Pegasystems Alignment to GDS's Technology Code of Practice

Build for Change®

PEGA®

Contents

Introduction

This paper has been compiled to help Government Departments understand how Pega can be used to support them in meeting the Technology Code of Practice and the Digital Service standards. These standards have been set out by the UK Government to provide guidance and best practice for purchasing and implementing software solutions.

The following standards have been referenced in this document:

Technology Code of Practice: Updated 27 March 2019

https://www.gov.uk/government/publications/technology-code-of-practice/technology-code-of-practice

Service Standard: Updated 30 June 2019

https://www.gov.uk/service-manual/service-standard

Technology Code of Practice

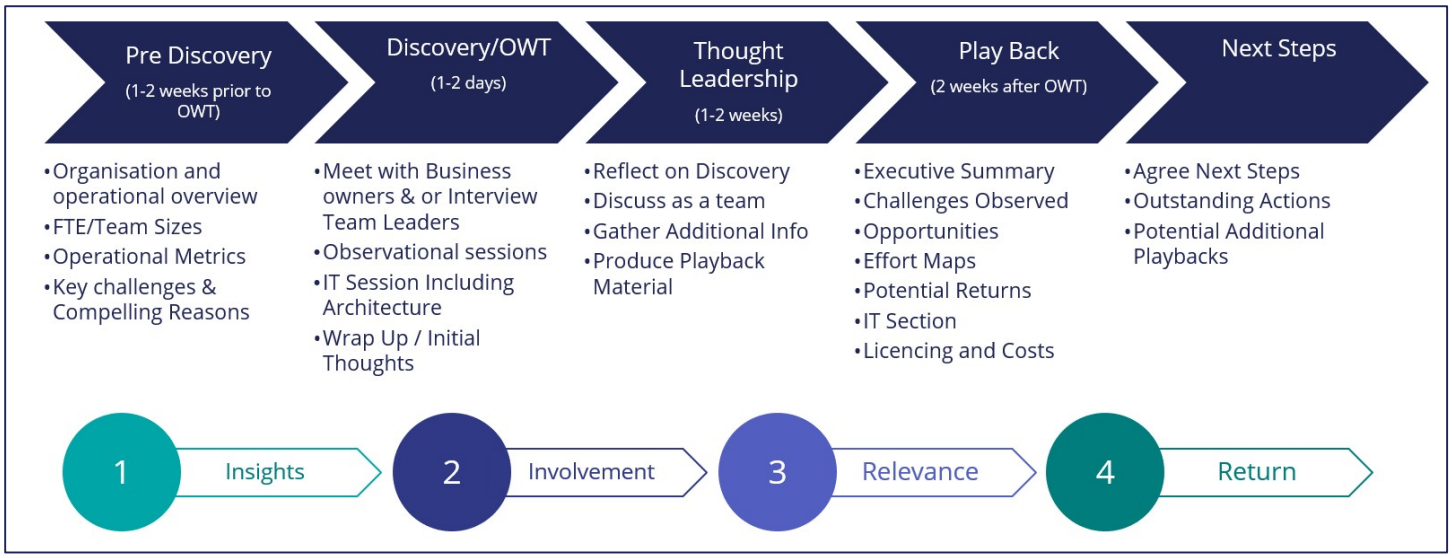
1. Define User Needs

Understand your users and their needs. Develop knowledge of your users and what that means for your technology project or programme.

Pega uses three core approaches to help customers understand their user needs. Each of these approaches feature a significant involvement of end users, subject matter experts and product owners, so the needs are firmly defined. Initially an **Operational Walk-Through** (OWT) establishes a baseline of understanding of user needs, strains on the departments and, stakeholder requirements. A design thinking workshop, using our **Pega Catalyst** approach, directs business involvement to establish a baseline for the initial delivery of features to solve immediate challenges and promote a quick return. Finally, ongoing **Direct Capture of Objectives** (DCO) sessions drive iterative delivery in an agile way.

The Operational Walkthrough

The start of the journey for engaging with Pega, is normally an operational walkthrough. The operational walkthrough typically highlights end user challenges and needs and, results in a solution recommendation and business case.



Operational Walkthroughs are discovery exercises that are conducted collaboratively with the client and Pega. The goals of the operational walkthrough include:

- Identify potential areas and metrics for improvements in productivity, cost savings, and quality
- Establish a potential Uplift or Operational Impact Percentage for long range benefit
- Establish a potential road map for future impact to include projected Costs and Benefits
- Provide Pegasystems with an understanding of the targeted project scope, issues, and challenges

Operational Walkthroughs generally occur in four phases that include:

1. An area manager who can explain the operation from end to end
2. An IT person who can explain the existing systems that support the operation
3. The time spent observing and questioning the operations people
4. A review of the differences (virtually always true) between what management thinks is happening and what was observed

The review session is used by Pega to present their understanding:

1. Understand the "As-Is"
   - Determine the total population of processes across the targeted area.
   - Review and record steps of three to five randomly selected processes/transactions per staff. The randomly selected transactions should fairly represent the type of transactions consistently performed
   - Developed model to determine the cost associated with the "as-is" processes.
   - Identify and count the number of activity steps and average handling time within the "as-is" processes that will be potentially handled in the "to-be" processes.
   - Extrapolate the number of activity steps handled by the "to-be" in the sample processes to the total population.
   - Develop a model to determine the operational impact of applying "to-be" in reducing the number of manual activity steps.
   - Business benefit impact.
   - Identify additional areas of potential impact.
   - Identify additional metrics and areas of measurement.
2. Develop Operational Impact Model
3. Develop Business Benefit and Recommend Additional Areas of Impact

Pega Catalyst

Pega's Catalyst approach helps companies understand not only what the design problems are that they need to solve, but also how to solve them. It helps you look at your journeys in a very different way than the more traditional requirements gathering or employee/customer interviews. It's a way to help organisations understand the transformations they want to make in a more holistic fashion. Organisations struggle with innovation – some by structure, some by design. Our job is to jump start that innovation process. The Pega Catalyst™ team helps you understand the players and pick a journey that you want to map out. The goal of all Pega Catalyst™ engagements is to deliver value and deliver it quickly. We also capture business requirements that are fed into a case backlog, so when it comes time to fully implement, you are well on your way.

We help clients design and deliver far-reaching change efforts through our Catalyst methodology. This approach helps leaders shape a change vision and set targets that; are tightly linked to business outcomes, diagnose the organisation's ability to meet those targets, and deliver improvement initiatives that strengthen performance, build capabilities, and change organisational mind-sets and behaviours.

More specifically, we see that key capabilities for implementing major change efforts include:

- Clear, organisation-wide ownership and commitment to change across all levels of the organisation;

- Continuous improvements during implementation and rapid action to devise alternate plans, if needed;
- Ability to focus organisation on a prioritised set of changes;
- Sufficient resources and capabilities to execute changes;
- Planning from day 1 for the long-term sustainability of changes;
- Effective program management and use of standard change processes;
- Clear accountability for specific actions during implementation.

The Direct Capture of Objectives

While most organisations create voluminous requirements documents in order to build software applications, a direct capture of objectives (DCO) is integrated into the software to facilitate build-for-change development while satisfying both IT and business priorities. The DCO principle is a key Pega Platform capability for capturing requirements and process models directly in the Pega application. Pega directly captures the business policies and procedures that define how work gets done—rules, data models, UI, integrations, reports, and organisational structures—as part of your automated process, eliminating errors of omission and misinterpretation that can occur when programmers manually translate requirements into code.

With Pega, business people and IT collaborate, using a shared visual modelling environment that automatically generates a working application as well as the application documentation. DCO dramatically increases both the speed and accuracy with which business requirements are captured. Moreover, the modelled process is "live" upon save to the rules base, meaning that developers can execute and view the working process in real time, even if the process is not yet complete. The process can be rolled back, revised, and rerun as many times as necessary by the development team, with the coding and documentation captured every time directly in the software.

By directly capturing the application requirements in this unique model-driven environment, the business can easily collaborate to more rapidly implement projects with fewer change requests and with an end product that meets the needs of the enterprise and the end user. Pega uniquely supports the entire lifecycle of a business process, from design and development through deployment and production, in an automated, always accurate, and continuously documented manner.

Our approach to developing and delivering business applications is 100% model-driven and collaborative. The Pega Platform manages all aspects of the software needed for the desired business process/application, including:

- Goals and declarative instructions
- Workflow and business process
- Business logic and policies
- User interface and multi-channel client presentation
- Decision strategies and analytics
- Integration with other systems and sources of data
- Specific situational requirements

Most Pega projects start with business groups defining and designing requirements in our Application Studio environment, which allows web-based capture of business objectives, basic flows, use cases, measurable

goals, and process participants. Unlike competitor offerings, Pega does not treat requirements gathering as an isolated input, where business requirements are handed off to developers to translate word-based requirements and diagrams into code. Instead, all elements of the application are created in web forms and visual models, and executable code is automatically generated from these models by the software.

As the requirements link to the models, and the models drive the application functionality, Pega-built applications will actually generate their own comprehensive documentation (including application screenshots, data models, business rules, and business process diagrams), providing a direct link between requirement and application component.

2. Make Things Accessible

Make sure your technology, infrastructure and systems are accessible for users.

Accessibility is a crucial part of designing a user experience. Enterprise applications must be accessible for users that require assistive technologies. The Pega Platform user interface includes features and capabilities that enable everyone to use the applications you create. Dynamic layouts can be assigned a role that clearly communicates its functionality to a screen reader. Containers can have heading levels that allow an assistive technology to recognise its position in the document.

As a configurable platform, all Pega Products can be designed to conform to WCAG 2.0 Level AA through both inherent accessibility within the product as well as choosing the right components in the UI design. W3C's Web Accessibility Initiative (WAI) provides accessibility guidelines that are widely regarded as the international standard for web accessibility. The Pega Platform uses WAI-ARIA (Web Accessibility Initiative – Accessible Rich Internet Applications) roles to communicate information about on-screen application elements to an assistive technology. WAI-ARIA roles display in the HTML code of your application, this is in addition to the many accessibility guidelines that are built into the core UI generation engine. Combined, these components, along with proper accessibility aware design and development methods, provide a configurable foundation for the design of applications that meet the WCAG AA standard.

Our capabilities include and are not limited to:

- Semantic html tags and roles on generated mark-up that allow assistive technologies to announce the correct information to users
- Natural tab key navigation throughout the application
- Ability for developers to specify ARIA roles/landmarks on any layout for additional accessibility support
- Ability for users of assistive technologies to skip to specific areas of the UI such as navigation, search and main area for more efficient navigation around the application
- Ability to configure heading levels that provide users of assistive technology the ability to understand the structure of the application UI
- Ability to conditionally turn on accessibility for users that require assistive technologies through specialised access group. This includes the ability to serve separate CSS that is more suited for high contrast displays used by users with low vision.

The Pega Platform is accessibility capable. Applications built using the Pega Platform must be designed with accessibility in mind and must be configured to use these capabilities.

3. Be Open and Use Open Source

Publish your code and use open source to improve transparency, flexibility and accountability.

Throughout its evolution, Pega has focused on evolving software to drive ease of use, by allowing open access through defined API's and leveraging open source wherever possible. As a part of these efforts, we've made the Pega Platform increasingly accessible through the cloud, including via free trials, and have continued to incorporate open-source technologies. Examples include OpenAPI, Swagger, Kafka, Cassandra, Hazelcast, Ignite, Lucene, jQuery, Handlebars.js, Moment.js, D3, and OpenCSV.

We have engaged organisations across industries and geographies to better understand how customer engagement and digital process automation solutions are used, and which technologies, including open source, are viewed as strategic. We have also deployed expertise and best practices around concepts such as DevOps and design thinking, because digital transformation is not just about the type of technology – it's how you make the technology work. Providing a future-proof architecture to our clients means we take every effort to be an open system. We have designed our architecture to allow enterprises to use preferred opensource technologies to complement the powerful customer engagement and digital process automation capabilities of Pega. Organisations like PayPal, Google, Amazon, and others use Pega technology, integrated with their own custom-built applications and open-source technology, in a truly hybrid approach.

Pega technology combines more than three decades of proven business process automation and decisioning expertise with a powerful and open architecture. This has enabled us to optimise the use of open-source technology to strengthen and improve our customers' experiences in strategic areas such as DevOps, OCR, UI, blockchain, APIs, and containerisation. In these and other areas of the architecture, Pega has not only used open source, but has also opened collaboration on projects via Pega Exchange and Github.

Pega Infinity, our latest software release, marks a new milestone in providing a more open and advanced platform. It's a massive step forward in our product capabilities, specifically around our use of AI, embedded robotics, ease of use, speed to value, and ability to deliver in a SaaS model.

Highlights include:

Support of container-based deployment: Docker support enabling unified container deployment using Kubernetes and OpenShift. This solution offers well known, open standards-based cloud deployments that are easy to adapt and automate, and offers extensible deployment of customer-focused configurations, such as security modules.

Digital experience API: Gives developers the flexibility to leverage popular UI frameworks, such as React and Angular, together with Pega's powerful UX design approach to create connected customer experiences with their preferred tools.

End-to-end automated testing: Pega has extended its automated testing suite by adding UI testing to its capabilities. Clients can now automate testing from the logic level through the UI level natively within Pega apps, as well as through third-party testing suites such as Selenium.

Blockchain kit for Ethereum: Pega's Blockchain Innovation Kit provides downloadable proof of concept (POC) templates, enabling customers to demonstrate how blockchain – based on Ethereum's open-source project – integrates with Pega Know Your Customer™ (KYC) and Pega Client Lifecycle Management™ applications.

Expanded bot library accessible to all Pega clients: Pega clients can access a growing library of pre-built bots that save time on common business tasks, such as: "start my day"- a bot that boots up applications, signs into them, and re-arranges the agent desktop; "call wrap-up" – a bot that performs the call wrap tasks for an agent; and intelligent virtual assistants that can optimise the email channel and initiate cases.

OpenAPI support: Pega's adoption of the OpenAPI standard for RESTful APIs makes it easier to integrate with other systems. We leverage popular open-source tools, such as Swagger, to document, edit, consume, mock, and rapidly gain value from integrations. As we continue to evolve the Pega Infinity™ generation of our technology, we will invest and leverage open source in two dimensions: 1. Use of well-established and actively developed open-source technology. This ensures we are providing the best core technology to our customers while freeing our engineers to focus on value-added capabilities. 2. An open architecture, able to evolve with the industry and customer requirements. This ensures our clients can extend and integrate their Pega applications seamlessly with other technologies. It is important to note that for software to be considered a sound choice, it is not necessary for it to be open source. Examples of this are the Amazon AWS (S3, Kinesis, etc.) suite of technologies that serve as the backbone of Pega Cloud. Open source is an enabling, but not a required factor, in building and selecting a robust and compelling software suite.

Further information can be found by clicking here.

4. Make Use of Open Standards

Build technology that uses open standards to ensure your technology works and communicates with other technologies and can easily be upgraded and expanded.

Pega is committed to creating optimal technology to deliver the outcomes our clients demand. This commitment includes the use of a wide and growing range of open source tooling. Some highlights include:

Integration

- OpenAPI: A widely adopted standard from the Linux Foundation for creating, consuming, documenting, and mocking RESTful APIs
- Swagger UI: Interactive API documentation that supports discovery and testing
- Kafka: High throughput messaging for consumption of big data in support of Pega's decisioning and analytics

Database technology

- Casandra: NoSQL database used for Pega decisioning and analytics
- PostgreSQL: Default database used on Pega Cloud
- Elasticsearch: Powers Pega's search capabilities and is becoming the foundation for our reporting capabilities.
- Hazelcast/Ignite: In-memory data grid for distributed computing. This is one example where Pega is moving from proprietary software to open source technology (Pega Pulse) to another in a way that is seamless to customers.

UI

- jQuery: Feature-rich JavaScript library used throughout Pega's UI and event model
- Moment.js: Used for date conversions and internationalisation

- Handlebars.js: Serves as the bedrock for Pega's new client-side based templating
- D3: A visualisation library used in Pega visualisations

DevOps

- Git: Provides a repository for distributing and deploying Pega configuration changes
- Gradle: A build automation tool that uses the concepts of Apache Maven and Apache Ant
- Coming soon with Project fnx, Pega will be looking to bake docker images to support ephemeral infrastructure better using self-contained docker images without the need for application servers for better auto-scaling and being able to align closer with DevOps best practices.

5. Use Cloud First

Use public cloud first as stated in the government's cloud first policy.

We believe cloud should come with choice. The choice to:

- **Run where you want** – our cloud, your cloud, a partner's cloud
- **Customise the way you want**, unconstrained by limits
- **Move from your cloud to ours,** vice versa, or even to on premise if it makes sense for your business

Pega is there for you to ensure no technical lock in. Our cloud choice initiative is backed by the Pega Cloud Choice Guarantee program. You can rest assured that Pega is there for you in whatever way you choose to deploy Pega technology. "Future-proof" takes on a whole new meaning by delivering the flexibility necessary to adapt to changes in your business. Whether you want Pega Cloud, Customer Managed Cloud, or Partner Managed Cloud, Pega is there for you today and tomorrow.

The Pega Cloud Choice Guarantee program offers the following for supported clouds:

- Full Pega Global Customer Service support 24/7 for clients running Pega
- No penalty for migration to or from any supported cloud environment
- Reference architectures, related configuration, and support documentation for deploying and managing Pega technology
- Available runtime components
- Continuous certification of Pega solutions – including Pega Platform and all Pega applications – on currently supported cloud environments
- Commitment to continue evaluating additional popular cloud platforms

There are three models for how to deploy Pega Platform on the Cloud:

Pega Cloud: Pegasystems' managed cloud platform service offering is architected for Pegasystems' applications. Pega Cloud is the fastest time to value. Our Infrastructure as a Service (IaaS) provider is Amazon Web Services (AWS). AWS operates ISO27001 certified data centres in support of Pega Cloud

Customer Managed Cloud: Customer owned and controlled environments that are run within private clouds or running on infrastructure-as-a-service (IaaS) offerings delivered by providers such as Amazon Web Services, Microsoft Azure, or Google Cloud Platform.

Partner Managed Cloud: Business partner owned and controlled environments that deliver the Pega Platform as a custom hosting solution or purpose-built application service provider.

Along with cloud choice options, customers are also able to deploy Pega solutions on premises using their hardware.

6. Make Things Secure

Keep systems and data safe with the appropriate level of security.

For Pega applications, all transactional data is stored within an RDBMS, and data can be protected by storing it as an encrypted BLOB or individually encrypted columns. Data is also protected by Pega authentication and authorisation processes, through which system administrators can define and configure user roles and access permissions to the database as well as the data itself. Access to the database still does not allow viewing of encrypted data. Data can also be protected in-flight by use of SSL encryption, both for the Web session and for any incoming/outgoing E-mail.

Pega supports encryption in motion using industry-grade 256-bit SSL/TLS encryption. This applies to data traveling to and from both the viewer and presenter browser environments.

Specific to Pega Cloud Deployments:

Pega Cloud provides a secure and robust infrastructure environment for Pega Platform and Strategic Applications that achieves high levels of security and data integrity. The Pega Cloud provides host-based virus protection, continuous security monitoring, vulnerability and security management of Pega Cloud-delivered environments, customer-specific encryption of data at rest, and sandbox environments that can be hibernated to block threats and conserve energy. Pega Cloud's dedicated security team manages compliance, security monitoring, and security event response.

Pega Cloud uses data-at-rest encryption (DARE) in all Pega Cloud customer instances to help you secure your application data, as well as to help you comply with industry-standard security requirements. "Data at rest" refers to any content that is saved on a hard drive.

Encryption of data at rest is implemented for all sandbox and production environments. All customer data stored in volumes within a customer cloud environment is encrypted with 256-bit AES encryption, and we include customer data, logs, data files and database files. We also encrypt data in motion, over IPSEC VPN tunnel or HTTPS (128-bit minimum TLS encrypted browser session)

The key pairs used to encrypt the disk are created and managed by Pega Cloud Security Operations for each unique customer. These keys are rotated on a regular basis and are securely stored in an encrypted key store facility within Pega Cloud Operations.

7. Make Privacy Integral

Make sure citizens' rights are protected by integrating privacy as an essential part of your system.

Since the GDPR laws have come into effect, EU residents now have unprecedented powers to view, limit, or even erase any information businesses collect about them. According to a recent Pega study of 7,000 EU residents, 82 percent plan to exercise these new GDPR rights. But saddled with legacy systems, most global businesses are unprepared to track and gather this information on demand across their siloed organisations. This could result not only in the loss of valuable customer data, but also massive fines of up to four percent of global revenue for non-compliance.

To address this extraordinary IT infrastructure challenge, Pega GDPR Accelerator provides a set of customisable GDPR templates and sample best practices extensions for Pega applications and users. These templates enable companies to quickly stand up an automated GDPR request portal that fetches customer data spread across the enterprise. Pega's underlying software orchestrates these requests across highly dispersed global systems – even when no APIs are available. This allows businesses to manage GDPR-related requests with security and accountability while providing a full picture of their customer's data. Pega software is uniquely suited to handle the anticipated onslaught of GDPR-related consumer requests through these capabilities:

Dynamic case management for rapidly establishing and orchestrating the GDPR processes that every business will need to enforce and audit across the enterprise.

Pega® Workforce Intelligence to track workflows and identify inefficiencies in GDPR response processes.

Pega® Robotic Automation to automate and streamline manual, repetitive tasks involved in GDPR compliance to save time and resources.

Pega® Customer Decision Hub with AI to sense and mitigate customer dissatisfaction that could lead to future GDPR erasure events.

Pega Customer Decision Hub's T-Switch to empower businesses to control the level of transparency within their AI systems and ensure the logic behind each automated decision is explainable to GDPR regulators.

Under the GDPR, as under the EU Data Protection Directive, a distinction is made between "data controllers" and "data processors." Companies who collect personal data are considered the "data controllers.". As such, they will be primarily responsible for complying with the obligations imposed by the GDPR. For customers who install Pega on their own premises, Pega will be considered a "data processor" when performing professional services or global customer support services and, during the course of providing such services, when receiving personal data from the customer. For customers who deploy and run Pega applications on the Pega Cloud, Pega would be considered a "data processor" whenever the customer uploads personal data into a cloud environment.

Article 28 of the GDPR requires that data controllers enter into a data processing agreement (DPA) with data processors. In its capacity as a data processor, Pegasystems shall enter into a DPA with each of its European customers. Under the DPA, Pegasystems will agree, among other things, to only process personal data on documented instructions from the controller, including with regard to international transfers and to assist the controller with complying with its obligations under the GDPR. Furthermore, Pegasystems has the following capacity to support GDPR:

- **Secure Applications:** The Pega Platform provides for the development of secure applications with built-in protection mechanisms and defences against attacks and common vulnerabilities as described in the OWASP Top 10 "The Ten Most Critical Web Application Security Risks." In addition, the Pega Platform provides support for the encryption of individual properties and BLOB encryption. Decryption is done only for authorised users who are defined by the application developer.
- **Notice and Consent:** Pursuant to Article 6 of the GDPR, data controllers are required to provide notice of the expected processing activities of personal data and to obtain the consent of data subjects for such processing. For the Pega Platform and most strategic applications, ordinary notice and consent will be sufficient.
- **Explicit Consent:** Pega Predictive Analytics Director and Adaptive Decision Manager allow our customers to create high-quality predictive models of their customers' behaviour, such as acceptance, churn or credit risk, and the optimisation of real-time strategies. Article 22 of the GDPR gives individuals "the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her." Unless our customers are confident that the profiling decisions have no legal or otherwise significant effect, as, for instance, may be the case in some marketing, but not likely in the case of collections or underwriting, or in the case where such profiling is expressly authorised by law, such as for fraud and tax-evasion monitoring and prevention purposes, our customers should obtain the "explicit consent" of their customers to conduct profiling activities.
- **Rights to information, to access, to rectification, and to erasure:** Under Section 2 of the GDPR, data controllers are obligated to provide data subjects with information about the identity of the data controller, the purpose for which their personal data will be processed, and the expected period for which their personal data will be stored, among other things. Data subjects have the right to obtain access to the information that has been collected about them, the right to rectify inaccurate personal data, and the right to obtain from the controller the erasure of personal data. These obligations are the responsibility of the data controller.
- **EU-US Privacy Shield:** Pegasystems has self-certified its compliance with the EU-US Privacy Shield Framework. Pegasystems' adherence to the Privacy Shield Principles allows European companies to comply with the data protection requirements of the EU Data Protection Directive when transferring personal data to Pegasystems and its affiliates outside of the EEA and with the requirements of the Swiss Federal Act on Data Protection when transferring personal data outside of Switzerland. The Privacy Shield will also provide a means of compliance with Article 46 of the GDPR for international transfers of personal data. In regard to PSD2, we empower our clients to be compliant, but we do not make them compliant.

8. Share & Reuse Technology

Promote good practice and avoid duplicated efforts by sharing and reusing services, data and software components.

Internal Reuse

Pega was designed from the ground up to solve the problems of reuse and specialisation required for getting work done across lines of businesses, regions, and customer segments. Pega provides a patented architecture called the Situational Layer Cake that lets you capture the common parts of your organisation, while seeing where specialisation must occur. Our customers get the speed to market and consistency that

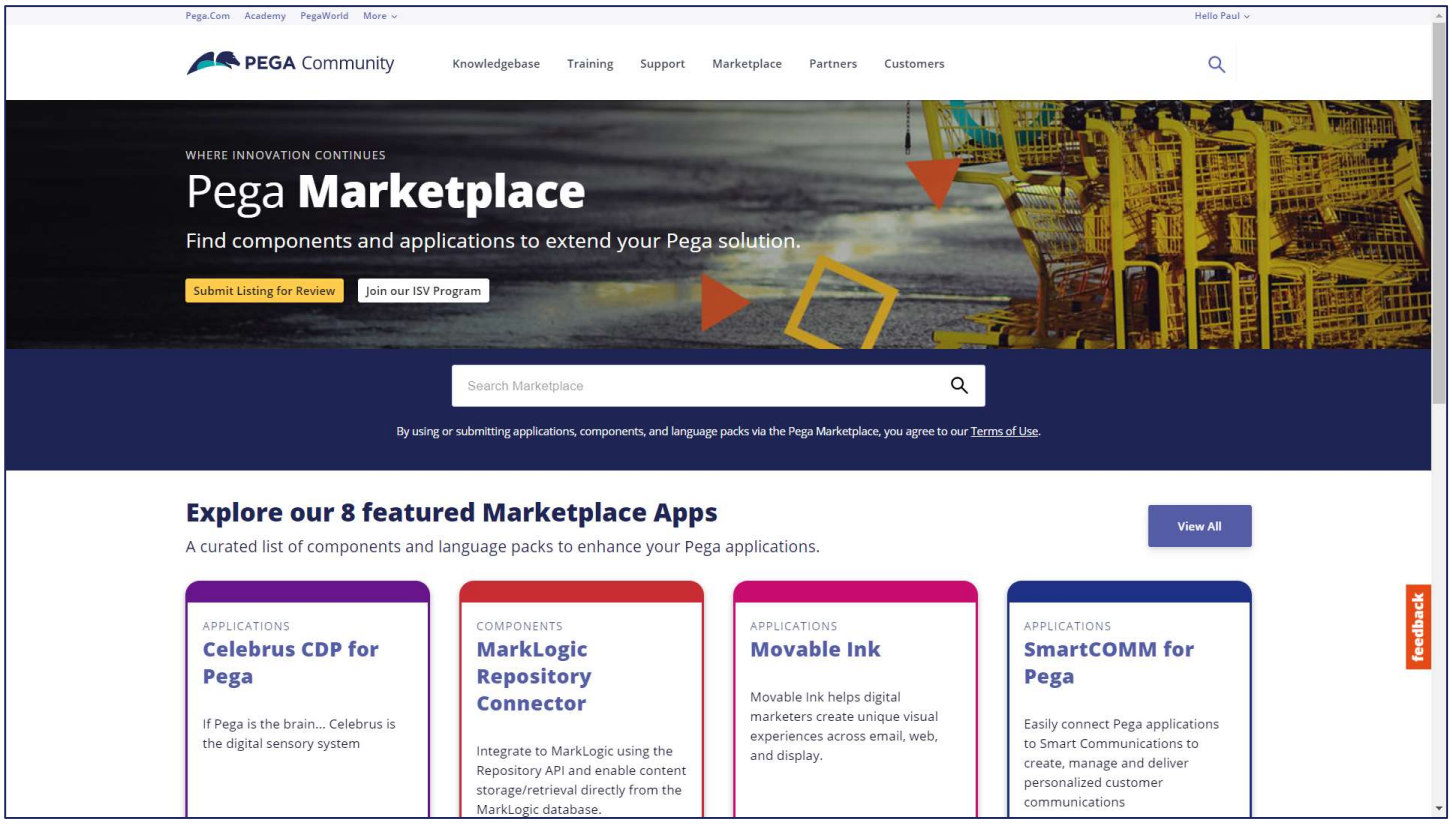
comes with massive reuse, while ensuring that they can meet the needs of different markets, differentiate their products, and treat each customer as an individual.

Pega uniquely enables reuse and specialisation across multi-dimensional circumstances that typically include the type of customer, the location, the product, the channel, and the version, among others. In short, rather than expensive copy/paste/edit for changes, you simply reuse assets and specialise the application just by describing the differences for the particular dimension. This capability underpins Pega's strategic application capabilities and allows organisations to easily roll out sophisticated processes across entire organisations.

Once you have your process or customer journey captured and specialised, Pega can automatically generate and deploy the software needed to run and execute that process. Crucially, the model created through directly capturing objectives is the one that is generated and deployed, speeding the time-to-delivery of your application, and ensuring your customers experience truly individualised service. To view a short video about this capability, please visit: http://www.pega.com/insights/resources/build-change-situational-layer-cake

The Pega Exchange saves organisations time and resources by providing downloadable building blocks that enable users to quickly build new applications or add and deploy robust features to existing applications. Pega supports all third-party components to improve overall productivity, application quality, and time to market while adding advanced functionality.

External Reuse



The Pega marketplace includes add-on components and connectors from Pega partners such as DocuSign, a global leader in Digital Transaction Management (DTM) and e-Signature technology, and Box, a leading content management platform. It also enables third-party developers to upload their own finished applications and add-ons and gain recognition for their contributions to the greater Pega community. The

website is closely monitored to ensure users have access to the highest quality building blocks for their own applications, as well as corresponding documentation on compatibility and installation.

The Pega Exchange also houses Pega Innovation Labs products – applications and components in beta that will be available for users to tinker with and test. For example, new components will allow users to create their own applications by drawing directly on tablets and other touch-enabled devices.

9. Integrate and Adapt Technology

Your technology should work with existing technologies, processes and infrastructure in your organisation, and adapt to future demands.

Pega provides you with the ability to create applications that are built for change and, at the same time, provide seamless integration to your legacy systems by using technologies and live data to extend your apps to multiple channels, connect them to external sources, and integrate them your critical business systems. Pega can help you do that through the following integration capabilities:

Connectors are Pega connecting out to services, databases, etc., both inside or outside of your enterprise. Pega provides protocol connectors – SOAP, EJB, JCA, Java, JMS and MQ, HTTP or RESTful – and, based on recent customer demand, we also provide application-specific connectors to leading 3rd party software such as Box.com, DocuSign, and SAP for integration to your ERP systems via Pega Exchange. If the endpoints we are connecting to provide some sort of metadata for introspection, like a WSDL file for SOAP or a formatted URI for REST, Pega can generate the models for you. We have integrated through many of the leading middleware an ESB platforms like MuleSoft, TIBCO, and Oracle Service Bus. If you do not possess a middleware or ESB-layer, we can still do point-to-point integration and leverage our Live Data capability to give you the integrate capability you need.

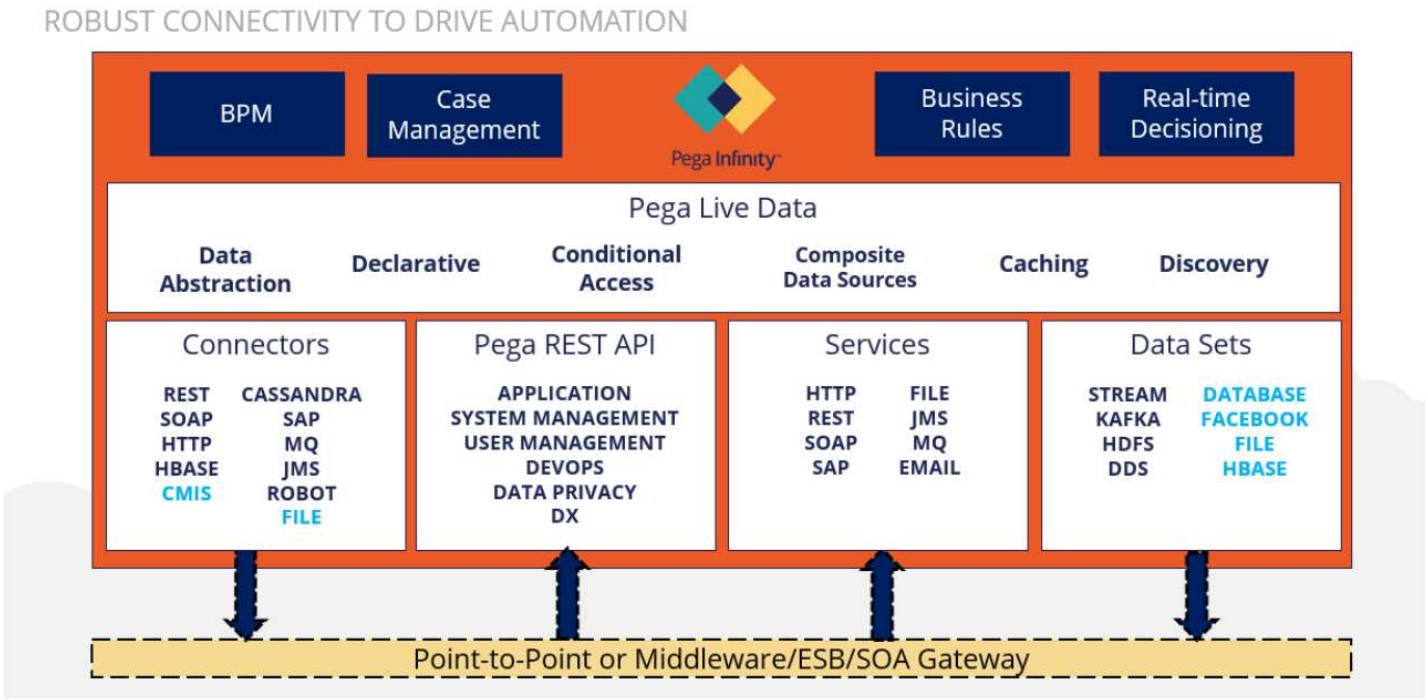
Services are applications connecting to Pega (the opposite of Connectors). Pega provides support for the most widely used protocols – SOAP, EJB, JCA, Java, JMS and MQ, HTTP or RESTful services, JSR-94 (the Java rules engine standard) and files or FTP. Services can expose nearly anything in Pega from a full-blown BPM process flow to a simple Business Rule. If the service type has metadata associated with it, the application can automatically generate it, such as publishing the various steps of a business process as a WSDL.

Transformations: Pega can transform the data it receives or sends. Pega supports XML-based data transformation, native interaction with Java objects and Java Beans, delimited and structured file records, complex transformations via Regular Expressions, and even a limited amount of free text parsing.

Additionally, we also ship with the **Pega API**. The Pega API is a RESTful API that uses JSON for request/response. Many of the more common tasks can be achieved directly thru the Pega API. For example, pulling a list of Assignments for a user, creating a Case, etc. Recent additions to the Pega API have been in support of our DevOps initiatives, which will now allow you to do things like pull/push Branches and execute Unit Test Suites.

Complementing our pure data integration capabilities is **Pega Live Data**. Pega Live Data brings a number of middleware-like capabilities to the table, out of the box. Pega Live Data provides a number of key capabilities on top of our integration:

- **Data Abstraction**. Those configuring your Pega application are simply working with the data model and aren't concerned with where the data came from or what protocol was used to get it. With Data Abstraction, they don't have to be.
- **Declarative in nature**. You don't have to explicitly instantiate your data objects when you want to use them. Simply refer the model and properties and Pega Live Data will determine if the data needs to be fetched/refreshed.
- **Configurable Conditional Access**. This is used for situations where your data model might be populated from different systems of record based on a condition or business rule. Pega Live Data can do meditation at runtime to determine which system of record should be used to populate your data model.
- In situations where your data model is sourced from multiple systems, Pega Live Data provides native support for **Composite Data Sources**. For example, general customer information such as name and address may come from your customer information system, but benefit information might be housed in a separate system. You might want to join that information in populating your Customer data model. Pega Live Data can populate that data model from those systems. Furthermore, that data can be retrieved in parallel so that you can meet your performance SLAs.
- Speaking of **performance**, Pega Live Data also provides robust caching support, native in the platform. So for those situations where data does not always need to be real time (for example – a list of products), you can use Pega Live Data to cache the information in memory. Caching can be at session scope all the way to cluster-wide scope. In addition, Pega Live Data allows you to determine how long things stay in cache – whether it's based on a business rule or a time interval you define.
- **Pega Live Data** makes the discovery of existing Data Pages easy. No more hunting and pecking thru your application for existing integrations. All Live Data items are readily available for you on the Data tab in App Studio



10. Make Better Use of Data

Consider how to minimise data collection and reuse data to avoid duplication of datasets.

There's a number of ways in which Pega meets this best practice recommendation:

- Use of Data Pages

Pega integrates in real-time with disparate enterprise systems of record, eliminating the need for data replication. For process that require similar data, Pega uses data pages to store data that the system needs to populate work item properties for calculations or for other processes. When the system references a data page, the data page either creates an instance of itself on the clipboard and loads the required data in it for the system to use, or responds to the reference with an existing instance of itself.

- Contextual Presentation of fields (for both data collection and display)

Pega's dynamic user interface supports the context display of fields for information or data collection. This means that end users only see the fields that are relevant to the interaction or process being undertaken.

11. Define Your Purchasing Strategy

Your purchasing strategy must show you've considered commercial and technology aspects, and contractual limitations.

Pega has maximum flexibility to provide its software in a variety of ways. We can grant a license for on-premise use, with either a perpetual fee (capital budget) or a term fee structure (operating budget), as well as a monthly subscription-based fee for delivery via Pega Cloud.

The perpetual license structure provides for a one-time up-front license payment, plus annual maintenance that gives you access to our support services and entitles you to all upgrades and revisions of the software.

We are also able to offer term licenses and Pega Cloud subscriptions to allow you to spread out your costs. The term and Pega Cloud subscription models each provide for an annual payment that covers both license and maintenance.

Pega works with its customers to define appropriate licensing models that are flexible, but predictable in addressing our clients' needs. Our philosophy is for our customers to maximise success by licensing the right combination of Pega technology and applications using an easily understood/defined business metric(s) that are aligned to our customer's scope of use within the business operations.

Pega's pricing model is based on 3 principal elements:

- The purpose(s) for which a customer wishes to use the software;
- The specific software products to be licensed;
- The volume of usage.

Based on the combination of those elements, Pega is able to construct a model that best meets your needs. Pega has a significant commitment to maintaining a superior total cost of ownership. Many traditional

competitors focus only on license cost while Pega addresses the complete ownership life cycle cost. Too often, users realise that license costs are only a portion of the total solution cost.

12. Meet the Digital Service Standard for Digital Services

If you are building a service as part of your technology project or programme you will also need to meet the Digital Service Standard

The digital service standards are a set of guidelines for the customer to follow, that can be easily supported by Pega (see follow-on section)

Digital Service Standard

1. Understand User Needs

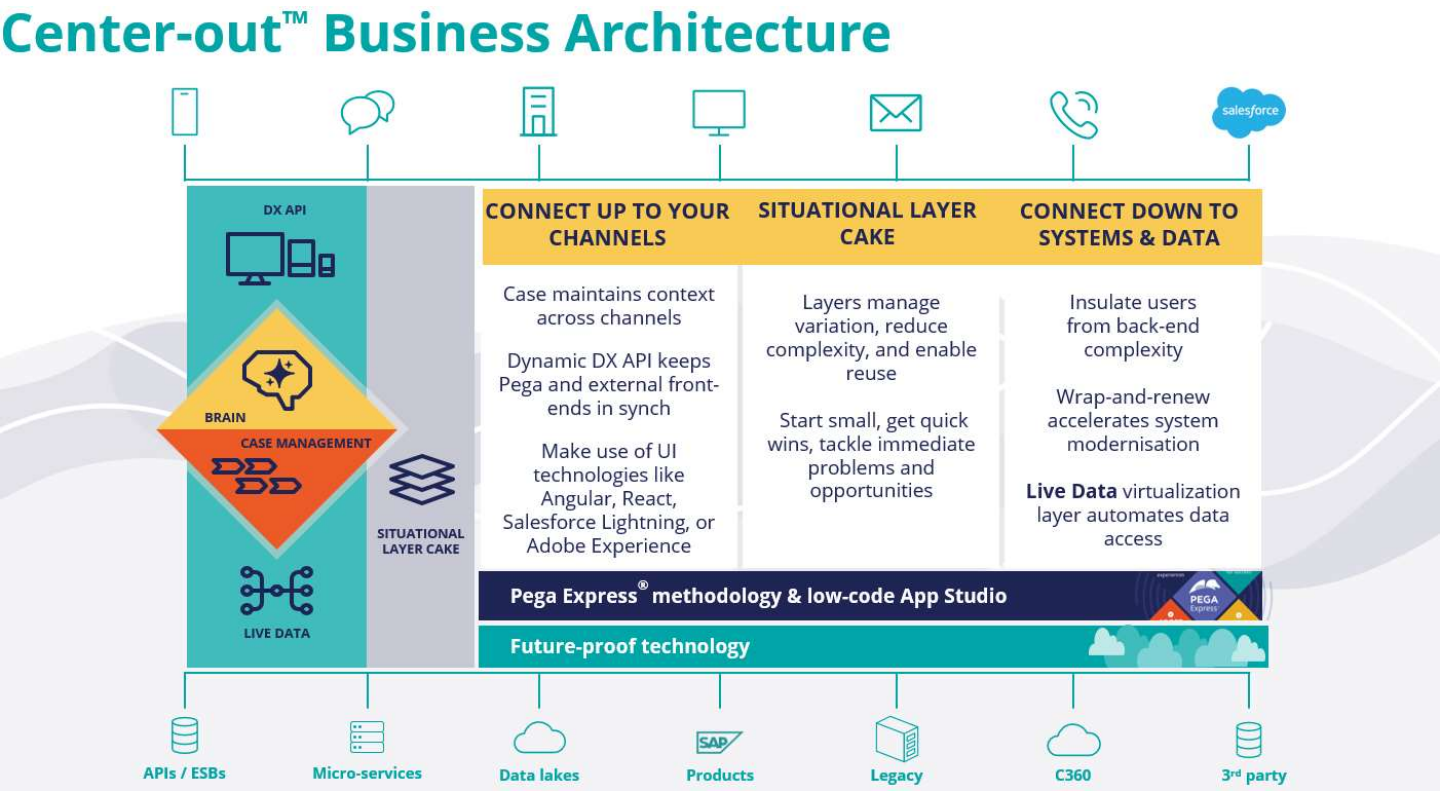
Develop a deep understanding of users and the problem you're trying to solve for them.

This is achieved through collaboration as described in Technology Standard no.1 whereby Operational Walkthroughs, Pega Catalyst and DCO sessions have direct input to the solution construction.

2. Solve a Whole Problem for Users

Work towards creating a service that solves one whole problem for users, collaborating across organisational boundaries where necessary.

The Pega Business Architecture's ***Centre-Out*** approach is the cornerstone to driving service and problem resolution that transcends organisational boundaries and IT silos.



Using the low-code environment to design and deploy, automated, streamlined, intelligent microjourneys, manual work is eliminated and time to outcome is significantly reduced.

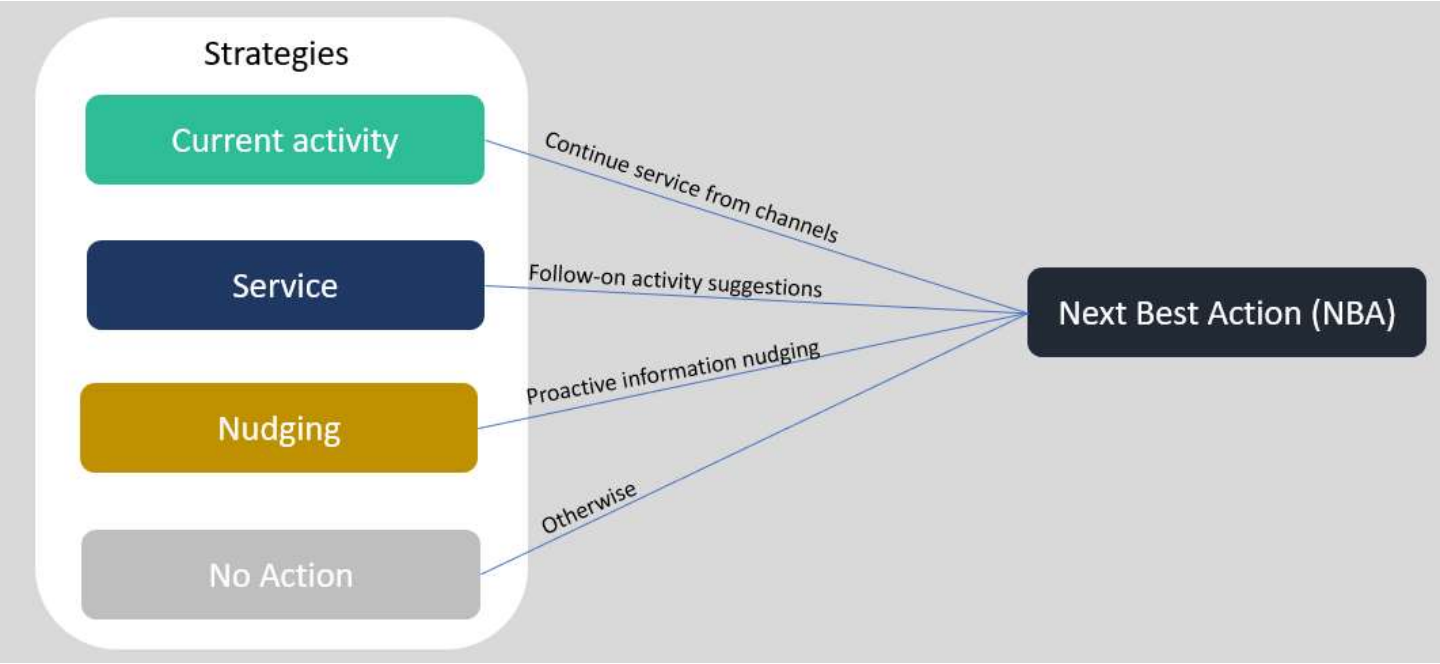
Combined with Pega's unified messaging and technology adapters (for both channels and legacy system

integration), microjourneys can be exposed to deliver consistent, efficient experiences across differing channels.

In short end user journeys can be delivered across many channels without the need to code, specialise or deploy on a per channel basis. The microjourney is the central process and omnichannel compatible.

Built entirely on Pega Infinity, Pega Customer Service is a pre-configured application that capitalises on the Centre-Out architecture.

Pega Customer Service takes a holistic view of the customer and uses information gleaned from many disparate sources, such as internal data repositories, web behaviour, current service requests and interactions to determine the next best action. Whilst the customer may be interacting about a specific issue or service, Pega is able to determine other (Next Best) actions based on what it knows about the customer and what other services/issues are in-flight. Consideration can also be given to the customer current disposition, i.e. level of vulnerability, when driving next best actions strategies during interactions.



Pega's analytics engine leverages real-time and historical big data to calculate likely customer behaviour, which can be easily embedded into action strategies, enriching decisions and improving outcomes.

Real-time decisioning automatically executes the Next-Best-Action that aligns the customer and company objectives. In addition to providing a model factory for developing predictive and adaptive models, Pega also supports existing models may have been developed via third-party tools such as SAS and R.

Predictive models created by those systems can be imported to Pega using the industry standard PMML format.

3. Provide a Joined-up Experience Across Channels

Work towards creating a service that meets users' needs across all channels, including online, phone, paper and face to face.

Pega is designed to be channel agnostic. By this, we mean that a process is built once and deployed across all channels as required. Therefore, it is possible to truly switch channels in real time, and have different people take over the process from a support channel as needed. Pega supports integrated, multi-channel support capabilities for managing telephone, e-mail, fax, and Web-based service interactions including chat, Web self-service, mobile (including mobile apps) and social media interactions, enabling a seamless, cross-channel service delivery to support contacts and foster contact relationships. A customer can initiate an interaction in the channel most convenient to them at that moment and seamlessly transition to any other channel without any loss of context.

Pega maintains context by storing all past actions and data along with future actions in the form of a case. Once created, every interaction and every task is tracked within a case which can span multiple channels and indeed multiple business processes. This helps Pega to maintain context when moving the interaction from one channel to the next. In addition, if the system needs a piece of data that is not present, it can declaratively seek out that data in order to maintain the flow between channels. In this way, the case has persistent and transparent context across channels. Pega also enables users to work multiple simultaneous service requests across multiple channels where desired.

Pega's omni-channel capabilities offer a "design-once, access anywhere" user experience that opens applications to mobile and social channels, delivering consistent and intuitive user experiences across all channels of interaction. You create the UI once, then deploy on any device, in any locale, and in any browser; no coding is required. Pega automatically generates the semantics specific to browser and device environments using current web standards, markup (HTML5), CSS and JavaScript, allowing the application to be viewed on mobile devices. Pega applications operate consistently regardless of channel entry point. In fact, Pega can begin a process on one channel, for example, a tablet, and continue the process interaction on any other device that supports a browser or over the phone. No data is lost or needs to be re-entered. Transaction logging and auditing in Pega operate the same across all channels. Standard and ad hoc reports are the same across all channels.

4. Make the Service Simple to Use

Build a service that's simple, intuitive and comprehensible. And test it with users to make sure it works for them.

Pega provides an intuitive user interface based on latest web technologies, optimised by UX experts to reduce the number of clicks required to accomplish routine tasks. Also, it is very easy and fast to configure and change or add UI elements to address custom requirements without programming or code changes.

With Pega's Intent-Driven User Experience, users are guided through the processes with specific instructions, scripting, and fields based on the context of the interaction. This is configurable and driven by business rules and processes.

Because of Pega's build-once-deploy-everywhere approach to responsive design, the same process can easily be deployed across every channel (live care, self-service, mobile, retail, etc.) without any special consideration. The platform UI is easily altered and allows inheritance of created logic without having to re-generate, for rapid and cost-effective deployment.

The user screens of the Pega Strategic applications (Customer Service, Marketing & Sales Automation) are created by taking into account best practices of real projects and trends in compelling UI design. Pega intends to provide end users with just the information needed to get work done. We do not believe in throwing data on end user screens and having them discover what is required to execute the work. An intelligent guided sequence of screens is provided to allow end-users to perform their day-to-day work. Through automating every step that can be automated not all intelligent work is eliminated. Leaving the user with the tasks that matter.

The Pega Platform provides the capability to easily enhance and create end user screens and portals. Advanced 'drag-and-drop' capabilities provide business users with the option to design user-friendly screens that are meant to meet your requirements. These screens can be tailored to meet style guide principles and 'pixel perfect' blend in third web portals.

The ease of use of the Pega applications ensures that they are quickly adopted by the business.

5. Make Sure Everyone Can Use the Service

Provide a service that everyone can use, including people with disabilities or other legally protected characteristics. And people who don't have access to the internet or lack the skills or confidence to use it.

Technology Code of Practice No.2 Makes things Accessible.

6. Have a Multidisciplinary Team

Put in place a multidisciplinary team that can create and operate the service in a sustainable way.

Pega advocates a multi-disciplinary team, this is absolutely necessary for success and particularly for the agility of continuous deliveries. The DCO, and Pega Catalyst engagements, described earlier, are made up from a multi-disciplinary team from both Pega and the customer. A key output for Pega of this teaming is one of self-sufficiency, which promotes internal innovation, independent actions, and enhanced productivity.

Typically, a project team for a Pega project is comprised of 5-8 people depending on project size/complexity. Typical roles on the Pegasystems side are as follows:

- Engagement Leader
- Lead Business Architect
- Lead System Architect
- Senior System Architect

Additional part-time resources, as required, provide UEX, Design Review, Technical Architecture/Volume and Performance Support, and Phase Readiness Preparation. A Practice Director role (Delivery Leadership and Accountability) is appointed on a part time basis.

A specific project team structure will be proposed on completion of an initial Project Inception Phase where scope, approach, and roles are determined.

Typical customer roles would be:

- Project Manager: Project plan; overall project success; participate in Direct Capture of Objectives (DCO) design sessions;
- Business Architect: Create/calibrate use cases; participate in DCO design sessions;
- Subject Matter Experts: Provide insight into business process flows; respond to questions from project team; work closely with Business Architect and Pegasystems project teams; participate in DCO design sessions;
- Business Sponsor: Attend governance meetings for rapid and effective decision making;
- Infrastructure Team: Create and maintain infrastructure when on-premise; liaise with Pegasystems team;
- Solution Architect: Define application architecture and ensure system architecture conforms to group-wide standards and overall enterprise architecture;
- Test Manager: Liaise with project team to implement the testing strategy, organise and execute testing where appropriate; create and maintain test cases and test scripts; execute Smoke tests, SIT, UAT and performance tests against defined strategy;
- Rollout/Change Management: define and execute.

7. Use Agile Ways of Working

Create the service using agile, iterative user-centred methods.

Agile development is at the core of our delivery approach. During the implementation phase we believe that Scrum/Agile is the right approach because it gives our client full transparency into the health of the project. It also provides the business with the ability to manage the prioritisation of the work that will be worked on by the Scrum team. This along with the best practices of scrum helps teams deliver incremental, high quality deliverables on a regular basis.

Being able to innovate quickly and release more frequently is a competitive advantage. With Pega, by using an agile delivery methodology that emphasises short, frequent releases, focusing on the Minimum Loveable Product instead of building for the end state, clients can target a first production release in under 90 days, then iterate continuously based on user feedback. Since Pega supports a configuration- and model-based approach to application development, changes to applications can be implemented much quicker than traditional code-based development platforms. The Pega Platform is designed to enable business users to extend and configure the application to meet specific needs and to adjust to changes in business or market conditions. Thus, it is not necessary to initiate change requests to modify the functionality of the application, or depend on internal IT resources to configure and optimise the application. Our "Build for Change" approach enables our clients to extend the platform, modify as needed, and take ownership of the application.

According to the Forrester Total Economic Impact Study, with Pega:

- ROI was 321% with a payback period of less than 12 months

- Development cost savings of 75%. With the adoption of Pega, all of the interviewed organisations transitioned to a model-driven approach with agile methodologies
- Reduced time-to-market by 50%. The analysis commissioned that organisation are able to launch new business applications up to 90 days earlier
- End-user productivity gains up to 75%. Interviewees reported that their end-users had typically achieved 20% to 50% of productivity gains

Furthermore, according to a productivity comparison of Pega vs. Java, by Capgemini, which investigated how Pega stacks up against Java EE for developing global, feature-rich, and mobile-enabled enterprise applications, Pega was faster:

- 40% faster mobile development
- 8x faster analysis and design
- 8x faster introducing change

8. Iterate & Improve Frequently

Make sure you have the capacity, resources and technical flexibility to iterate and improve the service frequently.

Pega Infinity is an application development platform intended for large enterprises seeking to build, deploy, and evolve strategic business applications. By providing these capabilities in a unified, model-based, and cloud-enabled environment, Pega Infinity helps enterprises build and change strategic applications much faster than conventional programming.

That's why Pega is also talking about a Build for Change Platform® and our key principle is "Our world is constantly changing, only Pega lets you Build for Change."

Maximise Capabilities: In selecting Pega as your application, you're acquiring a continuously evolving, future-proof, leading case management and customer service solution. We encourage customers to take advantage of our mature and proven technology to enable rapid deployment using out-of-the-box application features, automated requirements-gathering and application documentation capabilities, and code-free development and re-usability features for rapid deployment and scalability.

Iterate to Success: Pega's approach to implementation is flexible and is designed to adjust to meet the specific needs of a client or a given project. Our standard approach is Agile Scrum, which enables us to:

- Break large programs into smaller, more manageable components, each with defined and deliverable business value, and the ability to go live and provide value on a phased basis
- Monitoring and analysing the "live" process/application frequently during the project to gain user feedback
- Begin testing early in the project lifecycle to drive higher levels of product quality and to gain user feedback
- Practice multi-level governance, including project management and reporting; technical governance; consistent alignment with the business vision; and active executive-level engagement
- Proactively manage risk, which includes risk assessment prior to project commencement, as well as a range of interventions during implementation, including triage and situation management that engages the global Pega community for risk and issue management when needed

Practice Co-Production: It is widely recognised that successful projects provide transparency and collaboration between delivery teams, end users and other stakeholders. Pega actively encourages co-production through business and IT collaboration throughout the project including Direct Capture of Objectives (DCO), frequent testing, and joint governance. We encourage business users to get hands-on experience to drive their empowerment and to enhance organisational buy-in and adoption of the delivered application. This will include enabling team members through role-based Pega training, and active participation in project delivery (e.g., allocation of appropriate Pega configuration tasks as part of the development effort, and other activities such as application testing). Every customer's journey to self-sufficiency is different, depending on business complexity, resource availability, and many other factors. Pega provides a range of delivery, advisory, and expert services to ensure our customers are supported with cost-effective tools and assistance throughout their organisational development.

Implement with Best Practices: Through our extensive experience of implementing case management and digital transformation projects with hundreds of customers, Pega has developed a set of proven best practices that support effective delivery of Pega projects. Application Development Guardrails represent the best practices for configuring Pega solutions, by which development team members can track compliance of the application configuration with best practices while meeting defined business requirements. We recommend that teams monitor compliance with the Guardrails on a regularly scheduled basis and share the compliance scores with management on a regular basis as part of a detailed project governance plan. Compliance with the Guardrails will result in more maintainable, upgradeable applications with significantly fewer defects than non-compliant applications.

9. Create a Secure Service which Protects Users' Privacy

Evaluate what data the service will be collecting, storing and providing.

Technology Code of Practice No.7

10. Define what Success Looks Like and Publish Performance Data

Work out what success looks like for your service and identify metrics which will tell you what's working and what can be improved, combined with user research.

All too frequently the business objectives or challenges a solution is trying to meet or solve are lost, not tracked and in almost all cases not actually defined in the solution.

In Pega, the business objectives, the requirements, and the user stories (specifications) are encapsulated in application definition rules which can be linked to the functional components themselves. This provides traceability on where in the solution a specific business objective is met and along with reporting data how the solution is performing.

With the ability to rate business objectives in terms of priority and complexity, the Application Analysis Dashboard can help drive the priority of the delivery.

In addition to business objective tracking, the Pega platform has extensive reporting features that support the tracking of work throughput.

The Pega Platform includes native reporting capabilities and out-of-the-box process management reports. These include reports that capture through-put quality that will allow Government departments to highlight areas for continuous improvement.

In addition to the standard reports, the native Pega Report tool allows users to build their own ad hoc/custom reports. A report wizard automatically takes you through the steps required to create these. Further, an ad hoc report, once created, can be added to a list of standard reports, and will not have to be re-created the next time it is called.

Many of the out of the box reports centre around the adherence to service levels, which provide a high value indication of processing performance

Pega reports on productivity and process metrics such as performance by individual, how successfully service requests were fulfilled, customer satisfaction, etc. The system has an extensible Key Performance Indicator (KPI) capability to allow dashboard representation of aggregate goals and specific strategic initiatives. KPIs can be reflected in reports that are available via the user portal, a dashboard, or scheduled to be sent out via email.

KPIs can be defined using business rules and stored within each case. They can be included in reports and dashboards and tracked and monitored as part of SLAs. KPIs can also be customised based on the type of case.

Out-of-the-box about 80 reports are provided that give insight on all major processing characteristics like: volume cases processed per user/department/business line, work queue volume, number of cases exceeding service levels, average task handing metrics, etc.

11. Choose the Right Tools and Technology

Choose tools and technology that let you create a high-quality service in a cost-effective way. Minimise the cost of changing direction in future.

Pega has a number of concepts that lend itself to the attributes required to choose the right tools and technology.

Build for Change & Agility

Pega is proven to be faster to configure and deploy. As mentioned earlier, data tells us that Pega provides deployments that go live 6.4x faster than traditional applications. The benefit to our customers is a rapid ROI of months vs. years. As mentioned, best practice to build an application is to leverage the agile SCRUM methodology, along with co-production with customer resources, who are expected to complete Pega training courses prior to working with the team. We find with this approach, we can significantly reduce total cost of ownership. Additionally, we've changed the way we gather requirements for applications, with business and IT collaborating in synchronicity, making it 8x faster to create applications. We've also eliminated voluminous requirement documents by capturing them in the models, then executing those models in real-time, without code.

Our Build for Change approach provides you with software that is designed to be configured and modified by your business users. Feature-rich applications easily connect to your existing data sources and eliminate upfront development costs. Pega maximises your existing investments by easily wrapping around legacy apps and then extending their functionality to rapidly evolve your business. Pega enables customers to extend and configure an application tailored to the specific operational needs and resolution goals of the enterprise. Therefore, it is not necessary to initiate change requests with Pegasystems to modify application functionality.

Maximising specialisation and reuse saves time and money as you scale your solution or extend Pega to other parts of the business. It is 8X Faster to introduce a new change and reuse layers for new lines of business. In contrast to traditional code-based development methods, this approach greatly accelerates application development speed and efficiency via reuse; solidifies standardisation across the enterprise; and results in significant measurable Total Cost of Ownership (TCO) payoffs in management of the system (e.g., if a global change is needed you change it in one place and all the layers above the global level inherit this change automatically). This foundation is the underpinning for Pega's strategic application capabilities and allows you to easily roll out processes of increasing complexity across the entire enterprise.

Focusing on the minimum lovable product and/or Quick Win packages produce a faster ROI. By focusing your implementation on packages proven to deliver functionality quickly, within 90 days or less, to begin your transformational journey, you open the doors to immediate victories and future add-ons. Additionally, should you choose to focus on creating the minimum lovable product (MVP), your result will be rapid delivery of scoped phases, with releases planned at a cadence that makes sense for you.

With Pega, you spend less and get more, and develop your applications more quickly, resulting in systems that are built for change.

Re-Use Architecture

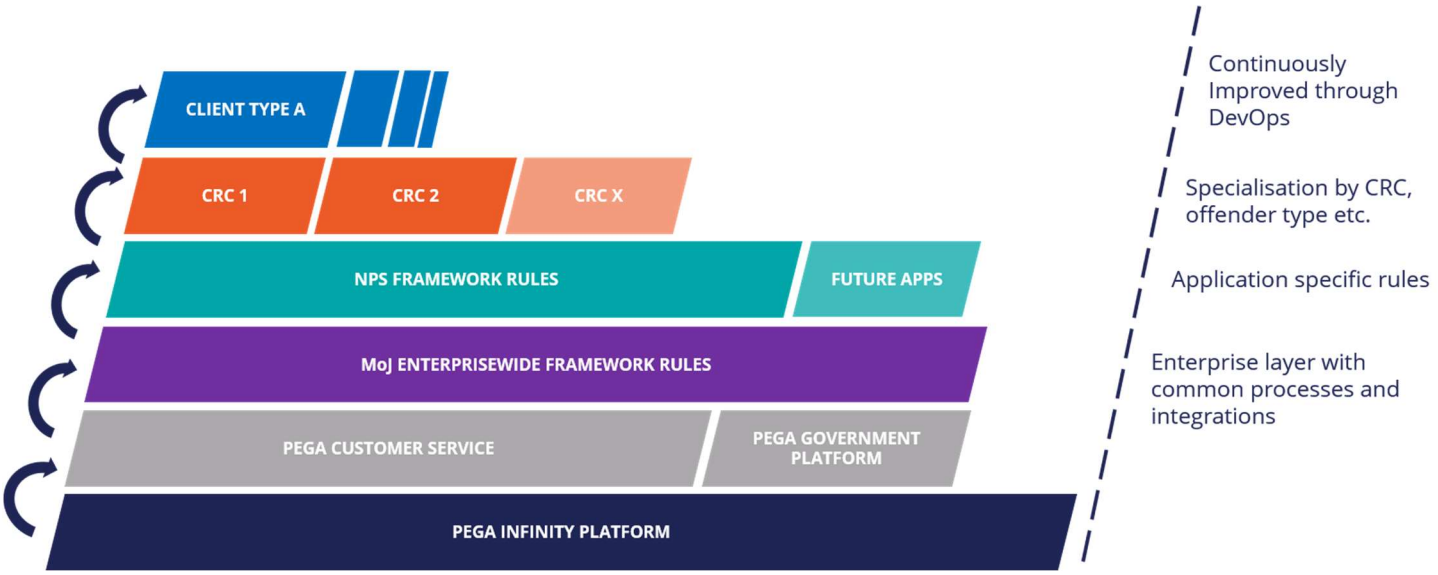
Our technology is designed from the ground up to manage the complexities of a multi-dimensional business. We capture the variations for each dimension in a patented architecture called Situational Layer Cake. Everything built in Pega – processes, rules, AI, data models, UI – is organised into layers. You can roll out new products, regions or channels without copying or recoding the application, maximising reuse while giving business owners control.

Pega models, organised into the Situational Layer Cake, are small and atomic, designed to be assembled together into larger processes and full applications. You can easily visualise the application layers for case processes and sections, including work areas and views. Models with common functionality such as the Pega product itself, Enterprise-wide integrations, and your core application are layered at the bottom. Additional layers are built up to add new capability or to supersede models in the lower layers. This approach allows common assets to be easily reused without copying, but also allows each business area to build the specialisations they need to differentiate themselves. When a user accesses a Pega application, they are given—based on their access rights and the type of work they are doing. — a particular slice of the cake. Within that slice, Pega dynamically assembles exactly the right rules, processes, screens, etc. for that request, starting with more specialised versions and dropping to more general options if a specialisation isn't found.

Since everything within Pega—the rules, the process models, the UI's, even the definitions of external interfaces—is stored in this layer cake, it's possible to both reuse and specialise all aspects of a business application.

Layers of the "cake" are independently versioned, and the version is taken into account when the slice through the Layer Cake is taken. Unlike traditional approaches, where applications are bound to a version at build time, Pega's approach makes versioning a runtime consideration. This means that multiple applications and application versions can run out of the same environment: older versions of a process can be "grandfathered" in to support already running processes, new versions of rules and processes can be pilot tested without the configuration of a separate pilot infrastructure, unwanted changes can be easily rolled-back without taking the system down.

It's dramatically easier to build a system this way than it is to try to pre-define every possible combination and program it in advance. It's also much easier to change! The Situational Layer Cake results in a system architecture, making it easy to document and even run the versions of processes and rules that may have been active months, even years prior, simplifying compliance and audit requests, and eliminating the need for expensive and error-prone manual documentation of code.



12. Make New Source Code Open

Make all new source code open and reusable and publish it under appropriate licences. Or if this isn't possible, provide a convincing explanation of why this can't be done for specific subsets of the source code.

Technology Code of Practices no. 3 & 4

13. Use and Contribute to Open Standards, Common Components and Patterns

Build on open standards and common components and patterns from inside and outside government.

Technology Code of Practices no. 3 & 4

14. Operate a Reliable Service

Minimise service downtime and have a plan to deal with it when it does happen.

Pega can be configured in a way that supports no single point of failure. The Pega Platform provides a mixture of specific high availability features that are mixed with platform vendor solutions for database mirroring/DR and application server clustering to provide a comprehensive solution with no single point of failure. All functionality is separated logically and physically to avoid single point of failure.

Pega provides redundancy/failover at the database tier using database vendor specific features and products. For example, with Microsoft we would use Database mirroring; with Oracle we would look to their database replication technologies; or if the application was suitable, we could create active-active databases, for immediate failover. Products such as Oracle Data Guard provide the fail over capabilities, and the JDBC drivers

would be failover aware, having an Availability Group of databases to connect to in the event of failure. Since Pega is an open system, we support most DR mechanisms our customers use, hardware or software based for the database and application tiers. We use failover technologies to conduct controlled upgrades without disruption of user access in production.

Specific to Pega Cloud deployments: The Pega Cloud Database Replication service protects production environments by deploying a real-time database mirror in a different availability zone (within the same Amazon Web Services Region).

As a JEE application, we enable Disaster Recovery (DR) solutions using vendors own products (for the application server and the database) or third-party replication products. DR is achieved firstly at the data level, using a database mirroring or syncing utility to store the data at a different site. Next, at the application server level, the App Servers can either be clustered (in a combined load-balancing solution) or the App Servers at the DR can wait to be spun up when required. As Pega's unique architecture stores both all of the work/ data AND all of the configuration in the database, the new site will immediately download the latest application configuration locally AND resume the work. Pega's persistence of all data (both developmental and work related) to the central database means that any database DR solution will work with Pega.

In a traditional on-premise installation scenario, in the event of an interruption or failure, Pega will store locally any in-process work through business rules workflow. Our Zero Disruption Architecture allows the user to resume processing from the stopping point, and the application only commits to the database at the end of a successful transaction, so there is no need to roll back a transaction at the database level unless the failure occurs mid-commit, at which point the database will roll-back the transaction. Backup/ recovery is performed via standard utilities that are included with your databases.

For the Pega Cloud deployment, if there was a failure in service on a production environment, we would failover to a warm site to bring production services back online. For a development or test environment, we would recover to instances in another availability zone or region with the latest backup that is available. Pega Cloud is hosted by our IaaS partner Amazon Web Services. At time of deployment customers can choose from a list of available AWS Regions in which Pega Cloud data centres are available.

Pega Cloud data centres are located in the following regions: US East and US
West; Singapore; Australia; Japan; Brazil, South America; Germany; Ireland and London. Pega Cloud customer environments and the business applications and data deployed in them are protected by multi-zone automatic failover and fully replicated database and application instances. The Pega Cloud Database Replication service protects production environments by deploying a real-time database mirror in a different availability zone (within the same AWS region). Failover to the production mirror is automatic, with a recovery point objective (RPO) of approximately 1 minute. This is the maximum amount of time during which data might be lost from a customer database. The recovery time objective (RTO) is approximately 4 minutes. This is the targeted time to restore the customer's cloud service.

About Pegasystems

Pegasystems (NASDAQ: PEGA) develops strategic applications for sales, marketing, service and operations. Pega applications streamline critical business operations, connect enterprises to their customers seamlessly in real-time across channels, and adapt to meet rapidly changing requirements. Our Global 500 customers include the world's largest and most sophisticated enterprises. Pega applications, available on-premises or in the cloud, are built on the unified Pega Infinity © platform, which uses visual tools to easily extend and change applications to meet clients' strategic business needs. Our clients report that Pega gives them the fastest time to value, extremely rapid deployment, efficient re-use and global scale. For more information, please visit us at www.pega.com.