Evaluating E-Forms Solutions for Business Process Automation

The Challenge

In today's competitive marketplace, organizations and their executives are mandated to create smarter, more agile organizations, while controlling costs and meeting more stringent security and compliance requirements. Businesses and governments alike face common challenges to their organizations, including how to:

- respond quickly to changing business, customer, partner, or supplier needs
- comply with industry and government regulations
- increase overall productivity and efficiency
- improve security
- increase speed and ease of access to information and processes.

As a result, organizations are increasingly turning to business process automation to determine new ways to solve business challenges and extend timely information to partners, suppliers, and customers. By automating forms-based business processes, organizations can streamline workflows, and efficiently integrate, manage, and access data while achieving key business objectives.

E-Forms as a Solution

E-forms pre-date the World Wide Web, and have their origins in network-based "print on demand" client/server applications. Twenty years hence they have matured and diversified, offering data capture and presentation at the low end and serving as business process agents at the high end.

IBM® Workplace Forms™ business process solutions are founded on industry- and technology-specific open standards, including XML, Web Services, and Java for greater interoperability. Organizations gain capabilities to lower costs associated with building, integrating, deploying and sharing information across the organization.

IBM Workplace Forms provide unmatched levels of security and enable regulatory and legislative compliance through implementing security-rich, auditable e-record transactions based on an open-standards foundation, serving as a critical component of solutions in government, insurance, banking, and manufacturing sectors.

IBM-Led Team to Create E-Forms Solution for U.S. Army

"Through 2006, XML-enabled e-forms will at least double in use as a standard enterprise document format (0.7 probability)."

"By year-end 2009, 25% of enterprises will use XML-based document processes (0.6 probability)."

"In 2005, the total worldwide market for e-forms is anticipated to exceed $400 million as e-forms become a major component of business process transformation for online vertical re-engineering and horizontal use."

- Gartner, *IBM-Led Team to Create E-Forms Solution for U.S. Army*, Rita Knox et al., February, 2005,

Evaluating E-Forms According to Key Business Requirements

Enterprises seeking to automate their forms-based business processes will want to evaluate the possible solutions according to performance and fit with the organizations' typical business requirements, which generally include the following:

❑ **Dynamic User Experience**
   To ensure a personalized and optimized user experience

❑ **Workflow**
   To extend functionality to enable offline use and automation of multi-step processes with signatures

❑ **Security**
   To enable encryption and support for multiple digital signatures while meeting industry certifications

❑ **Compliance**
   To promote document integrity, accuracy, and facilitate regulatory compliance

❑ **Performance**
   To ensure files with multiple signatures are kept to a manageable size

❑ **Fit with Enterprise Architecture**
   To help lower the cost of ownership & leverage standards-based infrastructure

E-Forms Evaluation Chart

Business Requirements	Things to Look for	Things to avoid
Dynamic User Experience	• Data-driven wizards • Ability to personalize forms process • Secure access outside a firewall	• Use of scripting to create limited dynamic behavior • Limited dynamic capabilities
Workflow	• Sectional signing capabilities • Multi-step workflows • Ability to lock down a document while enabling additional workflow • Definition of role-based workflows	• Forms that provide only document- level signing • Invisible fields in a workflow that can be invalidated
Compliance	• Use of declarative rules engine • Compatibility with signature standards to ensure compliance	• Use of JavaScript for dynamic forms that can lead to breaks in document integrity
Security	• Ability to lock down signatures on any combination of fields, sections, pages or forms	• Forms with no secure sectional signing
Performance	• Lightweight, compressible forms based on XML that enable multiple signatures with small file size • XML parsers with fast APIs to access/pre-populate data directly	• Large file sizes resulting from replication of forms attached with each signature • Requirement of numerous file formats that require server translations
Fit with Enterprise Architecture	• Open-standards connectivity to leverage existing architecture	• Proprietary infrastructures requiring specific servers resulting in higher total cost of ownership

Overview of IBM Workplace Forms

IBM Workplace Forms provide a security-rich, dynamic and intelligent front-end to On Demand business processes. The IBM Workplace Forms product family consists of a server, designer, and client viewer that together enable the creation, deployment, and streamlining of XML forms-based processes. By leveraging open standards to integrate an intelligent user interface with high-value back-end systems, Workplace Forms provide public- and private-sector organizations with compliant, security-rich forms that leverage existing resources and systems to better serve customers and increase operational efficiency.

By automating the accurate capture and processing of information, Workplace Forms reduce manual intervention, speed up transactions, and increase operational efficiency. Workplace Forms enable organizations to achieve a "once and done" process by eliminating costly exception handling and enabling straight-through processing of transactions, using open standards for data integration.
Built on open-standards-based component architecture, Workplace Forms provide the forms front end to SOA-based component applications. In addition, Workplace Forms enable integration and deployment with IBM Middleware and other standards-based products by supporting Java Specification Request (JSR)-168, JSR-170, J2EE, as well as Web Services.

Key Functionality of Enterprise E-Forms

1.0   Dynamic User Experience

E-forms are being used by organizations to help simplify the tasks of end-users, increase productivity, and minimize data entry errors. By reducing the amount of time it takes users to complete a form and minimizing manual data re-entry requirements, organizations can potentially reduce errors, and obtain significant cost savings as well as productivity gains.

Many business processes span multiple departments, government agencies, business partners, or consumers and citizens. In today's competitive environment, organizations require e-forms to enable business transactions with entities outside the enterprise. By securely connecting these external points of contact, organizations can potentially gain efficiencies, increase revenues, and improve services.

What to Look for

An enterprise e-form should leverage integration with existing technology and organizational systems to:

- minimize occurrence of data re-entry throughout a form
- present an intelligent, dynamic interface that manages the user's view and controls data accessed by a user according to pre-defined roles
- adapt to the amount and type of data the transaction requires
- guide the user easily through the form completion process
- enable secure access to form data from outside the firewall

An e-form should enable an organization to streamline data entry processes through pre-population of known information, and by sharing user-supplied information among the common fields of a form. To help improve efficiencies, an effective e-form will enable a user to step through complex tasks in a "wizard-like" fashion, minimizing data-entry errors and simplifying the process.

IBM Workplace Forms Approach

Dynamic data-driven wizards

Workplace Forms have an intelligent and dynamic user interface that allows the form's designer to create a guided, interactive, end-user experience. Dynamic, data-driven wizards intuitively guide the user through a set of interrogative panels to simplify the form-filling experience.

Ability to personalize solutions

Workplace Forms can be personalized for the user based on pre-filled data, real-time user data, form field relationships, and declared business rules. Access to the pages of a Workplace Form is completely controlled by the logic within the form, making "wizard" forms possible and ensuring that each end-user sees only the pages they need to (and should) see. Powerful, flexible type-checking, validation options, and specialized widgets, such as a calendar control, make it possible to eliminate virtually all data entry errors. (See Appendix 1 for a sample wizard-based form.) IBM Workplace Forms contain all elements of the form (template, user data, logic, image files, and attachments) in a single XML file enabling these forms to be easily routed both within and outside an organization.

2.0   Workflow

What to Look for
To enable an organization to succeed in a competitive market, e-forms must enable business processes to be responsive. The internal logic and integration capabilities of an e-form must be flexible to allow users to process and manage forms-based data efficiently within and outside an organization according to pre-defined business rules and roles.

IBM Workplace Forms Approach

Multiple signatures on any combination of fields
The IBM Workplace Forms team authored several key World Wide Web Consortium (W3C) specifications to enable the application and validation of digital signatures to specified areas of an XML form, Workplace Forms provide the ability to sign any section of a form with one or more signatures or to put restrictions on who has the authority to sign and/or change any section to which a signature is applied.

Role-based and data-driven workflow
Workplace Forms can be integrated with existing workflow and content management systems to enable flexibility and allow users to route forms via email to colleagues and supervisors for next-stage processing. Workflow roles, data, and "states" are maintained within the form for use online or offline. This is typically integrated into the authentication and access control infrastructure.

3.0   Security
Today, organizations must maintain strict levels of data security in order to manage the risk of unauthorized actions and related consequences. An e-form should be structured to help the user avoid errors and prevent industry or regulatory compliance infractions. An enterprise e-form must ensure the integrity of a document by ensuring validity of multiple digital signatures and enabling compatibility with a range of electronic signature technologies.

What to Look for
An e-form should either provide the tools, or work easily with tools, that allow their security to be centrally managed by an organization's IT group. These tools include encryption and signature support, and integration with content and records management systems.

An e-form should incorporate public key infrastructure (PKI) technologies for high-security encryption and signature scenarios, and support multiple, overlapping signatures for documents that move through a multi-step approval process. An e-form should also be certified according to relevant industry regulations.

IBM Workplace Forms Approach

Lockdown of document with multiple signatures
Workplace Forms offers industry-leading digital signature support and the capability to lock down a form's template when it is published to protect the integrity of the final document. Capable of incorporating multiple scripting or programming model rules, and ensuring validity of multiple signatures throughout a document, Workplace Forms enable the highest level of document integrity.

Industry-leading digital signature support
Workplace Forms have industry-leading support for digital signatures, ranging from "self-sign" clickwrap ceremonies to integration with all major PKI vendors.

Workplace Forms also offers a range of non-PKI signing options that extend existing user-management systems, such as LDAP, to provide a near-PKI level of security without the overhead of PKI-based systems. Workplace Forms are extensible and have been deployed in various high-security applications incorporating encryption and third-party security applications.

Industry certifications

Workplace Forms have received certification from the U.S. Defense Information Systems Agency (DISA) Joint Interoperability Test Command (JITC), allowing its products to be used throughout the Department of Defense public key security infrastructure.

4.0   Compliance

To achieve compliance with many government regulations and corporate policies, an organization must ensure that data captured in electronic forms is complete and accurate as an auditable business record. Organizations and users of e-forms must be assured that "what you see is what was signed". In the wake of scandals incurred by several large corporations, e-forms must be locked down with absolute assurance of document integrity relative to signatures and related data.

What to Look for

An enterprise e-form should bind the full context of any transaction (and steps within a transaction), including the template's presentation, data, logic, metadata, and supporting files (e.g., graphics, signatures, attachments), in one comprehensive electronic file.

To ensure ease of compliance, an e-form should support a variety of signature technologies and integrate with other security architectures, to ensure the integrity of the record.

IBM Workplace Forms Approach

Founded on declarative-rules and digital-signature standards

Workplace Forms are built on a declarative-rules engine (similar to establishing behavioral rules/relationships in Excel) that uses rules that are deterministic (as opposed to event-programmed scripting using JavaScript). In this way, Workplace Forms help to ensure document integrity.

Workplace Forms make it easy to audit archived Workplace Forms with non-IBM applications, thus ensuring that an enterprise's business records will always be available, even when the vendor's technology is no longer available.

Promoting document integrity

Workplace Forms are complete business objects. Each e-form contains all required components – the template, user data, logic, image files, and attachments – eliminating the challenge of reconnecting disparate components. Each Workplace Form may be stamped or signed by each user that handles it, creating an internal "paper trail" that promotes auditability and verification of each transaction. Workplace Forms enable accurate records of business processes.

5.0   Performance

The performance in retrieving, pre-populating, and submitting a form and its data will impact both the user and server-side throughput and integration with business processes. The size and format of a file can impact the acceptable times for the retrieval and pre-population of data within a form. Size and signatures can also affect form submission throughput, especially in lower-bandwidth connections. Server-side processing will impact the number of forms that can be processed at one time.

What to Look for

To help increase efficiency and gain benefits of process automation, an organization needs an e-forms program that enables flexibility and timely responses to business requirements. As noted previously throughout this document, an e-form should include capabilities for multiple signatures along with capabilities for seamless distribution of data to applicable individuals, departments, and systems. It is not uncommon for some forms programs to encounter dramatic file size increases resulting from the addition of many signatures to a form or set of forms. Clearly, large file sizes impact the speed with which forms-based data is distributed, thus limiting the productivity benefits.

IBM Workplace Forms Approach

Lightweight, native XML forms

Workplace Forms uses a lightweight XML file format that can use standard XML parsers and fast APIs to access/pre-populate data directly and validate signatures to ensure smaller file size and faster transactions. XML forms are inherently lightweight and highly compressible compared to a binary format such as PDF that is optimized for publishing and not for online use.

6.0   Fit with Enterprise Architecture

Organizations today face increasing global competition, security threats, and regulatory compliance requirements, along with the need to improve efficiencies and services with reduced budgets. E-forms are often a key enabler to attaining substantial benefits from automating business processes across an organization. Before embarking on an e-forms program, an organization must evaluate carefully many key business objectives to determine the correct solution for their specific needs. To gain the most long-term advantage from an e-forms program, an organization needs to ensure correct fit with their existing enterprise architecture.

What to Look for

In this section, the following elements are identified as key to assessing the fit of an e-forms program with an organization's existing technology and organizational infrastructure:

- Support for open standards
- Enabling flexibility with XML e-forms
- Web services support
- Support for a distributed workforce
- Ease of integration
- Re-useable form components
- Metadata support & version control

Support for Open Standards

An enterprise e-form should support and be compatible with open industry and technology standards. Standards-based technologies can help minimize the time, cost, and risk of addressing business problems with information technology. An open approach provides greater flexibility when designing and enhancing a system, helping enterprises to continuously improve and adapt to a changing environment. It enables the selection of a technology with an appropriate price-performance point, while meeting broader goals such as platform standardization and future scalability. Open-standards-based e-forms can help minimize vendor lock-in, a significant issue to an organization that requires long-term future access to critical business transaction records.

IBM is a strong supporter of XForms, the W3C standard that provides a forms-processing model that is being adopted and supported by vendors such as IBM, SAP, BEA, Oracle, Novell, and Documentum.

XForms makes it easier for organizations to create rich forms for the Internet and support re-usable form components beyond just presentation. XForms-compliant applications help enable increased

interoperability across the enterprise and allow processes to be more easily extended across the enterprise, thus streamlining workflow systems that leverage an organization's process and technology investments.

Enabling flexibility with XML e-forms

IBM Workplace Forms are written entirely in an XML language, Extensible Forms Description Language (XFDL), and may be processed by numerous third-party technologies. This helps protect Workplace Forms customers from vendor lock-in, as any tool may be used to view or edit the XML files.

In addition to being written in an XML language, Workplace Forms may host other XML documents in other XML languages, i.e., namespaces. This enables, for instance, an insurance e-form to have its appearance and logic defined in XFDL, but have its data stored in the industry-standard ACORD[1] XML, simplifying the exchange of data between the form and insurance applications, and between different parties (e.g., carriers, brokers) within the insurance industry. It also simplifies form processing, as the form's entire data may be a single XML document, moved in or out of a form with a single action.

Workplace Forms simultaneously supports multiple XML schemas within a single e-form document, enabling a Workplace Form to act as a composite application or front-end to many systems. This capability is unique in enabling "straight-through integration" with back-end systems and business-to-business transactions with suppliers and customers.

Web services support

XML e-forms have the ability to implement client-side web service calls. Web Services Description Language (WSDL) documents are embedded in Workplace Forms, and the Workplace Forms Viewer uses them to interact with remote Web services. The XML that is exchanged is also embedded in the form's XML model.

Support for a distributed workforce

To enable a remote workforce and seamless interactions with external business contacts, including suppliers and customers, an e-form should look and function the same offline or online. It should also be easily downloaded and saved for upload at a later time with availability through an HTML or client-based technology.

Workplace Forms allow end users to download forms, complete them offline, and submit them later. In doing so, users can save time, increase efficiencies, and avoid manual data re-entry while minimizing the load on the enterprise infrastructure by reducing the number of concurrent users.

Workplace Forms have low bandwidth requirements, as native compression can reduce sizes to less than a tenth of their full size. For cases in which less client-side functionality is required, Workplace Forms Server offers a zero-footprint way to view, fill, and submit an IBM Workplace Form.

Ease of integration

An enterprise e-form should offer flexible points of integration with a wide range of other technologies to ensure ease of integration and scalability for future requirements. Large organizations maximize their return on technology investments when they create completely digital, "front-to-back" integrated business processes. These provide the most value, by

- creating many small efficiencies within a process
- sharing information between systems
- capturing information about the process itself, allowing it to be better measured and managed

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[1] ACORD (http://www.acord.org) is the standards body for the U.S. insurance industry.

IBM Workplace Forms – Evaluating E-Forms Solutions for Business Process Automation

Integrating e-forms with existing systems enables an organization to leverage existing investments, and improve its return on investment while containing the cost of the new e-forms-based application. An enterprise e-form should make it easy to (1) dynamically assemble and pre-populate an e-form for each individual transaction and (2) extract the data from the resulting filled form, all with industry-standard development tools (e.g., Java, third-party XML tools, Web services). Use of the e-forms within major portal and content management products should also be possible.

Workplace Forms provide a high-functionality, low-overhead approach to electronic forms that bolts on to the existing Enterprise Architecture and is able to leverage the standard components available for use in an organization's Enterprise applications. Workplace Forms support, leverage, and integrate with

- Portal using the JSR168 standard
- Content Management Systems using the JSR170 standard
- Enterprise design and process modeling tools using the Eclipse standard
- Server-side Forms Processing and Integration across multiple vendors, using the XForms standard
- Straight-Through Integration with multiple source and destination systems, using XML Schema standards

Reusable Forms Components

Many forms have the same elements or groups of elements (e.g., Social Security Number, addresses) requiring the same appearance, format, and data validation procedures across multiple forms. By reusing these common components across multiple forms, organizations can reduce forms development time while ensuring the consistency of captured data.

An enterprise e-form should offer the ability to export and import groups of forms elements, and should either offer native management of such components or integrate with industry-standard source control systems. Workplace Forms offer a component-based design that includes the following key features:

❑ **Rich WYSIWYG Design Environment** is a "What You See Is What You Get" Designer based on the Eclipse Rich Client Platform – the most widely adopted development Integrated Design Environment (IDE).

❑ **Reusable Forms Component Library** enables faster form design and reuse of forms components across multiple forms, using a powerful forms library.

❑ **Personalized Design Environment** provides optimized views for each user involved in the e-forms application development. From Forms Designer, Data Architect, Business Analyst, to Forms Manager, each user is presented with specific views and options based on pre-defined roles and rules.

❑ **Extensible Eclipse Architecture** provides a familiar design environment that can be leveraged and extended by the Eclipse platform add-in components, to enable the customization of the design environment and smooth integration with other IDEs.

Metadata support & version control

An enterprise e-form should enable form creators to include arbitrary metadata within an e-form. Being able to embed information about an e-form within the e-form itself makes it self-describing. As such, the e-form is easier to manage, especially by automated processes, as it moves through its lifecycle from template to active document to archived business record.

Workplace Forms support all types of metadata, including standard items (e.g., author name, creation date, keywords), codes required by the applications that handle it (e.g., workflow, content management, records management), and numerous additional business process requirements (e.g., timestamps, department codes, digital signatures).

IBM Workplace Forms – Evaluating E-Forms Solutions for Business Process Automation

An enterprise e-form should allow the form designer to embed version information within the form for easy access by form users and all applications that process the form. Workplace Forms enable effective version control by specifying particular form ID's (made up of a serial number, version number, and page title), while enabling form designers to insert additional, user-defined version information.
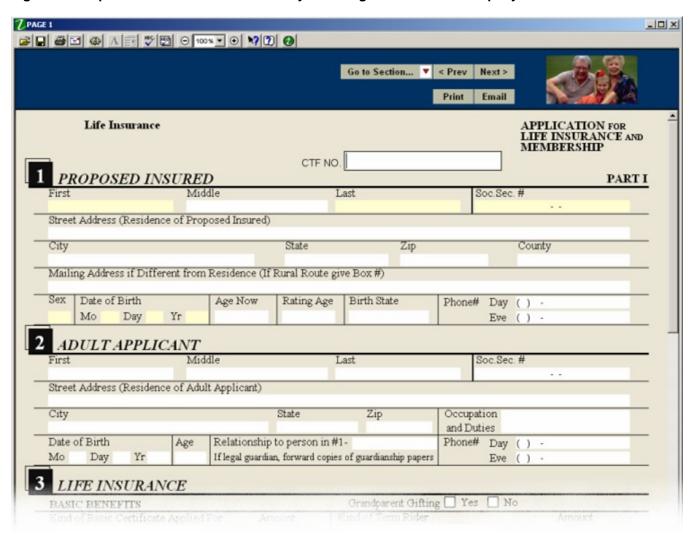
How IBM Workplace Forms Integrate with IBM Products

IBM Workplace Forms add value to the Workplace family of products, while providing opportunity to extend e-forms across IBM's broader portfolio of On Demand software solutions through tight alignment with IBM Workplace™, IBM WebSphere® Portal, and IBM DB2® offerings. Workplace Forms provide a security-rich, dynamic front-end to business processes, enabling process automation that leverages the major components of a complete On Demand operating environment, including portals, content management repositories, workflow, records management, and java application servers.

Workplace Forms add value to IBM Workplace, WebSphere, WebSphere Portal, IBM Lotus® Notes®/Domino® and DB2 Content Management software by automating forms-based processes through new capabilities such as offline processing, digital signing of multi-part forms, attachment handling, and inclusion of easy-to-use wizard-based forms. Workplace Forms revolutionize IBM's support for open-standards forms-based processing using XML. In addition, IBM Workplace Forms complement Industry Solutions by offering industry-aligned forms-based solutions to address business problems faced by a variety of industries, including government, insurance, banking, healthcare, and manufacturing.

Appendix

Figure 1. Sample wizard-based e-form used by a leading life insurance company

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