



It's a Digital World

Digital Content Services

Intelligent Information Management

For the

Fourth Industrial Revolution

By Linda Shave



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**Intelligent Information Management
For the Fourth Industrial Revolution**

By Linda Shave, 2017

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Introduction

We are at the beginning of something new the Fourth Industrial Revolution (also referred to as Industry 4.0). The fourth industrial revolution will change today's workplace and workforce just as dramatically as the second industrial revolution changed the factory floor.

The Internet of Everything is the era where objects are connected with other objects, people, processes, data and things. The Internet of Everything is the state where objects will be connected with other objects and the use of intelligent process automation, artificial intelligence, machine learning, robot virtual workforces, smart machines and drones will become common place.

The fourth industrial revolution will dissolve old business models and will challenge traditional approaches and thinking around information management. The fourth industrial revolution will revolutionise and introduce new pioneering approaches to create a new era for digital content services and intelligent information management.

About this eBook

This eBook is for anyone that has an interest in the future of all things digital or managing digital content and cyber physical systems into the future. It is for those people who like me have a fascination of how the world might look like in the wake of the fourth industrial revolution and the ever evolving connected world.

Opinions, views and statements given in this book represent the author's views only. They are not necessarily endorsed by any business entity, management, group, academia or professional association.

About the Author

Linda is a futurist who has a fascination on how evolving technologies can be used in innovated ways. Linda is acknowledged as a thought leader and an architect of change in the information management arena. She has chaired, facilitated, organised and presented at numerous conferences.

Her innovation, knowledge and expertise have been nationally and internationally recognised. Amongst her numerous industry awards is the prestigious international gold medal laureate for government innovation issued in Washington DC.

Linda is now taking a personal interest in future drivers such as cyber-physical systems, smart cities, smart industries and smart government. Linda also has an interest in intelligent information management, information architectures, semantic tagging and wrappers, digital perpetuation, intelligent process automation, natural language processing and evolving technologies that are yet to be named.

Chapter 1

The arrival of the Fourth Industrial Revolution

- We are at the beginning of something new
- A time line – The fourth industrial revolution and the evolution of the web
- **We are at the beginning of something new**

Today we stand at the beginnings of something new and exciting! The next industrial revolution is here which the World Economic Forum has labeled as the 'Fourth Industrial Revolution' (also referred to as Industry 4.0) and the Internet of Everything (IoE).

IoE is where objects are connected with other objects, people, processes, data and things. It is a world that is linked by cyber-physical systems (CPS) that are meshing the real and virtual worlds together. IoE and CPS will make smart services and products possible. We will see intelligent processing, artificial intelligence; machine learning, robot virtual workforces, smart machines and drones become common place.

-

This new global digital economy will be a world fuelled by omnipresent networks and sensors, independently recognising, collecting, exchanging, processing, analysing and responding to gargantuan amounts of digital data. Such real time digital data is required to manage, monitor and maintain ‘processes’ for smart products and services. Real time digital data needed to fuel smart cities, smart industries and smart governments. (Also see Chapter 7 – What do we mean by digital).

- **A time line - The fourth industrial revolution and evolution of the web**

The fourth industrial revolution will and is changing today’s workplace and today’s workforce even more dramatically than the second industrial revolution changed the factory floor (see Diagram 1 – Time Line Industrial Evolution).

Diagram 1: Time Line – Industrial Revolution

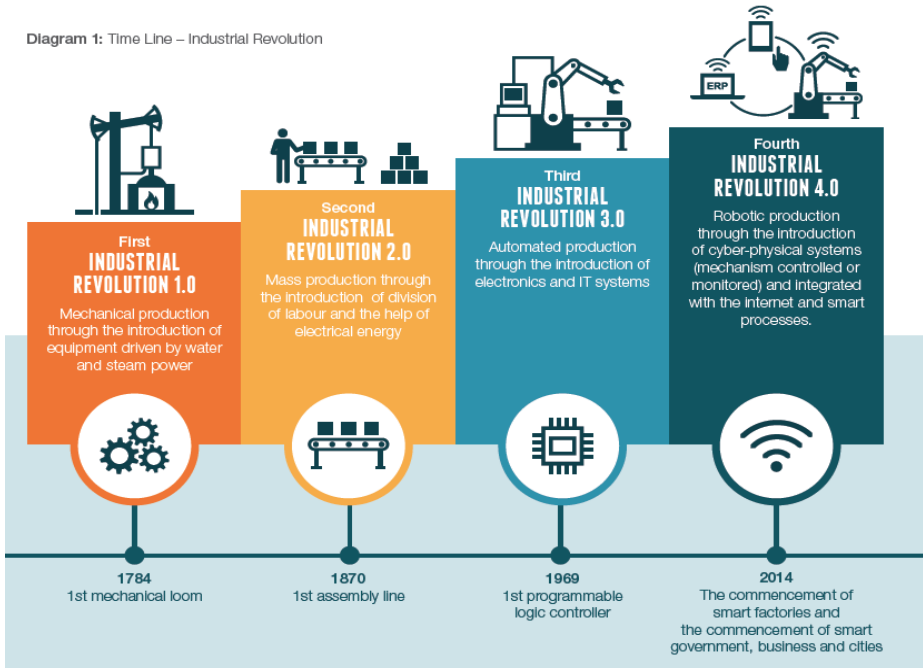


Diagram 1 – Time Line - Industrial Revolution

It is interesting to note that 30 years into the third industrial revolution we saw the start of Web1.0 and the birth of the electronic Government 1.0 in 1996. It took some 45 years to move from the third industrial revolution to the fourth industrial revolution and only 18 years to move from Web 1.0 to Web 3.0 semantic web the Internet of Things (IoT) in 2014. See Diagram 2 – Time Line Web Evolution.

Yet, 3 years later in 2017 we are already experiencing the digital transformation to Web 4.0 the Internet of

Everything (IoE), connected intelligence, omnipresent and the birth of digital Government 4.0. (See Diagram 2).

One question we may need to consider is will the industrial revolution and web evolution continue to advance with shorter time frames between each evolution and if so how will we respond?

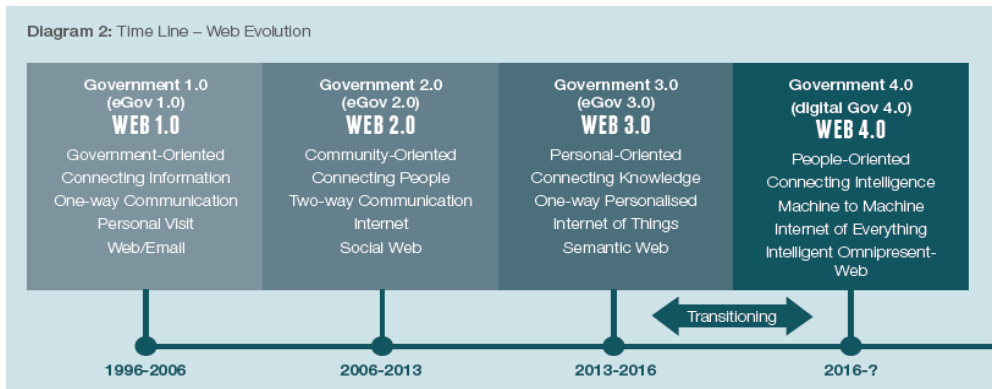


Diagram 2 – Time Line – Web Evolution

Chapter 2

Death of the Term Enterprise Content Management (ECM)

- The Death of term Enterprise Content Management (ECM).
- The Birth of the term Content Services
- **The Death of the term Enterprise Content Management (ECM).**

On the 5th January 2017 Gartner announced that the term “ECM is now dead (kaput, finite, an ex-market name) in a blog [‘The Death of ECM and Birth of Content Services’](#) and that after approximately 16 years the term ‘ECM’ will be replaced with the term ‘content services’. The term ‘content services’ has been broken into two categories, ‘Transactional Content Services’ and ‘Business Content Services’. See Table 1.

These changes in terminology from ECM to Content Services should be seen as an opportunity for records and information professionals and the information management industry as a whole to shape a new destiny.

- **The Birth of the term Content Services.**

From a historical perspective the formal splitting of ECM into the two categories of Transactional Content Services and Business Content Services was first started by Forrester in 2015. In 2017, Forrester continued the practice of splitting ECM into the two submarket groups of ‘Transactional Content Services’ and ‘Business Content Services’.

In Table 1, we can see that Forrester indicates that the underlying components of these ‘content services’ platforms will require ‘foundation repository services’ in order to perform records and information management functions. These core capabilities are expressed as application programming interfaces (APIs) and services.

From the author’s perspective the suggested categories in Table 1 do not appear be addressing the arrival of the Fourth Industrial Revolution, the Internet of Everything (IoE) nor the rise of Cyber-Physical Systems (CPS). See Chapter 3.

Therefore, the author believes that there is a gap and a need for a third category. So in keeping with the theme ‘content services’ I will name this ‘Digital Content Services’. (See Chapter 4).

Type	Description
Source: <i>The Forrester Wave™: Enterprise Content Management — Transactional Content Services, Q2 2017</i> http://www.project-consult.de/sites/default/files/2017-04/Forrester_Wave_BCS_Business_Content_Services_4_2017.pdf	
Transactional Content Services	“Transactional content drives high-volume customer-focused processes. Transactional content often originates outside of the enterprise, from third parties such as customers and partners. Highly structured processes support these high-volume activities, such as accounts payable or customer claims processing.”
Business Content Services	“Business content drives the day-to-day workplace experience. Business content typically originates inside the enterprise... Business content includes familiar formats such as office documents, spreadsheets, email, and multimedia. The content may be formal (with structured templates or forms) or informal (created ad hoc). Key capabilities include flexible user interfaces, document management, team collaboration, and secure file sharing”.
Foundation Repository Services are table stakes for both ECM categories	“Core library services such as version and access controls, life-cycle management, metadata, and search continue to be essential capabilities for ECM in both the business and transactional content services submarkets. Increasingly, analytics, mobile app toolkits, and flexible interface design tools are highly desirable components. These core capabilities, expressed as APIs and services, are also fundamental to the emerging content platform market”.

Table 1 – Transactional & Business Content Services and Foundation Repository Services as defined by Forrester in The Forrester Wave™: Enterprise Content Management — Transactional Content Services, Q2 2017.

http://www.project-consult.de/sites/default/files/2017-04/Forrester_Wave_BCS_Business_Content_Services_4_2017.pdf

Chapter 3

The Internet of Everything (IoE) and Cyber-Physical Systems (CPS)

- The Internet of Everything (IoE)
- Cyber-Physical Systems (CPS)
- Introducing a Third Category – Digital Content Services

- **The Internet of Everything (IoE)**

What is the Internet of Everything? In simplistic terms, people, processes, data and things make up the four components of the Internet of Everything. Diagram 3 provides a snapshot of what each of the four components are related to.

In Diagram 3, we also note that people, processes and things are fuelled by data that is constantly being recognised, collected, exchanged, processed, analysed and responded to. For example data is responded to by rejoining, answering and/or triggering another ‘process’ and/or a ‘thing’ such as a sensor or object.

These activities are then fuelled by more data and so the process of recognising, collecting, exchanging, processing, analyzing and responding etcetera continues.

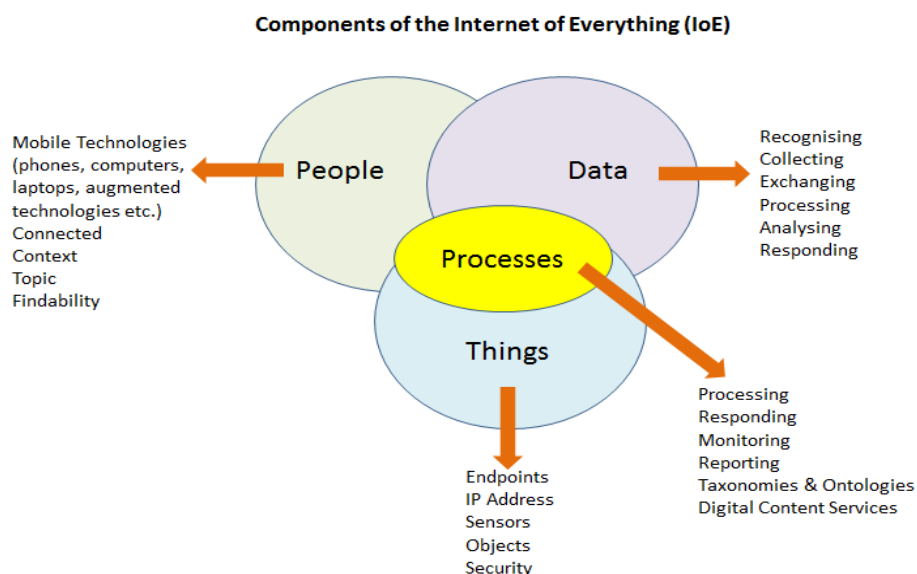


Diagram 3 – The four components of the Internet-of-Everything

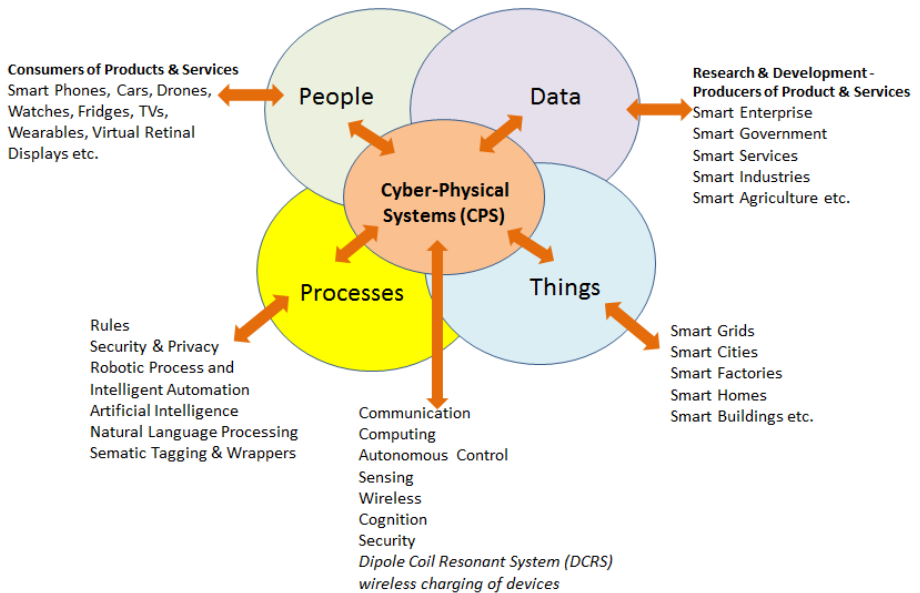
- **Cyber-Physical Systems (CPS)**

At the foundation the Internet of Everything are Cyber-Physical Systems (CPS). In diagram 4 we can see the essential role that cyber-physical systems play in transforming how we communicate and interact with the four components of the Internet of Everything people, processes, data and things.

Cyber-physical systems are transforming how we communicate and interact and are meshing the real and virtual worlds together.

A simple example of real and virtual worlds being meshed together is the mobile (cell) phone, which was simply a phone and today has morphed into the ubiquitous smart mobile phone. A smart mobile phone that is now a computer, GPS navigator, a banking tool, camera, TV, audio/video recorder, entertainment center, etcetera.

Cyber-Physical Systems and the Internet of Everything (IoE)



Wireless sensing, distributed actuation, network processing and sensing - bringing the real and virtual worlds together.

Diagram 4 – Example Cyber-Physical Systems the foundation of the Internet of Everything

Further, diagram 4 shows that the outcome of wireless sensing, omnipresent networks, sensors and the constant flow of real time data is constantly being pushed and pulled via cyber-physical systems.

Real time data is the backbone of smart products and services. It is the very lifeblood needed by ‘producers’ of smart products and services. It is also the essential source for their continued research and development

of new smart products and services. Real time data is the enabler for smart grids, cities, factories, homes, building and connected lifestyles for people who are the consumers of these smart products and services.

As suggested in Chapter 2 and can be seen from diagrams 3 and 4 the categories Transactional Content Services, Business Content Services and Foundation Repository Services are not addressing the arrival of the Fourth Industrial Revolution, the Internet of Everything (IoE) and the escalation of Cyber-Physical Systems (CPS).

With this in mind the author is introducing a third category 'Digital Content Services' which she believes will form the basis of Intelligent Information Management. See Chapter 4.

Chapter 4

Adding a Third Category – Digital Content Services

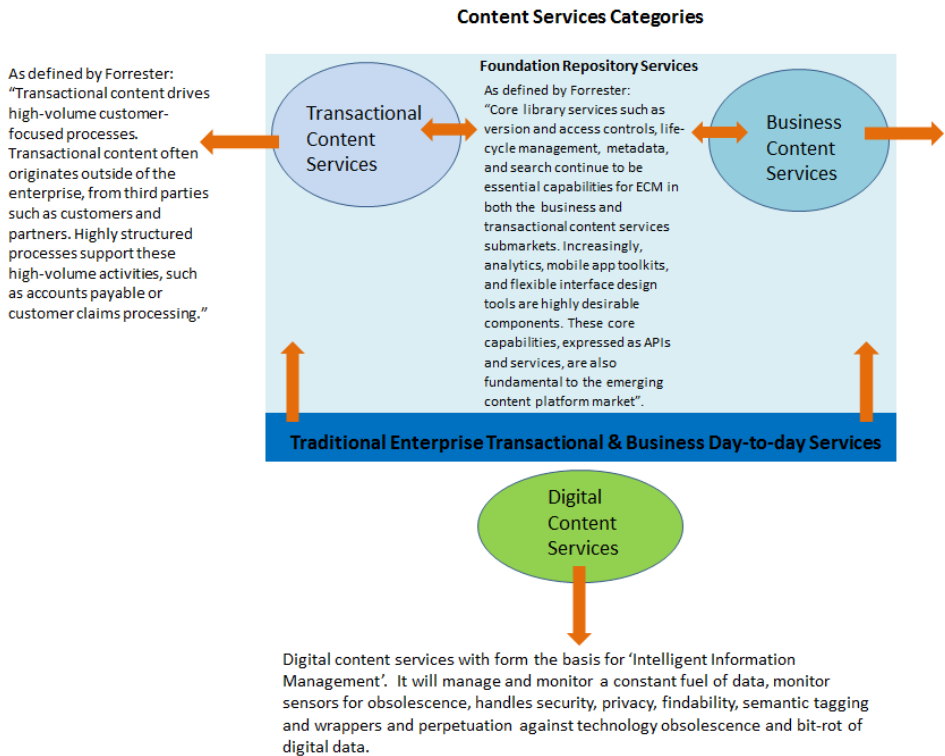
- Adding a Third Category – Digital Content Services.
- **Adding a Third Category - Digital Content Services**

Diagram 5 introduces the third category ‘Digital Content Services’. Digital content services will form the foundation for ‘Intelligent Information Management’. Digital content services will take a holistic view and consider a much bigger picture than Transactional Content Services and Business Content Services.

Digital Content Services has to encompass managing, protecting, storing and perpetuating the gargantuan amounts of digital data as an outcome of the Internet of Everything and Cyber-Physical Systems.

Digital Content Services will need to manage and monitor a constant flow of data, monitor sensors for obsolescence, handle security, privacy, findability, semantic tagging and wrappers and perpetuation

against technology obsolescence and bit-rot of digital data. (See Chapter 5 – Digital Content Services).



See Chapter 5.

Diagram 5 – Adding a Third Category - Digital Content Services – The basis for Intelligent Information Management

Chapter 5

Digital Content Services for Intelligent Information Management

- Digital Content Services for Intelligent Information Management
- **Digital Content Services for Intelligent Information Management**

Digital content services will form the foundation for 'Intelligent Information Management' and will take a holistic view of managing digital data assets. Digital content services for intelligent information management would need to manage the constant flow of real time data between and across the Internet of Everything and Cyber-Physical Systems.

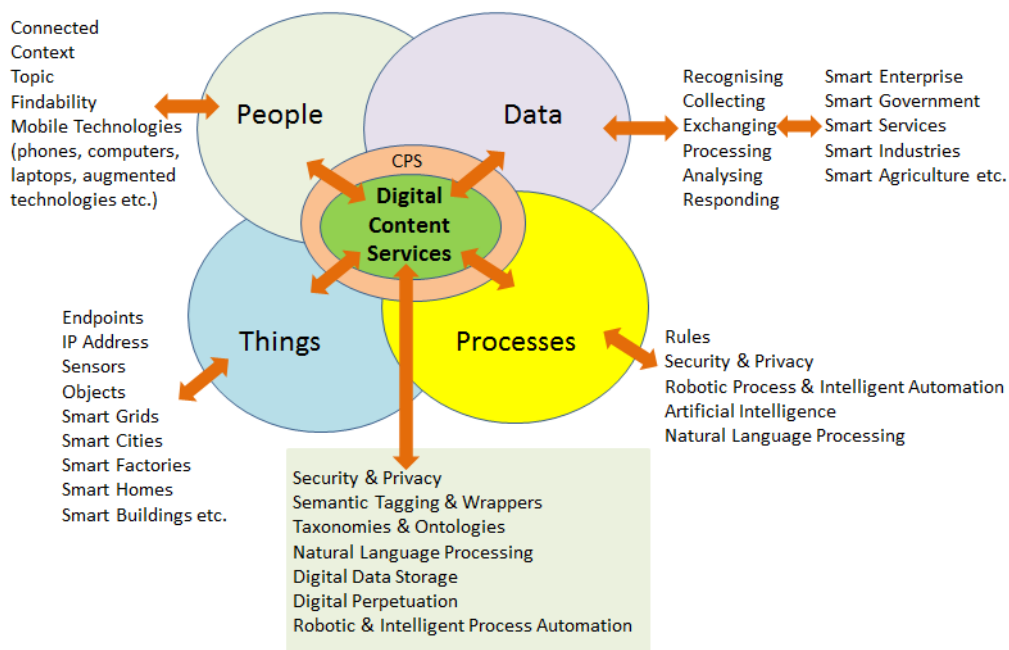
Real time data that is being recognised, collected, exchanged, processed etcetera not only between smart enterprises for day to day business activities but also for the production and management of smart products and services. Smart products and services that capture, exchange, and process data across smart grids, cities, factories, homes, buildings etcetera to consumers (people) who use smart phones, fridges, wearables and so on.

Visualising what digital content services might look like is not easy. However, Diagram 6 is attempting to represent what digital content services for intelligent information management could look like and introduces 7 elements that the author considers to be crucial components these are:

1. Security & Privacy
2. Semantic Tagging & Wrappers
3. Taxonomies & Ontologies
4. Natural Language Processing
5. Digital Data Storage
6. Digital Perpetuation
7. Robotic & Intelligent Process Automation

Diagram 6 also takes into consideration that digital content services for intelligent information management will need to manage, protect, store and perpetuate the vast amounts of digital data as an outcome of the Internet of Everything and Cyber-Physical Systems. Digital content services for intelligent information management will need to adopt new strategies, models and utilise technologies, analytics and evolving trends for the continued monitoring and reporting on sensor obsolescence, security, privacy, digital storage and perpetuation against technology obsolescence and bit-rot of digital data.

Digital Content Services for Intelligent Information Management



Digital Content Services Holistic View across Cyber-Physical Systems and the Internet of Everything

Diagram 6 – Sample Digital Content Services – Intelligent Information Management for Cyber-Physical Systems and the Internet of Everything

For more information on the 7 elements of digital content services for intelligent information management see Chapter 8.

Chapter 6

A Framework for Digital Content Services the Foundation for Intelligent Information Management

- A Framework for Digital Content Services the Foundation for Intelligent Information Management
- **A Framework for Digital Content Services the Foundation for Intelligent Information Management**

Digital Content Services will provide intelligent information management services for traditional transactional and business processes and activities as well as providing intelligent information management services across the internet-of-everything and cyber-physical systems.

Diagram 7 provides a Digital Content Services Framework for Intelligent Information Management. It highlights that Digital Content Services will provide intelligent information management services horizontally and vertically.

**Digital Content Services Framework
for Intelligent Information Management**

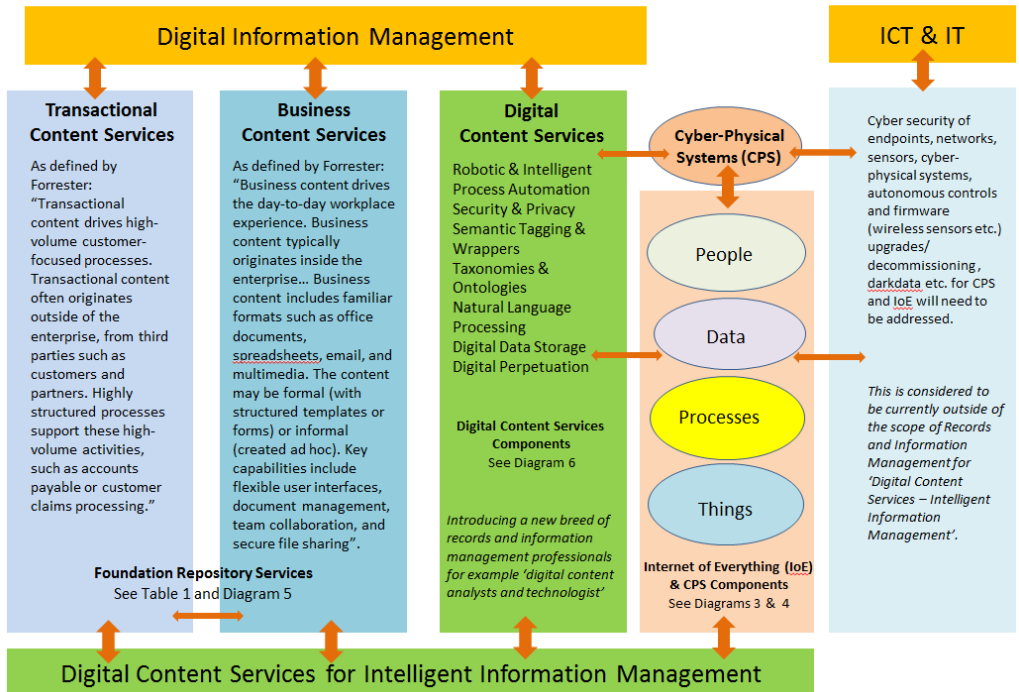


Diagram 7 –A Framework for Digital Content Services – Intelligent Information Management

It accentuates that Information Management (IM) professionals would be actively involved in the Digital Content Services for Intelligent Information Management. I envisage that Digital Content Services for Intelligent Information Management will bring together a new breed of IM professionals, for example 'digital content analysts and technologist'. IM

professionals skilled in the use of such tools and activities as Taxonomies & Ontologies, Semantic Tagging and Wrappers, Robotic and Intelligent Process Automation, Natural Language Processing and Digital Perpetuation. (See Chapter 8).

Diagram 7 also reflects that cyber security of endpoints, networks, sensors, cyber-physical systems and autonomous controls etcetera will need to be addressed by ICT & IT practitioners. These activities are currently considered to be outside the scope of IM professionals for Digital Content Services for Intelligent Information Management.

Another consideration will be the need to manage ‘dark data’. That is structured and unstructured data that over time can become disjointed, the meaning for which it was collected is nonexistent, data or records are forgotten and files are lost. This inactive information can include confidential, personal or sensitive information. (See Chapter 8).

Chapter 7

A World of Change

- Science fiction meets reality.
- What do we mean by digital?

- **Science Fiction meets Reality?**

Chapter 1 introduced the arrival of the fourth industrial revolution also known as Industry 4.0. The fourth industrial revolution will see the fields of quantum computing, robotics and artificial intelligence continue to grow.

Everything that can be connected will be connected, everything that can be digital will be digital, resulting in entire smart cities, smart governments, smart industries, products and services that are automated and autonomous. No one knows entirely what the future holds. We can however be certain that it will be beyond anything we can imagine today.

In this chapter we focus on ‘the world of change’ and one might be excused for thinking that you have suddenly stepped into a science fiction novel where the unbelievable is true.

The reality is our everyday lives are already being affected by new forms of far-reaching technologies, intelligent process automation, robot virtual workforces (chatbots and intelligent bots), natural language processing, artificial intelligence, drones, autonomous appliances and self-driving vehicles and these will continue to evolve.

We will see the rise of intelligent process automation which is underpinned by cognitive technologies which are able to understand natural language, recognise images, and can learn from observing humans. This will lead to the upsurge of intelligent bots that are not only able to search, find and answer questions but are able to continuously learn. Intelligent bots will have the ability to maintain systems and tasks and able to communicate at multiple levels between systems and people and systems to systems. Intelligent bots that have the potential to also become social robots in the future as they become more flexible and acquire social skills.

Another, example of science fiction meeting reality is the Jetsons who lived in Orbit City with their flying car (drone) that folded up into a brief case was just a 1960's TV series. Yet, flying drones are already here and the ability to fold up a drone into a brief case might become a reality sooner than one might think with the emergence of technologies such as 4D object printing. 4D object printing is where the fourth

dimension is time and objects can reshape or self-assemble themselves over time. These smart self-assembling materials can move, change shape and respond to stimuli or a trigger to start the transformation.

The augmentation of human and robot interactions will rise significantly as artificial intelligence; natural language processing, intelligent process automation and machine learning are precipitously embedded into robots, sensors and almost every aspects of society. Added to this are other innovations that are currently underway. These are experiments for DNA digital data storage (see Chapter 8) and the dipole coil resonant system (DCRS) wireless charging which has the potential to say goodbye to the power cord. A few decades ago all of these would have been in the realms of science fiction.

• What do we mean by Digital?

As we cross the boundaries between the real and the virtual worlds, autonomous robotics, machine learning robots and connected intelligent processes a continuous flow of *digital* data is being generated. (Also see Chapter 3).

This digital data is generated, processed, exchanged, transmitted and stored with digital technologies using a series of ones and zeros (bits and bytes). This

method of computation is also known as a binary system.

So what is digital? Basically, 'digital' means something that fundamentally is a string of ones and zeros. Such binary codes of ones and zeros can be encoded into words, music, audio, images, objects, sensors, applications, documents, web browsers or databases.

Chapter 8

Intelligent Information Management 2020 and Beyond

- Intelligent Information Management 2020 and Beyond
- A Brief Description of the 7 Elements of Intelligent Information Management
- **Intelligent Information Management 2020 and Beyond**

This chapter takes a futuristic view of what intelligent information management might look like in 2020 and beyond. Diagram 8 shows the 7 elements of ‘intelligent information management’ as introduced in Chapter 5. The 7 elements are:

1. Security & Privacy
2. Semantic Tagging & Wrappers
3. Taxonomies & Ontologies
4. Natural Language Processing
5. Digital Data Storage
6. Digital Perpetuation
7. Robotic & Intelligent Process Automation

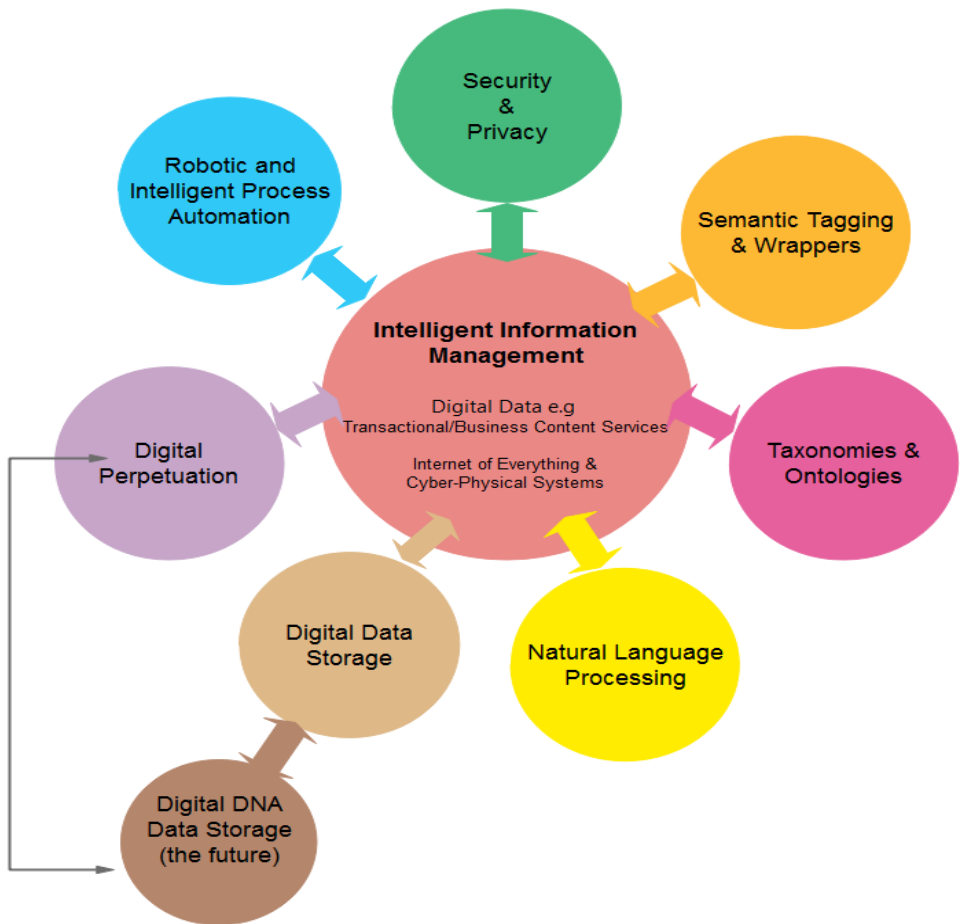


Diagram 8 – 7 Elements for Intelligent Information Management
(including possible Digital DNA Storage for the future)

- **Brief Description of the 7 Elements of Intelligent Information Management**

Digram 8 introduced the 7 elements of Intelligent Information Management. The following will provide a brief description of each of the 7 elements.

1. Security and Privacy.

Privacy may have different meanings due to factors such as context, prevailing social standards, and geographic locations. Whilst privacy is very often united with security; they are two separate concepts. In the context of business, security is about protecting information from loss, or unintended or unauthorised access, use or sharing whereas privacy is about the appropriate collection, use and sharing of personal information to accomplish business tasks.

The importance of these two ideas intersects for the customer if their personal data is not safeguarded against external malicious breaches, inadvertent internal breaches and/or third party partner breaches.

▪ What is Personal Data in the Digital Age?

Personal data stem from three data types these are self-reported, digital exhaust and profiling data (see Table 2).

Type	Description
Self-reported data	Information people volunteer about themselves, such as their email address, work, education, age and gender.
Digital exhaust data	For example, location data, browsing history which is created when using mobile devices, web services or other connected technologies.
Profiling data	Personal profiles used to make predictions about individuals' interests and behaviours which are derived by combining self-reported, digital exhaust and other data.

Table 2 – Personal data types in the digital age

Personal data is described in privacy and information security circles as information that can be used on its own or with other information to identify, contact or locate a single person or to identify an individual in context.

With the advent of rich geo-location data and associative analysis such as facial recognition the magnitude of personal data collected is greatly expanded and so are challenges for security in protecting such information from loss, or unintended or unauthorised access, use or sharing. Coupled with this, a further privacy challenge is the need to comply with a range of conflicting regulations on privacy especially as privacy regulations can vary by region and country.

- **What is cyber-security?**

As previously expressed in the context of business, security is about protecting information from loss, or unintended or unauthorised access, use or sharing. This is in contrast to ICT cyber-security which is defined as the protection of systems, networks and data in cyberspace.

2. Semantic Tagging and Wrappers.

This section will not be addressing the topic of metadata. Although metadata enables the creation, registration classification, access, preservation and disposal of digital records or can be used to tag a web page(s) that link documents to documents is important it is not the primary focus of this section. The focus of this section is on the future use of semantic tagging and wrappers.

Semantic tagging is often interchanged with semantic indexing in the context of ‘findability’. Semantic tagging can be defined as tagging for the semantic web (the internet of everything) with a primary focus of tagging ‘information’ objects as a whole and linking data with data.

From an intelligent information management perspective semantic tagging would not only incorporate tagging information assets such as documents/records at birth but also tagging digital data being pushed and pulled via the internet of everything and cyber-physical systems.

It will require collecting all the related data during the complete life cycle across multiple systems. Through robotic and intelligent automated processing and analytics it will be constantly monitoring for technology obsolescence and bit-rot of digital data. It will constantly be reassessing the value of the information and re-evaluating retention periods.

At the end of the information lifecycle a ‘wrapper’ containing all the information captured during the complete life cycle would be wrapped around the complete ‘object’. Wrappers would encase the complete object and also provide the foundation for active digital perpetuation. (See Digital Perpetuation).

Wrappers would create a header and other information for packaging the ‘object’ (e.g. a block of digital data) for digital DNA storage. The wrapper embedded in DNA molecules would also provide the relevant information needed for searching, finding, unwrapping and using the information for the future. (See Digital DNA Data Storage).

3. Taxonomies and Ontologies.

A taxonomy can be described as a collection of controlled vocabulary terms that are organised into a hierarchical structure. Taxonomies can be seen as a standalone ‘tree’ whilst ontologies are more like a ‘forest’ that is ontologies can house a number of taxonomies.

Today’s information architecture approaches have in large retained a narrow, web-centric view of using a taxonomy for searching, organising and navigating content in pages within a business web page on the internet.

Unfortunately, information architecture and the use of taxonomies as we currently use them is not ready for the massive scale and huge amounts of data streamed from the physical world and the new communication patterns it creates. This traditional approach will be no longer flexible for the world of the internet of everything.

New information architecture structures will be required in order to build and link taxonomies and ontologies for interoperability and findability between traditional services, the internet of everything and cyber-physical systems. New information architecture structures that provide, build and link taxonomies and ontologies for smart cities, smart governments, smart industries, products and services.

4. Natural Language Processing.

Natural language processing allows a virtual bot to converse in natural language, respond to queries, understand questions and perform detailed step-by-step activities for certain processes. A virtual bot is a conversational online avatar that can simulate a conversation to deliver voice or text-based engagement on any web application or mobile interface. A virtual bot is able to continue to learn and if programmed are capable of understanding different languages. Additionally, virtual bots can generate reports showing the frequently asked queries, unanswered or new enquiries and the level of

customer satisfaction with the responses. This is in contrast to a chat bot which responds with text scripts only.

In the context of ‘intelligent information management’ a virtual bot through natural language processing could answer questions, perform routine tasks and provide reports. Through continuous improvements and intelligent process automation virtual bots could perform non-routine tasks, monitor processes across sensors etcetera could undertake diagnostics and continuously monitor touch points, provide alerts, reports etcetera.

▪ **Relationship of Taxonomies & Ontologies to Natural Language Processing?**

Looking to the future ontologies and taxonomies can be viewed as providing the platform to take advantage of natural language processing (NLP).

By bridging the gap between the repository of questions and answers opportunities can arise to create bot-scripts for intelligent virtual bots to not only search, retrieve and answer intelligent information management questions and perform complex tasks but also have the ability to maintain multiple systems and complete multiple tasks.

5. Digital DNA Data Storage for the future.

So what is Digital DNA data storage? Digital DNA data storage is the process of encoding binary data by converting binary digits (bit) of 1 (one) and 0 (zero) to letters. Each individual bit is converted to C or T for 0 (zero) and A or G for 1 (one). See Diagram 9.

The letters A, C, G and T represent the 4 main compounds found in DNA these are adenine, cytosine, guanine, and thymine. To recover the data the reverse process is undertaken that is sequencing (determining the order of the four bases in the strand of DNA) then decoding the letters A, C, G and T back to the original sequence of bits of 1 (one) and 0 (zero).

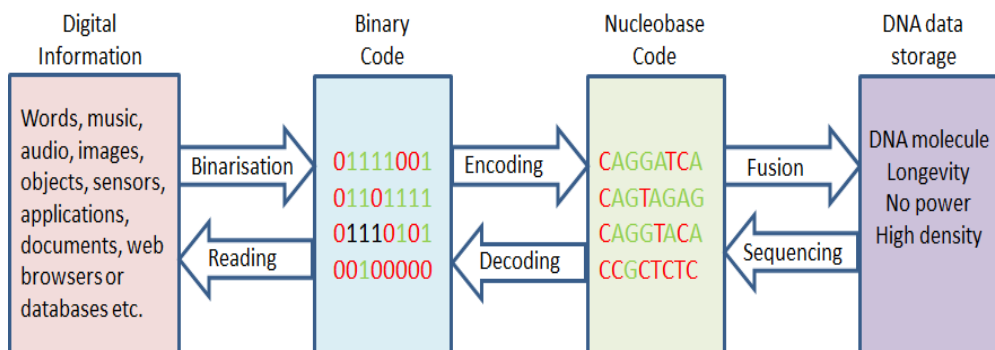


Diagram 9 - Encoding and decoding binary code to nucleobase code for Digital DNA data storage.

The future is already here. Digital DNA storage whilst still in its infancy is a reality. For example Microsoft in collaboration with researchers from the University of Washington have come up with digital DNA storage as a technique for storing data and increasing digital storage capacities.

We are at the frontier of something tremendous, the digital world of the future with robots recalling data, information, audio, pictures, videos etc. from wrappers embedded in DNA molecules for digital data storage. Digital DNA data storage that could last for thousands of years without degrading and which could be recovered by robots, people or information archaeologist for many generations to come. After all why not? DNA has been reliably safeguarding genetic information for millions of years.

6. Digital Perpetuation.

As we move forward the challenge will be how to sift through the volumes of digital data, find, read and unlock its value given the fast pace of technology change and the shortening of time in which storage formats, digital data formats and technology become obsolete. Moreover, digital data can be prone to unseen damage where a 1 (one) may randomly change to a 0 (zero) due to digital obsolescence.

Other factors, such as business trends to swap from one Software as a Service (SaaS) product to another,

will require numerous migrations creating a potential risk called bit-flip or bit-rot. Bit rot is insidious and can be due to bits in the files being 'flipped' producing minor errors that are impossible to correct making data/files unreadable into the future.

Executives need to understand the difference between digital perpetuation and digital preservation. Digital perpetuation is the process of 'actively' preserving digital data assets from 'obsolescence' and 'bit rot'. Digital perpetuation will be an essential process for business for their continued existence into the future.

Digital preservation is the formal task of ensuring that digital information such as archives, books, collections, artefacts, analogue, digitised and born digital records of continuing value remain findable, accessible, readable and usable. It is usually the domain of information and record management professionals, archivist, librarians and curators.

The following definitions in Table 3 have been sourced from the internet and may help in understanding the differences.

What is Preservation? Meaning/definition - Cambridge English Dictionary.	The act of keeping something the same or of preventing it from being damaged.
What is Perpetuation? Meaning/definition - Askdefine online English dictionary.	The act of prolonging something; "there was an indefinite prolongation of ... The act of prolonging existence, of keeping something alive or active.

Table 3 – Definition of Preservation & Perpetuation.

Table 4, highlights the people, process and technologies used in digital perpetuation and digital preservation. As we move to Web 4.0 and beyond, digital perpetuation will have a heavy dependency on analytical tools for managing, assessing and reporting on the continued value of digital assets to the business, much the same way as Big Data analytics.

Whilst the same active preservation and analytic tools might be used for both digital perpetuation and digital preservation, how they are applied will be fundamentally different. Digital perpetuation analytical tools will be essential for enterprise profitability and continued sustainability.

Accountability	Culpability	Activity	Technology/Tools
Executives and Digital Risk Officer.	Digital Perpetuation Enterprise (Private and Public)	Active preservation. Digital data assets & Digital Risk Management.	Automated ‘active preservation’ technologies and analytic tools for enterprise profitability and continued sustainability.
Responsibility	Task	Activity	Technology/Tools
Archivist, Curators, Librarians & Record Managers.	Digital Preservation Archives, Educational Institutions, Libraries & Museums.	Archiving and Long Term Preservation. Archives, Books/ Collections, Records & Artefacts.	Technology tools for managing the process of long term preservation.

Table 4 - People, process and technologies for digital perpetuation and digital preservation.

7. Robotic Process Automation (RPA) and Intelligent Automation (IA)

Robotic-led process automation (RPA) is a way to automate routine tasks that are transactional, repetitive and often rules based processes. RPA software robots, ‘bots’ for short, can interact with business applications but they must follow a highly systematic set of instructions and simple conditional logic. RPA software robots are not humanoid robots nor something that can entirely replace humans they are however able to replicate some human cognitive functions.

There are two streams, robotic process automation (RPA) and intelligent automation (IA). Both RPA and IA have the potential to make processes smarter and more efficient in very different ways. (See Chapter 9). Neither RPA nor IA solutions replicate human reasoning, they only follow pre-programmed processes. Table 5 describes the differences between RPA and IA.

Robotic Process Automation (RPA)	Intelligent Automation (IA)
Routine	Non-Routine
Automates tasks that are routine such as systematic, repetitive, transactional, rules-based	Automates tasks that are non-routine and require thoughtful consideration.
Is able to follow instructions	Is able to come to a conclusion
They are software ‘robots’ that plug into, and access, existing business software	

Table 5 - Describing the differences between RPA and IA.

Chapter 9

Robotic and Intelligent Process Automation

- Robotic Process Automation (RPA) Vs Traditional Business Process Management (BPM) projects
 - Advantages of Robotic Process Automation
 - How might you embark on a Robotic Process Automation (RPA) Journey?
 - Moving towards the next platform – Intelligent Automation (IA)
-
- **Robotic Process Automation (RPA) Vs Traditional Business Process Management (BPM) projects**

Traditionally, business process management (BPM) projects focussed on re-engineering the underlying processes to drive efficiencies, in most cases resulting in building new applications to replace existing legacy business applications. Whereas, robotic processes automation (RPA) on the other hand focuses on automating routine manual intensive processes without changing or replacing existing legacy business applications and freeing up a human full

time employee (FTE) to concentrate on other more complex tasks.

- **Advantages of Robotic Process Automation**

Advantages of robotic process automation (RPA) over traditional approaches are:

- RPA is a good candidate for almost any organisation that has a number of different business systems involved in routine transactional repetitive, rules-based processes. It helps to provide higher productivity benefits.
- Utilising RPA robots as a virtual workforce offers organisations an alternative to 'outsourcing' which in turn can result in lower operating costs.
- RPA technology tracks and monitors all tasks enabling improved compliance and controls and helping companies to meet audit and regulatory requirements.

- RPA technology has the potential to help management in redefining workforce roles, redesigning organisational structures and enabling cross-functional collaboration for the new jobs of the future. Enabling organisations to develop new business models and building a new workforce that integrates a RPA robot virtual workforce and humans in new ways.
- **How might you embark on a Robotic Process Automation (RPA) journey?**

Embarking on a RPA journey requires considering several questions. Using the 5WH methodology of What, Why, Where, How, Who and When. Table 6 provides an example of questions you might ask when embarking on a RPA project.

Question	Description	Considerations
What	Automation opportunities	<ul style="list-style-type: none"> • Which process are the best candidates for robotic process automation? • Which process would be most suitable for a robotic process automation pilot?
Why	Prepare a business case	<ul style="list-style-type: none"> • What are the benefits of RPA? • What are the pain points that can be erased?
Where	Establish the best place to start	<ul style="list-style-type: none"> • Where will the best gains be achieved?
How	Determine the best operating model for your business	<ul style="list-style-type: none"> • Who will manage and monitor the software robot?
Who	Identify the best supplier in the RPA space	<ul style="list-style-type: none"> • Who are the main providers who cater for your specific business needs in the RPA space?
When	Plan the automation time line	<ul style="list-style-type: none"> • How long should your pilot be? • What is your strategy for the future?

Table 6 – The six building blocks for consideration for RPA journey

- **Moving towards the next platform – Intelligent Automation (IA)**

The advantages of Intelligent Automation (IA) over traditional approaches will be the capability of automating non-routine tasks that require making decisions based on systematic consideration. Intelligent Automation (IA) is underpinned by powerful analytics and cognitive technologies which are able to understand natural language, recognise images, and can learn from observing humans.

When intelligent automation (IA) is integrated with robotic process automation (RPA) these combined cognitive technologies result in robotic virtual workforces or virtual bots. The use of virtual bots is fast becoming the norm, with virtual bots sprouting up everywhere.

With future of intelligent and social robots on the horizon these intelligent and social robots will not only be able to directly assist people in the performance of non-routine and automated tasks but be able to take on complex tasks and manage systems at multiple levels. In some cases this will replace the need for humans in some industries.

Chapter 10

Skills for the Intelligent Information Management Transition

- Skills for the Intelligent Information Management Transition
- **Skills for the Intelligent Information Management Transition**

With the onslaught of the fourth industrial revolution the internet of everything (IoE) digital skills requirements may vary from one organisation to another based on their digital maturity and digital transformational capability.

Depending on these factors the digital workforce may require a fusion of technology, business, adaptability, critical thinking, problem solving, communication, entrepreneurialism, innovation, interpersonal and leadership skills.

Providing a digital workforce with these digital transformation skills will require understanding future educational and professional development needs and packaging these components into three general categories ‘working, thinking and tools’.

Table 7 provides a sample breakdown for each of the three categories, working, thinking and tools.

Working	<ul style="list-style-type: none"> • Business savvy • Agile – Adaptable • Entrepreneurialism/Intrapreneurialism • Leadership • Communication • Interpersonal, collaboration, teamwork • Lifelong learning, personal management and well-being
Thinking	<ul style="list-style-type: none"> • Creativity and innovation • Critical thinking, problem solving and decision making
Tools	<ul style="list-style-type: none"> • Technology • Information literacy • Digital and technology literacy • Analytics

Table 7 – Sample skills for the digital workforce

The transformation to intelligent information management will be challenging and will require strong digital leadership to navigate and drive the evolution of these new digital jobs. Intelligent information management leaders may need to take on an entrepreneurial mind-set in order to successfully drive these changes and be able to persuade,

encourage, support and enthuse the embryonic intelligent information management workforce through this period of upheaval. Table 8 provides a sample of some leadership skills.

Leadership Transformation	<ul style="list-style-type: none"> ✓ Redefine workforce roles for the new digital workforce ✓ Identify the digital skill gap within the workforce ✓ Produce a digital skills catalogue ✓ Redesign organisational structures ✓ Redesign, develop and communicate new educational and professional development models and packages ✓ Reconsider traditional diversity thinking in the era of intelligent automation and a growing robotic virtual workforce ✓ Enable cross-functional collaboration
Leadership Digital Skills Advocacy	<p>Embracing and promoting the three general categories ‘working, thinking and tools’. See Table 7 - Skills for the digital workforce.</p>

Leadership Entrepreneurial/ Intrapreneurial	<ul style="list-style-type: none"> ✓ Persuade, encourage, support and enthuse teams ✓ Become the instrument of change ✓ Manage, organise and solve current problems and relevant issues ✓ Take a concept and convert it into a reality ✓ Become the champion of the new digital project, policy, process, product or solutions ✓ Share and collaborate ✓ Learn from mistakes
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Table 8 – Sample Leadership Skills

The digital content services for Intelligent Information Management is full of opportunities and especially if we embrace the changes that robotics, smart cities and smart industry bring. The 7 elements of Intelligent Information Management are new and evolving concepts requiring new rules, new tools and new ways of thinking, working , upskilling and reskilling current and future workforces.

Government, enterprise and academia need to ensure that they are ready, agile and able to meet the demands and challenges of a global digital world and meet the needs of an outcome economy.



Digital Content Services

Intelligent Information Management For the Fourth Industrial Revolution

This eBook is for anyone that has an interest in the future of all things digital, managing information into the future and those people who like me have a fascination of how the world might look like in the wave of the fourth industrial revolution and the internet of everything.

Linda Shave, BizWyse®, 2017

