

RICH INTERNET APPLICATIONS, PLATFORMS AND TOOLS - A PARADIGM SHIFT IN WEB USER EXPERIENCE

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ABSTRACT

There has been a paradigm shift in the way how organizations are moving towards enterprise-level adoption of Rich Internet Applications and Platforms with the evolution of internet. Earlier the webpages were more of static content and involved lot of traversing through pages to complete a transaction, now the web applications are very much dynamic, interactive and help the user complete the same transaction in a few clicks. In the near term, such adoption will favor The deployment of Rich Internet Applications and technologies added more twist to these changing terrains by providing desktop like features, sandbox security and many more capabilities there by creating an integrated rich user experience where most of the business users want to access their RIA applications on Mobile and tablet devices.

This paper also presents key trends to understand the evolution of different RIA technologies and also harness the power of RIA in creating an interactive and converging user experience across domains and industries.

KEYWORDS

Rich Internet Applications, RIA Security, RIA Frameworks, Content delivery Network, Flex, Ajax

1. INTRODUCTION

The focus of internet competition is rapidly progressing beyond mere delivery of products and services to address the quality of the end user experience. It altogether brings a paradigm shift in the way the business applications are developed, delivered and consumed. The continuous change in user expectations has been brought about due to the new frontiers explored by the technology. Gone are the days of static HTML pages with poor or no interaction. However, in the past, technology was playing a crucial role in deciding how and where to access information, but today, the business is playing a crucial role in deciding the channels of information management and want to gain the operational and cost advantages of deploying rich interactive applications over the Internet, but worries surround with the limitations that Web browsers impose on user interfaces. RichInternetapplications(RIAs)maybecomethenewnormforapplicationsusedbydecision-makersandtask-orientedworkers. The Key Characteristics of RIA-based Solutions as below –

- Accessibility
- Advanced communications
- Complexity

- Consistency
- Installation and Maintenance
- Offline
- Security
- Performance
- Richness

However, meeting the demand for information through innovative and rich interactive applications will continue to gain more prominence in the enterprises.

2. CHALLENGES FOR ADOPTING RIA

Most organizations need to factor-in various challenges in adopting RIA technologies –

- **Accessibility and integration** – Most of the RIA applications are developed using Ajax/JSON and JavaScript technologies. Prevailing issues with Ajax implementation and JavaScript models are not new. Apart from the look and feel of RIA applications, most of the organizations are concerned about the integration and communication protocols.
- **RIA Security** - Security is a key concern for RIA deployments across enterprises. Several client-side frameworks open up new avenues of compromising critical information. The lack of security aspects in RIA application is the major concern for its adoption across enterprises.
- **Lack of standards** – There is a lack of standards in RIA technologies. There is a lot of confusion on using AJAX or Flex or a combination of both while each of them have their own advantages and issues, say for example, some of the Ajax tools have cross-browser and cross-platform problems. There is a need to identify and consolidate best practices and provide reference implementation for tools interoperability and decide on right programming models.
- **Lack of Rich, Interactive Use Experience** – Organizations are looking a rich user experience that engages business users more effectively and personalize their web experience based on their preferences and needs so that they can make better informed decisions in real-time which is only possible through an intuitive and easy-to-navigate RIA.

3. POTENTIAL OF A NEW RIA PARADIGM

A rich Internet application (RIA) is the converging point between both desktop-based and browser-based applications. RIA's are generally lightweight applications which provide the features of a desktop based application and is executed and displayed via a browser. RIA based applications have evolved over the time to deal with the challenges and limitations of development and delivery of both web and desktop applications.

Some of the RIA benefits for enterprises are given below –

- The same application can accessed within desktop, browser and mobile platforms
- Rich user experience meeting the consumer demands along with the ones of business users
- Multiple types of content can be served using a single user interface than having to build and maintain multiple applications
- Enables an engaging, interactive user experience without page reloads or refreshes
- Real-time data and cross platform support
- Increased customer and partner productivity and reduce operational cost

There are several recurring problems that need to be addressed by considering right design principles in RIA applications. With the same context, enterprises need to look at a few fundamental questions –

- What are the business benefits of adopting RIA and what are the challenges?
- Will RIA implementation lead to increased end user productivity?
- How to design a RIA application with fast response time?
- How secured is the RIA Application architecture?
- When to use RIA frameworks? Which technology to choose?
- How RIA fits into SOA-based Enterprise Architecture Stack?
- What is the Role of RIA in Cloud delivery model?
- Is RIA solution based on open standards?
- When to use Ajax?
- Is RIA Mash-up required?

While significant attention has recently been placed on emerging RIA technologies such as Asynchronous JavaScript and XML (Ajax) style solutions to Cloud-based mash-up deployments, but their success, mainly depends on the user-centered design which offers desktop-like experience by combining real-time user interaction with rich user interfaces. Moreover, enterprises need to align their technology practices and to instill the right composition of technology, platforms and disciplines in order to consistently execute ahead of others.

4. RICH INTERNET APPLICATIONS (RIA) EMERGING TRENDS

Rich Internet Application platforms are moving from an early adoption phase to enterprise level adoption and are emerging as next generation vehicles more suited to decision makers and business end users who need seamless, high quality visual user experience. This leads to the key RIA trends that we see across the industry. To name a few:

4.1. Improve Customer Experience Through RIA

No matter how customers interact with an enterprise, whether it through an online store, net banking portal, or a mobile application designed to indicate the latest products or services available where each interaction builds on the top of the last one. There are a few important factors to consider while delivering an intuitive customer experience –

4.1.1. Consistent Experience Across Channels

In the recent past, there have been remarkable changes in the mobility space with technology advancements and new innovations meeting the need of accessing information through intuitive and rich applications on smartphones and tablets. Ubiquity of information on all form factors of mobile and tablet devices changes the user perception on how they ought to get what they need in whatever form and wherever they need it.

A common theme that has emerged across customers, RIA exist as part of an overall Web experience where a collection of Web technologies such as Ajax, Flex, JavaFx are looked as the subset of RIA each flourishing in its own right, coming together in powerful new ways but they complement each other when used in the context of Service oriented architecture (SOA).

Without a concrete focus on Mobility strategy or long-term roadmap, enterprises today misses out an opportunity to acquire new customer and leverage many different channels across their line of business and it is even more important to ensure that user has a consistent and rich experience

across all such channels. To this effect, enterprises generate powerful positive word of mouth and convert their customer base from satisfied customers to loyal advocates.

4.1.2. Empowering Customers

It is in the best interest of organizations to invest in technologies to enable and empower their customers by provide in their applications, across channels, the right number of options and automation capabilities to allow end users to customize their experience, and let them manage their information. Not only does this empower business users to customize the information presented to them, it also greatly increases the adoption of the applications as well as the likelihood of them sticking with it and recommending it to others.

4.1.3. Intuitive, User Friendly Interfaces For Enterprise Processes

Enterprise Processes are most critical for day to day operations of global businesses and systems. It is imperative to enhance all customer touch points with enterprise processes, by building user interfaces that are intuitive and interactive and guide them to provide all essential data, required by the enterprise as well as regulatory and compliance processes. This data can then be plugged into enterprise processes and used to generate all manner of documentation, legal or otherwise, in whatever layout or format desired.

There is a need of having an RIA developed capability to provide a consolidated view of information from all relevant systems and processes at one place at the same time. More and more companies are moving towards such a consolidated dashboard, that they can build around key activities and strategic analysis, leveraging not only information within the company firewall but also relevant information outside it. Such a consolidation of information is going to be key in future, for companies to squeeze out productivity out of their employees and save on time, as well as being nimble when it comes to looking at the bigger picture across systems.

4.2 RIA Security

One of the most important assets on which an enterprise stands is data and the security of the data is of vital importance for the enterprise. Technology selection depends significantly on its compliance to core security model. The criticality of the data governs the choice of technology where security needs to be one of the prime features. The sand box model introduced by Java applets in the early 2000 can be considered as a benchmark in this area where in the client cannot access any local resources except that the ones from where it originated. Sandbox security is an important trend to provide a security-rich user experience from RIA-based architectures. This idea is being implemented by several RIA technologies like Adobe Flex providing a secure environment for the data to be used by the intended application only.

4.3 RIA on the Cloud

Most of the enterprises are moving their platforms and services to the cloud where RIA applications are deployed on the cloud and clients access their services on pay-per use model without much worrying about deployment and scalability. In social media space, enterprises are leveraging RIA mash-ups to provide their users a unified view of various information hubs.

4.4 RIA Applications - Server-side Components

The USP of RIA based applications is the way they abstract the server side capabilities from the user by providing a desktop based application kind of look and feel. The earlier technologies

failed to create this wave as they relied heavily on HTTP and web services based communication with the components located in the server and these often would get clogged due to the increased data transfer. The current technologies have gone a step ahead and started using a new protocol – Binary protocol. Action Script Messaging Format (AMF) used by GWT, JavaFx, Adobe Flex etc., is an example of this protocol.

A recent trend observed is that several RIA frameworks comes bundled with support for integration with server-side technologies which essentially ease the work of system integrators to ensure that all integrate and communicate with each other seamlessly.

5. WEB USER EXPERIENCE ADOPTION

The behavior of the web users has changed over the times with the ad-vent of new business opportunities and how soon they grab those to stay current in the market. The earlier web technologies use to pose challenges to the users like:

- Traversing through multiple pages to accomplish as set of tasks which takes a lot of time and being less intuitive to new users.
- The data visualization was more monotonous and less interactive in providing visually appealing and interactive data display, which is very much needed by the current day user as data plays a vital role in their data to day activities.
- The users were unable to customize the look and feel as needed and perceived by them for their usage needs. The web pages were less interactive and had a bigger learning curve to get acquainted with the application to cater to their activities.

The behavior based programing has brought in a paradigm shift in the thought process of both the users and developers as it allows in creating views that simulate desktop application components like menus, but-tons, trees, etc. for the developers and the applications are more intuitive and interactive and also considerably decreasing the learning curve and thus changing the overall experience of the users.

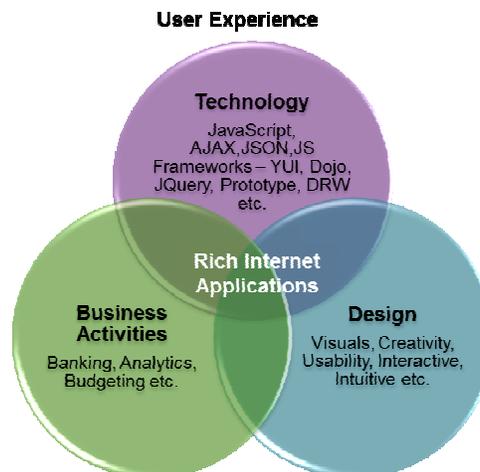


Fig. 1. User-centered Design

The RIA's unlike traditional web applications use the client environment to provide a desktop like look and feel by using plug-in like features and thus offloading some load from the servers. This helps in providing a desktop like look and feel and in some cases offline usage capabilities. The offline usage capabilities might be needed in some scenarios where in the users might be working from a remote location or a place of less connectivity, they can still continue to work and the application gets synced with the server once the connectivity is available, thus preventing from the loss of productivity, time and data.

5.1. RIA – Impact on Web User Experience

The evolving RIA technologies are creating a lot of impact in the way the applications are developed and experienced by the users. The traditional web applications rely a lot on the servers as the browser is used as a mere rendering layer/engine to the user. All the validations, computations etc. are performed at the server side and the browser just renders this aggregated response to the user and while doing this it might make a lot of trips back and forth to the server to compile a chunk of displayable content. This increases the response time to the user and creating a negative impact on the user experience.

On the contrary the RIA's have created an impact by involving the client tier of not just display but for some of the validating and processing activities, thus reducing the load on the server and decreasing the response time. Only the required and requested data is brought back from the server. Using some of the latest design methodologies and technologies the user's next action can be predicted and the data needed for that action can be pre-fetched from the server. This has improved the user experience manifolds. There is a downside for this design approach, if the user does not perform the expected action, even then the application needs to cater to the current user action and this might impact the user experience. Although the latest RIA technologies up to some extent help the designers in this aspect, utmost care needs to be taken other-wise it might ruin the user experience.

5.2. Key RIA Technologies and Platforms

There has been a significant focus on various RIA platforms such as Adobe Flex/Flash, Microsoft Silverlight and IBM Lotus Expeditor in a belief that these enterprise-oriented vendors offer feature rich RIA tools and platforms that go beyond basic Ajax capabilities. Moreover, their market adoption is seen to be increasing as the technology matures and the market broadens over time.

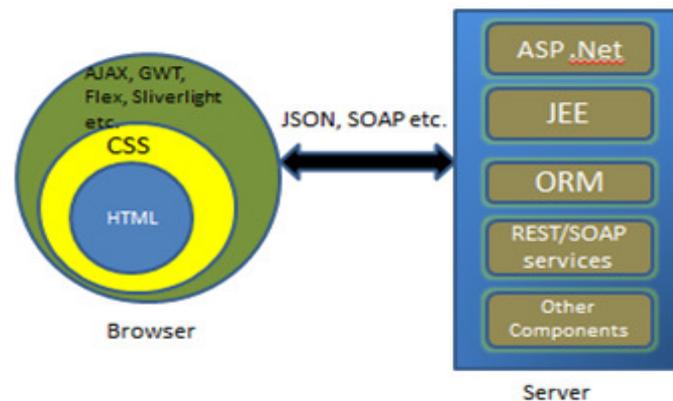


Fig.2. RIA – Key Technologies

The emerging trends are portraying a picture that enterprise RIA addresses the enhancements in existing web applications, next-generation enterprise portals, event-driven applications, BI and mash-up oriented solutions. From software development perspective, RIA follows a standard model with rich controls that include powerful data and multimedia capability allowing end users to present a rich set of information in more attractive interface. From design perspective, RIA delivers highly customizable output with a CSS (Cascading Style Sheet) based model.

As far as, an expressive, secure and cross platform user experience is concerned, there is a necessity to bridge the gap between user experience design and programming logic. Rich Web technology like JavaFx addresses such gap by featuring a high-performance declarative scripting language with a suite of tools and authoring solutions that helps building and delivering the next generation of rich Internet applications for desktop, mobile, TV, and other consumer platforms. Apart from the Java language itself, there are several well-known JVM languages available in the market such as – JavaFx Script, JRuby (an implementation of Ruby), Jython (an implementation of Python), Rhino (an implementation of JavaScript), but Groovy, an agile and dynamic language for JVM, is getting popular and started taking shape in customer technology landscape to improve productivity by accelerated deployment cycles. Dynamically typed languages are much more expressive and easier to code with than statically typed languages. With this perspective one the areas to be explored is the flexibility of Groovy over Grails as Grails currently supports all popular frameworks like Prototype, Dojo, script.aculo.us and Yahoo User Interface (YUI).

6. KEY TAKEAWAYS

Due to the availability of feature rich technologies in the RIA space enterprises are investing in building and deploying rich and dynamic content based applications to improve their user experience. However as every coin have two sides there are some challenges that the enterprises are facing along with the features. RIA can have a significant and transformative impact on businesses and a few learnings on the same line as given below –

- **RIA project strategy to be developed** in-line with organization business goals that improve the brand value by bringing company's web presence in the market
- **Organization to consider adding RIA components** to existing sites and micro-sites to reduce cost in long run
- **Next stage of Internet** – RIA to support mobility initiatives and integrate with cloud based delivery model and services (PaaS/SaaS)
- **A new generation of RIA tools** to use standards-based technologies and industry specific programming models and patterns to create solutions that deliver secure, scalable and high performance solutions
- **Leverage a lightweight fully featured UI framework** for RIA development that closely matches the look and feel of a native desktop application GUI.
- **Dynamic Content delivery**-As long as the application has static content and data that does not change frequently; they can be cached to deliver faster experience to the users. Content Delivery Network (CDN's) like Amazon Cloud Front, Akamai can be leveraged for this. These CDN's have a wide network of Edge location across the globe and can cache the static content in those servers and can deliver it to the users swiftly. As the dynamic data increases it becomes difficult to cache and thus takes a long response time and affects the user experience. In this situation new technologies like Akamai's Dynamic Site Accelerator (DSA) can be leve-

rated. The DSA ensures that all site elements including the static ones and dynamic are delivered with an improved response time.

- **Usability**-Although the RIA based applications are meant to improve the user experience with interactive and simple look and feel, if the design is too complicated then it may confuse the users and in turn hits their experience. It is always suggested to keep the design simple and more intuitive so that the user has a pleasant experience while using the application.
- **RIA application to be designed addressing key enterprise issues** like security, integration, authentication and authorization.

7. CONCLUDING NOTES

The rich internet application space is replete with software products, and witnesses launches every day. It is obvious that with the emergence of RIA technologies, customer immediate focus has shifted towards those tools, technologies or platforms that deliver rich user experience that is visibly different than what's delivered by traditional server-centric platforms.

With its proven market convergence RIA based applications flaunt their ability to combine the strengths and advantages of browser and desktop applications. The web applications focus on accessibility, contextual interaction, ease of use and quick deployment to deliver a more relevant, aggregated and social experience to the user.

The potential of RIA is not fully realized by enterprises yet. As the RIA adoption is catching up, the bar regarding the basic requirements like security, availability, reliability and similar features is getting raised. The RIA technologies are coping up with the raised bar and evolving to bridge the gap with the requirements.

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