User Interface in Integrated Platforms: The Need of the Hour

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Abstract

Customized Business Applications, which are typically developed by a vendor company, scope the project and remodel the applications according to the business and user requirements. The time and effort required to develop such customized software is considerable, and starting an entire project life cycle for each customized software application often becomes highly repetitive. To address the problem, we have developed a new model that will exploit existing knowledge and industry best practices to better align a solution with the unique business need.

This model will allow for the integration of software that is built exclusively for a business with its own enterprise application software (EAS) or products. However, while such integration often aligns well with the client's business model, the user experience is often compromised. This paper will use a case study to present how Usability Engineers can develop innovative ways to balance the benefits of integrated EAS with a business- and user-friendly experience.

1. Introduction

Any EAS can be customized to meet the customer's needs and has an end-to-end solution for a certain business domain. However, tailor-made software can require huge investment in infrastructure and development, slowing its time to market. But through the implementation of an integrated platform using concepts such as open architecture and cloud computing, we can reduce the costs involved in such investments.

2. Integrated Platform

An enterprise system aligns with the business process and processes the data. Apart from this understanding, we need to know the level at which the integration has to be done. In an enterprise application there are three main levels: the Data Level, the Application Interface Level and the User Interface Level.

Integration at Data Level: This is the process of transferring data between data stores. Information is extracted from one database, processed and then updated in another database. The advantage of data-level Enterprise Application Integration (EAI) is its potentially low cost. If there are no changes to the application code, there is no need to test and deploy the application, resulting in minimal expenditure.

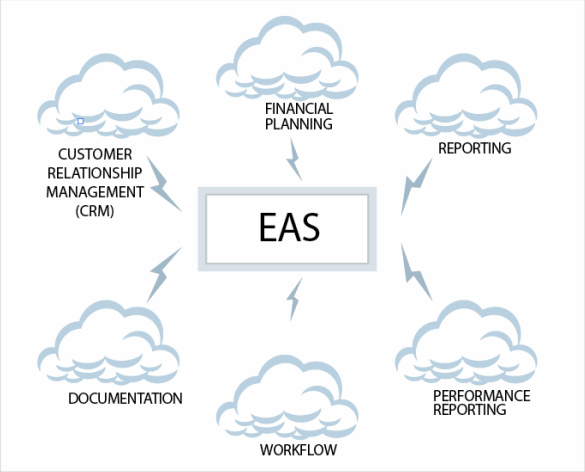
Integration through Application Programming Interfaces: This refers to the process by which developers leverage interfaces provided by custom or packaged applications to access both business processes and simple information. Using these interfaces, developers are able to bring many application programming interfaces (APIs) together, allowing them to share business logic and information. The only limitation that developers face is that they will not be able to customize the API.

Integration at User Interface Level: Architects and developers are able to bundle applications by using their user interfaces as a common point of integration. This type of integration can be very useful when an application that is already successful in the market has to be integrated. This way most of

the costs involved in developing an application internally can be reduced.

From a UX standpoint, only the User Interface Level integration is of interest to the usability fraternity.

3. Cloud Computing



The three types of integration patterns that have been described can be implemented using the cloud computing concept. As its name suggests, this kind of platform allows developers to write applications that run "in the cloud" (the Internet) or use services provided from the cloud, or both. Today, different names are used for this kind of platform, including on-demand platform and platform as a service (PaaS).

"Cloud computing is a better way to run your business. Instead of running your apps yourself, they run on a shared data center. When you use any app that runs in the cloud, you just log in, customize it, and start using it. That's the power of cloud computing." - www.salesforce.com

3.1 Cloud Platforms in Context: Three Kinds of Cloud Services

When a development team creates an in-house or on-premise application (in other words, one that will run within its organization), much of what that application needs already exists. An operating system provides basic support for executing the application, interacting with storage and more, while other computers in the environment provide services such as remote storage. If these basic functions had to be built for every on-premise application, there would be many fewer applications today. Similarly, with respect to cloud computing, using what already exists instead of building basic functions from scratch would be beneficial in terms of both time and cost.

Software as a Service (SaaS): An SaaS application runs entirely in the cloud (that is, on servers at an Internet-accessible service provider). The provider licenses an application or product to a client for use as a service on demand. On-premise clients are typically browsers or clients with some other basic need. One popular example of an SaaS application today is Salesforce.com.

Attached Services: Every on-premise application provides useful functions on its own. An application can sometimes be enhanced by accessing application-specific services provided in the cloud. However, these services are usable only by that particular application. One popular consumer example of this is iTunes® by Apple®. The desktop application allows the user to play music and more, while a service allows the user to buy new audio and video content. Microsoft® Exchange Hosted Services provides an enterprise example, adding cloud-based spam filtering, archiving and other services to an on-premises Exchange server.

Cloud Platforms: A cloud platform provides cloud-based services for creating applications. Rather than building a custom foundation, for example, a new SaaS application could instead be built on a cloud platform. Understanding cloud platforms requires some agreement on what the word "platform" means in this context. A broad definition of a platform is any software that provides developer-accessible services for creating applications.

4. Drivers for Cloud Computing

There are several key business drivers for cloud computing, including cost reduction, usage-based billing, fast deployment, capacity on demand and the ease of maintenance of cloud-based solutions.

Since both cloud computing infrastructure and application services are sold as a service, the upfront capital costs are minimized in exchange for increased ongoing variable costs. The conversion of fixed capital expenditure (CapEx) costs to variable operating expense (OpEx) costs creates significant and immediate cost savings

and significantly affects information technology (IT) budgets.

This new wave of SaaS enterprise applications is only at the beginning stages. As these applications become more mature, many organizations will bypass IT and directly sign up for cloud-based services.

Also, many businesses these days are looking to cut infrastructure costs and increase user productivity by encouraging employees to use peer-to-peer and sometimes even employee-to-client communication methods online, such as blogs, social networking sites and instant messaging, instead of telephone calls. Social networking applications like Facebook and LinkedIn have started to sell products online specifically for customers who use these sites for business purposes, in addition to providing more support for those customers and creating customer communities. Most of these services exist outside the enterprise and only as web services; therefore, they require the integration of the enterprise applications with the public clouds.

4.1 Business and Product Development Perspective

The total cost of ownership (TCO) and return on investment (ROI) for the cloud is an important consideration. Risk mitigation, especially for cloud application security, is another important consideration, as well as business application performance and availability and application customization and flexibility.

In addition, there are issues concerning single-source vendor lock-ins, multi-tenancy with other web service enterprise customers and the associated security issues, as well as issues concerning accurate billing, customization, integration and interoperability of the cloud with the existing enterprise infrastructure and applications.

"Security is one of the core competencies of the cloud provider." ---Jason Staten, Forrester

4.2 On the Upside

Fast Start-Up: Cloud computing allows any start-up to test a business plan very quickly and for little money. Every start-up, or even a new division within a company, should consider the cloud computing concept in its plan.

Business Agility: Cloud computing allows you to solve problems quickly without making a long-term commitment, and its agility and low cost make it the best option available.

Faster Product Development: Given the trend toward more iterative, agiler development, the ability of cloud computing to test and roll out quickly can be a competitive differentiator. In the cloud, developers can test and deploy complete production-scale systems on demand—saving the time and expenses it takes for traditional testing scenarios, enabling faster handoff from development to operations.

Low Capital Expenditures: Cloud computing services provides solutions to issues such as lack of space in your data center, and applications that have outgrown the infrastructure, and it allows a company to shift from capital to operational expenses even in the most dire circumstances.

Best Buy: Since the integration would be viewed from the product standpoint, using the cloud as a separate application could be a consideration.

Increased Storage: Since data would be stored in the cloud, storage space would no longer be a concern. This feature can also help to avoid problems related to storing all the data locally.

Highly Automated: As software would be automated in the cloud, IT personnel would no longer need to worry about keeping software up to date.

More Mobility: Employees can access information wherever they are.

A Shift of Focus for IT companies: Cloud computing would eliminate the need for IT companies to worry about constant server updates and other computing issues; they will be free to concentrate on innovation.

Reduced Cost of Testing Security: An SaaS provider only passes on a portion of its security testing costs. By sharing the same application as a service, you avoid having to pay the expensive security code review or penetration test on your own. Even with PaaS, where your developers get

to write code, there are potential cost economies of scale, particularly around the use of code scanning tools that sweep source codes for security weaknesses.

4.3 On the Downside

Cost of Bandwidth: The cost of bandwidth can be higher than the cost of storage. For example, Sony Pictures Image Works faced storage scalability challenges, so it considered an external cloud service. However, accessing and generating up to 12Tb of data every day resulted in a bandwidth cost that was higher than buying the storage.

Public versus Private Clouds: When network latency is taken into account, a private cloud might lead to improved application performance, but a public cloud would not . This would be of particular concern to organizations that are sensitive to latency issues.

Concern over Security: Security-conscious businesses are rightly cautious about running applications using sensitive data outside their firewall. A company that stores customer credit card numbers or other financial information, or a health care company that handles patient files, would not likely want to run such applications in the cloud. Data that is subject to strict policies and laws are less suited for cloud computing. Many will not want to put an application that provides competitive advantage or contains customer-sensitive information along with the public cloud.

Large Scale: Cloud computing promotes better resource utilization, but only when beginning with a relatively small consumption of resources. Very large enterprises may achieve a better economy by creating its own cloud, rather than using an outsourced one.

Lack of Human Capital: Exploring next-generation IT models requires technical astuteness and flexibility. For an organization that lacks human capital for this, taking on cloud computing can be very frustrating.

Network Connection Dependency: A major issue in the use of cloud computing is that it relies totally on network connections, which at times goes down or become bogged down, slowing the system.

Limited Features: Today, many web-based applications do not yet have as many features as desktop-based applications, though this particular point is destined to change in the future. Compare, for example, the feature set of Google Presentations with that of Microsoft® PowerPoint®. Though the basic functions are similar, the cloud application lacks many of PowerPoint's advanced features.

The advantages of being a User Experience Architect have never been better, and it could be the one thing that enables the technology sector to survive the current recession and even grow through it. Cloud computing provides real value with cutting costs.

5. User Experience

What Is the "User Experience"?

The primary concern for end users is that they want applications that work and are easy to use. Of lesser concern are scalability, system architecture and configurations.

Because of the increasing interest in how cloud computing can revolutionize the implementation of applications, the responsibilities of user experience architects will drastically change. Although there are some concerns to cloud computing as discussed in this section, Usability Engineers should be able to work through them, as the cloud computing will only continue to grow in popularity and demand.

5.1 Advantages

Increase in Responsibility: The responsibilities of Usability Engineers will continue to increase as they take on the important decisions of selecting the right product for their users. As more and more companies are creating their own versions of the cloud, it will be important for Usability Engineers to ensure the quality of what is being delivered and maintain the user experience consistently across the application.

More Clarity With User Requirements: User experience architects will need to guide clients or stakeholders to a solution that not only fits most of the user's needs, but saves time, money and fits within a platform. For example, a client wants certain features in the intranet, instead of

collecting requirements. An application could be test driven in the cloud environment in a week.

Technology No More an Excuse: Designs are often turned down due to technical limitations, but the cloud concept makes use of the latest technology in the market. The only technical constraint is to have both the cloud service and the EAS in open architecture to be compatible.

5.2 Disadvantages

Inconsistent User Experience: Among themselves, cloud services have different patterns of navigation, interaction, information and visual design and also from that of the enterprise application. An as-is integration would present a great challenge for usability and visual design.

Service Levels Impact: It would not be possible to demand or exercise control when it comes to maintaining the Service Level Agreements (SLA) with the application in cloud, which could reduce the overall user experience of the product.

Specific Audience for Generic Solutions: When designing for a user, incorporating a generic application often does not meet the user's specific needs.

Skipping the End-to-End Process: The concept of cloud computing contradicts the typical process we follow i.e. requirements gathering; wire frame; product, but in the cloud the products are already available and we need to customize it accordingly, which could create some gaps.

Designing With Compromises: In the cloud, not all functionality is visible, though in some circumstances the cloud provides unnecessary functionality. For those reasons, some compromises in design may have to be made when it comes to integration.

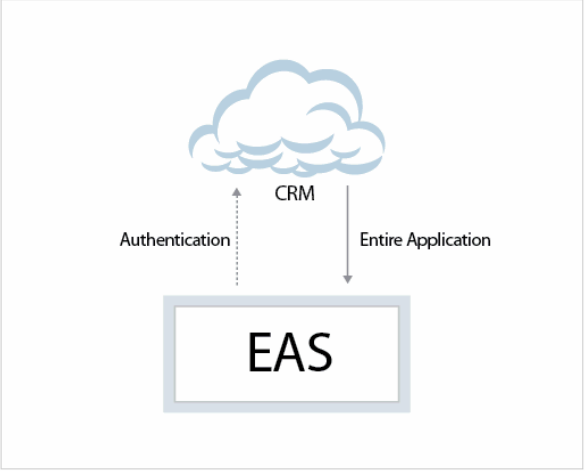
6. Case Study

Most existing EASs do not have an open architecture to adapt cloud computing within their various layers, such as presentation, business, security and database. But should a business or user request new features and functions, a change of platform and the technology of the products or applications would become necessary. These "time-to-market" solutions (products or applications) have to be addressed immediately. An end-to-end process to enhance or improvise would be costly.

The previous sections have presented both the advantages and disadvantages of cloud computing in terms of business, development and usability. The following case study provides an example of how some of the ideas that could be used to integrate an application (solution) into a product (EAS) in an incremental way. This concept was formulated in such a way that all avenues of a software development equally benefit.

From the user experience perspective, it is recommended that the integration take place in **three progressive steps,** or even more, depending on the client's willingness to adapt and the integrating partner's demands. The following steps could help a company make use of the cloud computing concept efficiently and iteratively. But before these steps can be taken, it is important to ensure that when an enterprise application is built, it has an open architecture that will accept concepts like cloud computing through integration.

6.1 Type 1 Integration



A type 1 integration requires a single sign-on. A single sign-on will allow one to access the application (in the cloud) from the product using a redirect. What is there in the cloud is not integrated with what is stored within the EAS. Though single sign on may seem like a simple and easy solution, it is only a quick fix for the integration process. It will not cater to the needs of the different types of user personas and scenarios, as well as the business' needs when

it comes to user experience and providing functionality. The following sections provide a look at some of the pros and cons of this level of integration.

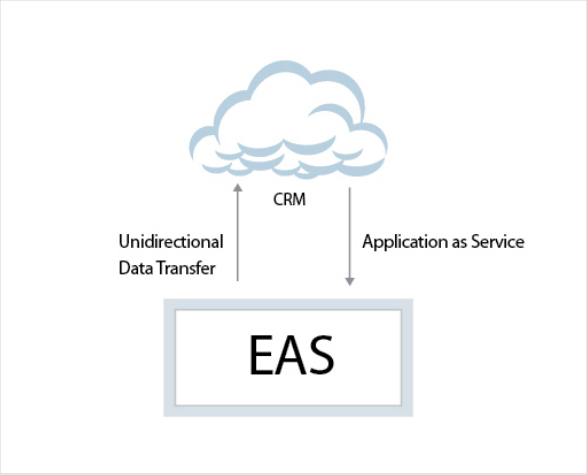
6.1.1 Advantages

- It can be considered a one-stop solution in which users will not need to switch between applications for their various tasks.
- Since the time involved in switching applications is minimized, users get to spend more time with a single product, thereby increasing their revenue.
- Overall, the amount of time involved in developing the software is reduced to a great extent.
- This type of integration would attract vendors that provide cloud services because this type of integration would allow them to maintain their brand image and they would not have to change much to the application.

6.1.2 Disadvantages

- Control of the navigation is lost when users move to the application in cloud.
- With a single sign-on, product standard inside the application (rendered from the cloud) is limited.
- The look and feel of the product is also not consistent throughout the application.

6.2 Type 2 Integration



This type of integration can be viewed as "a bridge" to the next level of user experience. Here, the entire application is not integrated, only context-sensitive services from the cloud. The navigation inside the application is made consistent with the rest of the product. But the page in the services that comes from the cloud will still be powered by the cloud (in other words, the UI elements, which are whatever features that is provided by the cloud). Since all the pages are available as services, users get to see whatever they want to see and not the entire application from the cloud. Data integration goes only one way; in other words, data from the enterprise product is sent to the cloud for processing.

6.2.1 Advantages

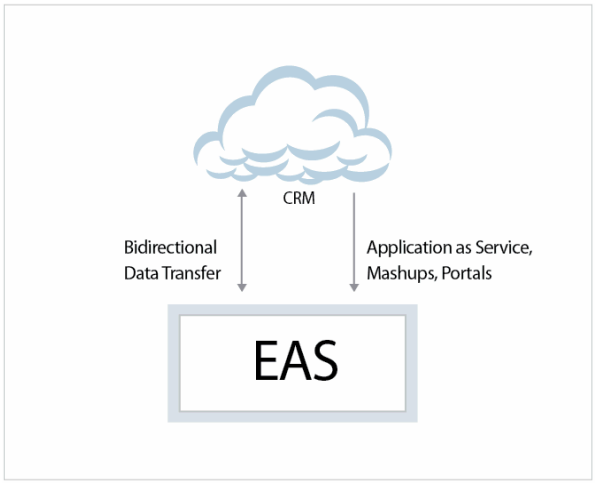
- The navigation and menu for accessing the application will be consistent with that of the product.
- One product feel is achieved to a larger extent.
- Data integration is done partially.

6.2.2 Disadvantages

- There is no control on screen-level elements.
- Information design cannot be customized to meet specific needs; the design is whatever is provided by the cloud.
- Data integration is partial, but the goal would be to achieve a complete integration that would be more useful for the users.

Since type 2 integration is a transition phase, it will only achieve about half of what would be considered a complete integration. For even greater leverage, a third level integration will provide even more advantages.

6.3 Type 3 Integration



Type 3 integration can be considered the "zenith" of integration. It is one that can provide the most from a user experience standpoint. The goal of a type 3 integration will be to project a complete product and use the cloud for the very purpose for which it was designed.

With this type of integration, one can make use of data feeds, mashups and portals from the cloud wherever necessary across the product. Data traffic will be bi-directional. Usability professionals will have the ability to tweak the information architecture the way users want it. They can also test the product and make changes quickly.

6.3.1 Advantages

- One product feel is achieved.
- Screen-level integration is completely seamless.
- Information architecture can be customized according to the specific need.
- Data integration is complete.

6.3.1 Disadvantages

Having decided to completely depend on the cloud in this level, it is important to ensure that the proper vendor is selected from the cloud to avoid the potential for data security problems.

Since the goal is to achieve the feel of a single product., it is important to beware that any technical snag in the service (from the cloud) will affect the brand image of the product more when compared to other types.

All the levels in a nutshell from a usability standpoint:

USER INTERFACE	LEVEL 1	LEVEL 2	LEVEL 3
Menu	Not Available	Partial	Complete
Navigation	Not Available	Partial	Complete
Screen Level	Not Available	Not Available	Complete
Information Architecture	Not Available	Not Available	Complete
Visual Design	Not Available	Partial	Complete
Authentication	Not Available	Complete	Complete
Data Sharing	Not Available	Partial (Unidirectional)	Complete (Bidirectional)

7. Conclusion

Having reviewed some of the major advantages and disadvantages of cloud computing, it cannot be denied that usability is compromised to a great extent. In addition, technology improvements and innovations towards cost effectiveness must be made. If mistakes are made by users or in terms of technology or business, the cost of implementation and deployment can be costly. Many solutions to the integration of cloud services have been proposed, but the suggested incremental model could have lesser impact on users, business and technology. This step-by-step process also provides enough time to enable technology modifications to the existing architecture to meet business expectations such as time to market, and at the same time takes a progressive step towards a better user experience.

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