NIA Project Registration and PEA Document

Date of Submission

Dec 2016

Project Reference Number

NIA_NGGT0104

Project Registration

Project Title

Cognitive Technology for Technical Standards

Project Reference Number

NIA_NGGT0104

Project Licensee(s)

National Gas Transmission PLC

Project Start

December 2016

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Richard Waine, box.GT.innovation@nationalgrid.com

Project Budget

£460,000.00

Summary

Cognitive Technology is a significant opportunity to revolutionise analytics of unstructured data and decision making across Knowledge spheres in Gas Transmission. The vision is for an intelligent system that can capture knowledge, expertise and experience supplied in any format. In turn, this will provide a powerful capability to inform decisions based on the best practice across a range of business knowledge spheres. A key element to achieving this vision is to identify suitable methodologies for interacting with cognitive technologies, in particular when capturing from individual experts within the business who provide the information verbally based on their own wealth of knowledge and prior experience.

This project will develop a pilot using the IBM Watson core engine, which will capture knowledge from 630 Technical Standards Documents and use cognitive techniques to provide intelligent, reasoned responses to queries. In addition, the process for Third Party Enquiries (known as SSW/22) will be included, to demonstrate the ability of cognitive technology to remove the manually intensive element of information interrogation and cross referencing as part of key business processes, and to reduce the reliance on technical experts with more common enquiries. Natural language conversational interfaces will be demonstrated that will allow untrained users, whether internal or external, to interact with appropriate National Grid business processes.

The Third Party Enquiry Process is required to ensure that third parties carrying out work in the vicinity of National Grid high pressure gas pipelines (above 7 bar gauge) and associated installations take appropriate measures to prevent damage. Any damage to a high-pressure gas pipeline or its coating can affect its integrity and can result in failure of the pipeline with potential serious hazardous consequences for individuals located in the vicinity of the pipeline if it were to fail. It is therefore essential that the procedures are complied with when working near to a high pressure, above 7 bar gauge, pipeline. Third Party Enquiries which are received require our team of experts to carefully consider each case, cross referencing a number of technical standards, sources of information and experience and expertise of colleagues in order to process each case. The demand on knowledge from a range of sources, requiring intelligent cognitive technology makes this process an ideal candidate for the pilot programme.

Third Party Collaborators

IBM

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

As an asset manager responsible for 7,500km of pipeline and assets, National Grid has a vast distribution of knowledge spread across a wide range of sources. A large proportion of knowledge is held by our employees through their experience and expertise and in many cases this is not captured in a tangible form. The source of knowledge is varied, and can be internal or in some cases external. It is often in an unstructured format. A number of routine, complex and critical processes rely on the interpretation of this knowledge by individuals to execute the process. The Gas Transmission business faces three core challenges associated with Knowledge retention and subsequent decision making 1) Engineering knowledge is dispersed across over 600 technical standards, numerous associated reports and supporting data; 2) The business has an ageing workforce and a number of experts are nearing retirement age; 3) The regulator and commercial environment requires greater agility and efficiency in decision making.

Cognitive Technology differs from traditional computing methodologies in that it is capable of handling unstructured data; building & retaining knowledge; understanding natural language; applying reasoning and learning from interactions with humans. The technology is an opportunity to address the business challenges listed above through the capture of knowledge spread across various sources, alongside the experience and expertise of individuals to create an amalgamation of knowledge and information. On completion of knowledge curation and system training, cognitive technology will provide a tangible and intelligent method to interrogate this knowledge in a timely, effective and consistent manner. Achieving this will unlock the full potential of the knowledge contained in technical standards, making more informed, consistent decisions that deliver the greatest value to our customers.

Method(s)

The project aims to prove the concept of capturing a subset of existing knowledge and information within Gas Transmission through the application of Cognitive Technology. The subset chosen is the 630 standards documents and in particular information supporting the Third Party Enquiry Process (SSW/22), which will be included as part of the trial, as it currently requires a large amount of information interrogation and cross-referencing.

The Cognitive Technology tool that has been identified as a candidate vehicle to build this cognitive capability across the suite of Gas Transmission knowledge is the IBM Watson core engine. During this project, these capabilities will be configured and developed for specific use cases which involves R&D concepts of – content annotation, natural language querying and conversational based interaction.

This project will result in a pilot which will be achieved in 3 key stages:

Build a "Engineering Standards Cognitive Advisor" - A repository of all relevant standards with capability to quickly find concise answers to questions regarding the standards. The application will demonstrate helping users find the most relevant information for their query by using a combination of search and machine learning algorithms to detect "signals" in the data, thereby demonstrating cognitive search across the Gas Transmission Operator (GTO) business.

Build a "Engineering knowledge cognitive advisor" - A repository of all relevant standards, third party enquiry process and supporting information with capability to search , explore and interpret the content in a cognitive manner. The advisor will provide a unified information application and build upon the work completed for the Engineering Standards Cognitive Advisor.

Build a "Cognitive conversation bot" – A conversational messaging application with that facilitates a natural language based conversation between a user and a "cognitive knowledge advisor" that guides a user through successful completion of common repeatable business processes.

Scope

Cognitive Technology is a significant opportunity to revolutionise analytics of unstructured data and decision making across Knowledge spheres in Gas Transmission. The vision is for an intelligent system that can capture knowledge, expertise and experience supplied in any format. In turn, this will provide a powerful capability to inform decisions based on the best practice across a range of business knowledge spheres. A key element to achieving this vision is to identify suitable methodologies for interacting with cognitive technologies, in particular when capturing from individual experts within the business who provide the information verbally based on their own wealth of knowledge and prior experience.

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Objective(s)

The objective of the project is to assess and demonstrate the application of cognitive technology in an Asset Engineering sphere of knowledge. The project will build a corpus of knowledge across National Grid's Technical Standard Documents and Third Party Enquiry process (SSW/22), allowing the application of three tools from the IBM Watson suite. The tools will be trialled to demonstrate how it can engage intuitively with its users to learn from training and feedback to discover insights across the knowledge repository. These insights will aide in decision making by removing human biases and providing intelligent evidence based inferences based on industry best practices. The project will produce a test environment of both the engineering knowledge and standards advisor that can be transferred to Business as Usual at the end of the project. A demonstration of the Conversation Bot will be produced to demonstrate the application of this technology in a Gas Transmission Stakeholder environment. The system development and training elements supporting delivery of the three use cases will enable the business to develop a value assessment tool. This will enable Gas Transmission to assess the potential of cognitive technology in the engineering knowledge sphere and support targeted future deployment to fully leveraging the value of the tool.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Success will be delivery of the three stages stated above. This in turn will enable the testing of decision making based on the reasoning and recommendations of cognitive technology. The technology should enable the business to better leverage subject matter experts through reduction of low level standards enquiries; enhance the technical standards development process driving value through more agile responsive and consistency standards; significantly enhance the ability of technical standards users to interrogate technical standards; drive efficiencies in the third party process and demonstrate the potential to provide a conversation bot to external stakeholders. Further, this proof of concept will enable the business to understand how cognitive technology can bring benefit to knowledge spheres; identify areas for application and assess business value.

Longer term, this project will inform the wider vision for an intelligent system that can capture knowledge, expertise and experience supplied in a variety of formats, and to provide a powerful capability inform decisions based on the best practice across a range of business processes.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project is desk based utilising the IBM Watson core engine which is cloud based alongside IBM Watson Explorer (on-premise installed software), inputting knowledge and information from a range of sources.

Technology Readiness at Start   Technology Readiness at End

TRL3 Proof of Concept	TRL5 Pilot Scale

Geographical Area

Within the National Grid and IBM offices.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£460,000

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

Knowledge is retained in a variety of sources from policies, specifications, regulations but also in our employees through their wealth of expertise, experience and abilities. Capturing this and disseminating this knowledge consistently across the business is vital to ensure we do not lose this knowledge indefinitely when employees move on from their role. There have been many cases in the past whereby incumbent employees have spent up to a year "shadowing" experts, in order to facilitate knowledge transfer, maintaining high levels of expertise to be retained by the business. Even this cannot possibly ensure that all knowledge, nuances and exceptions to problem solving and best practices are retained. When considering this against the current Gas Transmission Engineering population, there are at least 60 recognised Technical Specialists. It is estimated that on average these individuals are spending 20% - 40% of their time on subjects associated with technical standards, resulting in an annual cost of £2m-£4m (5,000 to 10,000 hours). This proof of concept will enable the business to quantify the potential savings available to the business in this area.

Additional savings are available in the areas of user interactions with technical standards, risk reductions and agile technical standard development. These will be further understood following completion this project.

Please provide a calculation of the expected benefits the Solution

Project is at TRL 3 - N/A.

Please provide an estimate of how replicable the Method is across GB

This project is a proof of concept which focuses on an issue prevalent to all Gas Networks and to the wider engineering industry as a whole. Vast quantities of data, coupled with knowledge, experience and expertise is spread across organisations and being able to quantify this before it is lost from the business is a significant challenge. This project informs the methodology for "training" Artificial Intelligence to be able to apply Cognitive Technology to complex information in order to provide accurate, justified decisions based on best practice. This contributes towards the potential for expanding the knowledge within the Cognitive Technology to support a wider range of processes.

Please provide an outline of the costs of rolling out the Method across GB.

Not currently established. Core learning will be transferable between a variety of business processes.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The project addresses a problem of knowledge transfer present for many Network Licensees and the development of tools and techniques to efficiently capture, manage and interrogate this knowledge would be beneficial to all.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

The project is aligned to our Strategic Theme.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

This project has been approved by a senior member of staff

☑ Yes