



# Cognitive knowledge management

## Executive Summary

In this paper, we take a strategic view on how cognitive systems will play a key role in delivering effective knowledge management in UK's engineering and asset intensive companies. Globally, energy and utility companies are facing a period of unprecedented change as a result of economic, regulatory, environmental and sustainability pressures. In the workforce, ageing generations risk retiring, retaining these and handing knowledge to new entrants is time consuming using traditional methods. Equally, reskilling the 55+ bracket to meet evolving technology demands is difficult. Learning preferences differ across age groups, it is not sustainable, attractive, or for many, competitive to continue with traditional training methods. More efficient ways are needed to retain years of explicit and tacit knowledge and share it with the next. IBM has been developing knowledge management corpuses and virtual assistants to guide the newer and older generations through the long list of tasks and demands needed in the current technology revolution, increasing right first time and job productivity, it is time industry adopt this new technology.

## Cognitive Knowledge Management

Every second, cognition, the mental action or process of acquiring knowledge and understanding, is happening. Our brains process incredible amounts of data. We constantly evaluate every incident by putting it into context (understanding), going through multiple stages of analysis (reasoning), learning and then deciding on how to act. Humans have long relied on tools and more recently computers to expand the power of our cognitive abilities. For the better part of 60 years, these tools have presented themselves in the form of programmable computers all of which have helped us to become more effective. However, the data revolution and explosion in data is driving the need for a new technology to keep pace: Cognitive Computing.

## What is Cognitive Computing?

Cognitive computing systems are able to:

- learn how to behave from being taught
- support forms of expression that are more natural for human interaction
- continue to evolve as they experience new information, new scenarios, and new responses

## IBM is bringing Cognitive capability to business with Watson

Watson is a Cognitive System that can understand, reason, learn and interact across the entire data universe, helping businesses and organizations scale expertise to meet new and evolving challenge.

Woodside are harnessing the power of IBM Watson technology and cognitive

computing to extract meaningful insights from 30 years of complex engineering data to enable fact-driven decision making on complex projects.

Woodside are realising 10 million AUD savings in employee costs because of faster access to and more intuitive analysis of engineering records. The geoscience team is realising a 75% reduction in time spent by the team reading and searching through data sources.

## **Knowledge Management Theory**

As defined by Davenport and Prusack (1998) 'Knowledge is a fluid mix of framed experience values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information'. In today's dynamic business environment, the importance of knowledge is becoming increasingly pronounced; it can be used to reduce project time, improve quality, customer satisfaction and minimize the 'reinventing of the wheel syndrome' as suggested by Love, Fong and Irani (2005)

Knowledge is broadly classified into two categories, tacit and explicit. Tiwana (2002) defines tacit knowledge as 'personal, context specific knowledge that is difficult to formalise, record or articulate; it is stored in the heads of people'.

Tacit knowledge as intuition, experience, judgement, assumptions and intelligence is developed over time through trial and error process. Some theorists believe there also exists a middle ground between tacit

and explicit knowledge, they call it implicit knowledge.

Implicit knowledge is the subset of tacit knowledge that can be transformed into explicit knowledge. Knowledge, which could be codified if subjected to some type of a mining or translation process, is another view of implicit knowledge. It is this process of creating implicit knowledge which is important to cope with the challenge of the data explosion, knowledge retention and the new learning requirement of Generation Z.

Key to knowledge creation 'lies in the mobilization and conversion of tacit knowledge' Nonaka and Takeuchi (1995).

The common theme that came across while analysing the challenges as well as the growing need to manage knowledge was a need for a system that enables "creation, transfer, utilization and retention" of knowledge. How knowledge can be created by communities of practice, transferred to members/users, utilised and subsequently upgraded and retained. The diagram below draws a framework for how these common themes can interact, addressing the knowledge challenge of asset intensive, engineering centred companies.

## **Why use Cognitive Systems for Knowledge Management?**

Cognitive Systems can navigate the complexity of human language and can read and understand unstructured information like blogs, tweets, newspapers, videos. They get progressively smarter with every interaction and use.

## What could this mean for the workforce?

**Generation Z:** The terms, “millennials” and “Generation Z” (a term derived from the novel<sup>1</sup> by Canadian, Douglas Coupland) are used to define those people who are between approximately thirteen and twenty-one years old in 2017. It is this generation that will become the new back bone of the UK work force. However, the difference between the new and ageing work force is significant when compared to previous generation shifts.<sup>1</sup>

**Ageing Workforce:** The UK population is ageing and is affecting us all. It is estimated that by 2022, some 12.5 million jobs will be opened up in the UK through people leaving the workforce, mostly through retirement or ill-health. Over the same period an estimated two million new jobs will be created. How does a company manage this exodus of knowledge, attract and recruit new employees and quickly bring them up to speed?

It's long been felt that experience and knowledge residing in the minds of ageing individuals who when retire take this precious knowledge with them. Employers must consider how they retain corporate knowledge, either by retaining employees beyond 55 or enabling new entrants to readily absorb the knowledge. Countering the early retirement appeal with changes to working practice or role is one approach.

Retaining staff in the same roles until the state pension age of 67 is difficult. In the Energy and Utilities industry, Field Technicians are often overwhelmed with information and lack an effective way to

diagnose problems. Reliance is on both experienced technicians but also those able to maintain pace with new technology, it is rarely the manuals that are used to resolve the issue. Blending together new technology competence and established engineering knowledge is key to all age groups successfully adapting to the latest challenges.

The TUC was recently tasked by the government as to how it will retain it's members in the workplace between the age group of 56 to 67, whether that be in their current jobs or in taking up new roles. Too often, the barriers to starting a new role after 55 is the perceived amount of new learning and training needed. Traditional apprentice style on-the-job learning is lengthy and costly. A new learning approach can be enabled by technology, one that appeals to both new generations and the established. With that, a new series of apprentices can be introduced, blended from the two pools of workers. Teaming the tech savvy with the work savvy, productivity will be maximized, overcoming the fears around technology and artificial intelligence while sharing the learned skills from experience in the workplace. Co-learning and working together with a learning platform that informs new (and often existing) employees the answers to the “how to” and “how do I” to many everyday tasks can drive up right first time, drive down job duration and drive up overall productivity.

Surveys from IBM Institute for Business Value<sup>2</sup> show us that Generation Zers are comfortable using interactive online tools, but that they prefer interactions with others

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<sup>1</sup> *Generation X: Tales for an Accelerated Culture*; Coupland, Douglas; St. Martin's Press, 1991.

<sup>2</sup> *Institute for Business Value*

to be in-person and personal. They like to have a diverse, collaborative, innovative workplace. In leadership roles, their thinking echoes this, they prefer to lead and participate in a *collaborative* working environment and one that builds a consensus approach to solutions. Engagement and *co-creation*; transparency and authenticity are touchstones. As this generation enters the workplace, it is ineffective to not tailor the work environment to these needs. In many field roles, once beyond the buddy training period, employees become lone-workers, working single-handedly to resolve tasks and customer issues with little chance to collaborate with colleagues.

Individually, they want to be distinctive but they also cleave to the concept of disruption, in the sense of being innovative, inventive, unconventional and experimental. Yet conversely, these people look themselves for both *credibility and continuity* in brands, in products, in services.

Employers must recognise that traditional classroom based learning, with reliance on manuals, library based knowledge management and sharing will be boring and unattractive, affecting recruitment and retention.

### How are companies adapting to these needs?

Woodside Energy had no systematic way to tap into the 30 years of engineering and drilling knowledge that lay buried in unstructured documentation and with its most experienced engineers. To ensure the next generation (Z) could successfully carry the torch, Woodside knew they had to harness the instinctual know-how of their best employees. This goal was to create a cognitive business to augment and share their tribal knowledge which is

embedded in large quantities of industry information.

Working with Watson, Woodside Energy built a customized tool that allowed its employees to find detailed answers to highly specific questions, even on remote oil and gas facilities. Watson ingested the equivalent of 38,000 Woodside documents, this would take a human over five years to read. This corpus of knowledge evolved into Willow, Woodside's cognitive solution powered by Watson on IBM Cloud. Woodside's employees can ask Willow questions in natural language, like

“What is the maximum weight of a helicopter landing on the platform?”, and Willow will respond accordingly.

Reference: 70 Miles From Shore with Watson: Woodside Energy and IBM <https://www.youtube.com/watch?v=GFZ2IaTVkY8>

### Conclusion

This paper has outlined some clear obstacles within asset intensive companies, foremost the retention of knowledge from an experienced ageing workforce that can be transferred to a new generation of employees, both old and new. The information retained must be accessible in a way that is adapted to younger generation's working and learning methods, teaming these with experienced workers re-skilling in a new profession. Interactive and personal elements are necessary to make the consumption of information attractive, ensuring retention.

Cognitive computing tools, such as IBM Watson create a platform in which implicit knowledge from a workforce can be captured quickly, correlated into a

database and distributed in a style that adheres to interaction preferences.

The use of Cognitive Systems such as Watson allow for efficient solutions in knowledge transfer between generations, and has the ability to consume complex unstructured data whilst adapting and learning with each interaction.

## **About the author**

Palash Banerjee is an Associate Partner in IBM's Cognitive Solutions Team. With over 18 years of experience he has significant knowledge in data/information management, analytics, business intelligence, program management, operational management and global sourcing. He has worked in UK, Germany, France, India and USA and has a track record of successful practice management; program and project delivery bringing measurable benefits to clients, first-hand experience of full project life cycle and is well versed in IT industry best practices.

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PO Box 41  
North Harbour  
Portsmouth  
Hampshire, PO6 3AU

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