

# NOVEL APPROACH TO COMPARE OF AN ESTABLISHED OPEN-SOURCE ERP AND A NEXT GENERATION CLOUD COMPUTING ERP

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## ABSTRACT

The purpose of this paper is to compare two ERP softwares – one traditional *open source* involving IT infrastructure (servers, technicians, PC) at users end (A) and the other *cloud-computing* which needs only PC and internet connection at the users end (B). It seeks to find their relative strengths and weaknesses. It uses and analyses data from user – traffic websites to achieve this end. Results indicate that ‘A’ is more well – established and popular than ‘B’ but, ‘B’ with a growing user – base is catching up very fast. But, both types of software should hold their ground in the market in the future. There are pros and cons with both the software.

**Keywords:** ERP, cloud computing, website comparison, open source software

## INTRODUCTION:

ERP (Enterprise Resource Planning) softwares have become a key feature of businesses to integrate various functions across the organizations. There are lots of definitions for ERP in the literature. Many of the definitions for ERP focus on such properties of ERP as integrating processes, enabling optimization across the organization, elimination of complex links between computer systems, providing a common IT infrastructure, linking through the supply chain, adapting best industry and management practices for providing the right product at the right place at the right cost, tracking the status of a company's day-to-day activities, achieving consistency and efficiency through standardization, enhancing of market value and firm performance through efficiency and effectiveness gains, providing a quicker response to customer requirements and creating common measures ([1]Hirt and Swanson, 1999; [2]Rao, 2000; [3]Bendoly and Jacobs, 2004; [4]Hunton et al., 2003; [5]Moller, 2005).

[6]Hsu and Chen (2004) discussed the importance of ERP into an integrated, process-oriented, information-driven and real time organization where Sarkis and Gunasekaran [7] (2003) stressed the effects of ERP on competition. Boykin and Martz [8] (2004) emphasized that ERP systems forced the organization from a task-oriented approach to the newer process view. Besides, Davenport and Brooks [9] (2004) emphasized that enterprise systems are main drivers to apply a cross-functional process management. Buoanno et al. [10] (2005) explained the effect of business process concept as promoting cooperation and convergence of efforts among managers. Al-Mashari and Zairi [11] (2000) suggested that processes and systems and their integration in business strategy, structure and culture should be realized in ERP projects.

ERP softwares are notorious for their large size & huge databases. They tend to slow down desktops & laptops sold to the general public because these computers have limited RAM capacity for portability purposes. In many cases, computers loaded with ERP softwares are huge mainframe computers. This has led to many vendors offering their services on the cloud, that is, software as a service (SAAS). One of the ERP vendors of the study, is such an example. The other vendor offers services for free in two ways - SAAS or as an executable file of the ERP software that can be downloaded from their website. The comparison of the 2 softwares is based on the user-traffic to their websites where

(A) Traditional open-source ERP software or its website

(B) Cloud-computing ERP software or its website.

Referred henceforth as 'A' and 'B' only

## LITERATURE REVIEW:

The existing approaches to comparison of ERP softwares tend to measure their performance from financial performance metrics such as return on investment, net present value, or payback period ([12] Kivijarvi and Saarinen, 1995; [13] Murphy and Simon, 2001), but it is difficult to do so unless it is supplemented with subjective measures. In some cases, user satisfaction measurement questionnaires and methods for employees, middle managers, top managers and system engineers have also been applied to real cases ([14] Doll and Torkzadeh, 1988; [15] Klenke, 1992; [16] Saarinen, 1996; [17] Wu *et al.*, 2002). But these methods may present a biased picture unless a sufficiently large sample size is chosen for the questionnaire surveys. It is quite possible that the systems are more suitable for certain types of businesses than for the rest. Then the feedback from the users may be distorted & unable to depict the full picture.

Some other popular techniques used in recent times to measure the performance of ERP systems are the analytic hierarchy process (AHP), ([18] Chan *et al.*, 2006; [19] Chan and Kumar, 2007), data envelopment analysis ([20] Stensrud and Myrtveit, 2003), importance-performance maps ([21] Skok *et al.*, 2001), and balanced scorecard approach ([22] Michael and Jens, 1999; [23] Hagood and Friedman, 2002).

The AHP is designed to solve complex multi-criteria decision-making problems. It is a structured technique to deal with complex decisions. It helps decision-makers find a decision that best suits their goal & understanding of the problem. It is based on mathematics & psychology & was developed by an American mathematician, Thomas L Saaty in the 1970s. In this, the decision problem is decomposed into a hierarchy of more-easily understood sub-problems, each of which can be analysed independently. To determine local weights of the components in the AHP hierarchy, each set of components is compared using a pair-wise comparison method with respect to their immediate higher-level (parent) component in the hierarchy [24][25](Korpela and Tuominen, 1996). Quantitative or qualitative assessments can be used in the comparisons. It has been used to address ERP user satisfaction issues to a sample of 68 users within a Greek energy supply company ([26] Longinidis and Gotzamani 2009).

Data Envelopment Analysis (DEA) uses linear programming to measure efficiency of multiple decision-making

units when the production process presents a structure of multiple inputs and outputs. Its specific disadvantages are that the results are sensitive to the selection of input and output. Therefore it cannot be tested for the best specification.

The balanced scorecard (BSC) approach entails the presentation of a mixture of financial and non-financial measures each compared to a 'target' value within a single concise report. The report is not meant to be a replacement for traditional financial or operational reports but a succinct summary that captures the information most relevant to those reading it. It views an organisation from 4 perspectives – learning & growth, business process, customer & financial.

All these techniques can be integrated with traditional performance indicators to build up performance measurement systems but many researchers stated that there is no best appraisal technique that addresses all project considerations ([16] Saarinen, 1996; [27] Irani, 1999). They reasoned that investments in Information Systems are complex and each of them is unique. But the popular methods refer to common indices without using customised approaches that reflect the objectives of ERP implementation of a particular business organization’s ERP system.

**OBJECTIVE:**

The objective of the study is to identify trends and special features in the ‘A’ and ‘B’ softwares’ websites. This study will, in turn, help to identify trends in the open source ERP software market. It can be used to observe strengths and core competencies of ‘A’ and ‘B’. As ‘A’ is a traditional open-source software whereas ‘B’ is a cloud-computing software, the conclusions drawn from this study can also be used to observe how the recent phenomenon of cloud computing is affecting the open-source field.

**METHODOLOGY AND ANALYSIS:**

In this case-study of 2 ERP software, their websites usage has been analysed. Their websites have been analysed using data from website-traffic websites, mainly alexa.com. Five parameters have been used – popularity, purpose of the user, audience profile, loading time, queries.

**POPULARITY:**

The parameters used to compare the popularity of the 2 websites are given one by one followed by the comparison and analysis.

A) **Rank:** The ranks awarded by alexa.com to the websites in prominent countries like USA, France, India and the world in general are displayed in the table given below.

**TABLE 1: RANKS**

	‘B’	‘A’
United States of America	98,438	40,303
France	123,532	11,047
India	158,979	18,050
World	213,255	19,977

This rank is calculated using a combination of average daily visitors and webpage views over the past 3 months. Clearly, ‘A’ has been awarded a much higher rank in all the countries considered and also in the world in general.

B) **Daily Page-views:** The highest and the lowest percentages of daily global page-views for the 2 websites over a period of three months are depicted in the table below.

**TABLE 2: PAGE – VIEWS**

Websites	Highest %	Lowest %
‘A’	.001	.0002
‘B’	.0001	Negligible

The negligible % for ‘B’ may be attributed to the fact that very few page-views of ‘B’ have been recorded by the alexa.com toolbar around the world. However such statistical errors are not possible for the much more visited ‘A’. As can be seen from the table, the lowest % for ‘A’ is twice the highest % for ‘B’. It should also be

noted that A's page-views are never lower than the corresponding figure for 'B'.

C) **Global Reach:** The highest & lowest percentages of internet-surfing population visiting the 2 websites daily over a period of three months are displayed in the table below.

**TABLE 3: GLOBAL REACH**

Websites	Highest %	Lowest %
'A'	.013	.003
'B'	.001	Negligible

Similar reasoning can be applied in this case as before.

Again, the lowest % for 'A' is thrice the highest % for 'B'. It should also be noted that A's page-views are never lower than the corresponding figure for 'B'.

D) **Time Spent:** The highest and lowest average times in minutes spent on the websites daily by their users over a period of three months have been recorded and are displayed in the table below.

**TABLE 4: TIME SPENT**

Websites	Highest time (in minutes)	Lowest time ( in minutes)
'A'	10.5	4.5
'B'	9.5	0.5

The lower times for 'B', especially the extremely low lowest average time indicate that a relatively large percentage of users who visit 'B' stumble upon it by mistake and never visit it again. More of this topic is discussed under 'purpose of user' (section-4.1.2).

E) **Sites linking in:** There are 444 sites that contain links to 'A' whereas the corresponding number for 'B' is only 25. The number of websites containing links to a particular site is a most clear indication of a website's popularity and credibility.

It can be safely concluded from the above comparisons that 'A' is much more popular than 'B'. This can be attributed to the following facts. Firstly, 'B' has been functional only since 2010 whereas 'A' has been functional for a much longer time. Therefore, 'A' has a traditional user-base who makes it more popular. Secondly, 'A' is surfed by users in both the French – speaking and English – speaking world. It also offers some of its features in other languages. On the other hand, 'B' offers its services only in English. Thirdly, the concept of open source software is much more well-established and proven than the concept of cloud computing. Consequently, 'A', the traditional open source ERP software is much better known than 'B', the cloud – computing software. Fourthly, only 1 webpage of 'B' can be viewed without creating an account. The entire site of 'A' can be surfed without creating a user account. The requirement of creation of account puts off many internet users.

**PURPOSE OF USER:**

In this section, some parameters are discussed by which an attempt is made to infer whether the user is a random visitor to the websites and not interested in their contents, or she has a genuine interest and is a user of ERP systems.

A) **Page-views per user:** The table below gives the highest and lowest page-views by the average visitor to the discussed websites over a period of three months.

**TABLE 5: PAGE-VIEWS PER USER**

Websites	Highest page-views per user	Lowest page-views per user
'A'	10	4.5
'B'	6	2

It is clearly visible that the values for 'B' is almost as half as that of 'A' which indicates the frivolity and

randomness of B’s visitors though the fact that no user can view more than a page without creating an account may have also played a role.

B) **Bounce rate:** It indicates the percentage of visits to each website that consist of single page- views. The highest and lowest bounce-rates per day for a period of three months for the two websites are given in the table below.

**TABLE 6: BOUNCE RATE**

Websites	Highest bounce rate	Lowest bounce rate
‘A’	36	20
‘B’	50	26

The rates are lower for ‘A’ which indicates more serious visitors to the website as compared to ‘B’.

C) **Clickstream:** This term refers to the websites users visit immediately before (upstream sites) and after (downstream sites) visiting ‘B’ or ‘A’. The table gives the statistics for ‘B’ and ‘A’. The names of the top three clickstream sites are given accompanied by the percentage of upstream or downstream visits.

**TABLE 7: UPSTREAM SITES**

A - upstream site	A - % of visits	B - upstream site	B - % of visits
google.com	22.43	google.com	85.71
openobject.com	7.53	facebook.com	8.16
google.fr	5.48	youtube.com	6.13

**TABLE 8: DOWNSTREAM SITES**

A - downstream site	A - % of visits	B - downstream site	B - % of visits
google.com	20.19	google.com	80.39
openobject.com	14.15	facebook.com	13.73
google.fr	5.66	youtube.com	5.88

The name of a related site in the clickstream of ‘A’ indicates dedicated and serious visitors to the website, whereas for ‘B’ there is 1 generic site (google.com) and two totally unrelated sites (facebook.com, youtube.com) which make up the clickstream. It should also be noted that the percentages add up to one hundred for ‘B’, indicating that the most of the entire clickstream have been presented in the top three sites whereas for ‘A’ the percentages add upto around forty, indicating a varied and dispersed clickstream. Others sites in A’s clickstream are launchpad.net, wikipedia.org, sourceforge.net.

The section can be concluded by observing the fact that for ‘B’, the percentage of dedicated serious users is lesser than that for ‘A’, but these visitors are actually working on ERP software. The same conclusion cannot be drawn about ‘A’. Many of their serious users may only be reading on opensource software or ERP software and searching the internet for research materials to read, just like the authors.

**AUDIENCE PROFILE:**

- A: The site’s visitors tend to be low-income older males with post-graduate education who browse the site at their respective workplaces.
- B: This site’s visitors tend to be middle-income younger males with post – graduate education who browse the site at work.

Open source ERP softwares are used by small and medium entrepreneurs who tend to be males. The relative poverty of A’s users can be explained by the fact that most resources at ‘A’ are free including the executable files for the software, a detailed user manual and other resources. On the other hand, ‘B’ charges money for ERP accounts with more than two users.

Cloud computing is a relatively recent phenomenon. Young tech-savvy people are more aware about developments in this field than older people. When the age-groups of the people accessing these websites are compared, the relative youth of B’s users can be explained by this fact.

**LOAD TIME:**

The loading time for ‘B’ and ‘A’ along with the percentage of websites that are slower are given in the table below.

**TABLE 9: LOAD TIME**

Websites	Loading Time(in seconds)	% of websites which are slower
‘A’	1.264	57
‘B’	0.918	77

The developers of B offer their service solely through the site whereas developers of A earn a tiny percentage through the website. Therefore, ‘B’ has been made faster with better servers and better technology.

**QUERIES, VISITS FROM SEARCH ENGINES AND THE PATH AHEAD:**

**A) Queries:** The data and statistics on alexa.com offer wonderful insights on the relative possibilities of the links of the 2 websites being displayed when a query is entered in a search engine. The terms used are

- a) Query popularity: The phrase indicates how frequently the query is used on a scale from 0 to 100.
- b) Import Factor: A high import factor indicates that the website is getting significant search traffic for queries containing these phrases, despite a strong advertising campaign for these phrases. It is also awarded on a scale of 0 to 100.
- c) QCI: The short-form ‘QCI’ stands Query Competition Index. It refers the typical number of advertisements displayed for keyword searches on major search engines. A large index indicates a strong advertising campaign for a query. It is awarded on a scale of 0 to 100.

Given below are tables displaying statistical results for the top six search queries for these 2 websites along with other statistics.

**TABLE 10: TOP 6 QUERIES FOR ‘A’**

Query#	Import Factor	Query popularity	QCI
1	30.20	34	40
2	26.12	42	18
3	5.85	29	55
4	4.19	32	58
5	3.63	23	38
6	2.04	13	90

**TABLE 11: TOP 6 QUERIES FOR ‘B’**

Query#	Import Factor	Query popularity	QCI
1	48.06	22	20
2	9.83	5	60
3	9.20	10	30
4	4.47	9	48
5	4.15	37	52
6	2.55	3	40

The popularity of queries that lead to ‘A’ is significantly higher than the ones for ‘B’. Even QCI and import factors are on an average higher for ‘A’. It implies ‘A’ is better placed to generate search engine traffic to its site as compared to ‘B’.

**B) Search percentage:** It refers to the percentage of visits to the 2 websites that are from search engines. The table below gives the highest and lowest daily search percentages for the two sites for a period of three months.

**TABLE 12: SEARCH PERCENTAGE**

Websites	Highest %	Lowest %
‘A’	40	20
‘B’	40	Negligible



Clearly, 'A' generates considerable search traffic all the time. Though the highest percentages are equal, it should be noted that this is a percentage and not an absolute number. When the fact that 'A' has a larger audience is considered, it can be easily inferred that 'A' generates more visits from search engines on an absolute scale.

## CONCLUSION:

It can be concluded that traditional open source ERP software is still quite popular, evident from the huge and purposeful user traffic of 'A'. But, the phenomenon of cloud computing has picked up very fast indeed with its new dynamic user-base. 'B' is well on its way to catch up with 'A'. It should be noted that the actual future competitors of 'B' will be the traditional open source ERP software *changing* their services to cloud-computing ERP software and the newly launched cloud-computing ERP software and NOT the traditional open source ERP software.

Both types of software (Traditional open-source ERP vs. Cloud computing ERP) should hold their ground in the market in the future. There are pros and cons with both the software.

The future work that can be done must involve use of other & more sophisticated website traffic analysis tool. The number of downloads of the executable file of the ERP software from the site of 'A' and the number of accounts created in 'A' and 'B' should be monitored to track new users of these two softwares.

## REFERENCES:

- [1] Hirt, S.G. and Swanson, E.B. (1999), "Adopting SAP at Siemens Power Corporation", Journal of
- [2] Information Technology, Vol. 14 No. 3, pp. 243-51. Rao, S.S. (2000), "Enterprise resource planning: business needs and technologies", Industrial Management & Data Systems, Vol. 100 No. 2, pp. 81-8.
- [3] Bendoly, E. and Jacobs, F.R. (2004), "ERP architectural/operational alignment for order processing performance", International Journal of Operations & Production Management, Vol. 24 No. 1, pp. 99-117.
- [4] Hunton, J.E., Lippincott, B. and Reck, J.L. (2003), "Enterprise resource planning systems: comparing firm performance of adopters and nonadopters", International Journal of Accounting Information Systems, Vol. 4 No. 3, pp. 165-84.
- [5] Moller, C. (2005), "ERP II: a conceptual framework for next-generation enterprise systems", The Journal of Enterprise Information Management, Vol. 18 No. 4, pp. 483-97.
- [6] Hsu, L.L. and Chen, M. (2004), "Impacts of ERP systems on the integrated-interaction performance of manufacturing and marketing", Industrial Management & Data Systems, Vol. 104 No. 1, pp. 42-55.
- [7] Sarkis, J. and Gunasekaran, A. (2003), "Enterprise resource planning – modelling and analysis", European Journal of Operational Research, Vol. 146 No. 2, pp. 229-32.
- [8] Boykin, R.F. and Martz, B. (2004), "The integration of ERP into a logistics curriculum: applying a systems approach", The Journal of Enterprise Information Management, Vol. 17 No. 1, pp. 45-55.
- [9] Davenport, T.H. and Brooks, J.D. (2004), "Enterprise systems and the supply chain", The Journal of Enterprise Information Management, Vol. 17 No. 1, pp. 8-19.
- [10] Buoanno, G., Faverio, P., Pigni, F., Ravarini, A., Sciuto, D. and Tagliavini, M. (2005), "Factors affecting ERP system adoption: a comparative analysis between SMEs and large companies", The Journal of Enterprise Information Management, Vol. 18 No. 4, pp. 384-426.
- [11] Al-Mashari, M. and Zairi, M. (2000), "The effective application of SAP R/3: a proposed model of best practice", Logistics Information Management, Vol. 13 No. 3, pp. 156-66.
- [12] Kivijarvi, H. and Saarinen, T. (1995), "Investment in information systems and the financial performance of the firm", Information & Management, Vol. 28, pp. 143-63.
- [13] Murphy, K.E. and Simon, S.J. (2001), "Using cost benefit analysis for enterprise resource planning project evaluation: a case for including intangibles", Proceedings of the 34th Hawaii International Conference on System Sciences, pp. 1-11.
- [14] Doll, W.J. and Torkzadeh, G. (1988), "The measurement of end-user computing satisfaction", MIS Quarterly, Vol. 12 No. 2, pp. 259-74.
- [15] Klenke, K. (1992), "Construct and critique of user satisfaction and user involvement instructions", Information, Vol. 3 No. 4, pp. 325-48.
- [16] Saarinen, T. (1996), "An expanded instrument for evaluating information system success", Information & Management, Vol. 31, pp. 103-18.
- [17] Wu, J.H., Wang, Y.M., Chang-Chien, M.C. and Tai, W.C. (2002), "An examination of ERP user satisfaction in Taiwan", Proceedings of the 35th Hawaii International Conference on System Sciences.
- [18] Chan, F.T.S., Chan, H.K., Lau, H.C.W. and Ip, R.W.L. (2006), "An AHP approach in benchmarking logistics

- performance of the postal industry", *International Journal of Benchmarking*, Vol. 13 No. 6, pp. 636-61.
- [19] Chan, F.T.S. and Kumar, N. (2007), "Global supplier development considering risk factors using fuzzy extended AHP-based approach", *Omega*, Vol. 35 No. 4, pp. 417-31.
- [20] Stensrud, E. and Myrtveit, I. (2003), "Identifying high performance ERP projects", *IEEE Transaction on Software Engineering*, Vol. 29 No. 5, pp. 398-416.
- [21] Skok, W., Kophamel, A. and Richardson, I. (2001), "Diagnosing information system success: importance-performance maps in the health club industry", *Information & Management*, Vol. 38, pp. 409-19.
- [22] Michael, R. and Jens, W. (1999), "Measuring the performance of ERP software: a balanced scorecard approach", *Proceeding of the 10th Australasian Conference on Information Systems*, pp. 773-84.
- [23] Hagood, W.O. and Friedman, L. (2002), "Using the balanced scorecard to measure the performance of your HR information system", *Public Personnel Management*, Vol. 31 No. 4, pp. 543-57.
- [24] Korpela, J. and Tuominen, M. (1996), "A decision aid in warehouse site selection", *International Journal of Production Economics*, Vol. 45, pp. 169-80.
- [25] Korpela, J. and Tuominen, M. (1996), "Inventory forecasting with a multiple criteria decision tool", *International Journal of Production Economics*, Vol. 45, pp. 159-68.
- [26] Longinidis, P. and Gotzamani, K. (2009) "ERP user satisfaction issues: insights from a Greek industrial giant", *Industrial Management & Data Systems*, Vol. 109 No. 5, pp. 628-645.
- [27] Irani, Z. (1999), "IT/IS investment decision making", *Logistics and Information Management*, Vol. 12 No. 1, pp. 8-11.
- [28] Alexa (2011), <http://alexa.com> accessed on Dec 11, 2011.

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