Assessing TCO for Best-of-Suite Versus Best-of-Breed Architectures in the Communications Service Industry

By Raul L. Katz, Ph. D.
and Juan Pablo Pereira
APRIL 2007

TELECOM ADVISORY SERVICES, LLC

182 STISSING ROAD – STANFORDVILLE, NEW YORK 12581 – UNITED STATES
TELEPHONE: +1 (845) 868-1653 FAX: +1 (845) 868-1426

Contents

Executive Summary

Driven by factors ranging from regulatory reform (e.g. structural separation), cost reduction, convergence strategies and the competitive need to improve the customer experience, Communications Service Providers (SPs) around the world are in the midst of implementing major programs aimed at restructuring their information system architectures. These transformations are generally aimed at eliminating redundant applications, breaking down silo-oriented product driven systems and installing integrated solutions.

Although integration philosophies vary, SPs across the market seem to be moving towards adopting either Best-of-Suite approaches, while others are installing Best-of-Breed "hybrids" – Best-of-Breed applications complemented by in-house integration capabilities. Given the growing need to streamline operations and lower cost structures in an increasingly competitive marketplace, increasing emphasis is being placed on the question of which approach helps SPs to realize their BSS/OSS transformation goals while delivering a lower Total Cost of Ownership (TCO).

This white paper provides an analysis of the TCO delivered by Best-of-Breed and Best-of-Suite approaches in the communications industry. Findings presented here are based on primary research that developed case studies of seven Tier 1 SPs in Europe, North America and Latin America.

Our analysis has determined that, once conversion risks are controlled, Best-of-Suite architectures deliver lower TCO along the architecture life cycle. In addition, this approach better positions SPs to achieve the necessary business and organizational transformations to improve the overall customer experience, reduce time to market and capitalize on new convergent services and business models.

INTRODUCTION:

SPs spend on average 6.5% of their revenues on Information Technology (IT); this percentage is comprised of both capital and operating expenditures in any given year. A large portion of this amount (approximately 60%) is being spent on activities oriented to simply maintain the operating status quo (i.e. "keeping the lights on"). This is primarily due to the complexity of existing system architectures derived from either legacy systems or based on strictly implemented Best-of-Breed approaches. These require SPs to allocate an inordinate amount of resources to dealing with an unusually large number of systems and their interfaces. In addition to the resource burden, architectural complexity is also increasingly becoming a barrier to launch new products on time and deal with key challenges, such as improving the customer experience. TCO needs to be reduced, while more resources need to be focused on efficiently managing and growing the SPs business. To deal with this situation, we have found that, not surprisingly, most SPs around the world are engaged in projects aimed at transforming their IT infrastructures, migrating to new, integrated system architectures.

In addition to lowering complexity and costs, the strategic requirement to implement convergent services, has, in recent years become another impetus for SPs to migrate to more integrated system architectures. While this trend has been initiated by the need to enable a transformation of the SPs business and facilitate revenue replacement strategies, the chosen approach must also effectively lower operating costs. How similar are IT transformation approaches across SPs? And what are the cost implications?

To answer these questions we undertook an analysis of seven Tier 1 SPs across Europe, North America and Latin America[1]. In addition to understanding the experience of each SP, we compared the cost differentials of alternative architectural approaches. Our focus was on estimating the TCO for each system approach, by taking into consideration all the different stages of the architecture life cycle (e.g., acquisition, implementation, operation and maintenance). Our estimates were generated based on a uniform and consistent methodology, with the results validated by the SPs participating in the study. This paper discusses the findings of this analysis, focusing on a set of formulated hypotheses regarding the economics of both the Best-of-Breed and Best-of-Suite approaches.

HYPOTHESES:

Despite their importance to industry executives, the research literature on TCO of Best-of-Suite versus Best-of-Breed is not extensive[2]. In fact, only a few authors (Bragg, 2004; Byrne, 2005) present quantitative results supporting the economic advantage of one approach over the other. Despite the absence of studies, the review of the literature helped us formalize five hypotheses regarding TCO:

1. Best-of-Suite users save acquisition and implementation resources due to the fact that in these environments data harmonization and implementation costs tend to be lower.
2. Best-of-Suite architectures exhibit lower maintenance costs because in these environments there is less of a need to include large development staffs comprising diverse skills working on a large variety of integration tools.
3. Best-of-Suite installations enjoy more optimal hardware resource utilization.
4. Software licenses are significantly lower for Best-of-Suite users.
5. Best-of-Suite users tend to have more negotiating leverage with vendors.

[1] While the names of the specific carriers had to be kept confidential, a brief description of the study participants is included in Appendix A.

[2] See bibliography in Section 8.

Let's discuss each of these hypotheses in more detail.

With regards to the first hypothesis—the cost of acquisition and implementation—the research literature raises the hypothesis that Best-of-Suite approaches save resources due to enhanced data harmonization and reduced integration costs. More specifically, a streamlined definition of data elements throughout the architecture should lead to a reduction of customization costs as well as product development time downstream. Furthermore, Best-of-Suite environments would provide a faster time to deploy new system architectures as a result of comprehensive business process coverage. Best- of-Suite architectures, by definition are all encompassing in addressing all business processes that each function entails. As a result, suite installations require less ad-hoc development of modules needed to support uncovered processes. Less integration and customization speed time to production and minimize implementation costs. Furthermore, fewer vendors and minimal integration also decrease a SP TCO once implementation is completed. Research in the Supply Chain Management software arena (Bragg, 2004) has, to a large degree, validated the first hypothesis: that the cost of implementation and acquisition for Best-of-Suite architectures is lower than for Best-of-Breed. For example, Best-of-Suite users spend 40% less than Best-of-Breed in installing demand-planning systems. Similarly, according to this author, implementation of Best-of-Suite supply planning systems tends to cost 46% less than Best-of-Breed. In both cases, the large savings area was focused on data harmonization and integration. The same evidence was found in the content management arena (Byrne, 2005), where Best-of-Suite users experience less integration costs due to faster implementation.

Our second hypothesis posits that Best-of-Suite architectures exhibit lower maintenance costs due to better utilization of skill sets and the need for fewer integration resources. Furthermore, Best-of-Suite provides a single source for all support needs, coherent documentation, and a synchronized roadmap. This hypothesis was again confirmed in the Supply Chain Management arena, where Best-of-Suite environments experience 57% less support costs than Best-of-Breed (Bragg, 2004). This was partly due to the fact that some Best-of-Breed solutions used proprietary databases, needing specialist support. Again, similar evidence was found in the content management arena (Byrne, 2005).

Two hypotheses were formulated regarding hardware utilization and software license costs. They assume that Best-of-Suite installations enjoy more optimal hardware resource utilization and significantly lower software licenses. Research in the Supply Chain Management confirmed this, indicating that Best-of-Suite users spend 46% less in hardware and software licenses in demand planning systems than Best-of-Breed environments. In the area of supply planning, Best-of-Suite environments cost 68% less in software licenses than Best-of-Breed (Bragg, 2004).

According to the fifth and last hypothesis, the moment a SP makes the decision to partner up with a suite provider it gains substantial leverage in making that decision a win-win proposition: the SP gains the benefits associated to Best-of-Suite architectures, while the vendor has the opportunity to showcase to the industry as a whole a leading edge integrated solution. Along these lines, the vendor is interested in delivering full value, which in turn gives the SP considerable leverage in managing the relationship.

While the research literature so far appears to favor Best-of-Suite architectures, it seemed pertinent to also validate these hypotheses in the communica-

tions service industry. The multi-product complexity in communications is rampant. It is, therefore, important to consider whether Best-of-Suite would be compelling enough to control TCO costs. Also, the communications service industry can be considered to be a laggard when it comes to implementing integrated architectures and, in that respect, the evidence to support a Best-of- Suite approach might not be so easy to identify. Lastly, the independent software industry serving the communications industry has only in the last two years started to consolidate and might not have yet sufficiently proven the concept of integrated platforms capable of lowering TCO. We will first review the strategic imperatives driving SPs towards integrated architectures, then discuss the Best-of-Suite and Best-of-Breed approaches being adopted in this industry and evaluate each approach's ability to deliver lower TCO.

STRATEGIC IMPERATIVES DRIVING THE MIGRATION TO INTEGRATED SYSTEM ARCHITECTURES: Implementing and integrating new communications systems architectures, including billing, finance, logistics, CRM and a whole suite of OSS, is extremely difficult. And, yet, the need to enhance, upgrade and replace legacy systems has never been greater. At a strategic minimum, SPs not focused on application integration face serious risks in terms of longer time-to-market, higher development costs and the inability to enhance the customer experience. All of these challenges need to be met in the context of growing convergence trends and the pressure to introduce innovative, new services.

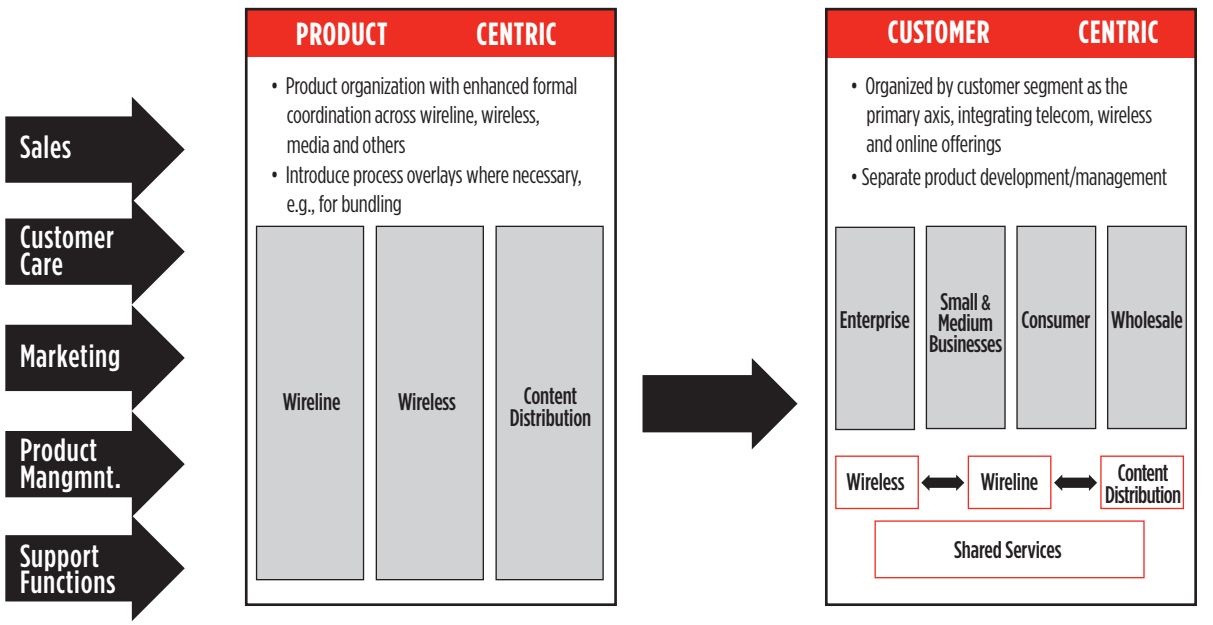
Almost all SPs in the market today are deploying convergent strategies. For example, incumbent SPs are becoming vertically and horizontally integrated (such as AT&T, Deutsche Telekom, Telefonica, KPN). Their objectives are aimed at delivering not only bundles of services, from fixed to mobile telephony, broadband and entertainment services, but also a new set of services developed by means of integrating multiple technology platforms. Beyond the incumbent carriers, cable TV operators competing with the communications SPs are also aiming at delivering similar value propositions. Even "pure play" operators, like Vodafone and Sprint-Nextel, have entered the fray of triple and quad-play, through either strategic partnerships or new technology platforms, like Wimax.

To tackle the convergence challenge, SPs have begun a process aimed at transforming their organizations, business processes, and management and information systems. At the organizational level, SPs are beginning to migrate from a product centric to a customer centric operating model. Product centric models, in the traditional SP organization, are based on product based business units (fixed telephony, wireless, media and online services). To enable these models to support convergent services, management has had to build formal coordination mechanisms across business units, and introduce process overlays, where necessary. However, these organizations are proving to be too cumbersome, exhibiting unusually long cycle times for launching new service offers.

The natural response chosen by many organizations has been the migration to customer-centric models, whereby the market-facing business units are not structured by product (fixed telephony, mobile, etc.), but by market segment (enterprise, small and medium enterprise, residential, etc.) (See exhibit 1).

While the customer centric model provides the highest revenue potential in terms of capturing the largest share of communications spending of a household or an enterprise, its level of complexity makes it difficult to implement. Among the com-

Exhibit 1: Alternative Organization Models



plexity issues, one should mention the coordination of market facing units and product organizations to avoid conflict and the need for market facing functions to support multiple product lines. Similarly, customer centric units present the greatest disruption to product-centric organizations, in terms of cultural change and migration risk.

When it comes to information technology, the migration to customer-centric operating models puts pressure on SPs to move rapidly to highly integrated system architectures, comprising common systems and business processes (rather than product-centric stove-pipe applications and processes), and harmonized customer data elements across systems. Having said that, integration is not easy. In fact, it is complex, costly and risky. Integration that fails to support the handoff of critical processes will lead to errors and delays, with the consequent degradation of the customer experience. This can allow revenue to slip through the cracks and compound the time and investment required to bring new services to market.

INTEGRATED SYSTEM ARCHITECTURAL OPTIONS —BEST-OF-SUITE AND BEST-OF-BREED:

While the imperatives to migrate to highly integrated system architectures are pervasive among SPs, the communications industry is not as advanced as other sectors when it comes to implementing them. For example, the Manufacturing sector was helped by the ERP wave, while the Pharmaceutical and Insurance sectors appear to be following through on a similar trend. It was therefore not surprising to find that the majority of SPs included in our analysis had IT architectures that can be characterized by a lack of systems integration.

Our research classified the SPs studied along a spectrum (from less to more integrated) according to a classification that included common origin of modules (in-house developed or third party vendor), assuming that greater consistency yielded a higher level of integration. As such, commonality can result from solutions being purchased from a single software vendor or applications developed in-house possibly by a SPs' IT resources or a systems integrator in the context of a one-off redesign effort.

According to this, five out of seven SPs studied currently have a low level of integration across mostly homegrown applications, while only two exhibited higher integration levels (see exhibit 2).

Having said that, almost all SPs studied indicated that they are transitioning to more integrated architectures (see exhibit 3).

These architectural choices are driven by the market and technology conditions specific to each SP. For example, a European incumbent SP included in the study is migrating closer to a Best-of-Suite architecture in billing and CRM to enable the consolidation of its business lines (e.g. telephony, broadband, and subscription TV). The objective is to implement a single integrated CRM that unifies all customer management and billing applications for most services on the fixed telephony side. Similarly, another European incumbent, that is undergoing a consolidation of its mobile and fixed telephony businesses into a single converged provider, is migrating its systems architecture to a single vendor Best-of-Suite model.

On the other hand, a North American wireless SP, aiming at controlling the migration risks associated with implementing an overarching Best-of-Suite solution, is moving to an integrated Best-of-Breed model, complemented by in-house integration

Exhibit 2: Current Systems Architecture

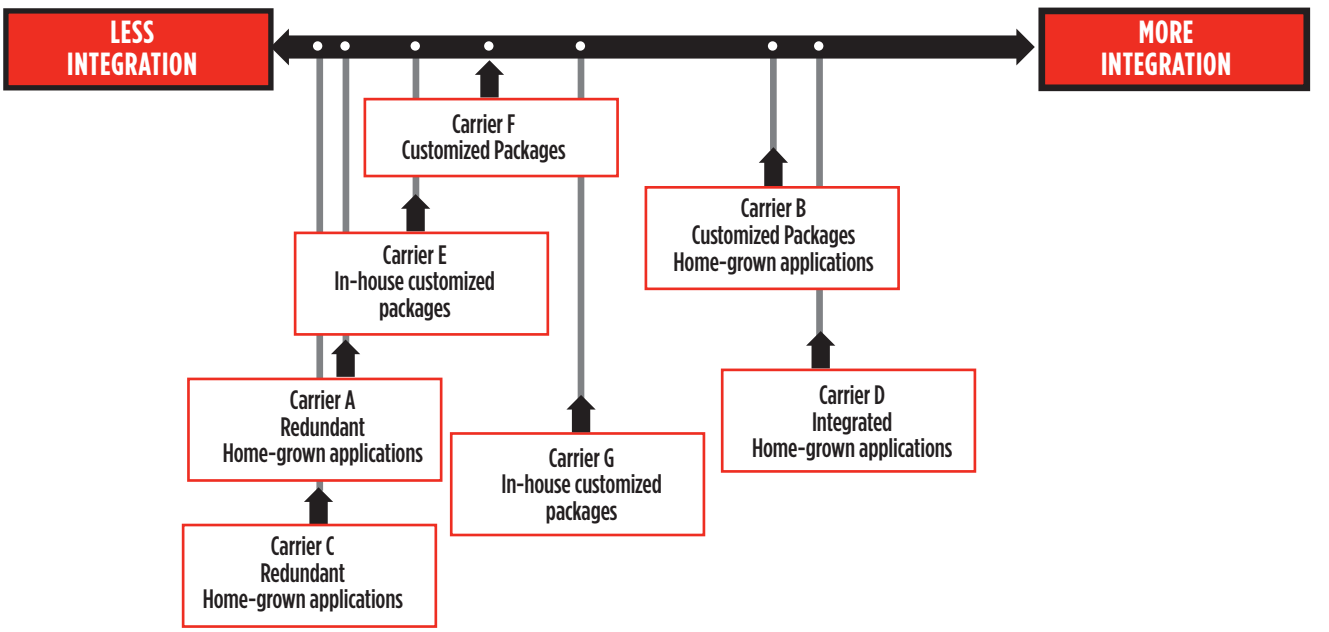
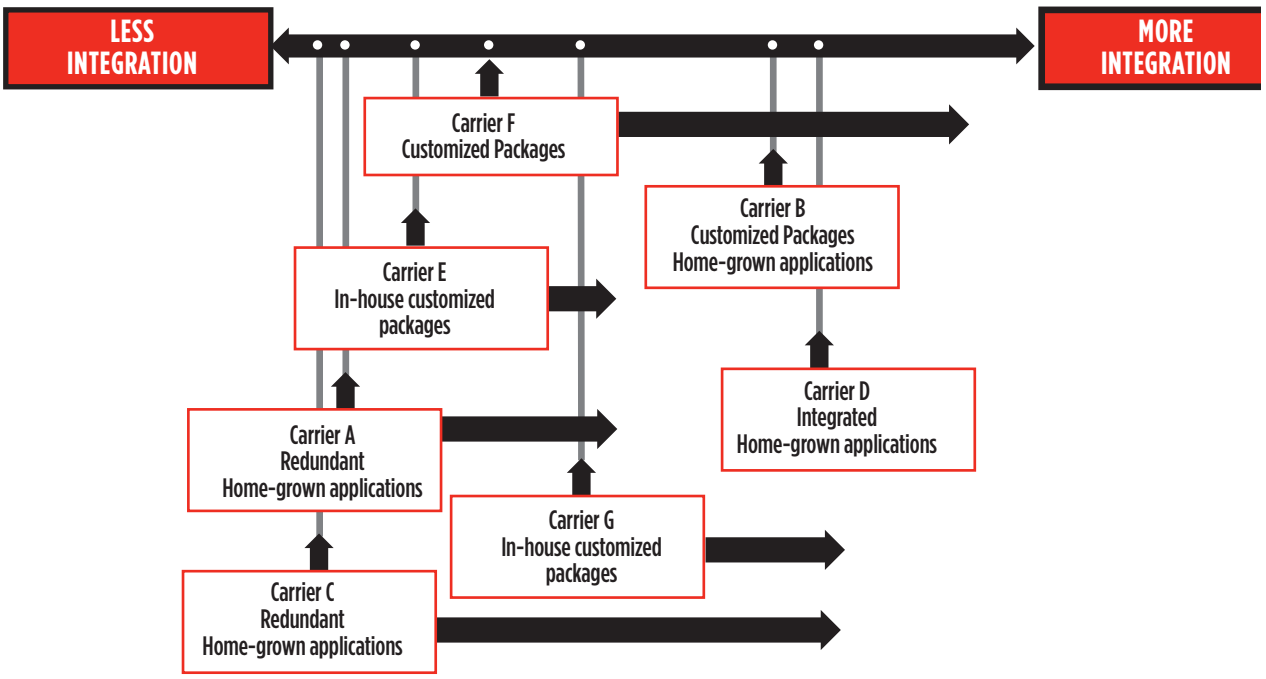


Exhibit 3: Architecture Transition



capabilities—what we refer to as a hybrid Best-of-Breed approach.

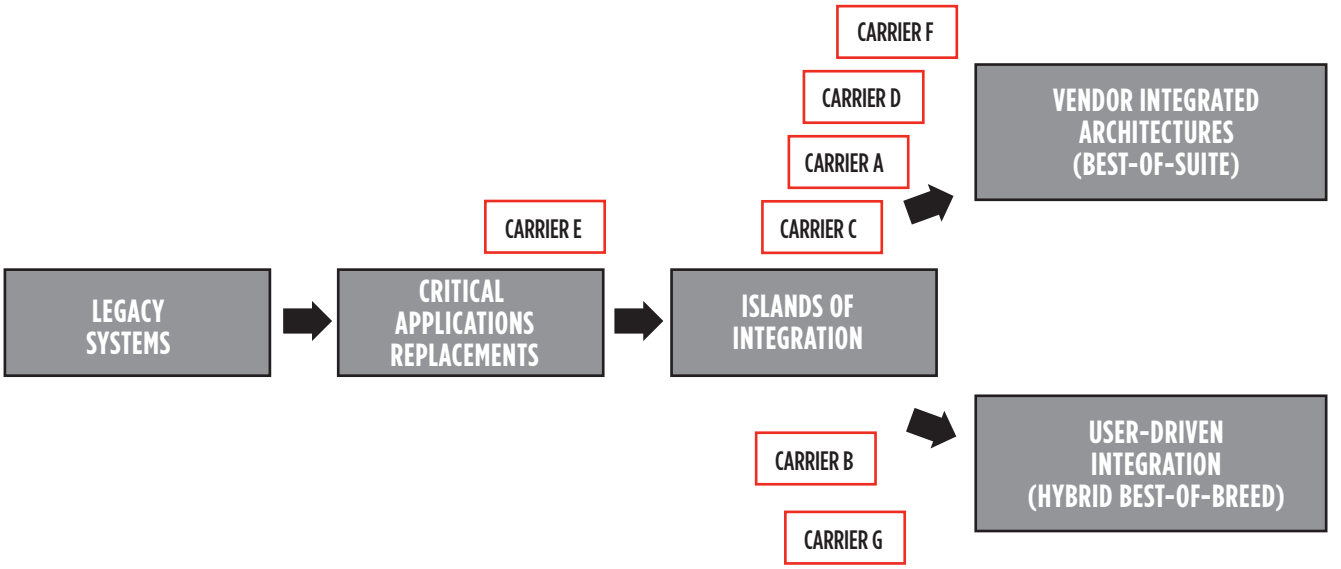
Regardless of the approach chosen by a SP, there is clearly a growing trend toward the integrated side of the architectural spectrum (see exhibit 4).

This trend merits a detailed explanation. As already discussed, SPs are universally migrating their system architectures to a state that can be characterized as more integrated. While this trend is pervasive, migration approaches vary. Indeed, growing integration is assuming two different flavors: a vendor-supported migration path versus a user-driven integration path. The vendor-supported path refers to a classical Best-of-Suite architecture. A user-driven path would be a hybrid Best-of-Breed path.

A vendor–supported integrated architecture results from the SP's strategic alliance with an application vendor, according to which the SP converts all primary applications clusters (e.g. billing, CRM, financials, selected OSS) to those offered by the same vendor. Our interviewees in the SP IT community revealed that the process for such vendors to acquire and integrate discrete modules would require some time, so we will expect that the offering of seamlessly integrated architectures is an ongoing process. Having said that, we have observed that some SPs have reached the conclusion that this path will not only enable them to meet the convergence challenge in an efficient way, but also the one that will allow them to keep their IT costs in check. We will come back to this point in the following section.

A user driven path consists of migrating applications clusters to Best-of-Breed commercial packages, while developing and controlling the integration in-

Exhibit 4: Path to Integrated Systems Architecture



house, either by an SI, or by an in-house IT organization. We call this path a Best-of-Breed hybrid because vendors are selected for specific clusters with the objective of migrating away from custom build, while consolidating platforms around a "rule of one" (no more than one platform per application). For example, a European incumbent chose Siebel for its CRM platform, BEA for digital commerce and collaboration, Convergys for billing, Oracle for financials and logistics and a mix of vendors for their OSS. Similarly, a North American wireless SP has chosen primarily Amdocs for billing, SAP for financials and logistics, and a yet-to-be-selected vendor for CRM. In parallel, carriers that have chosen this path build an internal competency on systems integration that facilitates the linkages among the acquired Best-of-Breed application clusters. Closely following an SOA strategy, the SPs codify the integration standards and hire additional development resources organized around an integration capability. Obviously, this path requires adhering to an SOA philosophy, the development of an architectural vision, built around consolidated master files (product catalogue, customers, assets, etc.) and reusable modules. These last steps are also common to a Best-of-Suite approach.

Is there any pattern as to when a SP chooses one path or another? Yes, to a large degree. First, new entrants tend to choose the vendor supported path or a Best-of-Suite approach in order to reduce their time to market since flexibility and speed are critical. Similarly, SPs that are leaders in transformation processes aimed at breaking the product centric operating model tend to also adopt vendor supported Best-of-Suite architectures. They have chosen this path based on the belief that only Best-of-Suite approaches will enable them to effectively break down the product-driven application stovepipes that characterize their operating environments.

Having defined the two paths to architecture integration, vendor integrated architectures (Best-of-Suite) and user-driven integrated architectures (hybrid Best-of-Breed), it is important to empha-

size that each SP roadmap is very dynamic in the sense that SPs reach an end state after following a process of gradual integration that is characterized by a stage known as "islands of automation". This is defined as the gradual integration of applications clusters (e.g. CRM, Billing, Financial Management, etc.) around single-vendor platforms. These stages or points in the path to an integrated architecture result from consolidating multiple (in some cases, redundant) applications into single solutions. We have seen this first stage as being quite pervasive among wireline incumbents, both in emerging and developed markets. We believe this stage ("islands of automation") to be transitional. SPs reaching this point in the migration path will have to decide to either pursue the vendor supported Best-of-Suite approach by choosing a partner among the multiple vendors that supply the application clusters (e.g. CRM, billing, or other) or, alternatively, start building an in-house integration capability that characterizes the user-driven Best-of-Breed hybrid approach.

At this point, the speed with which SPs that are migrating to customer-centric organizations tend to implement integrated architectures is highly dependent on organizational dynamics. Among those SPs that are rapidly tackling the transformational challenge, we have observed the following characteristics:

- A CIO that has a vision articulated in a top down fashion with support from the Board and Senior Management
- A governance process that allows management to tackle any temporary push-backs from business units advocating solutions that are independent from the integrated roadmap
- A well-defined transformation program conducted in a holistic fashion rather than incrementally (one functional area at a time)

TCO ANALYSIS:

Having reviewed the architectural trends among SPs, we will now turn to evaluating the economic impact of the Best-of-Breed and Best-of-Suite options. For this, it is important to emphasize that economic value will be measured by relying on the aggregate TCO which refers to the cost of managing a system's architecture throughout its entire life cycle (acquisition, implementation, operation and maintenance).

Before we review the results of our research, it is important to provide a methodological clarification as to how we derived the comparative data sets. In principle, it is difficult to generate a set of normalized data that would allow us to compare the economics of the alternative architectures across a sample of SPs. First, as mentioned before, architectures are not static but moving targets. Secondly, each SP experiences different market and technological environments having an impact on its economics. For example, a SP that has been under investing in infrastructure for a number of years might experience a spike when a migration is tackled and therefore, the TCO might be worse under the new infrastructure than under the legacy. And finally, metrics can rarely be fully standardized.

In light of these difficulties, the best approach would be to take each SP case study on a standalone basis, conduct a time-series cost analysis of managing the systems architecture (including implementation) and then compare the results across the sample of SPs, by focusing on the "before and after" effect. In some cases, the "after" represents a projected set of costs given that they capture future budgets estimated as a result of an architectural change. Having said that, we also assembled qualitative and quantitative evidence to ascertain whether the data directionally supports the hypotheses reviewed in Section 2 of this paper.

Furthermore, in addition to proving our working hypotheses with a cross-section of data points, we were also able to calculate the TCO for Best-of-Suite and Best-of-Breed architectures for the same SP. This was possible because in one of the case studies conducted (SP A), the SP examined the economics of the two alternative approaches before making a decision as to which model it should adopt. The results of this comparison for SP A can be seen in exhibit 6.

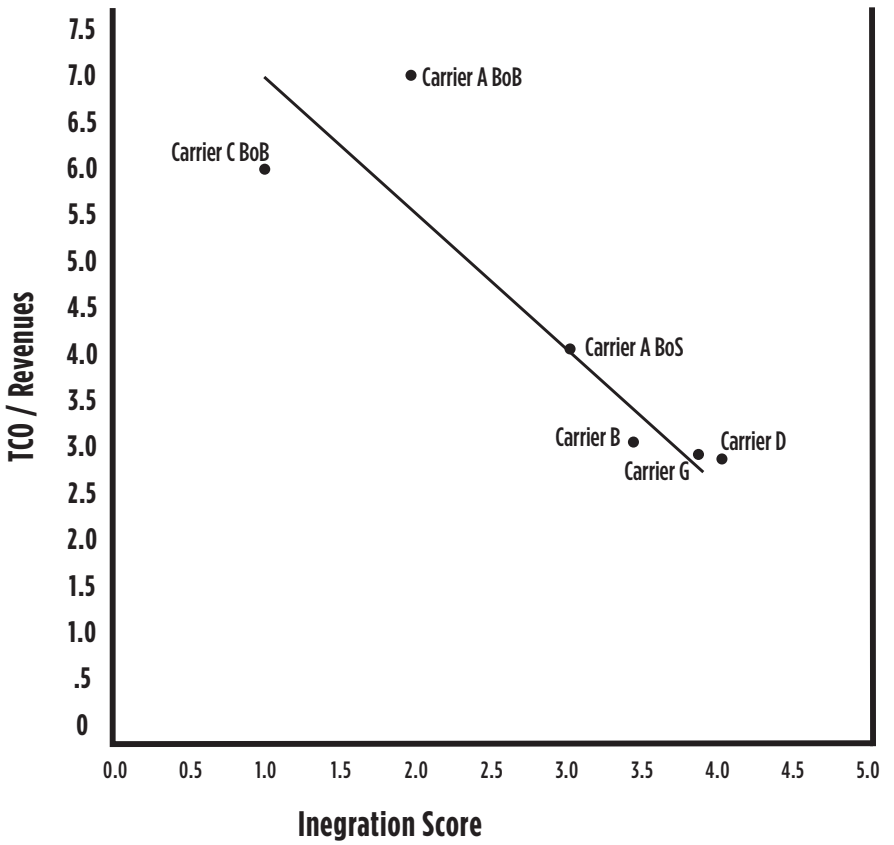
Cross-sectional data analysis contained in Exhibit 5 supports the basic hypothesis that TCO tends to decline with a higher level of integration within a systems architecture (see exhibit 5).

In another case, SP B that is gradually migrating from a Best-of-Suite architecture to a Best-of-Breed hybrid is experiencing an increase in TCO. Therefore, the two case studies confirm again the cross-sectional analysis presented in exhibit 5.

Beyond a confirmation of the overall hypothesis that Best-of-Suite exhibits lower TCO than Best-of-Breed, we were also able to confirm four of our five hypotheses

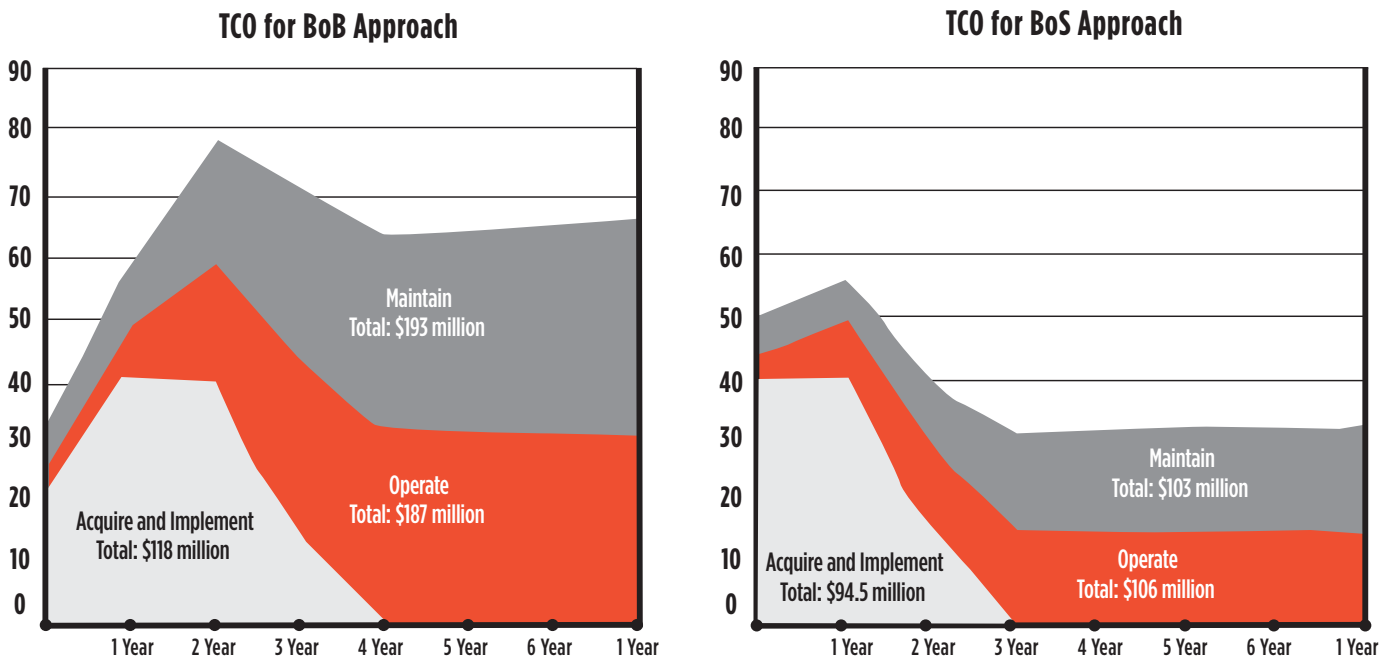
- Best-of-Suite users save acquisition and implementation resources due to data harmonization and implementation costs: five out of the seven SPs studied agreed that this hypothesis is valid.

Exhibit 5: Level of Integration vs. IT Costs



Note: TCO data was generated by adding the cost of acquisition and installation of a given architecture, as well as the costs of operating and maintaining it for eight years. For calculating the TCO/Revenue metric, we multiplied the SP's 2005 revenues by eight. Carrier A conducted an assessment of costs of both configurations, which allowed us to build two alternative data points.

Exhibit 6: Path to Integrated Systems Architecture



ACQUIRE AND IMPLEMENT	**= 20% REDUCTION IN TCO**
OPERATE	**= 43% REDUCTION IN TCO**
MAINTAIN	**= 39% REDUCTION IN TCO**

Note: Costs in millions of dollars. TCO data was generated by adding the cost of acquisition and installation of a given architecture, as well as the costs of operating and maintaining it for eight years.

One of them estimated savings to amount to 20%, while another one estimated them to be 15%.

- Best-of-Suite architectures exhibit lower maintenance costs due to better use of a smaller number of development resources: four out of the seven SPs agreed with this hypothesis, with savings ranging between 33% and 50% relative to Best-of-Breed.
- Best-of-Suite installations enjoy more optimal hardware resource utilization: four out of the seven SPs validated this hypothesis. Hardware efficiency estimates of Best-of-Suite architectures ranged between 50% and 35%.
- Software licenses are significantly lower for Best-of-Suite users: Four SPs agreed with this hypothesis. Estimates ranged widely, between 8% to 50%.

With regard to the fifth hypothesis (Best-of-Suite users tend to have more negotiating leverage with vendors) only one SP agreed with this hypothesis, while four others agreed with the opposite: that

Best-of-Breed reveals less vendor dependency. However, the SP that had agreed with the hypothesis (Carrier F) was the only one that had defined with the vendor a win-win co-development approach.

In summary, based on the combination of quantitative and qualitative data found, it can be concluded that a Best-of-Suite architecture provides:

- Lower acquisition and installation resources due to data harmonization and lower implementation costs
- Lower maintenance costs due to better skill set leverage and integration
- More optimal hardware resource utilization, and
- Lower software license costs

In addition to delivering lower TCO, Best-of-Suite architectures also enable SPs to more effectively address other strategic business challenges. The impact of Best-of-Suite architectures has been positively significant across three areas:

- Reducing time-to-market: as a result of streamlining the data architecture and modularizing the applications, a European wireline and wireless incumbent in the study was able to cut system development cycle times from 60 to 30 days; the same directional impact was experienced by another European wireline incumbent SP included in the study.
- Improving customer experience: the principal impact of Best-of-Suite architectures on the customer experience has been found to be on the order management process. Two European incumbent SPs participating in our study were able to migrate customer management processes, particularly order management to a single, streamlined process due to their simplified systems architecture. This has had significant impact on their ability to effectively manage their bundled offerings.
- Leveraging convergence: In addition to the impact on order management processes mentioned above, adoption of Best-of-Suite architectures has enabled SPs that were engaged in launching convergent services to migrate a large portion of development resources to "true innovation" initiatives. Since the suite reduces required maintenance, managers are able to shift resources to leveraging next generation investments. The percent of resources assigned to new business initiatives after implementing a Best-of-Suite ranges between 50% to 70%.

KEY REQUIREMENTS TO CONSIDER IN A BEST-OF-SUITE APPROACH:

Not all Best-of-Suites are created equal, so key requirements should be evaluated before embarking on a Best-of-Suite investment. These requirements are derived from both our findings and thought processes that guided the research.

First, SPs should verify that the Suite has the appropriate functionality in all the key domains—any trade-offs between functional capabilities and integration benefits should be understood, both now and in future releases.

Second, the scope of the Suite should be considered—for example, integration within the BSS domain and between BSS and OSS may be critical to enabling core business processes.

Third, SPs need to check that the Suite is structured around open standard interfaces, avoiding the reliance on proprietary vendor technology or any dependency on a particular middleware stack. An open approach is particularly important at key interface points to the Suite—for example, exposing customer business logic to multiple channel applications.

Fourth, some SPs might be concerned about single vendor dependence. To mitigate this risk, suite adopters should ensure that they can provide input on the requirements and development direction of the Suite.

Finally, SPs should verify the current state and maturity of the Suite's integration levels, and ensure it is supported by a well-defined and published development roadmap. Here it is important to test the maturity of the integration –ideally, integration has progressed over multiple product releases and implementation projects. Vendor claims based purely on 'future plans' should be taken with caution.

CONCLUSIONS:

As presented in this paper, the results of our study clearly indicate that the Best-of-Suite approach delivers a lower TCO than Best-of-Breed. In addition, a Best of Suite approach is better able to help SPs achieve critical business objectives, including capitalizing on convergence, achieving rapid time to market and enhancing the customer experience, all of which are critical to maintaining a leading competitive advantage in today's multi-media communications market. We also found that many of the leading SPs recognize the benefits of a Best-of-Suite approach and are adopting it as their chosen path to achieving an integrated architecture. However, we have also learnt that not all Best-of-Suites are created equal. When selecting a Best-of-Suite approach, SPs must consider key requirements such as the suite's long-term roadmap, the quality of its functionality and the use of open, standards based technology. By taking these factors into consideration SPs can select a Best-of-Suite solution that will not only lower their TCO as they transform their business and the underlying architecture, but also achieve this with minimal business risk.

Bibliography

- Holtz, B. *"Best of Breed vs. Suite—What to consider before making a CRM decision",* CRM Today
- Byrne, T. *"Suites vs. Best-of Breed",* CMS Watch, 2005
- Hill, K. *"CRM Suite vs. Best-of-Breed update",* BPM Today, May 12, 2005
- Bragg, S. *"TCO of Best of Breed and Suite SCP Solutions",* ARC Insights# 2004, September 30, 2004
- Gartner. *"Smart Enterprise Suite Market Poised for growth through 2008",* February 4, 2005
- Forrester. *"Content suites versus point solutions"*
- McElligott, T. *"CRM goes small to get big again",* Telephony, Oct 10 2005
- MediServe Information Systems. *"Best-of-Breed vs. Single Source",* Health Data Management, June 2003
- West, R., *"Total Cost of Ownership: A strategic Tool for ERP Planning and Implementation",* Center for Applied Research, 2004
- *Swam, M., "Total Cost of Charging and Billing: CapEx and OpEx",* Elisa Research
- Arthur, R., *"Operational Convergence for Mobile Operators",* Hewlett-Packard

Appendix A: Description of study participants

NAME	BRIEF DESCRIPTION
Carrier A	Wireline incumbent in Latin America
Carrier B	Regional wireless company in North America
Carrier C	Wireline and wireless incumbent in Latin America
Carrier D	Wireline incumbent in Latin America
Carrier E	Large wireline and wireless operator in Europe
Carrier F	Large wireline and wireless operator in Europe
Carrier G	Large wireline incumbent in Europe

About the Authors

RAUL KATZ is President of Telecom Advisory Services LLC. With over twenty-five years of experience in the communications industry, Dr. Katz has advised senior management of carriers in Europe, North America, Latin America and Asia. He retired from Booz Allen Hamilton, where he was a Lead Partner of the Telecommunications Practice in North and South America and also served as CEO of Adventis, a global communications consulting company. Dr. Katz frequently addresses industry conferences and teaches Strategy for High Technology Firms at Columbia Business School. He holds two undergraduate degrees, a Master in Political Science, another one in Communications from the University of Paris, as well as a Ph.D. in Management Science and Political Science and an M.S. in Communications Technology and Policy from MIT.

JUAN PABLO PEREIRA is a consultant at Telecom Advisory Services LLC and has extensive experience in product management and product marketing. Mr. Pereira worked at Juniper Networks as a Senior Marketing Manager and at NIKSUN as a Director of Product Management. He holds a BS in Computer Science from the Universidad de Los Andes in Bogotá, Colombia, and an MBA from Stanford University.

TELECOM ADVISORY SERVICES, LLC is a management consulting firm specialized in developing strategies for carriers as well as providers of products and services to carriers in the telecommunications industry. The firm has staff deployed in the United States, Europe and Latin America.