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# A Comprehensive Computational Analysis of ERP Vendor's Selection for Small and Medium Enterprises

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*Vendor's selection process for ERP is a multifaceted problem for small & medium enterprises (SMEs) which includes a complete computational analysis of both qualitative and quantitative factors. Different clients have different needs ranging from functional requirements, technical maturity, tolerance for risk, budget and a host of other factors. Consequently, they have a large and direct impact on the cost, quality, technology and time-to-market of new products. In this research paper, we present a comprehensive, comparative analysis of all small and major ERP software vendors over a period span of 2005 to 2015. These variables influence not only the choice of vendors but also the choice of specific solution offered by the vendors. It also provides the relevant insight on contract negotiations and avoiding negotiation mistakes.*

**Keywords:** ERP, SMEs, Vendors Selection, Function Fit, Computational Analysis, API etc.

## INTRODUCTION

ERP Vendor Selection process can be a very complicated and problematic for SMEs if they don't know how to approach it from the very start. When a company considers acquiring a new ERP system, they often struggle with clearly defining the evaluation criteria advises clients to start with five basic criteria such as Function fit, Technology Fit, Company Fit, Cost Fit and Support Fit. Function fit of the software is where most companies start. The fit of the vendor's software to your requirements is done with a demonstration of the software. Technology Fit review is normally done by the IT representative on the team. Company's IT department should determine the technology direction of the firm. This direction is often a qualifier for a vendor in a selection project. In addition to the technology direction, it is important to examine the technology tools available from the vendor for report development, application program interfaces (API), and proprietary development tools. Company Fit is the evaluation of the company as a strategic partner. This should include a review of their financial results, their direction and their management team including "survivability of SMEs". Cost Fit is the comparison of the cost proposals including software cost, annual support cost, implementation costs and hardware costs. Support Fit includes the review of a number of

areas. It includes examining implementation methodology, experience of consultants to be assigned, support tools such as education, on line tutorials, process documentation tools, web based support tools, vertical industry user advocacy programs, user and customer satisfaction surveys etc. [1].

In this paper, we compare the prominent vendor's characteristics, their competing products and technologies. The analysis will be summarized based on all solutions offered by these vendors and provides an independent and balanced comparison of the ERP market's leading software providers like SAP, ORACLE, Microsoft Dynamics and many other software vendor or reseller[1]. Therefore, to get the pin down details related to consideration or selection of ERP vendors, we will make extensive quantitative and qualitative study to evaluate major ERP software vendors over a period span of ten years from 2005 to 2015.

## COMPARATIVE ANALYSIS OF ERP VENDORS [YEAR 2005-2008]

The survey conducted by online polling with the help of Panorama Consulting Group shows the analysis of information collected from December 2005 to November 2008. The 670 participants represent global organizations in the US, Europe, Australia and Asia that have implemented ERP within the last three years. Participants were asked to provide quantitative and qualitative responses to questions about their experiences with Tier I (SAP, Oracle, Microsoft, etc.) and Tier II (Baan, Epicor, Exact, IFS, Infor, Lawson, Netsuite, Sage, etc.) ERP implementation [2].

The report shows that majority of companies (77 percent) adopted Tier I ERP software in which people refer SAP: 35 percent, Oracle: 28 percent, Microsoft: 14 percent and Tier II: 23 percent. Next, Tier I and Tier II ERP implementations take similar times (average: 19.8 months) to implement. It takes

SAP: 20 months, Oracle: 18.6 months, Microsoft: 18 months, Tier II: 17.8 months time to fully implement ERP solution. The average cost of implementing Tier I SAP and Oracle ERP software is significantly greater than the average cost of implementing Tier I Microsoft or Tier II ERP software. The total cost of ERP implementation SAP: \$16.8 million, Oracle: \$12.6 million, Microsoft: \$2.6 million, Tier II: \$3.5 million while total average: \$8.5 million. Companies report the most satisfaction with Tier I SAP and Tier II ERP software (Total Average: 67 percent). The satisfaction level of executive team with its ERP solution is overall with SAP: 73 percent, Oracle: 62 percent, Microsoft: 69 percent and Tier II: 70 percent. While Business Risk Factor for SAP: 50 %, Oracle: 56.9 %, Microsoft: 57.7 percent, Tier II: 61.8% and the total average is 54%. Business risk factor was calculated by responses to the statement of company experiencing operational stoppages or disruptions immediately following go-live.

Further we explore ERP implementation results of SMEs compared to their larger counterparts. In this study, we consider SMEs to the organizations with less than 500 employees and less than \$500 million (USD) in annual revenue. According to Gartner, SAP has the largest ERP software market share, followed by Oracle and Microsoft. The

Study reveals market shares comparable to findings by Gartner, with 35% for SAP, 28% for Oracle, 14% for Microsoft and 23% for Tier II vendors.

The market shares of ERP software vendors differ between SMEs and large organizations. Microsoft has only a 6% share of large organizations, but a 22% share of SMBs. The market share of Tier II vendors is fairly comparable in both SMEs and large organizations 17% of large organizations compared to 24% of SMEs. By contrast, SAP has a 43% share of large organizations, but only 30% of SMBs. However, SAP is still the largest vendor in the SMB market than any other ERP software vendors, followed by Oracle. SAP and Oracle possess over 75% of the market of the large organizations.

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As outlined in previous installments of our 2008 ERP Report, ERP software can provide tremendous benefits to organizations of all sizes. However, implementations can be risky if not managed appropriately. Risks for larger organizations include employee resistance and global supply chain disruptions, but SMBs often have more limited IT budgets and are more adversely affected by cost overruns than large companies. Moreover, SMBs have only an average of 20% of the internal employee resources to draw from, which can increase ERP implementation risk. Many companies such as Panorama Consulting Group offer independent ERP software selection and implementation expertise to SMBs and large organizations which can help reduce implementation risk, cost, and duration as mentioned in Figure 1 below.

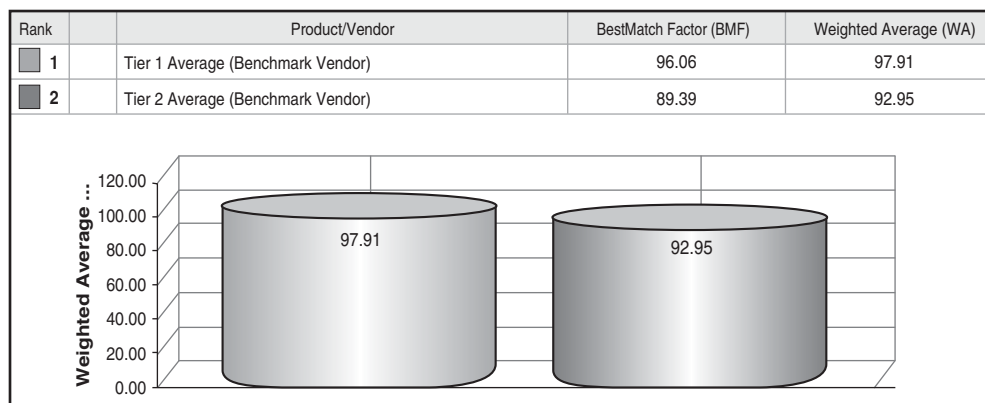
**Figure 1. Summary Results**

| Factors  | SMEs        | Large Organizations |
|--|-------------|---------------------|
| Duration (Months)  | 18.8        | 25.2                |
| Cost of Implementation                                   | \$3,073,232 | \$24,069,582        |
| Cost / Revenue   | 10.5%       | 4.9%                |
| Under budget / Within 5%                                 | 40.5%       | 35.9%               |
| Over Budget by 5%~100%                                   | 59.5%       | 64.1%               |
| # of Total FTEs<br>(Full Time Equivalent of an employee) | 14          | 74                  |
| Customization Level                                      | Low         | High                |

## COMPARATIVE ANALYSIS OF ERP VENDORS [YEAR 2009-2012]

In 2009, midsized companies are well served, as are their smaller and larger counterparts. New vendors continue to appear and new functionality continues to be released. The comparison made by TEC's online evaluation system between Tier I Big ERP like SAP ERP, Oracle E-Business Suite and Oracle JD Edwards Software and Tier 2 applications, such as Epicor ERP, IFS Applications, Infor SyteLine, Lawson M3, Microsoft Dynamics NAV, Microsoft Dynamics GP, Pronto ERP, EQAD, IQMS, Syspro and Jeeves is features and functions-based. It does not cover the technology area. To have a more accurate result, they excluded Product Technology criteria from the comparison and assigned equal priorities to all remaining functionality criteria [3].

The overall rating of tier 1 ERP for discrete manufacturing is expectedly higher than the overall rating of tier 2 products [Figure 2]. However, the difference is not as dramatic as one would expect and is only 4.96 points lower than the tier 1 average. This can be explained by the fact that more and more ERP vendors are capable of delivering strong basic functionality for manufacturing, such as master production scheduling (MPS), material requirements planning (MRP), and related activities: purchasing, inventory management, sales, etc. The



**Figure 2. Tier 1 vs. tier 2 Overall Rating Comparison [2009]**

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main functional differentiator between tier 1 and tier 2 vendors can be found when analyzing advanced manufacturing such as engineer to order (ETO) and process management, but also industry verticals with very complex activities (oil and gas, mining, electronics, etc.)[4].

The biggest differentiator between the two groups of products is in the human resource management area. Besides enterprise asset management (EAM) or product lifecycle management (PLM), is one of the areas where Big ERP vendors either acquired and incorporated software solutions, or developed their own add-ons, in order to address the complex needs of large multi-national corporations [4]. Though tier 2 ERP vendors are also working on developing the above mentioned functionalities, they usually decide to work with third-party tools or use application programming interfaces (APIs) to integrate with existing HR, EAM or PLM systems that their customers already use.

The differences in Manufacturing Management, Inventory Management, Sales Management and Procurement Management areas are minimal and are within two percent of one another [5]. In some situations, the tier 2 systems can be a strong alternative to Big ERP products, but this will only

show up during the selection process, depending on the specific needs and requirements of the company.

Panorama Consulting Group, an independent and vendor-neutral ERP consulting firm, developed the 2010 ERP Vendor Analysis Report based on survey results from 1,600 organizations that have selected or implemented ERP within the last four years. This report analyzes project benefits and drawbacks and summarizes implementation approach and satisfaction indicators segmented by major Tier I, Tier II and Tier III vendor [6].

Tier I ERP Packages have the lengthiest implementation durations. The average actual duration of Tier I implementations was 13.2 months, which is approximately the same as Tier III implementations. At 11.1 months, Tier II packages had the shortest duration times.

Next the difference between budgeted costs and actual costs is a major issue for most companies implementing ERP software packages. Compared with Tier I and Tier III software packages, Tier II clients have a better chance of limiting ERP spending and coming in under or on budget. Over 50% of Tier II and Tier III clients had actual costs that exceeded budget.

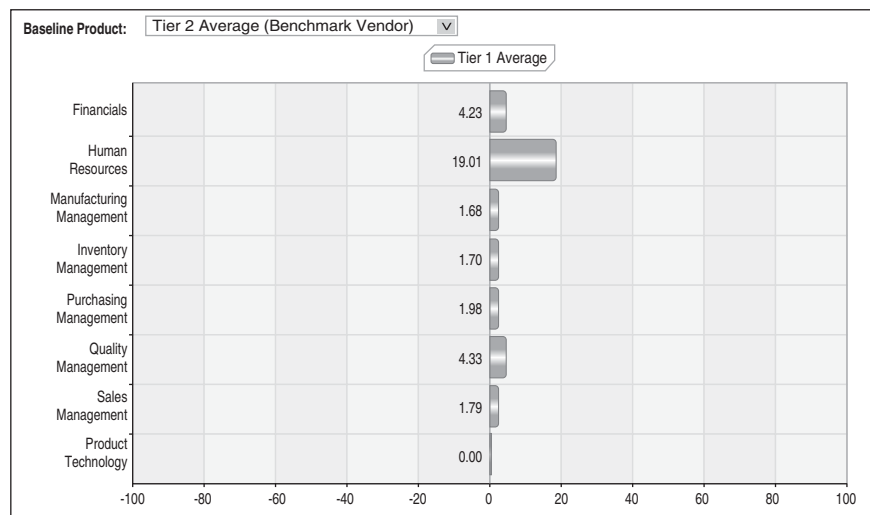


Figure 3. Tier 1 vs. Tier 2 ERP comparison by modules [2009]

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Panorama study shows that most companies that completed ERP implementations have a payback period (i.e., the length of time taken to recover the project investment) of two to three years. Tier I software packages were found to have the longest payback period (3 years), while Tier II payback averaged 2.2 years, and Tier III just 1.7 years.

No software package can meet 100% of business specific requirements. 25% of companies choose to heavily customize or completely customize their ERP software; the majority of companies tend to do at least some customization during implementation. Nearly half of the companies surveyed (47.8%) chose mostly vanilla customizations with at least some customization to the software. Only 28.3% implemented with no customization at all. The leading three Tier I vendors have fairly similar customization rates. These three vendors have small percentages of complete customization and higher percentages of mostly vanilla implementations. Although 22% of Tier II clients and 43% of Tier III

clients chose vanilla customizations, 69% of Tier II clients and 38% of Tier III clients chose at least some customization. This indicates that small and mid-size enterprises that chose Tier II or Tier III software also required some customization to fit their business processes.

Overall, most companies realized benefits fall below 50% of what they expected to achieve. Notably, 55% of companies realized 30% or less of expected business benefits. These failures are especially evident with Tier I and Tier III clients. Nearly 70% of Tier I clients and 72% of Tier III clients fail to realize at least 50% of business benefits. Figure 4 shows that once companies realize 20% of business benefits, the marginal utility of realized benefits begin to decrease. This means the chance of getting higher realized benefits becomes smaller. The red line shows actual realized business benefits and the blue line shows expected realized benefits. The expected chance of failure to deliver 50% of business benefits is 61.1%, which provides for only a 38.9% probability of realizing over 50% of business benefits.

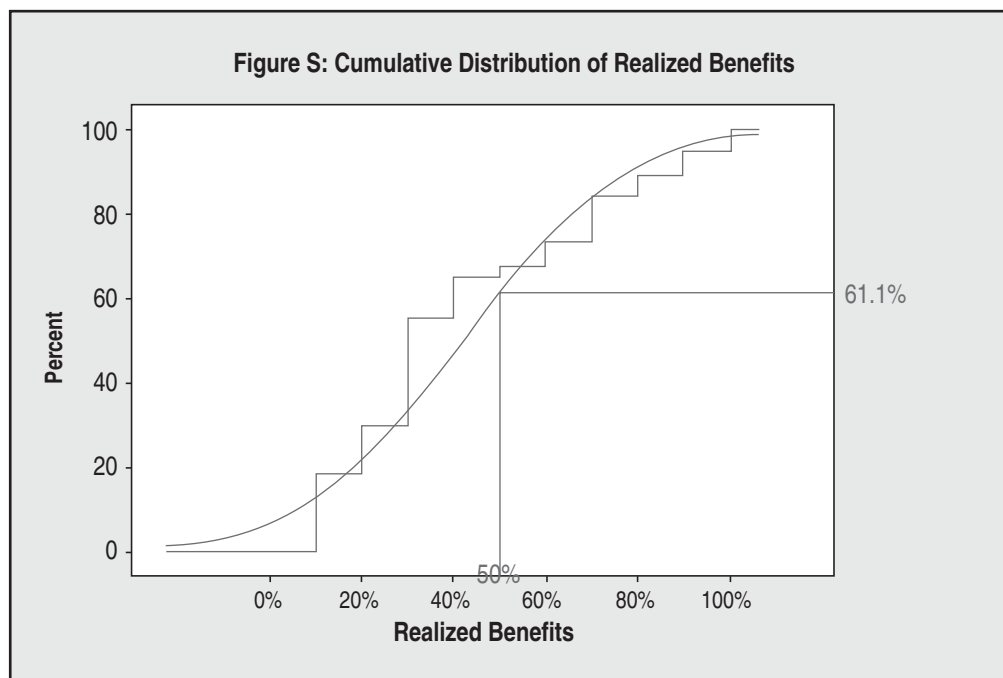


Figure 4. Cumulative Distribution of Realized Benefits [2010]



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The three risks identified in the survey responses: over-budget, over-time, and failure to deliver 50% of business benefits. Most implementations go over budget (51%) and fail to realize at least 50% expected business benefits (62%). In addition, a large proportion (36%) takes longer than expected to complete. Based on the probability analysis of the entire sample, there is a nearly three out of four chance (72.4%) that at least one negative result will occur and a nearly one in three chance (31%) that two or more negative results occur in any given implementation.

In 2011, Customer started feeling that selecting between SAP, Oracle and Microsoft is not always easy. Depending on a company's business circumstances and IT strategies, each solution has distinct strengths, weaknesses, and tradeoffs [7]. The best way to choose the appropriate software for your organization is to objectively assess these strengths and weaknesses relative to your unique business requirements.

Having explored all opportunities within the large enterprises for enterprise resource planning (ERP) solutions, in 2011 international players are now chalking plans to capture the small and medium enterprises (SMEs) segment. Attempting to strengthen its hold in the SME segment, Baan has even identified a domain for SMEs, while JD Edwards is busy experimenting to arrive at reasonably priced ERP solutions for this segment. Navision, on the other hand, boasts of its focus on SMEs since the beginning. The company offers a horizontal ERP product for all vertical sectors and works through solutions centres to cater to the specific needs of various sectors. SAP India too is eyeing the SME segment and is working on solutions to cater to the specific needs of the SMEs [8].

According to National Association of Software Services Companies (Nasscom), only a small fraction of the market has been exploited by the ERP solutions providers. ERP penetration is still limited to only top 200 companies of the total of over 6 lakh companies. There is immense opportunity for the

ERP players and they must concentrate on mid-sized and small-sized companies. Following this trend, Baan India has consciously taken a decision to target the SMEs.

In case of JD Edwards, SMEs already contribute a significant amount of almost 50 per cent to its revenues from ERP implementation. The company is planning to increase its focus on SMEs. The Indian companies deploy ERP solutions that are Web-centered architectures and componentized customer and supplier facing applications, according to experts. The network infrastructure used is WAN to connect multiple locations of the company and centralise the information flow. As companies demand ERP solutions that will make their business more and more customer centric instead of product centric, the ERP players need to constantly upgrade their technology to suit the customers' needs.

The data in Panorama's 2012 ERP Report presents a bit of a mixed bag of results. On one hand, it is incredibly gratifying to see that more than four out of five (81-percent) of respondents are satisfied with their ERP software and that the amount of both implementation budget overruns and schedule overruns have improved over the last year [9]. This shows that organizations are taking more steps to meet implementation goals quicker and are working to stop the absurd cost and duration overages we have seen in past years.

Based on the data and market situation, ERP vendors based on Business Size are;

### i) Small Business

Microsoft Dynamics is considered as top ERP for SMEs because the features are ideally suited to the requirements of small organizations. It has more than 83,000 ERP customers.

The family of Microsoft ERP products are as follows:

- a) Microsoft Dynamics AX (Axapata)
- b) Microsoft Dynamics GP (Great Plains)
- c) Microsoft Dynamics NAV (Navision)

d) Microsoft Dynamics SL (Solomn)

Both Dynamic AX and NAV offer strong distribution and manufacturing while dynamics GP remains a favourite channel and offers the strongest financial options among the MS product suite.

**ii) Middle Market**

The following two products as top ERP in this segment:

a) EPICOR

Epicor has 20,000 customers in more than 150 countries. It offers solid ERP functionality together with a number of impressive industry solutions for Professional Service Automation (PSA), hospitality management, pharma, manufacturing, distribution and non profit.

b) Infor

Infor has more than 70,000 customers and 3rd largest ERP manufacturer, behind only Oracle and SAP. INFOR has different ERP software systems and particularly strong distribution, lean manufacturing, complex manufacturing process solution and supply chain management (SCM).

**iii) Enterprise ERP Leader**

Obviously SAP and Oracle are the most top ERP in this segment. They are #1 and #2 ERP market share leader. Today SAP has released ERP solutions for SMEs named as SAP Business One and they claimed that they have helped more than 75,000 SMEs [10].

surveys related to investigate ERP software selection, implementation and satisfaction trends across industries, company sizes and geographic locations. Again SAP (with 34%) was the top in vendor list, sequenced by Oracle (26%), Microsoft Dynamics (19%), Epicor (7%) and Infor (5%). In spite of tough competition set by Tier I solutions SAP, Oracle & Microsoft Dynamics with massive resources, Tier II vendors Epicor and Infor are making their base in the ERP market [13].

The latest data shows that to amplify potential gains, 26% of companies including SMEs using cloud and SaaS solution, compared to last year data of 16%. Cloud and SaaS market share continues to increase but on-premise ERP systems still dominate.

The 2014 ERP Report by Panorama Consulting Solutions (based on the survey conducted on 192 respondents) presents independent analysis of ERP implementation costs, durations and achievement of business benefits from both domestic and multinational organizations of varying sizes. The report also discusses findings on ERP vendor selection, the role of ERP consultants and satisfaction and success ratings. It has found that the bulk of companies experience extended implementation durations and came in over-budget. The most common reasons for extended durations highlight "organizational issues" as the main culprit. It emphasises the importance of organizational change and business process management and their impact on implementation duration. Another interesting fact emerges that while third-party guidance is essential, finding the right consulting firm can be difficult.

General satisfaction levels for ERP software remain high, though significantly lower than last year. The majority of respondents (70-percent) are satisfied with their ERP software (as compared to 86-percent in our previous report) and 76-percent would select their chosen software again. Despite the high levels of overall satisfaction, it is interesting that only 63-percent of respondents consider their ERP project a

## COMPARATIVE ANALYSIS OF ERP VENDORS [YEAR 2013-2015]

Panorama Consulting Solutions prepared the 2013 ERP Report after conducting polling on Panorama's website (Panorama-Consulting.com), during a recent four-month period (September 2012 to January 2013). Total 172 respondents completed the

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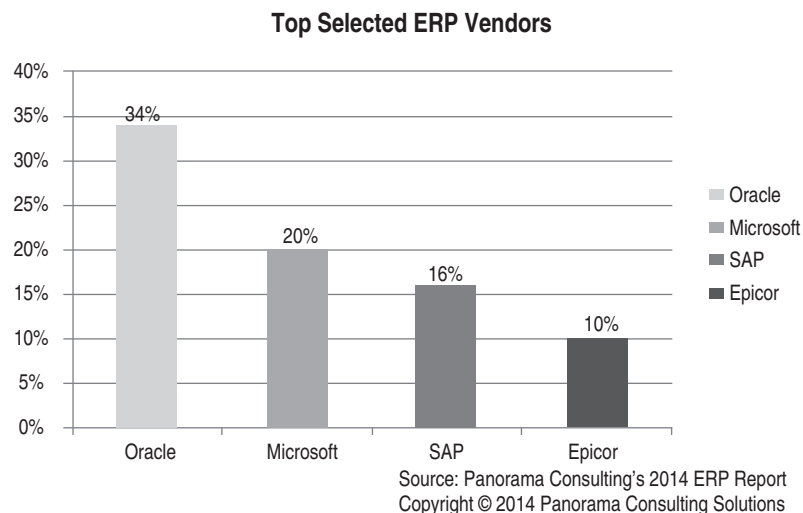
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“success.” Nearly one quarter of respondents (21-percent) are “neutral” or “don’t know” if their project was a success, indicating that organizations might not have created a business case, conducted a post-implementation audit or communicated about project results. Nearly one in five respondents (16-percent) indicates that their organization’s ERP project was a failure.

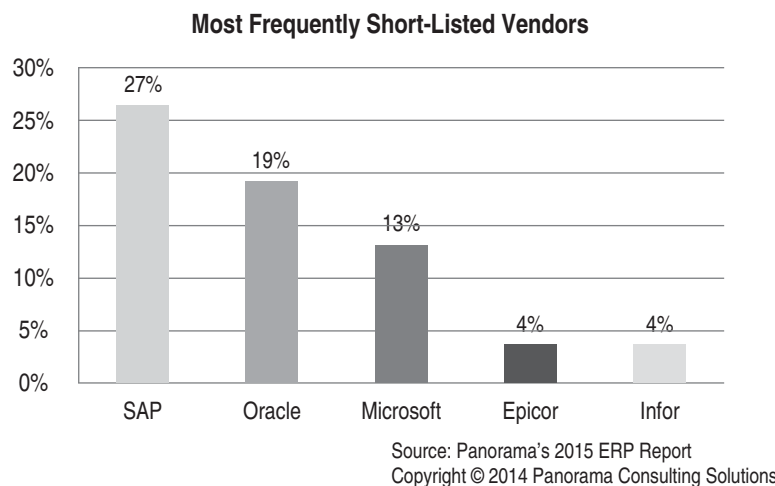
As depicted in Figure 5, in terms of specific vendors chosen, SAP was the vendor most frequently shortlisted by respondent organizations, followed by Oracle and Microsoft Dynamics.

In terms of percentage of times the vendor was chosen after they had been shortlisted, Oracle was the vendor most frequently selected (34-percent of the time), followed by Microsoft Dynamics (20-percent of the time), SAP (16-percent of the time) and Epicor (10-percent of the time)[14].

The 2015 ERP Report by Panorama Consulting Solutions (based on the survey conducted on 562 respondents) presents facts on ERP software selection, implementation and satisfaction trends across industries, organization sizes and geographic locations. The report summarizes the experiences of



**Figure 5. ERP Vendor's Preferences by Customers in 2014**



**Figure 6. ERP Vendor's Preferences by Customers in 2015**



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ERP customers with regard to enterprise software, vendors, consultants and overall implementations. Over the past five years, the average cost of ERP implementations has been approximately \$6.1 million with an average duration of 15.7 months. Of these projects, approximately 58-percent exceeded their planned budgets and 65-percent experienced schedule overruns. Post implementation, 53-percent of organizations achieved less than 50-percent of the measurable benefits they anticipated from new ERP software. Of those respondents who exceeded their planned durations, a large percentage indicated that “unrealistic timelines” and “expanded scope” were the primary reasons [15].

While the market for cloud ERP is growing, the majority of respondents selected on-premise software. Reasons for this include not having sufficient information about cloud products (40-percent), perceived risk of security breach (20-percent) and perceived risk of data loss (10-percent). Based on Panorama’s experience, we have found that these are misconceptions. In reality, cloud ERP vendors typically provide secure and reliable solutions. It is important for executives to thoroughly perform their due diligence in evaluating these risks during the selection process.

ERP implementations are plagued by technical, process and organizational issues – all or any of which can cause an operational disruption. According to Panorama’s research and experience, it is the process and organizational issues that pose the most risk. Technical issues do exist, and are likely responsible for short-term disruptions, but they are typically more quickly and more easily resolved than organizational issues. As shown below in Figure 6, SAP continues to be the vendor most frequently shortlisted by the organizations (27-percent), followed by Oracle (19-percent) and Microsoft Dynamics (13-percent). These data points are consistent with the previous year. Epicor and Infor are also frequently shortlisted.

The majority of organizations report extended implementation durations and over-budget projects. ERP failure is also on the rise as 5-percent more respondents compared to last year noted that their ERP implementation was a failure. Organizations that do not allocate time and money to these critical success factors are more likely to implement over-budget and experience timeline overages due to end-user resistance and low system usage. The data indicate that the same organizations that are struggling with budget and timeline overages are also unlikely to seek guidance from ERP consultants. Since last year, there has been a decrease in the percentage of respondents who engaged ERP consultants. Of those that do choose to work with ERP consultants, the nature of the organization’s engagement with consultants has shifted. Compared to last year, a higher percentage of organizations are relying on consultants to guide them through the post-implementation phases of their project. Post-implementation activities often involve project recovery work as well as the verification and validation of vendor contracts and overall project deliverables.

## CONCLUSION & DISCUSSIONS

Throughout the research of more than a decade (2005-2015), we focus on the early stage of evaluating and selecting an ERP system prior to implementation. Our research data analysis has emphasized the importance of organizational change management and business process reengineering. This year also, the data point to a need for these same success factors. Third-party guidance is essential and the ideal consulting firm is one that can help ensure that every dollar spent on an ERP project contributes to the organization’s long-term goals. This is of particular importance because SMEs are more and more experiencing the need for integration, especially for inter-organizational integration and expecting ERP software to fulfil these needs.

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Organizations with strong third-party guidance understand that a significant amount of their time and budget should be allocated to organizational change management and business process reengineering in order to maximize benefits realization. The availability of relatively inexpensive hardware is fostering this situation. Standardized business processes and clearly defined organizational roles contribute to the success of a project by keeping organizations focused on how an ERP system will achieve specific business goals.

### FUTURE SCOPE

Over the past decade, the SMB market has become one of the highest-growth areas of the ERP industry. As Large ERP vendors are moving downstream to the SMB business market by developing lower-cost solutions with more appropriate functionality for smaller businesses. There are plenty of Tier II ERP software vendors that SMBs can choose from, such as Epicor, Infor, Sage and others. These Tier II vendors provide more options to SMBs beyond traditional Tier I providers [12]. The technologies continue to change and companies must be able to adapt new technologies if they wish to remain competitive. Therefore responsibility for key aspects of the project should not be delegated to software vendors or consultants only. These external parties should be viewed as auxiliary resources, not as drivers.

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### BRIEF PROFILE OF THE AUTHORS

**Rashmi Jha**, PhD. is currently working as an Associate Professor and Program Co-ordinator of MCA & MCA-DD departments of Gitarattan International Business School (GIBS) (College affiliated to Guru Gobind Singh Indraprastha University), New Delhi. She is Ph.D, M. Phil, and MCA in Computer Science. She is a Lean Six Sigma Green Belt Certified Computer Professional. She has more than 22 years working experience in computer field; 16 years experience of teaching to MCA, MBA and B. Tech. students of GGSIPU, IGNOU, MAHE and Delhi University and 6 years experience in Computer Programming field.

She has varied experience of working as Program & Project Coordinator(s) for IT departments of the College. She has organized various inter university cultural fests, national & international conferences, seminars, workshops and FDPs on various contemporary issues in computer science and management. She has served as primary member of various committees viz. NIRF's Ranking Committee, NBA accreditation team etc. She remains associated with various universities as paper setter, moderator, examiner and subject expert.

She has authored 33 research papers in various peer-reviewed national, international journals and conferences. She has also served as an editor & reviewer of many national & international conferences and journals of repute. Recently she won "IEOM Woman in Industry & Academy

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Award" in recognition and appreciation of Outstanding Service in IEOM Woman in Industry & Academia Forum and Support in Industrial Engineering and Operations Management Profession (IEOM) at Lawrence Technological University, Michigan, Detroit, USA during September 23-24, 2016. She also delivered a technical talk and chaired two technical sessions on Global Engineering Education for IEEE IEOM 2016 at LTU, Detroit, USA in 2016. In 2008, she presented IEEE Paper at Tianjin University in China on the topic "Implementing Best Practices in ERP for Small & Medium Enterprises" for IEEE Symposium of Advanced Management of Information for Globalized Enterprises (AMIGE' 08), jointly organized by IEEE, Arizona University (USA), Tsinghua & Tianjin University, UMBC, SAP & CN.

She has wide-ranging experience of organizing and attending more than Sixty Conferences/ Seminars / Workshops/ FDPs held at National and International level on various emerging issues in "Information Technology, Management Development and Quality Improvement Programmes" for teachers and working executives in Delhi. She is a life member of professional bodies like CSI, IEEE, IEOM (US) and KINDUZ Consulting Group of India.

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