 as a new distinct entity.

Among the common and popular dynamic tools of Web 2.0 are blogs, wikis and social networking sites. These technologies are open sources because they help people to interact, share and update their ideas, videos and photos globally. In contrast, Web 1.0 applications like e-mail had static content (not adaptable), and were closed source as the content of email is restricted only to its senders and receivers (Newman and Thomas, 2009; McAfee, 2009). By presenting some case examples, Bughin (2008) demonstrated how

Web 2.0 could improve work productivity and benefit organizations. While Web 2.0 is user focused as users are able to produce, organize and reason the online content (Levy, 2009), Web 1.0 was not. Thus, the Web 2.0 phenomenon may well be outlined as a brand new generation of Internet applications that allows people to collaborate and share data online (Tapiador *et al.*, 2006; Wigand, 2007). In contrast to the earlier prevalent static sites, Web 2.0 is a lot more dynamic, permitting users to contribute to content online and to support Web-based communities of users.

Social media is often defined by Web 2.0 technologies that people use to create and share information. So Kaplan and Haenlein (2010) consider Web 2.0 as a platform for the development of social media. Kaplan and Haenlein (2010) defined the social media as "Social Media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content." (Kaplan and Haenlein, 2010, p 61). A blog is "a frequently updated Website consisting of dated entries arranged in reverse chronological order". This means that the contents are arranged from the latest date to the oldest date (Walker, 2003; Trammell *et al* (2006)). Many bloggers enhance their blogs with news feeds by encoding the content of the blog in XML-based format known as RSS. RSS feeds notify people about the updates that happen in the blogs (Ojala, 2004). Blog is used as "bulletin board" to support communication and knowledge sharing in teams (Röll, 2003). Users are able to publish, filter, edit, search, subscribe, collaborate and communicate online (Tapiador *et al.*, 2006; Tredinnick, 2006). Accordingly, with high Internet accessibility and the availability of mobile devices, many users are attracted to using Web 2.0 applications in public; also, more organizations are interested in introducing Web 2.0 tools in the workplace.

Knowledge sharing and collaboration are important aspects of Enterprise 2.0 (Bughin, 2008; McAfee, 2006; Tredinnick, 2006). Enterprise 2.0 technologies, such as blogs, wikis and social bookmarking, enhance organizational knowledge, as they are collaborative, conversational and personal knowledge management technologies (Alqahtani *et al.*, 2011). Some of the earlier publications of Wahi *et al* (2014) have proposed models on the role that social media is playing in helping enterprises make a cultural, philosophical and social shift in their relationship with customers, suppliers and other partners. In another paper, Wahi *et al* (2015) have argued that the emergence of Big Data on the scene has acted both as an enabler and a challenge for the adoption of Enterprise 2.0 state in business situations.

Hinchcliffe (2007) has also summarized a few lessons for all organizations wanting to go the Enterprise 2.0 way. They are as follows:

- Enterprise 2.0 is going to happen in your organization with you or without you.
- Effective Enterprise 2.0 seems to involve more than just blogs and wikis.
- Enterprise 2.0 is more a state of mind than a product you can purchase.
- Most businesses still need to educate their workers on the techniques and best practices of Enterprise 2.0 and social media.
- The benefits of Enterprise 2.0 can be dramatic, but only builds steadily over time.
- Enterprise 2.0 does not seem to put older information technology (IT) systems out of business.
- Your organization will begin to change in new ways because of Enterprise 2.0. Be ready.

Paroutis and Al Saleh (2009) conducted an important study that investigated the determinants of knowledge sharing using Web 2.0 within organizations. They indicated that Web 2.0 has become a popular choice as a knowledge management system for an increasing number of organizations; yet very little is known about factors leading to its success or failure. Li (2012) shows that Web 2.0 improves employees' abilities and

business efficiencies simply by connecting people. Li (2012) lists a number of Web 2.0 benefits for business, for example, improving best practices sharing, facilitating collaboration and solving problems faster as well as enhancing and streamlining internal communication. These benefits not only are short term in nature but also have a long lasting impact. In addition, enterprises' implementation of this emerging technology needs to be driven by individual employees as organizations cannot force employees to adopt it (Kosalge and Tole, 2010).

Before the business is able to reap all these benefits, there are a whole series of challenges, and the research also highlights some of the issues which arise in parallel to its successful usage. Dawson (2009) identified potential key benefits from implementing Web 2.0, categorizing them as productivity and efficiency, staff engagement, knowledge and reputation. Work productivity is increased by employees' ability to access valuable resources and to collaborate with each other to improve innovations and solve work-related problems. Every coin has two sides and so does Enterprise 2.0. Even with these benefits, Enterprise 2.0 technologies have associated risks (Dawson, 2009). These risks are security, losing control over content and threats to reputation and reliability (Cook, 2008; Gilchrist, 2007).

Let us summarize the findings of all these studies in a Table I as presented below:

Objectives of the current study

This research will help provide organizations a framework to assess their readiness before they embark on the Enterprise 2.0 journey, including the benefits and impediments. Enterprise 2.0 planning involves assessing current capabilities, creating a future vision and then charting a course of action to get there. Keeping this in view, the objectives of this study are:

- to identify the factors that influence Enterprise 2.0 applications for business;
- to examine the level of use of data analytics in current Indian businesses; and
- to develop a model for understanding of antecedents and outcomes of Enterprise 2.0 in organizations.

Table I Previous studies on enumerating benefits of transformation to Enterprise 2.0

Sr. No.	*Author(s)*	*Benefits*
1	Alqahtani *et al.* (2011)	Enhance organizational knowledge as these techniques are collaborative, conversational and personal knowledge enhancing, thus improving management decision-making
2	Bughin (2008)	Knowledge sharing and collaboration leading to enhanced work productivity, reduced cost and increased innovation rates
3	Dawson (2009)	Improvement in productivity and efficiency, staff engagement, knowledge and reputation
4	Baxter *et al.* (2014)	Supports informal learning within communities of practice (CoPs) in the organization, builds a learning culture
5	Kaplan and Haenlein (2010)	Allow for the creation and exchange of user-generated content
6	Levy (2009)	Users are able to produce, organize and reason with online content
7	Li (2012)	Help in improving best practices sharing, facilitating collaboration and solving problems faster as well as enhancing and streamlining internal communication
8	Tapiador *et al.* (2006)	Allow people to collaborate and share data online
9	Tredinnick (2006)	Users are able to publish, filter, edit, search, subscribe, collaborate and communicate online leading to knowledge sharing and collaboration

For the purposes of this research, an organization's readiness to implement Enterprise 2.0 is defined as the availability of organizational resources and supporting conditions for the realization of Web 2.0 technologies implementation at the organizational level. Thus, the main aim of this study is to develop a framework that can be used to study this readiness which can be replicated in other situations. The review of literature presented earlier also identified a gap in understanding the implementation of such interactive technologies beyond the decision to adopt it. Lessons learnt from this study will also help similar studies in other countries or alternate situations.

As a result of this study, Indian businesses in particular and businesses across similar countries as India will gain insight into how to prepare themselves for the future. It will provide recommendations on how to drive the adoption of Web 2.0 and manage employee issues not only to make Enterprise 2.0 initiatives a success but also to deliver business benefits. Consequently, the organizations' investments in Web 2.0 will not be wasted, and the opportunities offered by such technology can be achieved.

On the basis of review of the literature cited and objectives outlined above, we intend to test the following hypotheses:

H1. Increase in business productivity and resultant benefits trigger the increased usage of simple/common Web tools.

H2. Increased usage of Web 2.0 tools has a direct bearing on improving business productivity and resultant benefits.

H3. Increased usage of simple/common Web tools along with simultaneous usage of Web 2.0 tools has a direct bearing on improving business productivity and resultant benefits.

Data collection process

To gain this understanding, the researcher explored the factors that affect adoption and how they influence the process of introduction of the emerging technology. The exploratory nature of this research has led to a qualitative approach to examine this complex phenomenon which, however, has immense potential of changing the way business will be done in the future. To examine this phenomenon, the first step was the analysis of the relevant literature to develop an understanding of how other countries had attempted similar research. This was followed by a qualitative study in two phases. In the first phase, a set of personal interviews with CXOs of a few organizations was taken up to refine and extend the findings from other similar studies available in the literature. Six people participated in the first-stage study discussions which helped in framing the initial questionnaire.

In the second phase, 42 senior employees from different organizations were personally interviewed to enrich the understanding about how the adoption is influenced and to validate the findings from the initial stage (which had resulted in the questionnaire) as well as exploring new adoption issues. This resulted in the necessary modifications to the questionnaire that became the basis for later work. The initial questionnaire developed after the meeting with the CXOs consisted of 67 questions besides demographic data. It was clear that this was too long and would not elicit a good response, and therefore, after validation with the senior executives, 13 questions were dropped and only 54 questions remained. A lot of futuristic questions were dropped, and those that related to choice of technologies were also removed in the absence of clarity on the state of readiness.

The final questionnaire was composed of questions which covered inter alia, questions on the following:

- The current state of access to relevant, accurate and timely data, analytic tools in current use and the extent to which this data-driven decision-making was helping business transformation.

- Level of familiarity with Web 2.0 tools like blogs, wikis, bookmarking and tagging, social networks, podcasting and livecasting, mashups, information aggregation, social media analytics and crowd sourcing, etc., at the personal level.
- Use and experience of the same Web 2.0 tools in the business situations.
- Impressions on the effects and benefits of these tools on personal and business situations and quantification of these business benefits.

To counter possible order effects in the responses, questions were randomized prior to the administration of the questionnaire. Items were measured on a five-point Likert-type scale, where one end indicated strong disagreement and the other end indicated strong agreement with the item (5 = Strongly Agree to 1 = Strongly Disagree).

The responses were collected at the organizational level (except for a few questions at individual level), where the respondent was answering on behalf of his organization. In the process, the effect of predictor variables on the outcome variable was measured on behalf of the organization.

The data were then subjected to advanced statistical analysis. The technique that was identified was structured equation modeling. The various stages of this are described in the following section.

Research methodology

To capture the variability in the data and to identify the most prominent variables that contribute to this variability the most, factor analysis (principal component analysis) was conducted. Exploratory factor analysis (EFA) is used to reduce the data to a more manageable number of variables or factors. Principal component method of extraction with varimax rotation has been used. The item that did not load well was removed, and the indicators that loaded onto their proposed factors well were retained. Models using the observed variables as linear combinations of the potential factors, plus "error" terms, help in understanding the interdependencies between these observed variables and, thus, reducing the total number of variables in the data. While in EFA, the assumption is that an underlying causal model exists; PCA has been termed as simply a variable reduction technique.

EFA was later followed by confirmatory factor analysis (CFA), which is a statistical technique used to verify the factor structure of a set of observed variables emerging from the EFA. A CFA like the one proposed in this model is a deductive approach to predicting an outcome from a theoretical framework. CFA is done on the basis of indices generated in the output. Even though there is lack of agreement among researchers on the range of fit indices (Meyers *et al.*, 2013), but generally agreed upon fit indices should be close to the minimum level. To achieve the perfect fit model, the CMIN/df value should be below 5.00; NFI, CFI and IFI be greater than 0.900; PGFI be less than 0.500; and Root mean square error of approximation (RMSEA) be 0.08 and below. Similarly, standardized estimates should also be significant with *p*-values less than 0.05.

Different models establishing the relationship between the six factors identified by EFA were proposed, and then, attempts were made to determine the goodness of fit in describing the available data set. This type of structural modeling has widespread usage in a variety of subjects now. The subsequent sections deal with these research model variables and hypotheses and specify relationships between these variables in detail. The hypotheses are discussed in detail in the Findings section later.

Findings from the research

The outcomes from this research project have been grouped into two sections viz. descriptive analysis and statistical analysis. Each of these is described in detail below.

Descriptive analysis

Some of the initial results obtained from a simple compilation of the responses are detailed below:

A majority of respondents (83 per cent) were satisfied with the current state of access to relevant, accurate and timely information in their respective organizations, and only 17 per cent found it wanting (Figure 1).

However, when it came to analytics capability of the organization, the response was slightly poorer. A majority of respondents (75 per cent) were still satisfied with the current capabilities in their respective organizations; 25 per cent found it wanting (Figure 2).

Considering the perception of the respondents on the ability of top management to convert that information and analytics capability to improve decision-making and transforming the business and a similar picture emerged. Here, a majority of respondents (74 per cent) were still satisfied with the current capabilities in their respective organizations; 26 per cent found it wanting (Figure 3).

Figure 1 Satisfaction with current access to timely, accurate and relevant information

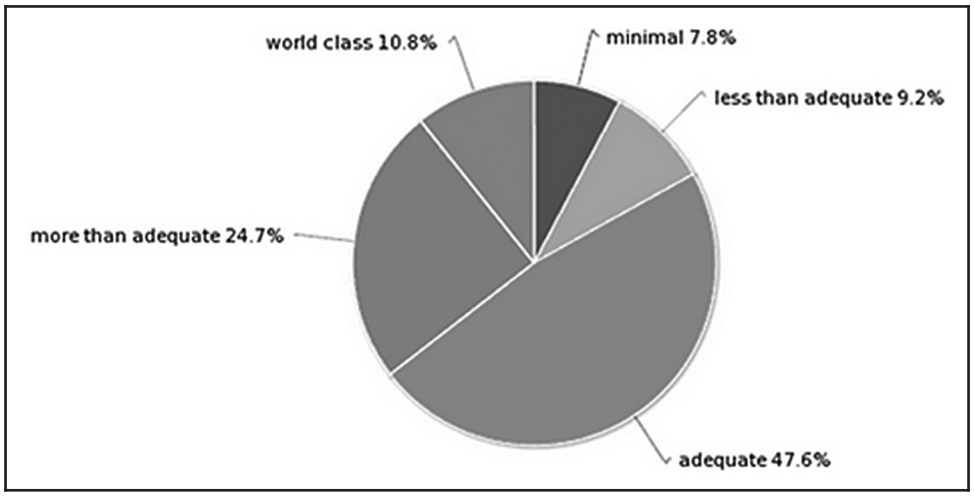


Figure 2 Satisfaction with current analytics capability of the organization

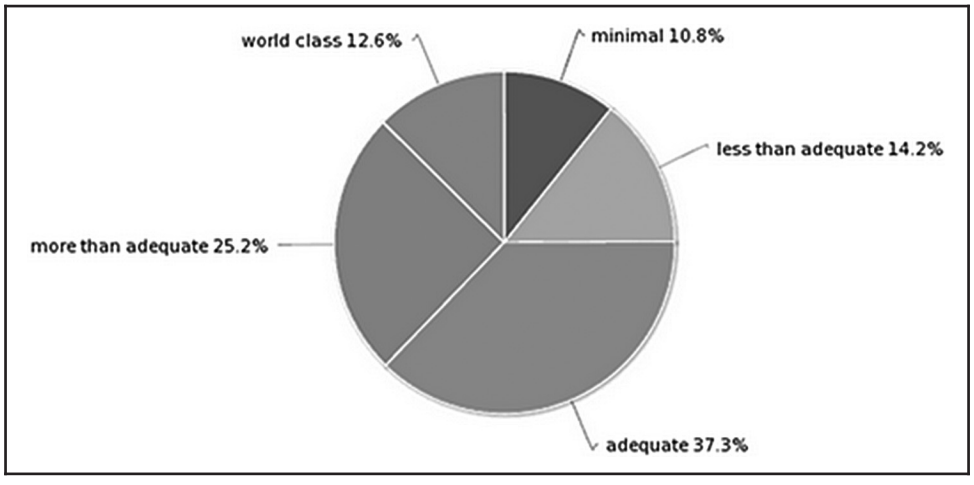
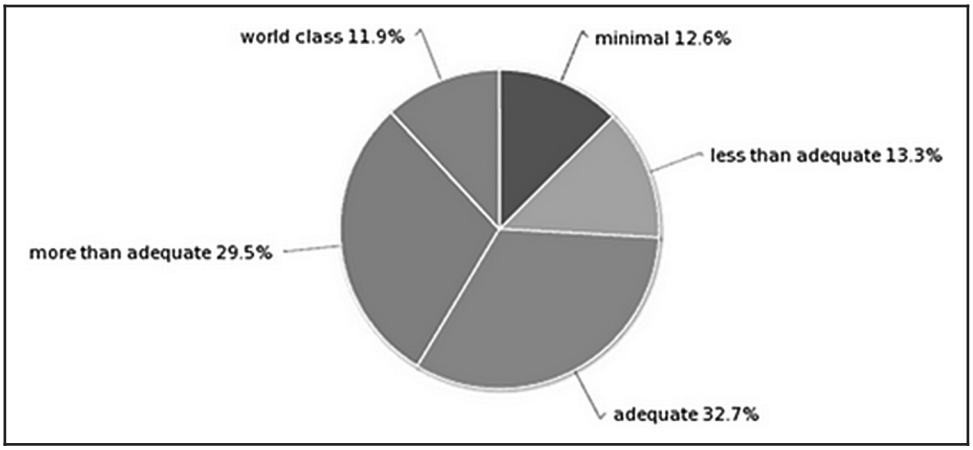


Figure 3 Ability of management to convert analytics capability to improve decision-making



To obtain impressions on the effects and benefits of these tools on personal and business situations, quantification of these business benefits was made by ranking a few statements on a five-point agreement scale, and the results are in the Figure 4 below.

An attempt to see the relevance of creating a business case before such investments are initiated was made, and only a very small portion of respondents said that their organization had gone by a projected or proven return on investment (ROI). While some tend to quantify the intangible benefits, a majority of them have no business case prepared as depicted in Figure 5.

By applying different weights to each level of comfort with the respective Web 2.0 tool and computing a weighted average comfort level for both personal use and business use, we

Figure 4 Inter-relationship between usage of Web 2.0 tools at personal and business levels

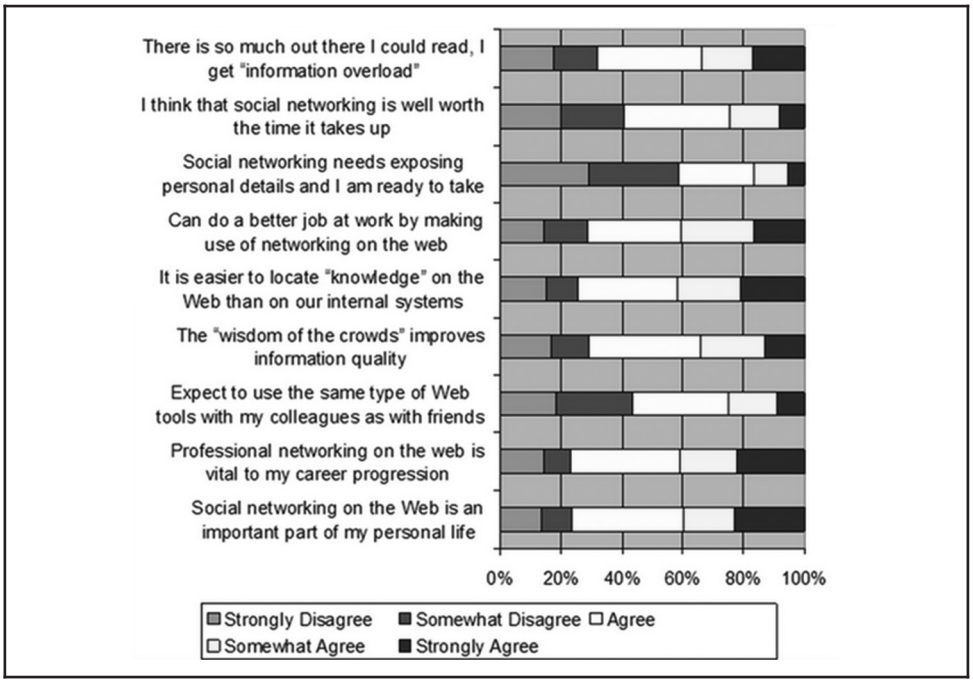
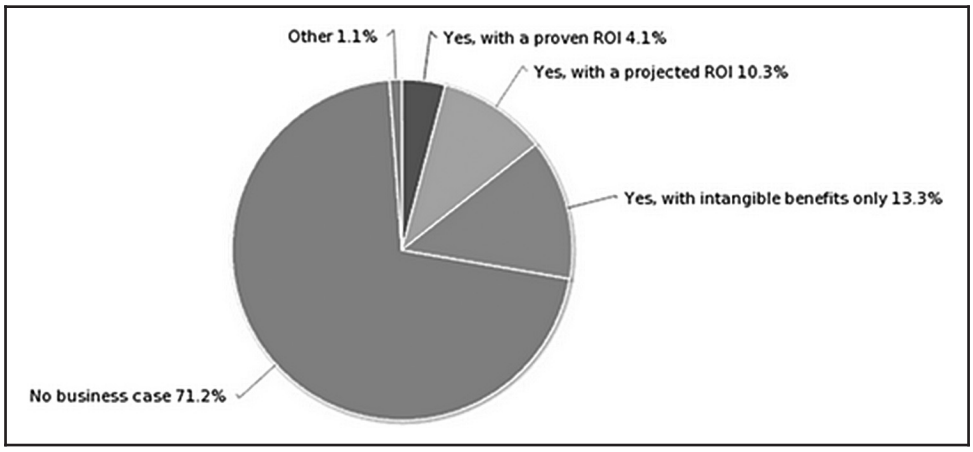


Figure 5 Need to create a business case for Web 2.0 investments



get a Figure 6 as depicted below. We notice that the use in business is usually lagging slightly behind personal use. Considering the same set of statistics, we can also tabulate them into broadly three categories viz. High, Medium and Low. The resulting grouping is then depicted in the Figure 7.

Relative level of comfort of multiple Web 2.0 technologies at personal and business level

An attempt was made to understand the level of usage of different Web 2.0 techniques by respondents in their personal lives and in their business roles. Figure 6 presents the results, and it is apparent that unless there is comfort on the use of the technique at the personal level, there is limited usage in business situations. There is also a difference in the relative usage of certain techniques versus the others (Figures 6 and 7).

Results obtained from the structured equation modeling

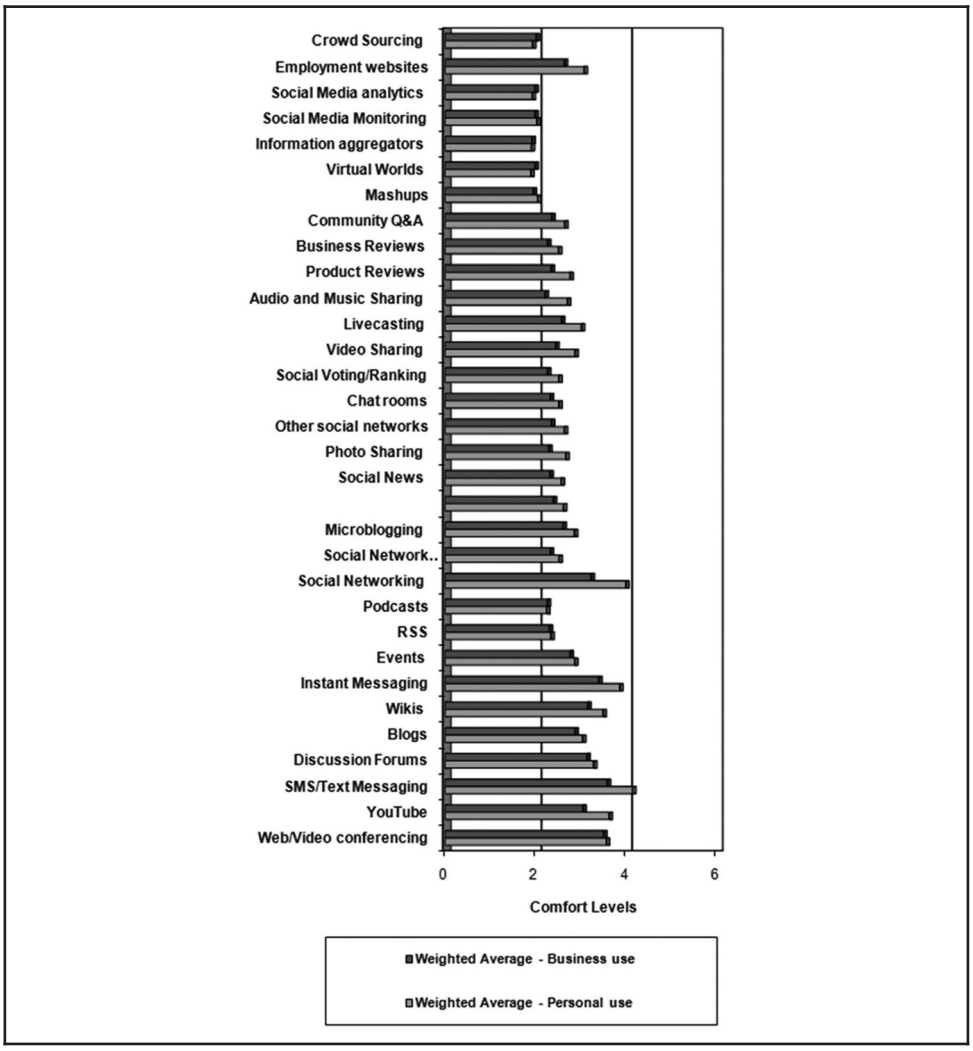
Exploratory factor analysis. The 77 variables used in factor analysis were reduced by using the PCA and varimax method. The six emergent factors from this were:

- *Factor 1*: Advanced Web 2.0 tools such as crowd sourcing, social media analytics, virtual worlds, information aggregators, mashups, etc. These are rated "Low" on level of familiarity in Figure 7 below.
- *Factor 2*: Basic Web 2.0 tools such as social bookmarking or tagging, photo sharing, livecasting and video sharing, business reviews, product reviews, etc.
- *Factor 3*: Impact of Web 2.0 tools on business productivity and information quality and acceptance of usage in balancing personal and organizational needs.
- *Factor 4*: Simple/common tools like blogs, text messaging, video conferencing or wikis for personal usage. These are rated "High" on level of familiarity in Figure 7 below.
- *Factor 5*: Simple/common tools like blogs, text messaging, video conferencing or wikis for business usage. These are also rated "High" on level of familiarity in Figure 7 below.
- *Factor 6*: Ability and comfort level of the organization currently with data analytics.

Because this is an emerging area of study, no clear theory exists on the relationship of these factors. To study their mutual relationship, they were grouped into three dimensions viz.:

1. *Web 2.0 tools*: This dimension is formed by clubbing Factors 1 and 2.
2. *Simple Web tools*: This dimension is formed by clubbing Factors 4 and 5.
3. *Business Benefits*: This dimension is formed by clubbing Factors 3 and 6.

Figure 6 Relative usage of Web 2.0 tools at personal and business levels



Multiple model fits were then tested using CFA techniques mentioned earlier under the methodology. Here are the results of the three hypotheses that were framed and tested:

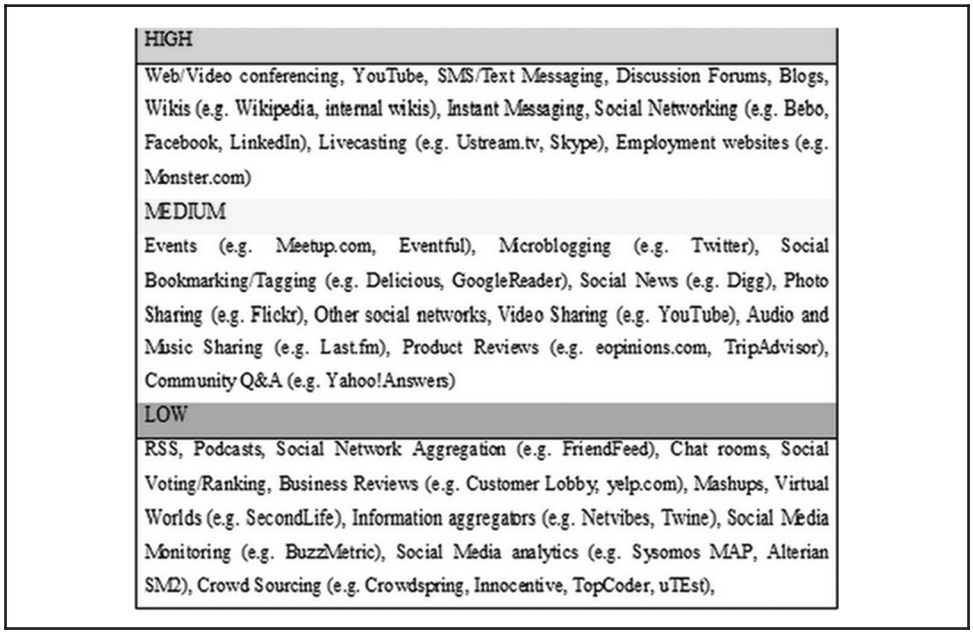
H1. Increase in business productivity and resultant benefits trigger the increased usage of simple/common Web tools.

Model 1 proposes a relationship between the usage of simple/common web tools and business benefits. The hypothesized model is represented in Figure 8 below. This study has, thus, tested the hypothesis that ability to use simple/common Web tools at a personal level and for business purposes are indicators of usage of Web tools in the business, and that impact of usage of these tools on business productivity and current usage of data analytics tools in the business are indicators of business benefits. They both rise together. These Web tools are essentially Web 1.0 and a few elementary Web 2.0 tools (Figure 8).

The CFA of the hypothesized model assessed on IBM SPSS Amos 20 generated the following regression weights.

The regression weights in Table II below indicate the raw score regression weights and the exact probability of them occurring by chance if the null hypothesis is true. Coefficients that

Figure 7 Level of familiarity with different Web 2.0 technologies in Indian businesses



were constrained in the model specification viz. ability to use simple/common web tools for personal usage and for business usage as well as help in business productivity for business benefits cannot be estimated, and thus, a value of 1 is assigned to these paths. The resulting coefficients for other paths are estimated and the *p* values (probability values) are reported. Here, we notice that a value of 1.168 is the raw regression coefficient for simple/common Web tools.

The *p* values (indicated as ***) in the table represent a value less than 0.001, and therefore, all the three estimated coefficients are statistically significant. In other words, business benefits are a statistically significant result of the increased usage of simple/common Web tools and of the current ability of the organization in usage of data and analytics.

The standardized regression weights in Table III below display the path coefficients used in the structural diagram. These coefficients are the correlations between the factor and the indicator variables while controlling for the correlation of all other factors with the specified factor.

The chi-square and fit indexes are shown in Table IV. Although the chi-square test of the model was statistically significant with a value of 4.409 (2, $N = 437$), $p < 0.001$, the model yielded acceptable fit indexes for the GFI, NFI and CFI.

The target value of GFI is equal to or greater than 0.90 for a good fit: the present case yielding a value of 0.995 suggests an excellent fit. Similarly, the target values for NFI and CFI are 0.95; again, the obtained values of 0.990 and 0.995 are excellent fit situations. The target value for RMSEA is 0.08, and the obtained value of 0.053 again points to a good fit. Thus, in summary, the model can be stated to be an excellent fit situation.

Figure 9 presents the path model together with standardized regression weights (beta coefficients) associated with the hypothesized paths. Thus, in summary, the model can be stated to be an excellent fit situation.

The model coefficients suggest that usage of simple/common Web tools is measured through two attributes, namely, personal knowledge of the tools and their relevance for

Figure 8 Hypothesized Model 1 showing relationship between usage of simple/common Web tools and business benefits

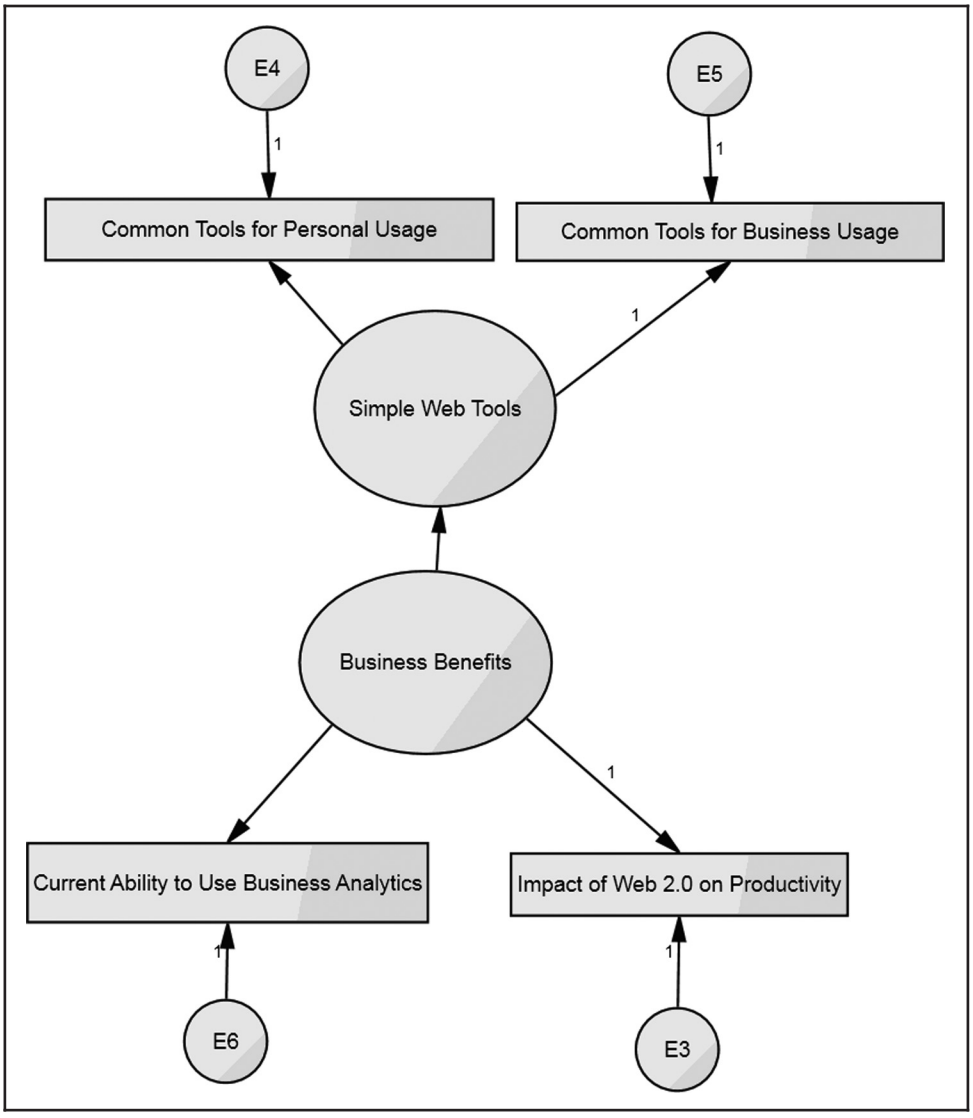


Table II Regression weights table

Relationship	*Estimate*	*Standard error*	*C.R.*	p	*Label*
Web1 tools <– Benefits	1.618	0.149	10.824	***	
Ability to use for personal usage <– Web1 tools	1.000	0.075	13.395	***	
Help in business productivity <– Benefits	1.000				
Using analytics <– Benefits	0.196	0.035	5.672	***	
Ability to use for business usage <– Web1 tools	1.000				

Note: $^{***}p < 0.001$

business usage, and that one unit increase in usage of simple/common Web tools is contributed by 0.84 units of the first and 0.83 units of the second. The findings also depict that there is a direct causality between business benefits and usage of simple Web tools.

H2. Increased usage of Web 2.0 tools has a direct bearing on improving business productivity and resultant benefits.

Table III Standardized regression weights table

Relationship	*Estimate*
Benefits <– Benefits	1.000
Ability to use for personal usage <– Web1 Tools	0.839
Using analytics <– Benefits	0.555
Help in business productivity <– Benefits	0.317
Ability to use for business usage <– Web1 Tools	0.831

Table IV Chi-square and fit indexes for Model 1 showing relationship between ability to use simple Web tools and business benefits

Factor model	*Chi-square*	*df*	*GFI*	*NFI*	*CFI*	*RMSEA*
Original	4.409	2	0.995	0.990	0.995	0.053

Figure 9 Model 1 showing relationship between usage of simple/common Web tools and business benefits

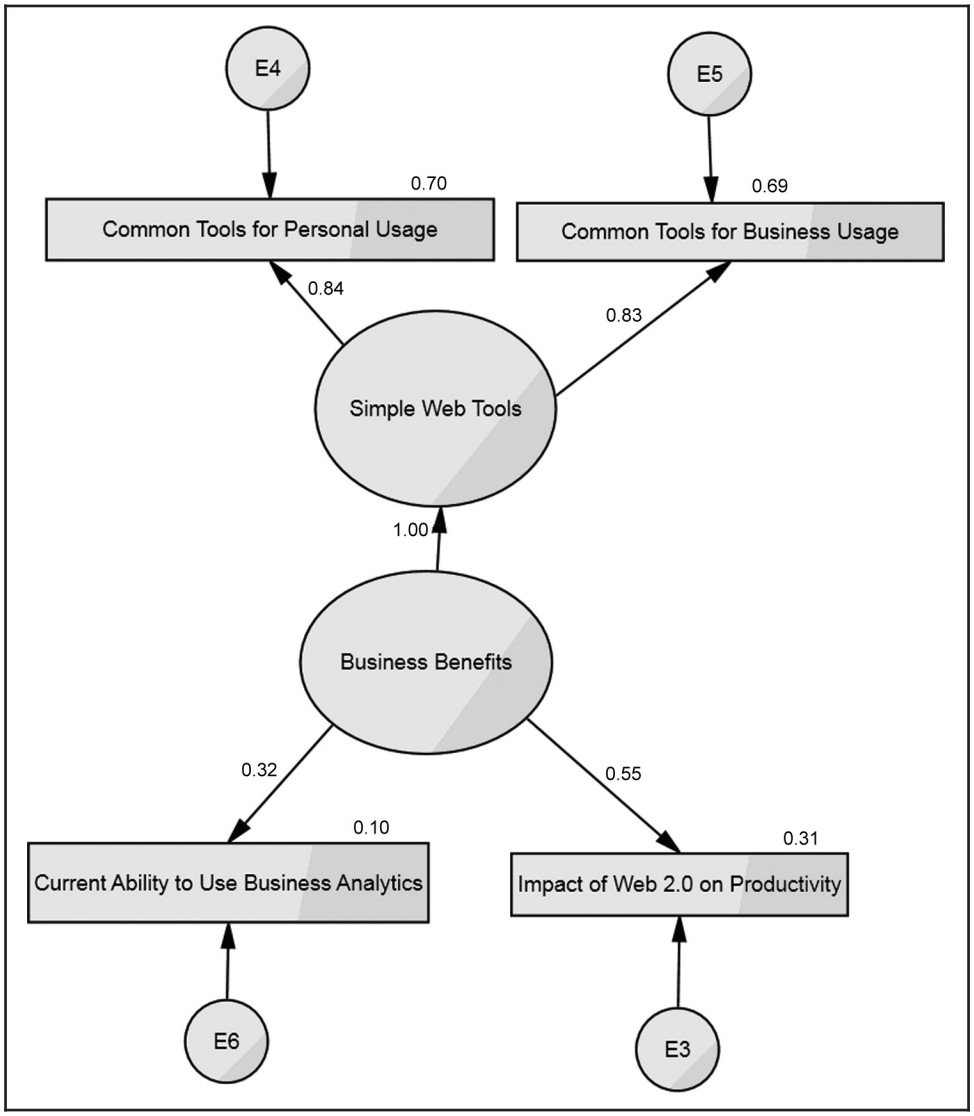
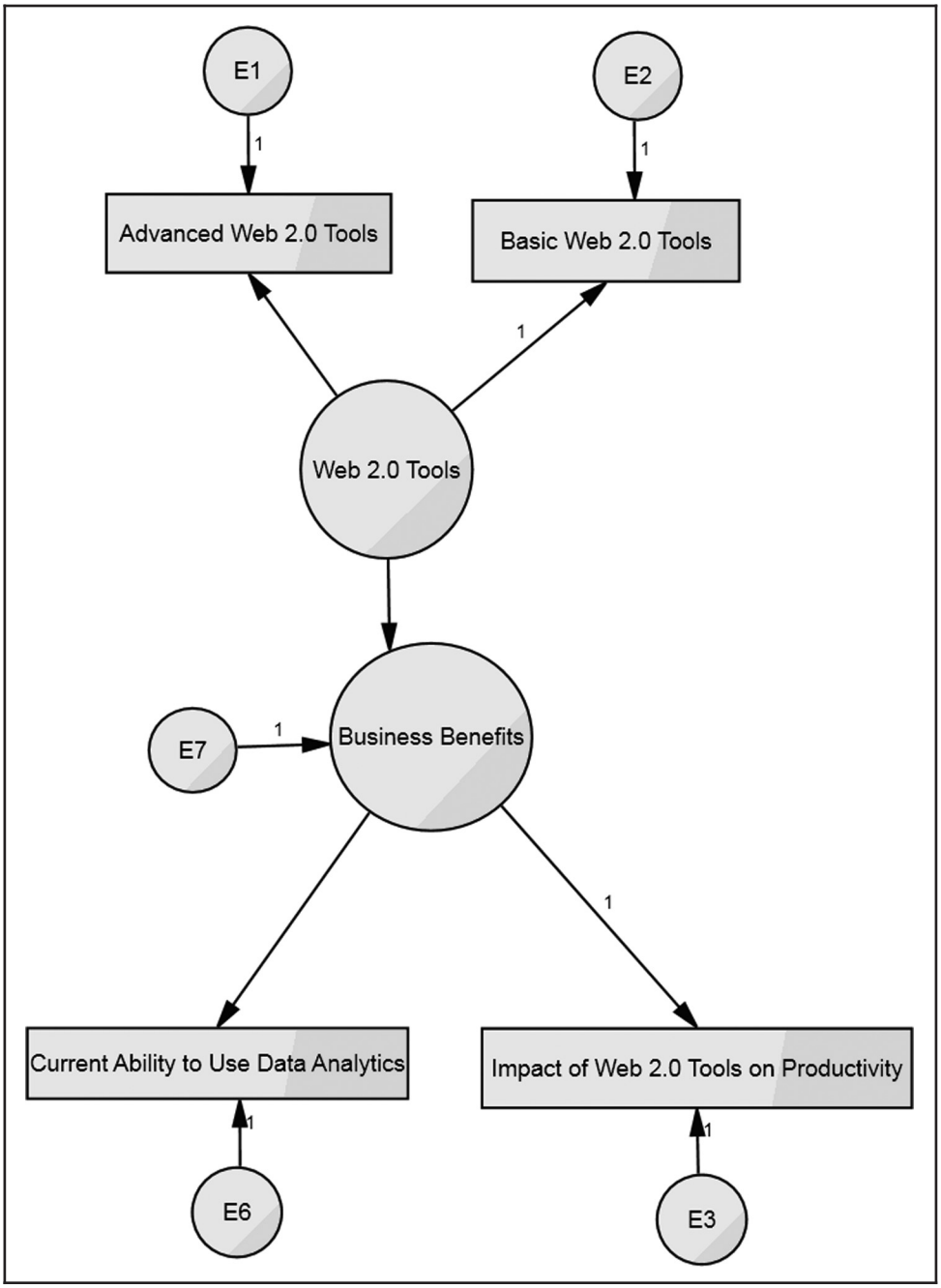


Figure 10 Hypothesized Model 2 showing relationship between Web 2.0 tools and business benefits

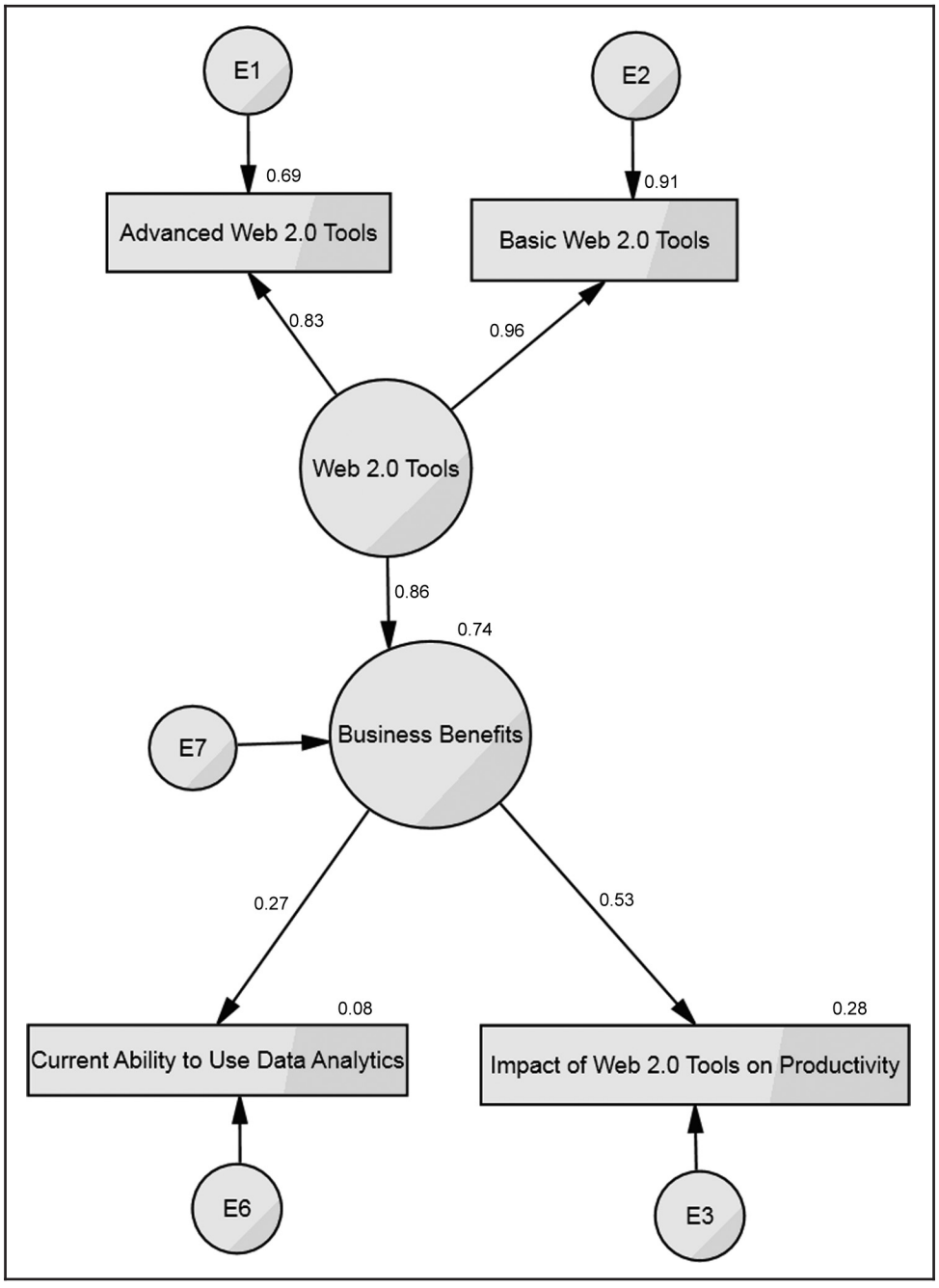


Model 2 proposes a relationship between the usage of more advanced Web 2.0 tools and business benefits. It is represented in Figure 10 below. In this model, the observed variables are the advanced and basic Web 2.0 tools (usually referred to in literature as indicator variables also) and latent variables viz. Web 2.0 tools and business benefits which are not directly measured in the study but are constructed by statistical procedure. Each path has a path coefficient which is an estimate of the predictive strength of the originating variable of the terminating variable. In this model, we have specified that business benefits are correlated with use of Web 2.0 tools. It is hypothesized that they both rise together. These Web tools are essentially more advanced Web 2.0 tools.

Besides these, there is an error term associated with each measured variable. This is so because in factor analysis, the variance is divided into two portions viz. the common variance and the unique variance. The analysis accounts for the common variance and treats the unique variance as the residual error (Figure 10).

This study has, thus, tested the hypothesis that usage of basic and advanced Web 2.0 tools are indicators of usage of Web 2.0 tools in the business, and that impact of tools on business productivity and current usage of data analytics tools in the business are indicators of business benefits, and the CFA of the hypothesized model assessed on IBM SPSS Amos 20 generated the path coefficients displayed in Figure 11.

Figure 11 Model 2 showing relationship between Web 2.0 tools and business benefits



The regression weights in Table V below indicate the raw score regression weights and the exact probability of them occurring by chance if the null hypothesis is true. Coefficients that were constrained in the model specification viz. basic tools for Web 2.0 Tools and help in business productivity for business benefits cannot be estimated, and thus, a value of 1 is assigned to these paths. The resulting coefficients for other paths are estimated and the *p* values (probability values) are reported. Here, we notice that a value of 2.33 is the raw regression coefficient for advanced tools. The *p* values (indicated as ***) in the table represent a value less than 0.001, and therefore, all the three estimated coefficients are statistically significant. In other words, advanced tools are a statistically significant indicator of Web 2.0 tools and using analytics currently of business benefits.

The standardized regression weights in Table VI below display the path coefficients used in the structural diagram. These coefficients are the correlations between the factor and the indicator variables while controlling for the correlation of all other factors with the specified factor.

The chi-square and fit indexes are shown in Table VII. Although the chi-square test of the model was statistically significant with a value of 1.193 (1, $N = 437$), $p < 0.001$, the model yielded acceptable fit indexes for the GFI, NFI and CFI. The target value of GFI is equal to or greater than 0.90 for a good fit: the present case yielding a value of 0.999 suggests an excellent fit. Similarly, the target values for NFI and CFI are 0.95; again, the obtained values of 0.998 and 1.000 are excellent fit situations. RMSEA fit index value also indicated an adequate fit for the model. The target value for RMSEA is 0.08, and the obtained value of 0.021 again points to a good fit.

Figure 11 presents the path model together with standardized regression weights (beta coefficients) associated with the hypothesized paths. Thus, in summary, the model can be stated to be an excellent fit situation.

The model coefficients suggest that usage of Web 2.0 tools is measured through two attributes, namely, basic Web tools and advanced Web tools, and that one unit increase in usage of Web 2.0 tools is contributed by 0.96 units of the first and 0.83 units of the second. The findings also depict that there is a direct causality between Web 2.0 tools and business benefits. Every unit increase in Web 2.0 tools usage results in 74 per cent increase in business benefits measured in terms of ability to use data analytics and impact on business productivity.

H3. Increased usage of simple/common Web tools along with simultaneous usage of Web 2.0 tools has a direct bearing on improving business productivity and resultant benefits.

Model 3 proposes a relationship between the usage of simple/common Web tools jointly with usage of Web 2.0 tools and business benefits, viz. all the three dimensions noted above. It is represented in Figure 12 below (Figure 12).

This model hypothesizes that usage of simple/common Web tools is linked to the usage of Web 2.0 tools which in turn leads to business benefits.

The CFA of the hypothesized model assessed on IBM SPSS Amos 20 generated the following regression weights.

The regression weights in Table VIII above indicates the raw score regression weights and the exact probability of them occurring by chance if the null hypothesis is true. Coefficients that were constrained in the model specification viz. basic tools for Web 2.0 tools, help in business productivity for business benefits and ability to use for business usage for simple/common Web tools cannot be estimated, and thus, a value of 1 is assigned to these paths. The resulting coefficients for other paths are estimated and the *p* values (probability values) are reported.

Table V Regression weights table

Relationship	*Estimate*	*Standard error*	*C.R.*	p	*Label*
Benefits <– Web2 tools	0.324	0.036	8.993	***	
Advanced tool <– Web2 tools	2.333	0.170	13.762	***	
Using analytics <– Benefits	0.177	0.039	4.500	***	
Help in business productivity <– Benefits	1.000				
Basic tool <– Web2 tools	1.000				

Notes: $^{***}p < 0.001$

Table VI Standardized regression weights table

Relationship	*Estimate*
Benefits <– Web2 tools	0.863
Advanced tool <– Web2 tools	0.829
Using analytics <– Benefits	0.274
Help in business productivity <– Benefits	0.531
Basic tool <– Web2 tools	0.955

Table VII Chi-square and fit indexes for Model 2 showing relationship between Web 2.0 tools and business benefits

Factor model	*Chi-square*	*df*	*GFI*	*NFI*	*CFI*	*RMSEA*
Original	1.193	1	0.998	0.999	1.000	0.021

Here, we notice that a value of 2.409 is the raw regression coefficient for advanced tools. The *p* values (indicated as ***) in the table represent a value less than 0.001, and therefore, all the three estimated coefficients are statistically significant. In other words, advanced tools are a statistically significant indicator of Web 2.0 tools and using analytics currently of business benefits.

The standardized regression weights in Table IX below display the path coefficients used in the structural diagram. These coefficients are the correlations between the factor and the indicator variables while controlling for the correlation of all other factors with the specified factor.

The chi-square and fit indexes are shown in Table X. Although the chi-square test of the model was statistically significant with a value of 96.65 (5, $N = 437$), $p < 0.001$, the model yielded acceptable fit indexes for the GFI, NFI and CFI. The target value of GFI is equal to or greater than 0.90 for a good fit: the present case yielding a value of 0.936 suggests an excellent fit. Similarly, the target values for NFI and CFI are 0.95; again, the obtained values of 0.927 and 0.931 are good fit situations. The target value for RMSEA is 0.08, and the obtained value of 0.17 again points to a good fit. Thus, in summary, the model can be stated to be a good fit situation.

Figure 13 presents the path model together with standardized regression weights (beta coefficients) associated with the hypothesized paths. Thus, in summary, the model can be stated to be an excellent fit situation.

The model coefficients suggest that usage of Web 2.0 tools along with simple/common Web tools has a higher impact on business benefits than when either of them is used in isolation. Every unit increase in combined usage of Web 2.0 tools and simple/common Web tools results in an 89 per cent increase in business benefits measured in terms of ability to use data analytics and impact on business productivity, as against 74 per cent when only Web 2.0 tools were used as suggested by *H2* above.

Figure 12 Hypothesized Model 3 showing relationships between usage of simple/common Web tools, Web 2.0 tools and business benefits

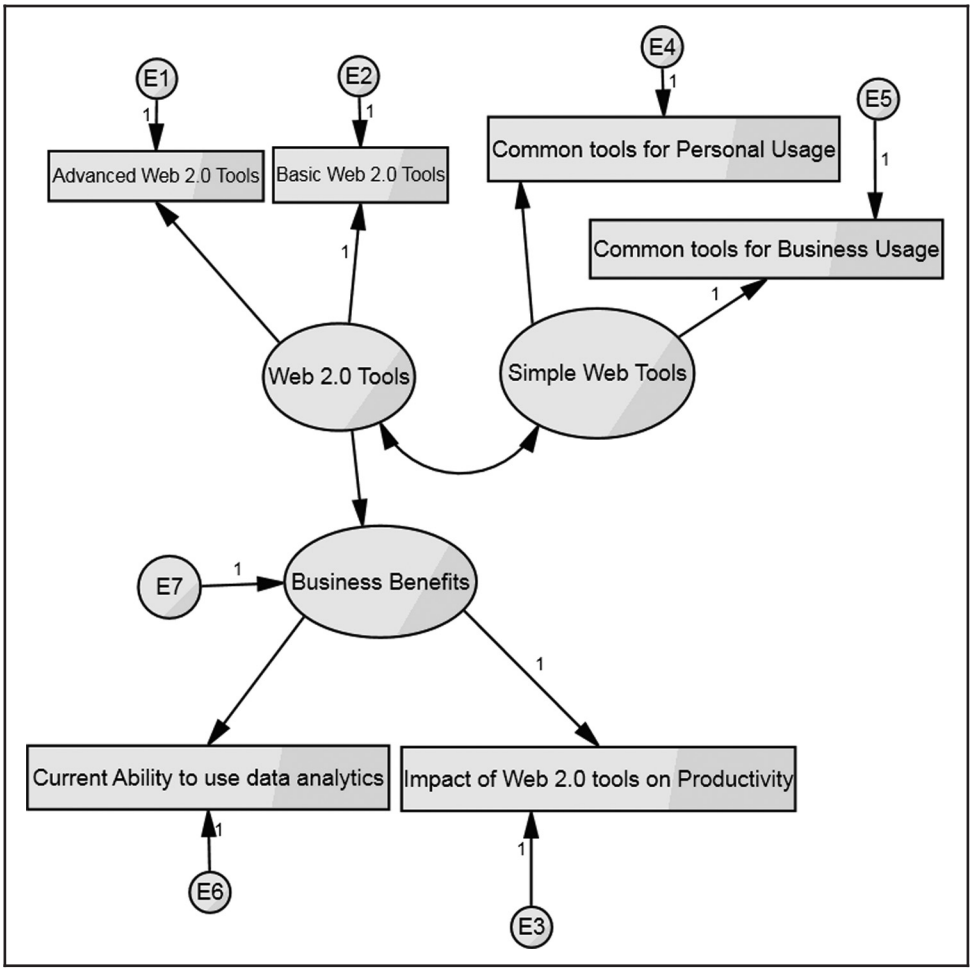


Table VIII Regression weights table

Relationship	*Estimate*	*Standard error*	*C.R.*	p	*Label*
Benefits <– Web2 tools	0.355	0.033	10.861	***	
Basic tools <– Web2 tools	1.000				
Help in business productivity <– Benefits	0.183	0.037	4.944	***	
Using analytics <– Benefits	1.000				
Advanced tools <– Web2 tools	2.409	0.104	23.239	***	
Ability to use for business usage < Web1 tools	1.000				
Ability to use for personal usage <– Web1 tools	0.973	0.051	19.175	***	

Note: $^{***}p < 0.001$

Discussion

It is important to understand the results that these validated and statistically significant models lead to. Starting with Model 1, we can surmise that:

1. usage of both basic and advanced Web 2.0 tools can result in significant business benefits to the organization.

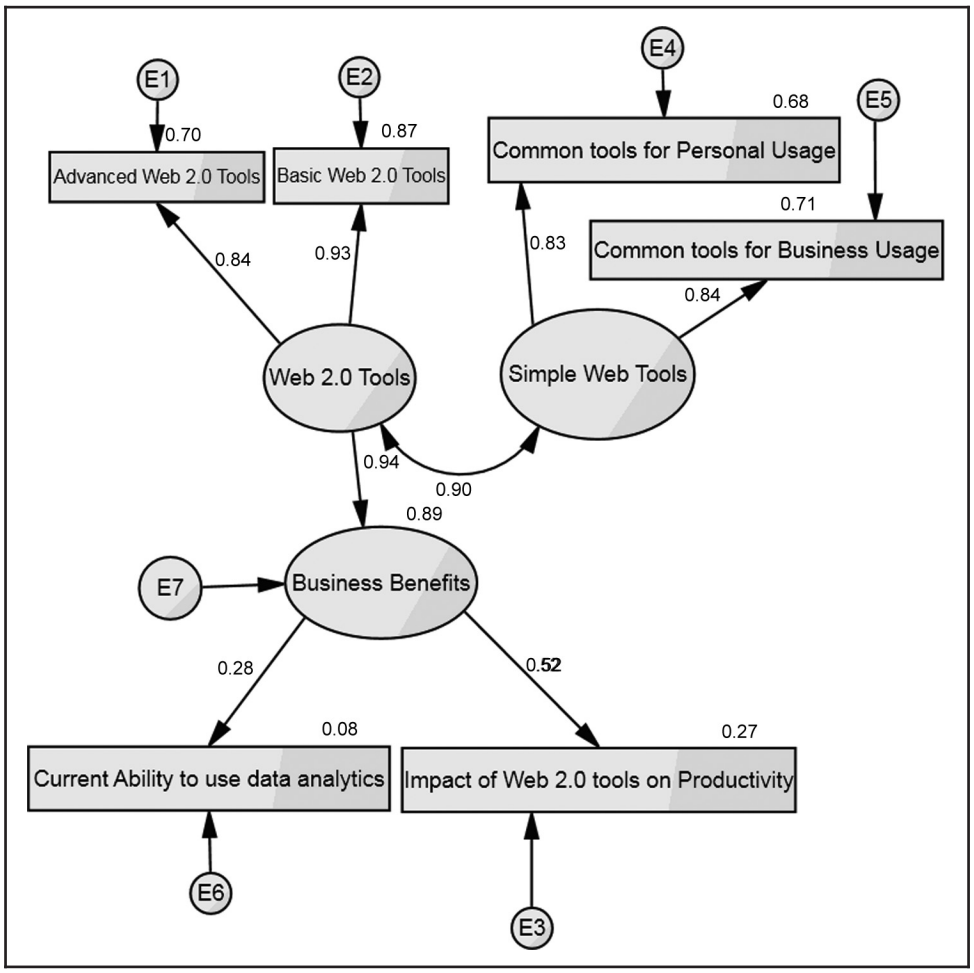
Table IX Standardized regression weights table

Relationship	*Estimate*
Benefits <– Web2 tools	0.942
Basic tools <–Web2 tools	0.934
Using analytics <–Benefits	0.279
Help in business productivity <– Benefits	0.522
Advanced tools <– Web2 tools	0.837
Ability to use for business usage <– Web1 tools	0.842
Ability to use for personal usage <– Web1 tools	0.827

Table X Model 3 showing relationship between usage of simple/common Web tools, Web 2.0 tools and business benefits

Factor model	*Chi-square*	*df*	*GFI*	*NFI*	*CFI*	*RMSEA*
Original	96.65	7	0.936	0.927	0.931	0.17

Figure 13 Model 3 showing relationships between usage of simple/common Web tools, Web 2.0 tools and business benefits



2. Basic tools have a higher correlation than advanced tools for determining the usage of Web 2.0 tools, and therefore, organizations should at least immediately start with the usage of these basic tools.

3. While current ability to use data and analytics is a good determinant of business benefits to be expected, the ability to balance personal and organizational needs and acceptable usage practices can have a higher impact on improvement in business productivity and information quality.

Moving to Model 2, the major conclusions are as follows:

4. Business benefits to the organization are significantly linked to the usage of Web tools. Till the time the organization achieves a good comfort level with Web 2.0 tools like social bookmarking or tagging, photo sharing, livecasting and video sharing, business reviews and product reviews, etc., it should definitely focus on simple and common tools, such as blogs, text messaging, video conferencing, Wikis, etc.

5. Conclusion 3 above is reiterated by this model also.

Reviewing Model 3 and its conclusions, we get to know that:

6. The business benefits are very significant when the organization has the maturity to use both the simple/common Web tools as well as the basic and advanced Web 2.0 tools.

At this stage, these conclusions may appear to be common sense as the same cycle appears to be involved with all change management situations. The typical cycle of education initially with simple tools and their adoption followed by more advanced tools, and their adoption are prerequisites of business benefits to flow. As similar results were obtained from a simple descriptive compilation of the results from the survey as pointed out earlier and reiterated by the subsequent validation by statistically significant Model fit it helps reinforce each others' these findings.

These findings are in line with those propounded by Baxter and Connolly (2014) that "even though all organizations are unique in terms of size, industry discipline and organizational culture, there are commonalities in the context surrounding the use of Web 2.0 tools in organizations". This research also reiterates the findings of Janes *et al.* (2014) that if a proper approach is adopted to the choice of technologies in introducing an organization to Web 2.0 technologies, the probability of success improves.

Implications for businesses

Businesses should not get into the "Chicken or the Egg?" syndrome when embarking on the exploiting of Web 2.0 tools for business benefits. If they keep waiting for employees to get trained and achieve a level of comfort with all the Web 2.0 tools, then they will never get going. It is therefore imperative that they encourage employees to start using whatever tools that they have mastered and keep encouraging them to learn more. However, it is equally important to have a policy of what outcomes are acceptable and what are not to ensure that the initiative does not go astray from the original objective.

As the results start appearing, there will be a natural motivation to experiment and master newer tools and the entire movement will get a positive spin. However, it is also essential to reign in those who are not following the guidelines or policies as the possibility of negative repercussions in the online world are also serious. It is essential to have a competency center in the organization monitoring the use of these tools and also training and guiding the employees across functions and locations. Case studies of successful endeavors can also be shared between employees to encourage appropriate behavior.

There may be initial skepticism about the applicability of these concepts for organizations beginning anew. This may be more predominant for small and medium industries. It is essential for them to focus on specific areas of use for such tools and techniques. For example, customer facing functions can enhance customer satisfaction by monitoring and

responding to customer sentiments on social media networks or increase marketing effectiveness by using such tools for spreading awareness or brand advocacy among prospective customers. Purchasing executives can search for suppliers on a more knowledgeable basis across countries not yet explored but at more competitive prices.

Besides external facing functions, Web 2.0 can be a big aid for innovation. Ideas may come from external facing functions, customers or suppliers but tossing around possible solutions and generating the appropriate knowledge about it through communication and collaboration of all internal functions can be helped in a big way using these tools. Speed is of essence when it comes to innovation or new product introductions.

Web 2.0 is making the Internet into a new super platform for all applications. Traditional heavy applications like the ERP, CRM, etc., are getting replaced by light weight applications running on the cloud, and are offering economical solutions to business issues that are easy to use, interactive and collaborative and with the facility of real times updates. With Internet speeds becoming faster every year, the constraints of yesteryears no longer chain businesses to slower top-down applications. Agility and interactivity are the new buzzwords. Even the chain of command has evolved over the recent years, and networked organizations are proving to be more successful.

A factor which has affected the adoption of these tools is the fact that they have till now been marketed to the end-user for personal use, rather than to businesses for organizational use. Slowly this situation is being corrected, and the next few years should see a mushrooming of enterprise-level applications based on these platforms. Businesses are waking up to benefits of using Facebook, Twitter, YouTube, LinkedIn, SlideShare and such tools for corporate requirements. It has been discovered by McKinsey in surveys conducted in the western world that internal collaboration leads to market leadership and external collaboration has been the characteristic of market challengers. However, both these groups are falling into the category of “learning organizations”.

Scope for future work

This research has focused essentially on the range of Web 2.0 tools currently in use. However, in recent times, a lot of work has been done on Big Data, Data Lakes, etc. Future work can encompass some of these more recent technologies in the model building exercise. It can also measure the business benefits in more quantitative means in terms of “above the line” and “below the line” aspects. It could also explore the impact of techniques like “Collaborative Planning, Forecasting and Replenishment (CPFR)” techniques using Web 2.0 tools to further enhance business efficiency and productivity. It may also be a good idea to figure out whether use of these tools is more effective in external facing functions, such as sales or purchase, or in inward facing functions, like accounting and inventory control.

Conclusion

While there is already discussion on the semantic Web and Internet of Things (IoT) in management literature, it is essential that businesses learn the best ways of transitioning themselves into the Enterprise 2.0 space first. These tools and technologies have been around for more than a decade, but the exploitation of the power of these tools is still the prerogative of a small percentage of businesses. The hypotheses formulated and tested in this work should be a good guide for businesses around the world to gain the comfort and confidence to undertake this change management strategy.

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Appendix

Statistical techniques used – explained in simple terms

Factor analysis is used to reduce the data into a more manageable number of variables or factors. Principal component method of extraction with varimax rotation has been used. The item that did not load well was removed, and retained the indicators that loaded onto their proposed factors well. Models using the observed variables as linear combinations of the potential factors, plus "error" terms, help in understanding the interdependencies between these observed variables and, thus, reducing the total number of variables in the data. While in EFA, the assumption is that an underlying causal model exists; PCA has been termed as simply a variable reduction technique.

EFA was later followed by CFA which is a statistical technique used to verify the factor structure of a set of observed variables emerging from the EFA. CFA is used by researchers to test various postulated hypotheses about relationships between observed variables and their underlying latent constructs. This is based on the knowledge of the subject and the empirical research results, and usually leads to a relationship pattern either getting statistical validation or not.

EFA is an inductive bottom-up strategy of developing a conclusion from observations obtained. It is an interpretation of the factor based on the most strongly associated

Table AI Acceptable levels of fit for different tests

Absolute indexes		*Relative indexes*	
Test	*Target value*	*Test*	*Target value*
Chi-square	$p < 0.05$	CFI	0.95
Chi-square/df	2.00	NFI	0.95
GFI	0.90	IFI	0.90
RMSR	0.05		
RMSEA	0.08		

measured variables. CFA, on the other hand, is a top-down deductive approach of predicting an outcome from a theoretical framework. In this framework, the researcher proposes a relationship between the factors and the error terms and then tests for the goodness of fit on the basis of observations made. In other words, the extent to which the proposed covariance matches the observed covariance determines the quality of the predicted model. Quantifying the degree of fit between the model and the observed data can be done in multiple ways.

A CFA like the one proposed in this model is a deductive approach to predicting an outcome from a theoretical framework. The resultant statistical analysis is the specification of the significance of the predicted relationship. Thus, in a statistical language, the analysis figures out if the proposed covariance matches the observed covariance. Thus, summing up, the five-step process involved in a CFA is:

1. Model specification.
2. Model identification.
3. Selection of the model estimation technique.
4. Model evaluation.
5. Model respecification, if necessary.

For many years, researchers have relied only on the chi-square index as the primary index for assessing the degree of fit. However, there is a school of thought which feels that as this index is sensitive to sample size, it should not be the sole indicator. When sample sizes are large, which is usually true, the chi-square test can overplay even small discrepancies between the predicted and observed covariances resulting in concluding a poor fit and a good model that may get rejected for trivial reasons resulting in a Type II error.

While there is no unanimity on how to assess the degree of fit of a model and various authors have proposed different measures and values for the measure, one commonly acceptable set comes from Meyers *et al.* (2013), who propose the following measures of absolute and relative fit indexes and the values that represent acceptable levels of fit for models (Table AI).

Different models establishing the relationship between the multiple factors identified by EFA were proposed and then attempts made to determine the goodness of fit in describing the available data set. This type of structural modeling has widespread usage in a variety of subjects now.

The model uses three types of symbols. The rectangles represent measured variable or factors, the circles represent the latent constructs or dimensions referred to above and lines with arrows represent paths in a given direction.

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