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Introduction to Determinations Engines

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Executive Overview

IT tools and approaches can deliver significant benefits to policy implementation and operations in government. This paper explains how modern Determinations Engine software allows government agencies to operationalize even very complex policies consistently, accurately and cost-effectively. Oracle provides standard Commercial Off The Shelf (COTS) Determinations Engine software which governments use to automate complex decisions that affect citizens.

Introduction: What is a Determinations Engine?

A Determinations Engine takes human knowledge and converts that knowledge into a computer-generated problem solving application. A Determinations Engine is a class of business rules engine, but one which caters especially for the very complex requirements of government, and in particular to governments' requirement to translate thousands of pages of frequently-updated legislation and regulations into automated decision systems

Which Decisions Can Be Automated?

To understand what a Determinations Engine is, consider a person who is an expert income tax lawyer. That person has spent many years reading and learning legislation, cases, policies and guidance in an effort to answer questions like: "how much tax should I pay?" To answer that question, the lawyer will have translated legislation, regulations and other government policy instruments into rules, for example:

- "If you earn between X and Y, you need to pay Z% income tax"; or
- "You are eligible for benefit A if you fulfill criteria B and C".

A citizen wanting to know how much tax to pay could go to that lawyer to find out. The lawyer should:

- be up-to-date with the latest changes to the law;
- ask the taxpayer pertinent questions (not every possible question);
- tell the citizen the right answer every time, or tell the taxpayer what additional information is required in order to reach a conclusion;
- be able to clearly describe and justify the reason for the answer; and
- show the citizen the relevant laws or policies which influenced the decision.

These are exactly the types of decision which a Determinations Engine can automate — consistently, accurately and cost-effectively. A policy expert or business analyst can write rules to be applied by a Determinations Engine, and can easily verify that the rules faithfully mirror the governing statutes, regulations and policy — and give the correct results. Citizens or other IT systems can then access the Determinations Engine and either submit a specific set of data and request an answer, or be guided by the Determinations Engine application to answer relevant questions which will be used to generate automated advice or decisions.

How Are Determinations Engines Relevant in the Public Sector?

Interactions between citizens and government are governed by very complex rules. These rules are dictated by statutes, regulations, policy, guidelines, precedents and case law.

Consider the following examples:

- "How much tax should I pay?"
- "Am I eligible to claim this benefit?"
- "How do I set up and register my new business?"

There are three general options to handle these complex interactions or decisions:

Option 1: employ rooms full of highly-trained people to manually process and make decisions. However:

- this approach is very resource-intensive and requires extensive and detailed training to be provided to adjudicators;
- it spreads human decision-makers across an entire workload, rather than focusing human attention on the most complex or difficult cases which most require human involvement; and
- decisions are more likely to be inconsistent and therefore subject to challenge than if they were automated.

Option 2: write a specific, customized computer program to process the data and make decisions. However:

- these systems are normally difficult, complex and expensive to write, and it can be difficult to accurately forecast the cost of a project that will implement such a system;
- these systems can be difficult, complex, expensive and slow to update when the laws, legislation and policies change, due to a constant need to translate between the government policy documents and the highly abstracted and transformed computer code that implements the rules; and
- it is often difficult to integrate the custom code into other applications.

Option 3: *select a modern, best-in-class Determinations Engine to implement complex rules*. By selecting the right software, organizations can work with a small core group of content experts to build and maintain rules more quickly, effectively and accurately than is possible with more traditional approaches. The Determinations Engine software should:

- allow statutes, regulations and other policy documents to be very quickly transformed into automated decision-making systems;
- integrate with existing applications and be rapidly web-deployable to provide real-time interactive advice to citizens;
- allow rules to be written once and used across multiple service-delivery channels, including web self-service, call centers, customer service desks and for automated batch processing; and
- enable policy workers in government organizations to implement policies very quickly, by building business content direct from policy documents, allowing rapid deployment by IT personnel.

Are There Other Benefits to Using a Determinations Engine?

There are several additional benefits to using a Determinations Engine, as described in Option 3, above. These additional benefits over manual processing and custom-built systems include:

- significant improvements in the accuracy and consistency of decisions, because the automated system can be built directly from the governing policy documents;
- automatic production of a clear audit trail, which links each point of the decision process back to specific provisions of the original source material;

- increased ability for knowledge workers and citizens to learn about the rules that affect them while conducting everyday transactions, as the Determinations Engine steps them through the rules which are relevant to each scenario that arises; and
- rapidly deployable self-service capabilities, which allow the software to automatically determine relevant questions to ask a citizen or an employee online, and then to generate personalized advice, with an explanation of the decision.

Sample Applications for Determinations Engines in Government

Determinations Engine software is already used by national, state or provincial and local governments around the world. Sample applications for the software include:

Social Welfare/Human Services — "Which benefits will provide the most appropriate assistance to a particular citizen?" or "What is the amount of benefits payable in a given set of citizen circumstances?"

Tax — "Am I eligible for a tax credit and how much is it worth?" or "Do I need to pay taxes as an employee or as an independent contractor?"

Customs — "Does a particular shipment of goods need to be inspected?" or "How much duty does an importer need to pay?"

Immigration — "Is an applicant eligible for a visa to visit our country, and which of the many visa options is the best fit for the circumstances?"

Healthcare — "Am I eligible for government-funded or subsidized medical treatment and how much am I allowed to claim?"

Departments of Motor Vehicles — "Am I eligible to transfer my license from another state, and what is the legally required documentation to support my application?"

Airport and Seaport Billing Applications — "What amounts should be billed to each airline or shipping or cruise company based on that company's complex contract with the port authority?"

Grants — "Does my project meet the funding requirements for an economic stimulus program?" or "Is my business eligible for subsidies?"

Approvals — "Does a building plan meet the requirements for approval under state/provincial or local planning laws?"

Small Business Assistance — "What are the requirements to register a small business under local law?" or "How does employment law apply to different situations encountered by small business owners?"

Human Resource Management — "How do complex union rules and collective agreements apply to each of my employees' circumstances?", "Am I eligible for maternity benefits and what are my options?", "Will my employer pay me a Higher Duties Allowance if I act in my boss' job while she is on leave?" or "What are my travel allowance entitlements for a particular complex travel itinerary?"

These are all examples of public sector decisions which are based on significant volumes of complex legislation, policy, departmental guidelines, case law and precedent.

Will a Determinations Engine Work with my Existing Systems, and with Planned New Systems?

The right Determinations Engine package should be fully compliant with modern service-oriented architecture (SOA) principles, meaning that it should integrate easily with any system configured for open integration between programs. Some software on the market is also pre-configured to work with common off-the-shelf software applications — which is an important design principle for Oracle solutions.

Why Choose a Determinations Engine Solution?

The following are some key capabilities that are important for government decision automation applications:

- Ability to transform policy documents (legislation, regulation, policy) directly to executable form. This breaks the standard requirements bottleneck, where teams get stuck in "analysis paralysis" trying to take the traditional approach of defining a data model from thousands of pages of policy and then attempting to express policy rules in technical or code formats.
- Ability for policy experts to work directly with rules, using familiar tools (Word, Excel) in natural language.
- Ability to see clearly and at-a-glance that the rules implemented in the system match the policy, ideally by retaining the same language and structure as the original policy material throughout the rule lifecycle.
- Ability to simulate future policy changes, to see the impact of those changes on the citizen base, and to very rapidly implement changes.
- Ability to process against multiple versions of rules, e.g. retaining rules for multiple years; and to process across multiple versions of customer circumstances, e.g. when incomes and family structures change. The software should do this without requiring custom code to aggregate the results from each version of the rules and circumstances.
- Ability to write the rules once and to deploy a single set of rules for multiple purposes, e.g. the same rules for web self-service applications and also positioned as an enterprise service that can be called by CRM, ERP, custom and legacy systems.

Conclusion

Government organizations are unique in both the volume and the characteristics of the complex rules they need to apply day-to-day. The Determinations Engine approach to automating decisions recognizes the unique requirements of government, by allowing policy and business experts to work

closely with statutes, regulations and other policy materials, and to very rapidly transform them into automated decision-making applications. These experts work with the policy materials using familiar business software, while the Determinations Engine allows a common set of an agency's rules to be deployed in an IT standards-compliant manner for consumption by multiple IT applications and across multiple service-delivery channels.

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